NASA

Energy
A Continuing
Bibliography
with Indexes

NASA SP-7043(40)
January 1984

National Aeronautics and
Space Administration

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ACCESSION NUMBER RANGES

Accession numbers cited in this Supplement fall within the following ranges.

STAR (N-10000 Series)	N83-30354 - N83-37053
IAA (A-10000 Series)	A83-40666 - A83-50211

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NASA SP-7043(40)

ENERGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

Issue 40

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced between October 1 and December 31, 1983 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

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INTRODUCTION

This issue of *Energy: A Continuing Bibliography with Indexes* (NASA SP-7043(40)) lists 775 reports, journal articles, and other documents announced between October 1, 1983 and December 31, 1983 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of this continuing bibliography was published in May 1974.

The coverage includes regional, national and international energy systems; research and development on fuels and other sources of energy; energy conversion, transport, transmission, distribution and storage, with special emphasis on use of hydrogen and of solar energy. Also included are methods of locating or using new energy resources. Of special interest is energy for heating, lighting, for powering aircraft, surface vehicles, or other machinery.

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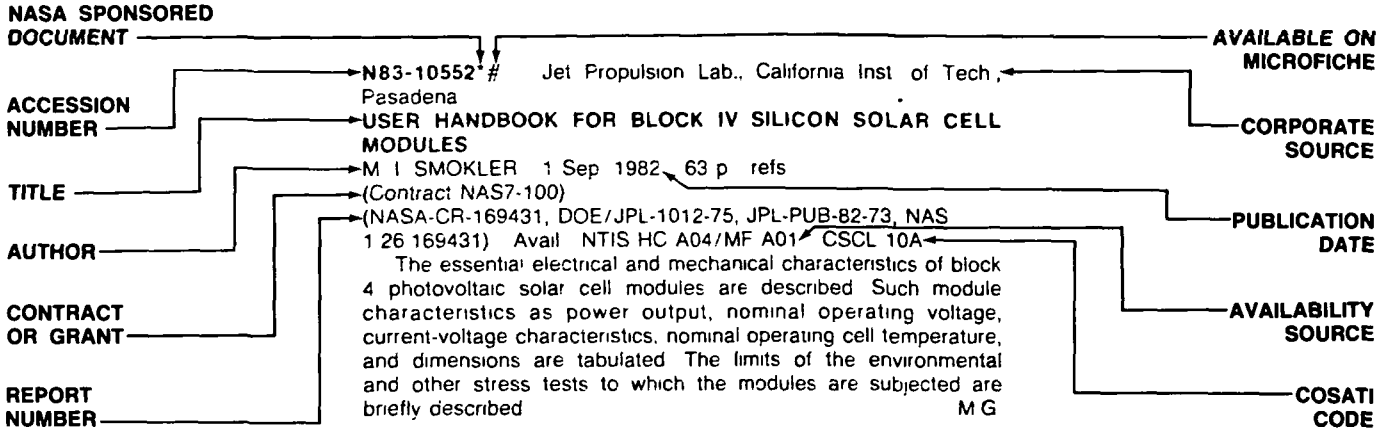

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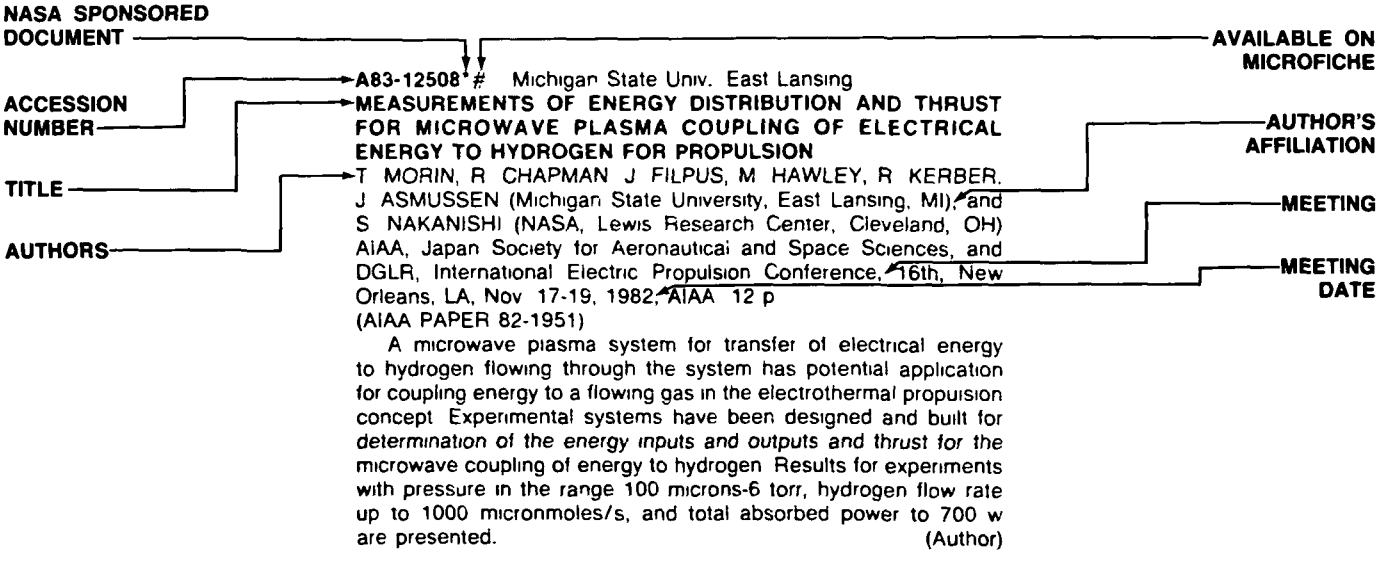

A Listing of Energy Bibliographies Contained in This Publication:

ENERGY

A Continuing Bibliography (Issue 40)

JANUARY 1984

01

ENERGY POLICIES AND ENERGY SYSTEMS ANALYSIS

Includes energy requirements, energy conservation, and environmental impacts of energy systems.

A83-41679*# Lockheed-California Co , Burbank.
AN ADVANCED CONTROL SYSTEM FOR A NEXT GENERATION TRANSPORT AIRCRAFT
J. J. RISING, W. J DAVIS (Lockheed-California Co., Burbank, CA), and W. D. GRANTHAM (NASA, Langley Research Center, Hampton, VA) IN Guidance and Control Conference, Gatlinburg, TN, August 15-17, 1983, Collection of Technical Papers . New York, American Institute of Aeronautics and Astronautics, 1983, p 195-209.
(AIAA PAPER 83-2194)

The use of modern control theory to develop a high-authority stability and control system for the next generation transport aircraft is described with examples taken from work performed on an advanced pitch active control system (PACS). The PACS was configured to have short-period and phugoid modes frequency and damping characteristics within the shaded S-plane areas, column force gradients with set bounds and with constant slope, and a blended normal-acceleration/pitch rate time history response to a step command. Details of the control law, feedback loop, and modal control syntheses are explored, as are compensation for the feedback gain, the deletion of the velocity signal, and the feed-forward compensation Scheduling of the primary and secondary gains are discussed, together with control law mechanization, flying qualities analyses, and application on the L-1011 aircraft M.S K.

A83-43370
TECHNICAL, ECONOMIC AND LEGAL ASPECTS OF WIND ENERGY UTILIZATION
G. M. OBERMAIR (Regensburg, Universitaet, Regensburg, West Germany) and L. JARASS (Regensburg, Universitaet, ATW, Regensburg, West Germany) Wind Engineering (ISSN 0309-524X), vol. 7, no. 2, 1983, p. 99-103 refs

Potentially problematical areas of the implementation of wind turbines for electricity production in West Germany are identified and briefly discussed. Variations in wind generator output due to source variability may cause power regulation difficulties in the grid and also raise uncertainties in utility capacity planning for new construction. Catastrophic machine component failures, such as a thrown blade, are hazardous to life and property, while lulls in the resource can cause power regulation capabilities only when grid penetration has reached significant levels Economically, the lack of actual data from large scale wind projects is cited as a barrier to accurate cost comparisons of wind-derived power relative to other generating sources, although breakeven costs for wind power have been found to be $2000/kW installed capacity, i.e., a marginal cost of $0 10/kW. M S.K.

A83-43639* Bionetics Corp , Hampton, Va.
EVALUATION OF HUMAN EXPOSURE TO THE NOISE FROM LARGE WIND TURBINE GENERATORS
K. P SHEPHERD, F. W. GROSVELD (Bionetics Corp , Hampton, VA), and D. G STEPHENS (NASA, Langley Research Center, Hampton, VA) Noise Control Engineering Journal (ISSN 0736-2501), vol 21, July-Aug 1983, p. 30-37 refs

The human perception of a nuisance level of noise was quantified in tests and attempts were made to define criteria for acceptable sound levels from wind turbines. Comparisons were made between the sound necessary to cause building vibration, which occurred near the Mod-1 wind turbine, and human perception thresholds for building noise and building vibration. Thresholds were measured for both broadband and impulsive noise, with the finding that noise in the 500-2000 Hz region, and impulses with a 1 Hz fundamental, were most noticeable. Curves were developed for matching a receiver location with expected acoustic output from a machine to determine if the sound levels were offensive. In any case, further data from operating machines are required before definitive criteria can be established M S.L.

A83-43743
WEIGHT REDUCTION FOR FUEL ECONOMY
N. J. CARRAWAY (Lockheed-California Co., Burbank, CA) Society of Allied Weight Engineers, Annual Conference, 41st, San Jose, CA, May 17-19, 1982 13 p.
(SAWE PAPER 1469)

The dramatic increases in the average cost of jet fuel during the time from 1967 to 1981 have made fuel cost a critical factor in the determination of the direct operating cost (DOC) of an aircraft. A reduction in fuel consumption as a result of efforts to decrease the operating empty weight of the aircraft will, therefore, lead to a significant reduction of the DOC. Suitable approaches for achieving such a reduction in the aircraft weight are considered. Attention is given to the incorporation of new generation light weight passenger seats, new digital avionics equipment, a use of assemblies made from composite material when replacing damaged or worn parts, and the removal of parts no longer required It is shown that fuel can also be saved by making appropriate changes with respect to the center of gravity G.R.

A83-44358#
WING TIP DEVICES FOR ENERGY CONSERVATION AND OTHER PURPOSES EXPERIMENTAL AND ANALYTICAL WORK IN PROGRESS AT THE LOCKHEED-GEORGIA COMPANY
G W. WEBBER and T. DANSBY (Lockheed-Georgia Co , Marietta, GA) (Canadian Aeronautics and Space Institute, Annual General Meeting, 29th, Toronto, Canada, May 4, 1982) Canadian Aeronautics and Space Journal (ISSN 0008-2821), vol. 29, June 1983, p. 105-120 refs

Winglet devices tested at Lockheed to reduce the drag on aircraft are described. The winglets also perform a stability, control, or active flutter suppression function, and can be added to existing aircraft The winglets introduce a secondary surface in the tip region and interact with the trailing tip vortices, reducing the lift-dependent drag. They can be applied in winglet, vortex diffuser, and sail configurations, and can feature discrete surfaces. Benefits are currently highest on aircraft where the span is kept as low as possible, of particular concern with specific types of military aircraft

Wind tunnel experiments with differently shaped winglets are detailed. M S K

A83-45064
ENERGY TECHNOLOGY X - A DECADE OF PROGRESS; PROCEEDINGS OF THE TENTH CONFERENCE, WASHINGTON, DC, FEBRUARY 28-MARCH 2, 1983
R. F. HILL, ED (Bridgeport, University, Bridgeport, CT) Rockville, MD, Government Institutes, Inc., 1983, 1501 p

The characterization, development, and availability of various energy sources for large scale energy production are discussed. Attention is given to government, industry, and international policies on energy resource development and implementation Techniques for energy analysis, planning, and regulation are examined, with consideration given to conservation practices, military energy programs, and financing schemes. Efficient energy use is examined, including energy and load management, building retrofits, and cogeneration installations, as well as waste heat recovery. The state of the art of nuclear, fossil, and geothermal power extraction is investigated, with note taken of synthetic fuels, fluidized bed combustion, and pollution control in coal-powered plants. Finally, progress in renewable energy technologies, including solar heating and cooling, biomass, and large and small wind energy conversion devices is described No individual items are abstracted in this volume M S.K.

A83-46318
SOLAR POWER SATELLITES AND SECURITY CONSIDERATIONS - THE CASE FOR MULTILATERAL AGREEMENTS
P. G. DEMBLING and D. D. SMITH (Schnader, Harrison, Segal and Lewis, Washington, DC) Journal of Space Law, vol 11, Spring-Fall 1983, p. 73-82 refs

The military implications of a solar power satellite system (SSPS) are discussed The SSPS could potentially become a target for a hostile nation, as well as become a powerful weapon if reconfigured, able to attack both space and terrestrial targets Multilateral agreements in the form of binding, nonbinding, and charters may be signed between nations. The documents often contain provisions which permit withdrawal from agreement under specific circumstances A binding version is cited as most favorable to prevent SSPS from being configured as weapons Nations may develop military capabilities to protect themselves against SSPS if the U S. should decide to build one One negotiating position could be removal of the SSPS from appropriation jurisdiction of the Outer Space Treaty. A difficulty may arise if on-site, live-in inspection is required, as it is expressly discouraged in the U.S. Constitution M S K.

A83-48174
SAVING FUEL WITH THE WIDE-CHORD FAN
J. CUNDY (Rolls-Royce, Ltd , Derby, England) Aeronautical Journal (ISSN 0001-9240), vol. 87, Aug -Sept. 1983, p 272-276.

The wide-chord compressor fan developed for use in the 545E4 jet engine for the Boeing 757 beginning in 1984 is characterized. The design parameters include diameter = 188 cm, pressure ratio = 1.6-1.8, air flow = 523 kg/sec, and blade-tip speed = Mach 1 5. The blade chord is increased by one half relative to previous fans, allowing the number of blades to be reduced from 33 to 22 and midblade snubbers to be eliminated. A lightweight construction consisting of Ti-alloy plates jointed to a Ti-alloy honeycomb core by activated diffusion bonding is employed Aerodynamic, strength, fatigue-strength, blade-retention, and bird-ingestion tests have been successfully completed, and the fan has been shown to contribute about 4 percent to the 10-percent overall fuel savings achieved by the 545E4 T.K.

A83-48760* Harvard Univ , Cambridge, Mass.
ATMOSPHERIC COMPOSITION - INFLUENCE OF BIOLOGY
M B. MCELROY (Harvard University, Cambridge, MA) (European Geophysical Society, Meeting on the Structure of the Upper and Middle Atmosphere, Leeds, England, Aug 23-27, 1982) Planetary and Space Science (ISSN 0032-0633), vol 31, Sept. 1983, p. 1065-1074. refs
(Contract NSF DEB-79-20282; NAG1-55)

The variability of atmospheric constituents influenced by biological organisms over various time scales is examined, together with the human contribution to atmospheric sulfur. The biogeochemistry of nitrogen is discussed, with an emphasis on N2O, NO, and microbially mediated reactions in soil and water. Carbon species are bound up mainly in sediments and the deep ocean, but human activities involving combustion may cause a doubling of the atmospheric levels of CO2 in the near future, which could produce a general low-level atmospheric warming. Longer term measurements are required to assess the effects of CH4 augmentation in the atmosphere through fuel combustion. Coal burning effectively doubles the amount of SO2 produced by natural sources, and reduces the pH of rainwater, thus posing hazards to fish, plankton, and mollusc life. D.H.K.

A83-50192
MEASUREMENTS OF BENZENE, TOLUENE AND XYLENES IN URBAN AIR
B M. WATHNE (Norwegian Institute for Air Research, Lillestrom, Norway) Atmospheric Environment (ISSN 0004-6981), vol. 17, no. 9, 1983, p 1713-1722 Research supported by the Norwegian State Pollution Control Authority refs

Measurements of the benzene, toluene, and xylenes content in Oslo, Norway air were made in 1980 to establish a data base for future comparisons when these compounds would be added to automotive fuels as an octane boost. The samples were taken through charcoal filters, with samples being analyzed with gas chromatography. Data were taken in March and September, and attention was given to diurnal variations. The benzene concentrations varied from 4-114 micrograms/cu m, while the aromatics concentrations were in the 1-210 micrograms/cu m range. Benzene and toluene exhibited higher concentrations in the late summer than in March Additionally, a higher correlation of ambient air benzene concentration was present in the late summer than in March. M.S.K

N83-30427*# United Technologies Corp , East Hartford, Conn Commercial Products Div
ENERGY EFFICIENT ENGINE LOW-PRESSURE COMPRESSOR COMPONENT TEST HARDWARE DETAILED DESIGN REPORT
C. J. MICHAEL and J E. HALLE Jun 1981 80 p refs
(Contract NAS3-20646)
(NASA-CR-165354; NAS 1.26:165354; PWA-5594-157) Avail NTIS HC A05/MF A01 CSCL 01E

The aerodynamic and mechanical design description of the low pressure compressor component of the Energy Efficient Engine were used. The component was designed to meet the requirements of the Flight Propulsion System while maintaining a low cost approach in providing a low pressure compressor design for the Integrated Core/Low Spool test required in the Energy Efficient Engine Program The resulting low pressure compressor component design meets or exceeds all design goals with the exception of surge margin. In addition, the expense of hardware fabrication for the Integrated Core/Low Spool test has been minimized through the use of existing minor part hardware. Author

N83-30429*# Pratt and Whitney Aircraft Group, East Hartford, Conn.

ENERGY EFFICIENT ENGINE HIGH-PRESSURE TURBINE SINGLE CRYSTAL VANE AND BLADE FABRICATION TECHNOLOGY REPORT

A. F. GIAMEI, R W. SALKELD, and C W. HAYES Jul. 1981 112 p refs

(Contract NAS3-20646)

(NASA-CR-165400; NAS 1 26:165400; PWA-5594-152) Avail: NTIS HC A02/MF A01 CSCL 21E

The objective of the High-Pressure Turbine Fabrication Program was to demonstrate the application and feasibility of Pratt & Whitney Aircraft-developed two-piece, single crystal casting and bonding technology on the turbine blade and vane configurations required for the high-pressure turbine in the Energy Efficient Engine During the first phase of the program, casting feasibility was demonstrated. Several blade and vane halves were made for the bonding trials, plus solid blades and vanes were successfully cast for materials evaluation tests Specimens exhibited the required microstructure and chemical composition. Bonding feasibility was demonstrated in the second phase of the effort Bonding yields of 75 percent for the vane and 30 percent for the blade were achieved, and methods for improving these yield percentages were identified A bond process was established for PWA 1480 single crystal material which incorporated a transient liquid phase interlayer. Bond properties were substantiated and sensitivities determined. Tooling die materials were identified, and an advanced differential thermal expansion tooling concept was incorporated into the bond process Author

N83-30430*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. Aircraft Engine Business Group.

ENERGY EFFICIENT ENGINE. CORE ENGINE BEARINGS, DRIVES AND CONFIGURATION: DETAILED DESIGN REPORT

C. L BROMAN Jun. 1981 61 p refs

(Contract NAS3-20643)

(NASA-CR-165376; NAS 1.26 165376, R81AEG307) Avail: NTIS HC A04/MF A01 CSCL 21E

The detailed design of the forward and aft sumps, the accessory drive system, the lubrication system, and the piping/manifold configuration to be employed in the core engine test of the Energy Efficient Engine is addressed. The design goals for the above components were established based on the requirements of the test cell engine. Author

N83-30566# West Virginia Univ , Morgantown Dept of Chemical Engineering

PHASE BEHAVIOR OF APPALACHIAN CRUDES WITH CARBON DIOXIDE Final Report, 28 Sep. 1979 - 30 Sep. 1981

T G MONGER Nov 1982 83 p refs

(Contract DE-AM21-79MC-11284)

(DE83-002979; DOE/MC-11284/17) Avail. NTIS HC A05/MF A01

The phase behavior of thirty mixtures of Appalachian crude oil and carbon dioxide are described. Stock tank oils from the Hilly Upland field in northcentral West Virginia, and the Bath field in northcentral Ohio are examined in the presence of equimolar amounts of CO2. The effects of small amounts of contaminant gases are probed using methane, nitrogen, hydrogen sulfide and sulfur dioxide. Additional changes due to the presence of brine are studied Data was collected in single contact phase equilibrium experiments using a high pressure windowed condensate PVT cell The volumetric behavior of sample mixtures was monitored Total sample and individual phase volumes were recorded up to pressures of 3600 psi, and at temperatures above and below the CO2 critical temperature. Saturation pressures and the extent of oil swelling were determined from the PVT measurements Significant results show that the phase equilibria determined for CO2-Appalachian crude oil mixtures generally emulate that reported for Western crude oil systems. DOE

N83-30673# Army Aviation Engineering Flight Activity, Edwards AFB, Calif. Directorate for Development and Qualification.

FUEL CONSERVATION EVALUATION OF U.S. (UNITED STATES) ARMY HELICOPTERS. PART 4: OH-58C FLIGHT TESTING Final Report, 22 Sep. - 20 Nov. 1982

D. BELTE and M. V. STRATTON Aug 1982 82 p refs

(AD-A127422, USAAEFA-81-01-4) Avail: NTIS HC A05/MF A01 CSCL 21D

The United States Army Aviation Engineering Flight Activity conducted level flight performance tests of the OH-58C helicopter at Edwards AFB, California from 22 September to 20 November 1981, and at St. Paul, Minnesota, from 12 January to 9 February 1982. Nondimensional methods were used to identify effects of compressibility and blade stall on performance, and increased referred rotor speeds were used to supplement the range of currently available level flight data. Maximum differences in nondimensional power required attributed to compressibility effects varied from 6.5 to 11%. However, high actual rotor speed at a given condition can result in less power required than at low rotor speed even with the compressibility penalty. The power required characteristics determined by these tests can be combined with engine performance to determine the most fuel efficient operating conditions. GRA

N83-31108# GKSS-Forschungszentrum Geesthacht (West Germany) Zentralabteilung Technikum

COMPARATIVE INVESTIGATION OF THE PERFORMANCES OF 10 KW POWER TYPE WIND ENERGY PLANTS [VERGLEICHENDE UNTERSUCHUNGEN DES BETRIEBSVERHALTENS VON WINDENENERGIEANLAGEN DER LEISTUNGSKLASS 10 KW]

S. FRIES, J. BRUEGMANN, G. PETERSEN, and H T. MENGELKAMP 1982 42 p refs In GERMAN; ENGLISH summary

(GKSS-82/E/48, ISSN-0344-9629) Avail NTIS HC A03/MF A01

A test field for wind energy converters, its technical equipment, and nine different wind energy converters are described Operating experience and results of the first 2 years of operation of the Aeroman and the Windmatic plants are summarized. Performances vary between 0.42 kW and 23.01 kW (Windmatic) and 1 59 kW to 11.07kW (Man) for average wind velocities 5 5 m/sec to 15.5 m/sec. Author (ESA)

N83-31601# Army Aviation Engineering Flight Activity, Edwards AFB, Calif Directorate for Development and Qualification.

FUEL CONSERVATION EVALUATION OF US ARMY HELICOPTERS. PART 5: AH-1S SLIGHT TESTING Final Report, 31 Jul. - 21 Sep. 1982

L. L. TODD, R. T. SAVAGE, R L. VINCENT, R. A. WILLIAMS, G T DOWNS, and M. K. HERBST Jan. 1983 74 p refs

(AD-A128532; USAAEFA-81-01-5) Avail: NTIS HC A04/MF A01 CSCL 01C

The United States Army Aviation Engineering Flight Activity conducted level flight performance tests of the AH-1S (Prod) helicopter to provide data to determine the most fuel efficient operating conditions Hot and cold weather test sites were used to extend the range of the advancing tip Mach number data to supplement existing AH-1S performance data Preliminary analysis of non-dimensional data identifies the effects of compressibility on performance and shows a power penalty of as much as 6% at a high NR/theta The power required characteristics determined by these tests can be combined with engine performance to determine the most fuel efficient operating conditions. GRA

N83-31898# Central Electricity Generating Board, London (England).
SAFETY ENGINEERING: KTA CODE OF PRACTICE. LIFTING MECHANISMS IN NUCLEAR PLANT
1983 21 p Transl. into ENGLISH of KTA 3290, 6/78 edition (BLL-CE-TRANS-7880-(9022 09)) Avail: British Library Lending Div., Boston Spa, Engl

Lifting mechanisms safety requirements are discussed in accordance with the present state of development of science and engineering for the protection of life, health, and assets against the dangers of nuclear energy and the ill effects of ionizing radiation Author

N83-31904# Advanced Mechanical Technology, Inc., Newton, Mass.
DESIGN AND DEVELOPMENT TESTING OF AN IMPROVED HIGH-EFFICIENCY WATER HEATER
A. D VASILAKIS, J. GERSTMANN, and E. A. VINEYARD 1983 25 p refs Presented at the ASHRAE Semiann Meeting, Atlantic City, N.J , 23-27 Jan. 1983
(Contract W-7405-ENG-26)
(DE83-006136; CONF-830102-3) Avail: NTIS HC A02/MF A01

A high-efficiency water heater is described which uses a design approach quite different from the conventional center-flue water heater While high efficiency was more readily achieved through the use of a powered combustion system, a cost/benefit analysis showed that a natural-draft system is more cost effective for residential water heating The subsequent improvements in a prototype and the current performance are described DOE

N83-31905# California Univ., Berkeley Lawrence Berkeley Lab. Dept. of Physics.
TECHNOLOGY FOR ENERGY-EFFICIENT BUILDINGS
A H. ROSENFELD Nov. 1982 9 p refs Presented at the 1st US/China Conf on Energy, Resources and Environment, Beijing, 7-12 Nov. 1982
(Contract DE-AC03-76SF-00098)
(DE83-005927, LBL-15182; CONF-821121-2) Avail: NTIS HC A02/MF A01

New Western buildings use little energy for heating, even compared to current Chinese usage. Research and progress in energy efficiency are summarized and applications to China pointed out, especially in regard to insulation, thermal mass, and improved daylighting DOE

N83-31964# Army Construction Engineering Research Lab., Champaign, Ill. Energy Systems Div.
ELECTRONIC TIME SWITCH EVALUATION STUDY Final Technical Report
L. R. THURBER Mar 1983 22 p
(Contract DA PROJ 4A7-62781-AT-45)
(AD-A127870, CERL-TR-E-184) Avail NTIS HC A02/MF A01 CSCL 09A

This report describes a study which tested and evaluated the feasibility of using electronic time switches to reduce the electrical energy consumption of Army buildings which may not be suited to other energy-saving techniques like the Energy Monitoring and Control System. The study emphasized heating, ventilating, and air-conditioning (HVAC) system controls in office and community support buildings Electronic time switches were installed in 12 buildings at Fort Carson, CO, and Fort Knox, KY Test results showed savings of between 12 kWh and 99 kWh per day for the electrical energy consumed in the test buildings Payback periods ranged from 5 months to 3-1/2 years This report also includes guidance on selecting and installing electronic time switches on HVAC system controls. Author (GRA)

N83-31990# Strategic Decisions Group, Menlo Park, Calif.
GENERATING CAPACITY IN US ELECTRIC UTILITIES: HOW IS IT USED? HOW MUCH IS NEEDED OVER THE DECADE
T W. KEELIN, E. N. OATMAN (EPRI), and M. R. GENT Oct 1982 39 p refs Sponsored by EPRI
(DE83-900733, EPRI-EA-2639-SR) Avail NTIS HC A03/MF A01

This report addresses how US generating capacity is used to supply today's consumers with electricity, whether new capacity planned over the next decade is enough to provide a secure supply of electricity, how delays and cancellations of planned capacity would result in higher electricity costs and threaten the security of electricity supply, and how today's decisions determine electricity supply for the next decade and beyond It is concluded that there is not an electricity supply crisis currently, but there is a planning crisis. This conclusion is based on the following: existing capacity supplies current needs, but provides little room for economic growth, new capacity is planned to provide a secure supply of electricity for the demand projected by utilities; if demand is lower, planned capacity will reduce costs and, if demand is higher, planned capacity will not be adequate; planned capacity may not be realized. Author

N83-32181# Systech Corp , Xenia, Ohio.
SURVEY OF FOREIGN SYSTEMS FOR INCINERATION AND ENERGY RECOVERY Progress Report, Jun. - Nov. 1982
R FROUNFELKER and B. A. HAUSFELD Port Hueneme, Calif. NCEL Apr 1983 137 p refs
(Contract N62583-82-MT-150)
(AD-A127461; NCEL-CR-83.025) Avail NTIS HC A07/MF A01 CSCL 13B

Solid waste heat recovery incinerator (HRI) facilities outside the United States, which were capable of 24-hour a day operation, had operated for about a year, and had combustors of between 0 75 and 3 0 ton/hr capacity were identified to permit selection of best facilities for field visits. Of the 40 vendors identified, 21 responses were received. Eleven of the vendors had facilities that fit the above criteria Facilities of six vendors were selected for field visits GRA

N83-32186# Perkins and Will, Inc., Washington, D.C
ENERGY CONSERVATION FOR HOUSING: A WORKBOOK
May 1982 319 p refs Prepared in cooperation with Ehrenkrantz Group, Washington, D C
(Contract HUD-H-2850R)
(PB83-185330; HUD-0002651, HUD/PDR-700) Avail NTIS HC A14/MF A01 CSCL 10A

Multifamily housing project managers can reduce their energy costs from 30 to 60 percent by capitalizing on a variety of energy conservation opportunities (ECO's) identified in HUD research on the physical condition of public housing stock This workbook prepares managers for this planning and for making individualized energy audits It provides all the materials they need to proceed, including analysis sheets for calculating costs - benefit and payback periods for each of the 50 ECO's described The ECO's listed all into four general categories architectural improvements to the energy design of the building envelope; heating system ECO's to increase energy efficiency; secondary ECO's related to the domestic water supply, air conditioning systems, and central laundry equipment; and electric system ECO's reducing utility surcharges and increasing light bulb efficiency Author (GRA)

N83-32187# National Bureau of Standards, Washington, D.C. National Engineering Lab.
PERFORMANCE ANALYSIS OF THE JERSEY CITY TOTAL ENERGY SITE Final Report
C. W. HURLEY, J D. RYAN, and C W. PHILLIPS Aug 1982 408 p refs Sponsored by Dept. of Housing and Urban Development
(PB83-185348, NBSIR-82-2474; HUD-0002654) Avail: NTIS HC A18/MF A01 CSCL 10B

Engineering, economic, environmental, and reliability data from a 486 - unit apartment/commercial complex was gathered. The

complex was designed to recover waste heat from diesel engines to make the central equipment building a total energy (TE) plant. Analysis of the data indicates that a significant savings in fuel is possible by minor modifications in plant procedures. The results of an analysis of the quality of utility services supplied to the consumers on the site and an analysis of a series of environmental tests made the effects of the plant on air quality and noise are included. In general, although those systems utilizing the TE concept showed a significant savings in fuel, such systems do not represent attractive investments compared to conventional systems. GRA

N83-32194# Pacific Northwest Lab , Richland, Wash.
CRITICAL CONSIDERATIONS IN THE ASSESSMENT OF HEALTH AND ENVIRONMENTAL RISKS: WHAT WE HAVE LEARNED FROM THE NUCLEAR EXPERIENCE
B. E. VAUGHAN Oct. 1982 10 p refs Presented at the 21st Hanford Life Sci Symp. on Biological Availability of Trace Metals, Richland, Wash., 4 Oct. 1981
(Contract DE-AC06-76RL-01830)
(DE83-005292; PNL-SA-9939; CONF-811035-6) Avail: NTIS HC A02/MF A01

Recommendations for modelling the environmental exposure pathways for both radioactive and chemical effluents are presented. DOE

N83-32196# Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Sciences.
HEALTH EFFECTS OF COMBUSTION-GENERATED SOOT AND POLYCYCLIC AROMATIC HYDROCARBONS: HUMAN CELL STUDIES Progress Report, 1977 - 1983
W G THILLY 1983 82 p refs
(Contract DE-AC02-77EV-04267)
(DE83-004578, DOE/EV-04267/06) Avail: NTIS HC A05/MF A01

Developments in human cell culture mutation essay technology are reviewed. Exhaust particulate extracts were analyzed for mutagenic chemicals. Studies aimed at understanding the biochemical component of the mutagenic process are presented. DOE

N83-32203# Acurex Corp., Mountain View, Calif. Energy and Environmental Div
ANALYSIS OF GEOTHERMAL WASTES FOR HAZARDOUS COMPONENTS Final Report
E L HAGMANN, D. D MINICUCCI, and C D WOLBACH Apr. 1983 101 p refs
(Contract EPA-68-03-2567)
(PB83-188680; EPA-600/2-83-030) Avail NTIS HC A06/MF A01 CSCL 08D

Regulations governing the disposal of hazardous wastes led to an assessment for geothermal solid wastes for potentially hazardous properties. Samples were collected from three active geothermal sites in the western United States: The Geysers, Imperial Valley, and northwestrn Nevada. Approximately 20 samples were analyzed for corrosivity, EP toxicity, radioactivity, and bioaccumulation potential The samples were further characterized by analysis for cations, anions, moisture content, priority pollutants, and additional trace metals in the leachate In addition, and aqueous extraction was conducted at ambient pH. This study characterized samples from a limited geographical area and results cannot be extrapolated to other geothermal resource areas. Author (GRA)

N83-32563# General Accounting Office, Washington, D C. Resources, Community and Economic Development Div.
REGIONAL LOW-LEVEL RADIOACTIVE WASTE DISPOSAL SITES: PROGRESS BEING MADE BUT NEW SITES WILL PROBABLY NOT BE READY BY 1986
11 Apr. 1983 65 p refs
(GAO/RCED-83-48, B-194786) Avail NTIS HC A04/MF A01

The problems in forming interstate compacts and disposing of low-level wastes are evaluated. The ability to establish new low-level waste disposal facilities is assessed. Alternative contingency plans are recommended. Author

N83-32564# Sandia Labs., Albuquerque, N. Mex.
CORROSION RESISTANT CANISTERS FOR NUCLEAR WASTE ISOLATION
N. J. MAGNANI 1982 8 p refs Presented at 6th Intern. Symp. on the Sci Basis for Radioactive Waste Management, Boston, 1 Nov. 1982
(Contract DE-AC04-76DP-00789)
(DE83-000090, SAND-82-1384C, CONF-821107-5) Avail: NTIS HC A02/MF A01

There are two different concepts being evaluated to provide durable canisters for waste disposal: (1) canisters fabricated out of extremely corrosion resistant materials such as Ti-base or Ni-base alloys, and (2) canisters fabricated out of less durable materials but designed with a corrosion allowance. Each of these types of canisters could fail to meet the design objectives through a variety of failure processes. The more important of these are discussed DOE

N83-32565# California Univ., Berkeley. Lawrence Berkeley Lab Earth Sciences Div.
THERMAL IMPACT OF WASTE EMPLACEMENT AND SURFACE COOLING ASSOCIATED WITH GEOLOGIC DISPOSAL OF NUCLEAR WASTE
J. S. Y. WANG, D. C MANGOLD, R. K SPENCER, and C F TSANG Aug. 1982 237 p refs
(Contract DE-AC03-76SF-0098)
(DE83-007314, LBL-13341; NUREG/CR-2910) Avail. NTIS HC A11/MF A01

The thermal effects associated with the emplacement of aged radioactive wastes in a geologic repository were studied, with emphasis on the following subjects the waste characteristics, repository structure, and rock properties controlling the thermally induced effects; the current knowledge of the thermal, thermomechanical, and thermohydrologic impacts, determined mainly on the basis of previous studies that assume 10-year-old wastes; the thermal criteria used to determine the repository waste loading densities, and the technical advantages and disadvantages of surface cooling of the wastes prior to disposal as a means of mitigating the thermal impacts The waste loading densities determined by repository designs for 10-year-old wastes are extended to older wastes using the near-field thermomechanical criteria based on room stability considerations. Also discussed are the effects of long surface cooling periods determined on the basis of far-field thermomechanical and thermohydrologic considerations. The extension of the surface cooling period from 10 years to longer periods can lower the near-field thermal impact but have only modest long-term effects for spent fuel. More significant long-term effects can be achieved by surface cooling of reprocessing high-level waste. DOE

N83-32567# California Univ., Livermore. Lawrence Livermore Lab.
DISPOSAL COSTS FOR SRP HIGH-LEVEL WASTES IN BOROSILICATE GLASS AND CRYSTALLINE CERAMIC WASTE FORMS
R B. ROZSA and J H. CAMPBELL 25 Aug. 1982 10 p refs
(Contract W-7405-ENG-48)
(DE83-003105; UCRL-53315) Avail: NTIS HC A02/MF A01

The overall burial costs of the glass and ceramic waste forms, including processing, storage, transportation, packaging, and emplacement in a repository were compared. Amount of waste will require approximately 10,300 standard (24 in. i.d. x 9-5/6 ft length) canisters of waste glass, each containing about 3260 lb of waste at 28% waste loading. The ceramic waste form requires about one-third the above number of standard canisters. Approximately $2.5 billion is required to process and dispose of this waste, and the total cost is independent of waste form (glass or ceramic). The major cost items (about 80% of the total cost) for all cases are capital and operating expenses The capital and 20-year operating costs for the processing facility are the same

order of magnitude, and their sum ranges from about one-half of the total for the reference glass case to two-thirds of the total for the ceramic cases. DOE

N83-32568# Sandia Labs , Albuquerque, N. Mex.
NUCLEAR-WASTE DISPOSAL: TECHNICAL ISSUES AND STATUS
T O. HUNTER 1982 21 p refs Presented at Inst for Nucl Mater. Management Seminar on Spent Fuel Management and Waste Disposal, Washington, D.C., 20 Oct. 1982
(Contract DE-AC04-76DP-00789)
(DE83-002185; SAND-82-2238C, CONF-821090-1) Avail: NTIS HC A02/MF A01

The nuclear waste from the defense programs of the United States and the commercial nuclear fuel cycle are planned for disposal in mined geologic repositories. High-level waste will require the development of one to three repositories A number of technical issues are associated with the selection and characterization of a suitable site, the design of surface and underground facilities, development of an appropriate waste package, and methods to assess the performance of the system relative to regulatory requirements These issues are being addressed by four major projects to evaluate salt, basalt, volcanic tuff, and other crystalline rocks such as granite. The key technical issues and the status of activities to resolve those issues are reviewed DOE

N83-32569# Sandia Labs , Albuquerque, N. Mex
SYSTEMS OVERVIEW OF THE SUBSEABED DISPOSAL PROGRAM
R. D. KLETT, L H. BRUSH, J. LIPKIN, and C M PERCIVAL 1982 14 p refs Presented at NWTS Information Meeting on Basalt Waste Isolation Project, Las Vegas, Nev , 14 Dec. 1982
(Contract DE-AC04-76DP-00789)
(DE83-000091; SAND-82-2021C, CONF-821205-5) Avail NTIS HC A02/MF A01

The Subseabed Disposal Program (SDP) is considering high-level waste (HLW) disposal in the oceanic geologic formations as a possible longer term complement to mined geologic repositories. The approach to safety assessment is to compute occupational exposure for all processes, predict the consequences and probabilities of pre-emplacement accidents and controlled release from the sediments, and analyze of all pathways to man and resulting health effects Models are being developed to form a physical/mathematical computer description of each process, to measure as well as possible associated phenomena and properties in the laboratory, to make predictions and run confirming in-situ experiments, and to modify predictive methods if required. Models have been developed to describe heat transfer, fluid flow, mechanical response of the sediment, nuclide migration in the sediment, physical and biologic oceanography, land transport accidents, dose to man, and health effects. DOE

N83-32571# Los Alamos Scientific Lab , N Mex. Environmental Science Group.
BIOLOGICAL INTRUSION BARRIERS FOR LARGE-VOLUME WASTE-DISPOSAL SITES
T. E. HAKONSON, J. F. CLINE, and W. H. RICKARD 1982 22 p refs Presented at the Symp. on Low Level Waste Disposal, Washington, 29-30 Sep. 1982 Prepared in cooperation with Battelle Pacific Northwest Labs., Richland, Wash.
(Contract W-7405-ENG-36)
(DE83-002061; LA-UR-82-2971, CONF-820911-2) Avail NTIS HC A02/MF A01

Intrusion of plants and animals into shallow land burial sites with subsequent mobilization of toxic and radiotoxic materials has occurred Based on recent pathway modeling studies, such intrusions can contribute to the dose received by man Past work on developing biological intrusion barrier systems for application to large volume waste site stabilization is described State of the art concepts employing rock and chemical barriers are discussed relative to long term serviceability and cost of application. The interaction of bio-intrusion barrier systems with other processes affecting trench cover stability are discussed to ensure that trench cover designs minimize the potential dose to man DOE

N83-32572# Idaho National Engineering Lab , Idaho Falls.
ENVIRONMENTAL EVALUATION OF ALTERNATIVES FOR LONG-TERM MANAGEMENT OF DEFENSE HIGH-LEVEL RADIOACTIVE WASTES AT THE IDAHO CHEMICAL PROCESSING PLANT
Sep 1982 665 p refs
(Contract DE-AC07-79ID-01675)
(DE83-002504; IDO-10105) Avail: NTIS HC A99/MF A01

The U.S Department of Energy (DOE) is considering the selection of a strategy for the long-term management of the defense high-level wastes at the Idaho Chemical Processing Plant (ICPP). This report describes the environmental impacts of alternative strategies. These alternative strategies include leaving the calcine in its present form at the Idaho National Engineering Laboratory (INEL), or retrieving and modifying the calcine to a more durable waste form and disposing of it either at the INEL or in an offsite repository. This report addresses only the alternatives for a program to manage the high-level waste generated at the ICPP. 24 figures, 60 tables. DOE

N83-32574# Los Alamos Scientific Lab , N. Mex.
OVERVIEW ASSESSMENT OF NUCLEAR-WASTE MANAGEMENT
B. W BURTON, V P. GUTSCHICK, B. A PERKINS, C. L. REYNOLDS, J. C. RODGERS, J G STEGER, T K THOMPSON, L. K TROCKI, E. M WEWERKA, and M L WHEELER Aug 1982 96 p refs
(Contract W-7405-ENG-36)
(DE83-004472; LA-9395-MS) Avail: NTIS HC A05/MF A01

The environmental control technologies associated with Department of Energy nuclear waste management programs were reviewed and the most urgent problems requiring further action or follow up were identified. In order of decreasing importance they are: (1) shallow land disposal technology development; (2) active uranium mill tailings piles, (3) uranium mine dewatering, (4) site decommissioning, (5) exhumation/treatment of transuranic waste at Idaho National Engineering Laboratory; (6) uranium mine spoils, and (7) medical/institutional wastes. DOE

N83-32594# General Accounting Office, Washington, D. C. Resources, Community and Economic Development Div.
STATUS OF DOE'S IMPLEMENTATION OF THE MAGNETIC FUSION ENERGY ENGINEERING ACT OF 1980
29 Apr. 1983 37 p refs
(GAO/RCED-83-105, B-210947) Avail: NTIS HC A03/MF A01

Federal magnetic fusion energy research is reviewed. Author

N83-32650# Joint Publications Research Service, Arlington, Va.
RESULTS OF COMPREHENSIVE PROGRAMS SUMMARIZED
D. ZHIMERIN *In its* USSR Rept.: Sci and Technol Policy No 9 (JPRS-82713) p 27-30 24 Jan 1983 Transl. into ENGLISH from Sots Industriya (USSR), 13 Aug 1982 p 2
Avail: NTIS HC A05

The results of 170 comprehensive programs which were developed by the USSR State Committee on Science and Technology, by the Union-level Gosplan, and the USSR Academy of Sciences are summarized. In summing up results, it can be said that in the recent past much has been done in the designing and introduction of new equipment and technology At the same time it is essential to note that in the past year the targets of the comprehensive programs were only fulfilled by 96 percent. In some cases deadlines were not met only because ministries such as the union Ministry of the Coal Industry, the Ministry of Non-Ferrous Metallurgy, the Ministry of Power Machine Building, the Ministry of Agricultural Machine Building, the Ministry of the Petroleum Refining and Petrochemical Industries, as well as certain construction ministries, have not brought the program targets to those who must fulfill them in time; nor have they adopted the necessary measures to fulfill them B.W.

N83-32668# Oak Ridge National Lab., Tenn.
MULTIPROGRAM LABORATORY PANEL ENERGY RESEARCH ADVISORY BOARD. VOLUME 2: SUPPORT STUDIES Final Report
I. SPIEWAK, M P. GUTHRIE, J P NICHOLS, E. L. PRESCON, C. D. WEST, T. J. WILBANKS, B. Y. WILKES, and A. C. ZERBY Sep 1982 203 p refs 3 Vol.
(Contract W-7405-ENG-26)
(DE83-002694; DOE/NBB-0023-VOL-2) Avail NTIS HC A10/MF A01

Statistical data on the multiprogram laboratories, examples of national laboratory use in foreign countries, domestic models for national laboratory utilization; relationships of laboratories with industry and universities; uses of laboratories for training industrial R and D personnel; legal mandates and constraints on the national laboratories are reported. Appendices on facts about Harwell, CEN-Saclay, TNO, Studsvik, and JAERI-Tokai; the Requirements Boards of the United Kingdom Department of Industry; impact of President's FY 1983 budget; and the PNL experiment are included DOE

N83-32678# *Committee on Appropriations* (U. S. Senate)
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT-INDEPENDENT AGENCIES APPROPRIATION ACT, 1984
Washington GPO 1983 50 p refs H.R. 3133 enacted into law by the 98th Congr., 1st Sess., 6 Jun 1983
(S-REPT-98-152) Avail US Capitol, Senate Document Room

Federal budget appropriations for the National Science Foundation, the National Aeronautics and Space Administration, and the Department of Housing and Urban Development-Independent Agencies are presented.

N83-32680# Committee on Appropriations (U. S. House).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT-INDEPENDENT AGENCIES APPROPRIATION ACT, 1984
Washington GPO 1983 53 p H R. 3133 enacted into law by the 98th Cong., 1st Sess., 2 Jun 1983
Avail: US Capitol, House Document Room

Federal budget appropriations for the National Science Foundation, the National Aeronautics and Space Administration, and the Department of Housing and Urban Development-Independent Agencies are presented

N83-32683# *Committee on Science and Technology* (U. S House)
DEPARTMENT OF ENERGY CIVILIAN RESEARCH AND DEVELOPMENT AUTHORIZATION ACT FOR FISCAL YEAR 1984
Washington GPO 1983 105 p Rept. to accompany H R. 2587 presented by the Comm. on Sci and Technol. at the 98th Congr., 1st Sess , 3 May 1983
(H-REPT-98-81, GPO-19-900) Avail: US Capitol, House Document Room

Solar energy, geothermal energy, nuclear fission, magnetic fusion, electric energy systems, energy storage systems, and small-scale hydroelectric systems research is summarized Geothermal resources, high energy physics, nuclear physics and uranium enrichment are also addressed Author

N83-33113# Centro Informazioni Studi Esperienze, Milan (Italy) Documentation Service.
INTERNATIONAL HEAT PUMP CENTER OF THE INTERNATIONAL ENERGY AGENCY: SHORT, AND HALF TERM ACTIVITY OBJECTIVES [CENTRO INTERNAZIONALE SULLE POMPE DI CALORE DELL'AGENZIA INTERNAZIONALE DELL'ENERGIA: OBIETTIVI ED ATTIVITA' NEL BREVE E MEDIO TERMINE]
E. PIANTONI and V. RECCHI (OTB) 1983 19 p In ITALIAN Presented at Conv FAST risparmio Energetico negli Edifici, Milan, 8 Jun. 1983 Sponsored by CNR
(CISE-2047) Avail: NTIS HC A02/MF A01

The main activities of the heat pump center are described. The goal of the center is to promote the technical and commercial development of heat pumps among the developed countries The activities include news letters, data banks and reports.
Author (ESA)

N83-33305# Department of Energy, Washington, D C Office of Coal, Nuclear, Electric and Alternate Fuels.
NATIONAL COAL MODEL: EXECUTIVE SUMMARY
Apr 1982 28 p refs
(DE83-006473; DOE/EIA-0325) Avail: NTIS MF A01

A simple, nontechnical description of the coal and electric utility industries as they are represented in the National Coal Model (NCM) is given The NCM is a linear programming model used by the Department of Energy to investigate the impact of Federal and State legislation on the coal and electric utility industries and to project the production, consumption, and price of coal This document is one of a set of four volumes of documentation describing the NCM and its operation. DOE

N83-33335*# Engineering Research West, Santa Monica, Calif. *Biocatalysis Research Activity.*
ISOTHERMAL SEPARATION PROCESSES
C. ENGLAND Jul. 1982 37 p
(NASA-CR-172961; JPL-9950-813, NAS 1 26:172961) Avail: NTIS HC A03/MF A01 CSCL 10A

The isothermal processes of membrane separation, supercritical extraction and chromatography were examined using availability analysis The general approach was to derive equations that identified where energy is consumed in these processes and how they compare with conventional separation methods These separation methods are characterized by pure work inputs, chiefly in the form of a pressure drop which supplies the required energy. Equations were derived for the energy requirement in terms of regular solution theory This approach is believed to accurately predict the work of separation in terms of the heat of solution and the entropy of mixing. It can form the basis of a convenient calculation method for optimizing membrane and solvent properties for particular applications. Calculations were made on the energy requirements for a membrane process separating air into its components. Author

N83-33340*# Jet Propulsion Lab., California Inst. of Tech , Pasadena
CALIFORNIA METHANOL ASSESSMENT. VOLUME 1: SUMMARY REPORT
R OTOOLE, E. DUTZI, R GERSHMAN, R HEFT, W. KALEMA, and D. MAYNARD Mar. 1983 151 p refs Sponsored by NASA Prepared in cooperation with California Inst of Tech., Pasadena 2 Vol
(NASA-CR-172990, JPL-5030-562-VOL-1; JPL-PUB-83-18-VOL-1; NAS 1.26.172990) Avail: NTIS HC A08/MF A01 CSCL 10A

The near term methanol industry, the competitive environment, long term methanol market, the transition period, air quality impacts of methanol, roles of the public and private sectors are considered. N.W.

N83-33357# Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service
ENERGY SAVING IN INDUSTRY: ITALIAN METHODS AND EXPERIENCE [RISPARMIO ENERGETICO NELL'INDUSTRIA. METODOLOGIE ED ESPERIENZE CISE]
F. DALLAVALLE and C DENARD 1983 22 p In ITALIAN Presented at Conv l'Imprenditoria Cooperative per l'Industrializzazione del Risparmio Energetico, Reggio Emilia, Italy, 16-17 Dec. 1982
(CISE-2020) Avail: NTIS HC A02/MF A01

The usefulness and characteristics of the energy audits practiced by a research and technology transfer center (CISE) in industry are described. Italian public financial incentives to energy saving are discussed. The qualification of CISE in energy auditing is commented on. Author (ESA)

N83-33375# Brookhaven National Lab, Upton, N Y National Center for Analysis of Energy Systems
COMPARING THE HEALTH AND ENVIRONMENTAL HAZARDS OF DIFFERENT ENERGY SYSTEMS
L. D HAMILTON 1982 58 p refs Presented at the Intern. Conf on Nucl. Power Experience, Vienna, 13-17 Sep 1982
(Contract DE-AC02-76CH-00016)
(DE83-004591; BNL-32275, CONF-820914-5) Avail. NTIS HC A04/MF A01

Assessing health impacts of different energy sources is discussed. Risk assessment methods are reviewed. Coal and nuclear fuel cycles are compared in respect to morbidity and mortality Other cycles (oil, gas and renewables) are also examined. In broadening comparisons to include new technologies, one must include the impact of manufacturing the energy producing devices as part of an expanded fuel cycle, via input-output methods Input-output analysis allows comparisons of direct and system wide impacts Throughout the analysis, uncertainties must be explicitly recognized in the results, including uncertainty in validity of data and uncertainty in choice of appropriate models No single method of comparative risk assessment is fully satisfactory each has its limitations. By use of several methods progress was made in understanding the relative impact of energy technologies DOE

N83-33379# Los Alamos Scientific Lab, N Mex.
LONG-TERM EXPOSURE OF SUP 238 PUO SUB 2 TO A TERRESTRIAL ENVIRONMENT
J. H PATTERSON, B HERRERA, G. B NELSON, F. J STEINKRUGER, G. M MATLACK, and D. PAVONE Dec 1982 10 p refs
(Contract W-7405-ENG-36)
(DE83-005607, LA-9487-MS) Avail: NTIS HC A02/MF A01

In many space missions that use radioisotope thermoelectric generators, 238PuO2 is used as the source of heat. We exposed some of this heat-source material to simulated terrestrial environments for an 8-yr period During this time we monitored the release of plutonium to water, air, and soil Plutonium was found in the air, especially after the beginning of a rain, and in the water that percolated through the soil after a rain, but the major part of the plutonium was held in the soil DOE

N83-33736# Rockwell International Corp, Richland, Wash. Energy Systems Group
GEOLOGIC, GEOCHEMICAL ROCK MECHANICS AND HYDROLOGIC CHARACTERISTICS OF CANDIDATE REPOSITORY HORIZONS
P E. LONG, M. J APTED, F A. SPANE, JR., and K KIM Sep. 1982 19 p refs Presented at NWTS Inform Meeting on Basalt Isolation Project, Las Vegas, Nev., 14 Dec. 1982
(Contract DE-AC06-77RL-01030)
(DE83-001491; RHO-BW-SA-252-P; CONF-821205-17) Avail NTIS HC A02/MF A01

The feasibility of constructing a nuclear waste repository in basalt (NWRB) on the Hanford Site is determined. Studies conducted indicate feasibility and performance requirements are within a significant safety margin. The two most promising candidate repository horizons for an NWRB are the middle Sentinel Bluffs and the Umtanum flows. Both of these flows are laterally continuous and have thicknesses of competent rock adequate to accommodate a repository. Significant geologic differences between the two flows are their depth, total thickness, and variability of flow top thickness. These differences are considered in selection of one of the two flows for breakout from an exploratory shaft The geochemical characteristics of both the middle Sentinel Bluffs flow and the Umtanum flow favor long term isolation of radionuclides by providing an environment in which canister corrosion rates and solubility of many radionuclide bearing solids is relatively low DOE

N83-33737# Rockwell International Corp, Richland, Wash Energy Systems Group.
BASALT WASTE ISOLATION PROJECT SITE ISSUES AND PLANS FOR THEIR RESOLUTION
S M PRICE and G. C. EVANS Sep. 1982 19 p refs Presented at NWTS Inform. Meeting on Basalt Waste Isolation Project, Las Vegas, Nev., 14 Dec 1982
(Contract DE-AC06-77RL-01030)
(DE83-001492, RHO-BW-SA-245-P, CONF-821205-15) Avail NTIS HC A02/MF A01

The Basalt Waste Isolation Project completed preparation and submittal to the US Nuclear Regulatory Commission of the project's Site Characterization Report The document, in addition to containing a comprehensive review of the status of site selection and characterization activities at the Hanford Site, contains a detailed analysis of the status of work aimed at meeting proposed regulatory criteria for a nuclear waste repository in basalt. DOE

N83-33738# Rockwell International Corp., Richland, Wash Energy Systems Group
BASALT WASTE ISOLATION PROJECT WASTE PACKAGE AND SITE GEOCHEMISTRY ISSUES AND PLANS FOR THEIR RESOLUTION
H. BABAD Sep 1982 19 p refs Presented at NWTS Inform. Meeting on Basalt Waste Isolation Project, Las Vegas, Nev, 14 Dec. 1982
(Contract DE-AC06-77RL-01030)
(DE83-001485; RHO-BW-SA-246-P) Avail NTIS HC A02/MF A01

The Basalt Waste Isolation Project completed preparation and submittal to the US NRC of the project's Site Characterization Report. This document, in addition to containing a comprehensive review of the status of site election and characterization activities at Hanford, contains a detailed analysis of the status of work aimed at meeting proposed regulatory criteria for a nuclear waste repository in basalt. DOE

N83-33740# Oak Ridge National Lab., Tenn Environmental Sciences Div.
GEOLOGICAL AND PETROLOGICAL CONSIDERATIONS RELEVANT TO THE DISPOSAL OF RADIOACTIVE WASTES BY HYDRAULIC FRACTURING: AN EXAMPLE AT THE US DEPARTMENT OF ENERGY'S OAK RIDGE NATIONAL LABORATORY
C. S HAASE 1982 13 p refs Presented at the 6th Intern Symp. on the Sci Basis for Radioactive Waste Management, Boston, 1 Nov. 1982
(Contract W-7405-ENG-26)
(DE83-003417, CONF-821107-31) Avail: NTIS HC A02/MF A01

At Oak Ridge National Laboratory the Pumpkin Valley Shale is used as a host formation for hydraulic fracturing waste disposal Determination of the relationship between the distribution of different lithologies and porosity permeability trends within this host formation allows these properties, important to hydraulic fracturing operations, to be related to measurable and mappable geological and petrological parameters It also permits extrapolation of such patterns to little studied portions of the Pumpkin Valley Shale Such knowledge better allows for the satisfactory operation and assessment of the hydraulic fracturing at Oak Ridge National Laboratory. DOE

N83-33741# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
DIRECTIONS IN LOW-LEVEL RADIOACTIVE-WASTE MANAGEMENT. TRANSPORTING LOW-LEVEL WASTE: EFFECTS OF REGIONAL MANAGEMENT
Nov. 1982 12 p refs
(Contract DE-AC07-76ID-01570)
(DE83-004448; DOE/LLW-6TB) Avail: NTIS HC A02/MF A01

The beneficial effects that regional management can have on transporting low-level radioactive wastes is discussed. Locations of the three currently operating disposal sites - one each in South Carolina, Washington, and Nevada - are widely dispersed and far from the sources of much of the nation's low-level waste. Establishment of regionally located sites would effectively reduce the distance, cost, and hazards of transport. Cited analytic work provides quantitive support of this appraisal This information is intended, primarily, to assist state officials - executive, legislative, and agency - in the management of commercial low-level radioactive waste. DOE

N83-33742# Baker (Michael, Jr.), Inc., Beaver, Pa.
ENGINEERING EVALUATION OF PROJECTED SOLID-WASTE-DISPOSAL PRACTICES. VOLUME 2: CASE STUDIES Final Report
J. C. HAYWARD, E H. ROTHFUSS, JR , W. J. FLICK, T. S. HAWK, and J A QUAY Sep. 1982 308 p refs Sponsored by EPRI
(Contract EPRI PROJ. 1728-1)
(*DE83-900629; EPRI-CS-2627-VOL-2*) Avail· NTIS HC A14/MF A01

Estimates of the cost impacts of the Resource Conservation and Recovery Act (RCRA) for hazardous and non-hazardous large volume waste classification scenarios on eight power plants was presented. Seven of the power plants were chosen to represent the range of waste management technologies and disposal site conditions existing in the United States today The eighth site was a fictitious site used to further evaluate the feasibility of ocean disposal of large volume utility wastes. For each site, the professional design team acted in the role of a consultant retained by the utility to bring its waste disposal program into complete compliance with RCRA. First, a conceptual design was developed for each scenario Then, cost estimates were developed for both scenarios, as well as for current operations. The cost estimates for current operations were performed in order to show the base cases necessary to determine RCRA's cost impacts DOE

N83-33743# Army Engineer Waterways Experiment Station, Vicksburg, Miss Geotechnical Lab.
TESTS FOR EVALUATING SITES FOR DISPOSAL OF LOW-LEVEL RADIOACTIVE WASTE
R. J. LUTTON, D. K. BUTLER, R. B. MEADE, D. M PATRICK, A. B. STRONG, and H. M. TAYLOR, JR. Dec. 1982 172 p
(DE83-901083, NUREG/CR-3038) Avail NTIS HC A08/MF A01, also available from GPO $6 50

The tests and other means of evaluating or documenting the important characteristics of sites for disposal of low level radioactive waste are identified. More than half of the tests and procedures are standard methods recognized and used nationwide, most conspicuously the numerous chemical tests Other tests are commonly used methods recognized widely as state of the art, e.g., geological and geophysical methods. The basis for choosing these state of the art methods is discussed, and the concept and procedures themselves are reviewed in the absence of standards for ready reference. Besides standards and state of the art practices a third category of methods involves the use of existing data sources or recognized correlations in place of new testing or documentation. It is particularly important that mapping, logging, sampling, testing, interpretation, and analysis be conducted by technically qualified and professionally motivated personnel using appropriate equipment and facilities, and general guidance is provided in this direction DOE

N83-33744# Pacific Northwest Lab., Richland, Wash
OVERVIEW OF THE MONITORED RETRIEVABLE STORAGE (MRS) PROGRAM
D. E. RASMUSSEN Aug. 1982 7 p Presented at the ANS Topical Meeting: Spent Fuel Storage, Savannah, 26-28 Sep 1982
(Contract DE-AC06-76RL-01830)
(DE83-002738; PNL-SA-10649; CONF-820943-7) Avail NTIS HC A02/MF A01

The current objective of the DOE MRS/Interim Storage program is to ensure that the Government has the capability to accept and store high-level waste and spent fuel in the amounts and on a schedule determined by DOE goals for nuclear energy, legislation and regulations Preliminary studies are complete and development of the concepts, with commercial sector involvement, is about to start. Spent fuel and high-level waste storage requirements for the reference case indicate minimum interim storage requirements if start of commercial reprocessing and repository availability remain on schedule DOE

N83-33797# Committee on Science and Technology (U S. House)
PACIFIC BASIN STUDY MISSION
Washington GPO Jan 1983 150 p Presented to the Comm. on Sci and Technol., 98th Congr., 1st Sess., Jan. 1983
(GPO-15-550) Avail: Committee on Science and Technology

A study mission to the Antarctic, New Zealand, Australia, and Japan is summarized. Energy and economic conditions are reviewed N.W

N83-33799*# Jet Propulsion Lab., California Inst of Tech., Pasadena
VEHICLE TEST REPORT: SOUTH COAST TECHNOLOGY ELECTRIC VOLKSWAGEN RABBIT WITH DEVELOPMENTAL LOW-POWER ARMATURE CHOPPER
J. E. MARTE, J A. BRYANT, and R. LIVINGSTON Jun 1983 57 p refs Sponsored by NASA
(Contract DE-AI01-78CS-54209)
(NASA-CR-172987; JPL-PUB-83-45; DOE/CS-54209/12; NAS 1 26 172987) Avail NTIS HC A04/MF A01 CSCL 13F

Dynamometer performance of a South Coast Technology electric conversion of a Volkswagen (VW) Rabbit designated SCT-8 was tested. The SCT-8 vehicle was fitted with a transistorized chopper in the motor armature circuit to supplement the standard motor speed control via field weakening The armature chopper allowed speed control below the motor base speed. This low speed control was intended to reduce energy loss at idle during stop-and-go traffic, to eliminate the need for using the clutch below base motor speed; and to improve the drivability Test results indicate an improvement of about 3 5% in battery energy economy for the SAE J227a-D driving cycle and 6% for the C-cycle with only a minor reduction in acceleration performance. A further reduction of about 6% would be possible if provision were made for shutting down field power during the idle phases of the driving cycles Drivability of the vehicle equipped with the armature chopper was significantly improved compared with the standard SCT Electric Rabbit. Author

N83-33861# Mitre Corp., McLean, Va. Metrek Div.
POTENTIAL FUEL SAVINGS OF SPECIFIC ATC SYSTEM IMPROVEMENTS Final Report
R A. RUCKER Feb 1982 160 p refs
(Contract DOT-FA01-82-C-10003)
(AD-A126449; MTR-81W275; FAA-EM-82-11) Avail NTIS HC A08/MF A01 CSCL 21D

Procedural restrictions are often imposed by the current ATC system upon the choice of routes and altitudes that the airspace user may fly. ATC imposed delays before departure, while en route, or before landing are also a common experience. To the extent that such restrictions and delays impose fuel or time penalties, they are of concern to today's fuel/cost conscious airspace user. To the extent they are needed to resolve actual conflicts between aircraft competing for the use of common

airspaces or runways, they are essential for maintaining air safety However, to the extent that they simply 'separate aircraft from otherwise empty airspace or runways', they impose unnecessary and costly penalties on the airspace users. The results of two studies of these problems and some unpublished case studies are presented in an attempt to better understand the causes and consequences of specific restrictions and delays to IFR flight movements. The potential for fuel savings if the ATC system could be improved to the point where only those restrictions and delays actually needed to insure flight safety are actually imposed is estimated These potential fuel savings are allocated as the estimated benefits of five specific ATC system functional improvements now being considered. GRA

N83-33876*# Kentron International, Inc., Hampton, Va
EFFECT OF ADVANCED TECHNOLOGY AND A FUEL EFFICIENT ENGINE ON A SUBSONIC-CRUISE EXECUTIVE JET WITH A SMALL CABIN
F. L. BEISSNER, JR., W A. LOVELL, A. W ROBINS, and E E. SWANSON Aug 1983 58 p refs
(Contract NAS1-16000)
(NASA-CR-172190, NAS 1.26 172190) Avail· NTIS HC A04/MF A01 CSCL 01C

An analytical study of a supersonic-cruise, executive, jet aircraft indicated the effects of using advanced technology. The twin-engine, arrow-wing vehicle was configured with a cabin of minimum practical size to hold one pilot, eight passengers, and their baggage. The primary differences between this configuration that of a previous report were the reduction in cabin size and the use of engines that are more fuel-efficient. Both conceptual vehicles are capable of forming the same mission. The current vehicle has a range of 3,350 nautical miles at Mach 2 3 cruise and 2,700 nautical miles at Mach 0.9. The concept description includes configuration definition, aerodynamic and propulsion-system characteristics, and mass properties Performance analyses are documented for intercontinental and transcontinental flight profiles In the latter case, a reduction in sonic-boom overpressure from 1 3 to 1.0 pounds per square foot was achieved by varying the flight profile slightly from that for optimum performance. Author

N83-33939*# TRW Defense and Space Systems Group, Redondo Beach, Calif.
SPACE POWER DISTRIBUTION SYSTEM TECHNOLOGY. VOLUME 1: REFERENCE EPS DESIGN Final Report
D. K. DECKER, M. D. CANNADY, J E. CASSINELLI, B. F FARBER, C. LURIE, G W FLECK, J W LEPISTO, A MASSNER, and P F. RITTERMAN Mar 1983 287 p refs 2 Vol
(Contract NAS8-33198)
(NASA-CR-170852; NAS 1 26:170852,
TRW-34579-6001-UT-00-VOL-1) Avail. NTIS HC A13/MF A01 CSCL 22B

The multihundred kilowatt electrical power aspects of a mannable space platform in low Earth orbit is analyzed from a cost and technology viewpoint At the projected orbital altitudes, Shuttle launch and servicing are technically and economically viable Power generation is specified as photovoltaic consistent with projected planning. The cost models and trades are based upon a zero interest rate (the government taxes concurrently as required), constant dollars (1980), and costs derived in the first half of 1980. Space platform utilization of up to 30 years is evaluated to fully understand the impact of resupply and replacement as satellite missions are extended. Such lifetimes are potentially realizable with Shuttle servicing capability and are economically desirable S L.

N83-34268# Centro Informazioni Studi Esperienze, Milan (Italy) Documentation Service.
INTERNATIONAL ENERGY AGENCY, HEAT PUMP CENTER: THE ROLE OF CNR/PFE IN ITALY [INTERNATIONAL ENERGY AGENCY: HEAT PUMP CENTER: IL RUOLO DEL CNR/PFE E DELL'ITALIA]
F DALLAVALLE, E PIANTONI, and V RECCHI 1983 40 p In ITALIAN Presented at Conv. le Pompe di Calore ed i Risparmi Energetici, Bolanzo, Italy, 7-8 Apr. 1983
(CISE-2021) Avail. NTIS HC A03/MF A01

The official integration of Italy to the International Energy Agency (IEA) heat pump centers program is discussed. The National Research Center coordinates the Italian activities related to the IEA The operating programs of several types of heat pumps, coordinated by different countries are described. The heat pump markets in European countries and in the United States are briefly commented on. Author (ESA)

N83-34269# Electricite de France, Chatou Dept. Optimisation et Automatisation des Processus
INDUSTRIAL HEAT PUMPS, STUDIES AND CONSTRUCTION: ACTIVITIES OF ELECTRICITE DE FRANCE'S PROCESS AUTOMIZATION DIVISION, 1976 - SEPTEMBER 1981 [POMPES A CHALEUR INDUSTRIELLES, ETUDES ET REALISATIONS: POINT DE L'ACTIVITE DE LA DIVISION AP DE 1976 A SEPTEMBRE 1981]
J. F REYNAUD Oct. 1981 7 p In FRENCH
(HP-42/81/18) Avail. NTIS HC A02/MF A01

Investigations of the performance of 59 industrial heat pumps are summarized The development of mechanical recompression of steam in industry is documented. Only 4 clients decided to build heat pumps in 1981, as against 50 who installed steam recompressors. Author (ESA)

N83-34437# Bendix Field Engineering Corp , Grand Junction, Colo.
NATIONAL URANIUM RESOURCE EVALUATION: RITZVILLE QUADRANGLE, WASHINGTON
B R FLESHMAN and S. P. DODD Jul. 1982 177 p refs
(Contract DE-AC13-76GJ-01664)
(DE82-018206, PGJ/F-041-82) Avail. NTIS HC A09/MF A01

The Ritzville Quadrangle, Washington, was evaluated using criteria of the National Uranium Resource Evaluation program for identifying environments and delineating areas favorable for uranium deposits. Reconnaissance and detailed investigations included the evaluation of reported uranium occurrences, geochemical sampling, and field evaluation of aerial radiometric anomalies. Detailed investigations were conducted mainly in the northeastern corner of the quadrangle where there are two producing uranium mines, the Midnite and the Sherwood The Midnite Mine uranium deposit is hosted by Precambrian metasedimentary rocks of the Togo Formation that are favorable for allogenic uranium deposits. Metasedimentary rocks of Paleozoic age are also favorable for allogenic deposits where they underlie a small area containing the Lowley Lease occurrence. DOE

N83-34466# National Audobon Society, New York, N Y
SIDE EFFECTS OF RENEWABLE ENERGY SOURCES
L MEDSKER Dec. 1982 75 p refs Revised Sponsored in part by NSF
(DE83-900852, NAS/EPRD-15) Avail: NTIS HC A04/MF A01

Using preselected criteria and guidelines, a number of side effects were identified, and qualitative descriptions were compiled along with a bibliography of recent references for nine major renewable sources of energy Various stresses, potential consequences, and possible mitigating factors are tabulated as the initial step toward establishing a SERES data base that will include for each type of renewable energy: environmental stresses organized by category; ecological consequences; possible mitigating factors and actions, and other data that can be used as input to models for projecting trends and for various calculations related to environmental side effects. This data base will be updated periodically. DOE

N83-34470# Battelle Columbus Labs , Ohio.
UTILIZATION OF BATTELLE-TREATED COAL IN GASIFICATION AND COMBUSTION PROCESSES TO CONTROL *SULFUR EMISSIONS Final Report*
H. N CONKLE, H. F. FELDMANN, A. LEVY, E L. MERRYMAN, D. R. HOPPER, and O. J. HAHN (Kentucky Univ.) 14 Sep. 1982 141 p refs
(Contract W-7405-ENG-92-111)
(DE82-021159, BMI-2096) Avail· NTIS HC A07/MF A01

An evaluation is given of the environmental and associated economic advantages of using a coal treated by a process developed by Battelle as a feedstock for: a new partial oxidation/combustion process; commercially available fixed-bed gasifiers, and utility combustors. Findings confirm the technical and economic feasibility of using Battelle Treated Coal (BTC) in at least the first two applications. For conventional pulverized combustors, temperatures are too high to allow compliance capture of sulfur at reasonable Ca/S ratios. The program consisted of experiments to investigate the potential performance of the BTC in these applications, and an economic feasibility study of BTC utilization An important advantage to small users is that the use of BTC eliminates the environmental problems associated with the treatment and disposal of sludges and waste water generated from flue-gas and fuel-gas desulfurization DOE

N83-34474# Pacific Northwest Lab., Richland, Wash.
RESIDENTIAL WEATHERIZATION-INDOOR AIR POLLUTION
G. B PARKER, P. C OWCZARSKI, and W F. SANDUSKY Apr. 1982 8 p refs Presented at the Natl. Conf. on Environ. Eng , Minneapolis, 14-16 Jul. 1982
(Contract DE-AC06-76RL-01830)
(DE82-018850, PNL-SA-10020; CONF-820723-1) Avail: NTIS HC A02/MF A01

The important factors to be considered in determining indoor air pollution concentrations in residences are described. Predictions of indoor air pollution concentrations and their impacts on human health and the environment were made in an Environmental Impact Statement (EIS) written for a residential weatherization program This program is designed to reduce energy consumption by reducing the air-infiltration (air-exchange rate), by offering air infiltration reduction measures to eligible electrically-heated residences. Indoor air pollutant concentrations are predicted in four residence types single family attached (i.e., duplexes, fourplexes), single family detached, mobile homes, and apartments). The pollutants addressed are: radon, formaldehyde, carbon monoxide, carbon dioxide, oxides of nitrogen, respirable particulates, and benzo-(a)-pyrene. The major sources of each pollutant in a residence are given DOE

N83-34478# *Sandia Labs., Albuquerque, N Mex*
UNITED STATES DEPARTMENT OF ENERGY SEWAGE SLUDGE IRRADIATION PROJECT
J. G. YEAGER and W H. MCMULLEN (DOE, Albuquerque, New Mex.) 1982 20 p refs Presented at Arizona Water Pollution Control Assoc Conf., Flagstaff, Ariz., 5-7 May 1982
(Contract DE-AC04-76DP-00789)
(DE82-016722; SAND-82-0948C; CONF-820584-1) Avail: NTIS HC A02/MF A01

The mission of the United States Department of Energy Beneficial Uses of Nuclear By-products Program is to identify and encourage the development of technology that uses radioactive by-products from US defense nuclear programs to provide alternative solutions to major national problems. A major project in the Beneficial Uses Program is the Sewage Sludge Irradiation Project The technology for this project was developed at Sandia National Laboratories and uses the radioactive byproduct cesium-137 to reduce pathogenic microorganisms in sewage sludge to levels where reuse of the sludge product in public areas meets current regulatory criteria for protection of the public health. A large-scale pilot plant is currently in operation and full-scale demonstrations of the technology are also planned. DOE

N83-34480# Argonne National Lab., Ill. Chemical Technology Div
OXYGEN-18 ESTIMATION OF PRIMARY SULFATE IN TOTAL *SULFATE SCAVENGED BY RAIN FROM A POWER-PLANT* PLUME
B. D. HOLT, E. NIELSEN, and R. KUMAR 1982 12 p refs Presented at the 4th Intern. Conf on Precipitation Scavenging, Dry Deposition and Resuspension, Santa Monica, Calif 29 Nov. 1982
(Contract W-31-109-ENG-38)
(DE83-008868, CONF-821136-21) Avail: NTIS HC A02/MF A01

The use of an oxygen isotope technique for determining the relative amounts of primary and secondary sulfates in atmospheric sulfates is proposed. The application of this technique to the estimation of the relative amounts primary sulfates and SO2 scavenged from the plume of a large power plant by summer rains is described. Results are given for the percent primary sulfate calculated for the sulfates scavenged by rain in the precipitation events that were not disqualified by the three imposed constraints. The average is 48%; the corresponding averages for background rain and rain at test sites for the same events were 24% and 37%, respectively. These results imply that about 48% of the scavenged sulfates originated in the power generating units as SO2 which subsequently hydrolized with water vapor in the flue gas to form particulate sulfate The other 52% originated as SO2 which oxidized in the plume rain system to form the secondary sulfates later found in the collected sample of rainwater. DOE

N83-34746# Rockwell International Corp , Richland, Wash. Energy Systems Group.
WASTE PACKAGE CONCEPTUAL DESIGNS FOR A REPOSITORY LOCATED IN BASALT
M. J SMITH Sep. 1982 11 p refs Presented at the NWTS Inform Meeting on Basalt Waste Isolation Project, Las Vegas, Nev. 14-15 Dec 1982
(Contract DE-AC06-76RL-01030)
(DE83-001750, RHO-BW-SA-254-P; CONF-821205-12) Avail NTIS HC A02/MF A01

Results are reported of a joint effort to develop conceptual designs for waste packages to be emplaced in a repository located in basalt Practical reference designs for commercial high-level waste and circular bundles of spent fuel rods from three pressurized water reactor assemblies or seven boiling water reactor assemblies were developed on the basis of cost effectiveness. Each of the designs is based upon clearly defined environmental and regulatory performance factors that were used in developing package design criteria. The package design was utilized in updating the conceptual design of the nuclear waste repository in basalt. A technique for developing performance and design criteria based on the favorable environmental characteristics (low-Eh, moderate-pH, low-ionic-strength groundwater) of the basalts beneath the Hanford Site are also discussed. DOE

N83-34747# Rockwell International Corp., Richland, Wash. Energy Systems Group.
TESTING OF CANDIDATE WASTE-PACKAGE BACKFILL AND CANISTER MATERIALS FOR BASALT
M. I WOOD, W. J ANDERSON, and G D. ADEN Sep 1982 9 p Presented at the NWTS Inform Meeting on Basalt Waste Isolation Project, Las Vegas, Nev , 14-15 Dec. 1982
(Contract DE-AC06-76RL-01030)
(DE83-001487; RHO-BW-SA-255-P; CONF-821205-23) Avail NTIS HC A02/MF A01

The Basalt Waste Isolation Project (BWIP) is developing a multiple-barrier waste package to contain high-level nuclear waste as part of an overall system (e.g., waste package, repository sealing system, and host rock) designed to isolate the waste in a repository located in basalt beneath the Hanford Site, Richland, Washington The three basic components of the waste package are the waste form, the canister, and the backfill. An extensive testing program is under way to determine the chemical, physical, and mechanical properties of potential canister and backfill materials. The data derived from this testing program will be used to recommend those

materials that most adequately perform the functions assigned to the canister and backfill DOe

N83-34748# Rockwell International Corp., Richland, Wash. Energy Systems Group.
SUMMARY OF NEAR-SURFACE TEST FACILITY RESULTS AND THEIR APPLICATION TO REPOSITORY DESIGN
E. C. GREGORY, M L CRAMER, W M. MCCABE, and K. KIM Sep. 1982 16 p refs Presented at the NWTS Inform. Meeting on Basalt Waste Isolation Proj., Las Vegas, Nev., 14-15 Dec 1982
(Contract DE-AC06-77RL-01030)
(DE83-001755, RHO-BW-SA-256-P; CONF-821205-20) Avail: NTIS HC A02/MF A01

Results from ongoing and newly initiated tests at the Near-Surface Test Facility contributed substantially to the store of knowledge of rock mass characterization of basalt at a variety of temperatures. Enhancements in monitoring instrumentation and testing techniques were achieved These developments assisted in the determination of site suitability of Hanford basalt formations and contributed to refinement of predictive numerical models for use in repository design. Most recently, the testing program resulted in the following: an improved method of determining thermal expansion effects on the borehole deformation gage; an improved method of monitoring the stress relief process during the doorstopper overcoring process; and the development of a high-resolution optical device for monitoring rock mass deformation in several directions simultaneously. DOE

N83-34749# Rockwell International Corp., Richland, Wash Energy Systems Group
NUCLEAR-WASTE REPOSITORY IN BASALT: SEAL DEVELOPMENT STUDIES
W J. ANDERSON, L. G. CLAYTON, A. E. COTTAM, G. K. JACOBS, W. W SCHULZ, and R. A WATROUS Sep. 1982 9 p refs Presented at the NWTS Inform. Meeting on Basalt Waste Isolation Proj., Las Vegas, Nev., 14-15 Dec 1982
(Contract DE-AC06-77RL-01030)
(DE83-001490, RHO-BW-SA-258-P; CONF-821205-16) Avail: NTIS HC A02/MF A01

Current efforts are concentrated on establishing performance requirements and design criteria for a seal system. To accomplish this objective, the repository seal system is considered as one component of the multiple barriers concept of waste isolation. A simple calculational method to predict steady state flow rates through a system of shaft seals and backfill zones as a function of plug dimensions, material permeability, and predicted hydraulic gradient was developed. A Tektronix desk top computer has been programmed to assist in executing the calculations A preliminary analysis of computer-produced data indicates disturbed rock zone permeability dominates calculated flow rates and travel times and, therefore as further studies proceed, greater emphasis will be given to the disturbed rock zone characterization. The goal is to develop a model that is supported and verified by design development and laboratory, field, and in situ materials testing. DOE

N83-34750# Rockwell International Corp , Richland, Wash. Energy Systems Group
CONCEPTUAL DESIGN OF THE NUCLEAR-WASTE REPOSITORY IN BASALT
D A. TURNER Sep. 1982 11 p Presented at the NWTS Inform. Meeting on Basalt Waste Isolation Proj., Las Vegas, Nev., 14-15 Dec. 1982
(Contract DE-AC06-76RL-01030)
(DE83-001486; RHO-BW-SA-259-P; CONF-821205-24) Avail: NTIS HC A02/MF A01

The conceptual Nuclear Waste Repository in Basalt, sized to dispose of spent fuel and commercial high-level waste equivalent to approximately 52,200 tons of heavy metal, cooled for 10 y, and 32,000 drums of low-level transuranic waste is discussed. Retrieval capability shall be maintained for up to 50 y The reference repository location is in the Hanford Site. The surface and subsurface facilities will occupy 40.5 ha (200 acres) and 588 ha (1455 acres), respectively. The design of the underground spaces is described. DOE

N83-34751# Pacific Northwest Lab., Richland, Wash.
IN SITU VITRIFICATION: APPLICATION ANALYSIS FOR STABILIZATION TRANSURANIC WASTE
K. H OMA, R. K FARNSWORTH, and J M. RUSIN Sep 1982 120 p refs
(Contract DE-AC06-76RL-01830)
(DE83-002889; PNL-4442) Avail NTIS HC A06/MF A01

The in situ vitrification process builds upon the electric melter technology previously developed for high-level waste immobilization. In situ vitrification converts buried wastes and contaminated soil to an extremely durable glass and crystalline waste form by melting the materials, in place, using joule heating. Once the waste materials have been solidified, the high integrity waste form should not cause future ground subsidence Environmental transport of the waste due to water or wind erosion, and plant or animal intrusion, is minimized. Environmental studies are currently being conducted to determine whether additional stabilization is required for certain in-ground transuranic waste sites An applications analysis was performed to identify several in situ vitrification process limitations which may exist at transuranic waste sites. Based on the process limit analysis, in situ vitrification is well suited for solidification of most in-ground transuranic wastes DOE

N83-34752# Pennsylvania State Univ , University Park Materials Research Lab.
REACTIONS OF A PROTOTYPE NUCLEAR-WASTE CERAMIC WITH A HOT MAGNESIUM-RICH BRINE
S. KOMARNENI, B. E. SCHEETZ, W. P. FREEBORN, G. J. MCCARTHY, and W. B. WHITE Oct 1982 66 p refs
(Contract DE-AC06-76RL-01830)
(DE83-002762, ONWI-307) Avail· NTIS HC A04/MF A01

Prototype ceramic nuclear waste forms were experimentally reacted with a high calcium and magnesium brine under hydrothermal conditions. The said reaction products and fluid were analyzed at the end of the experiment. Alteration of the waste forms was observed and the reaction products identified. Uptake of cesium, rubidium, strontium, barium, lanthanum and neodymium into the brine was measured with a strong temperature dependence, i e., increased concentrations with increased temperature The concentrations of the six elements also increased with time, and imply that dissolution of the ceramic is controlled by diffusion and/or crystalline dissolution mechanism DOE

N83-34754# Sandia Labs., Albuquerque, N Mex Seabed Programs Div
SUBSEABED DISPOSAL: SYSTEMATIC APPLICATION OF THE SITE-QUALIFICATION PLAN
L. E. SHEPHARD, J E. DAMUTH (Lamont-Doherty Geological Observatory), D. B. HAYES (Lamont-Doherty Geological Observatory), G R. HEATH (Oregon State Univ , Corvallis), E. P. LAINE (Rhode Island Univ , Narragansett), M. LEINEN (Rhode Island Univ , Narragansett), and B. E. TUCHOLKE (Woods Hole Oceanographic Inst) 1982 15 p refs Presented at the Marine Technology Society and Geological Society of America Conf. on Oceans, Washington, D.C., 20 Sep. 1982
(Contract DE-AC04-76DP-00789)
(DE82-018750, SAND-82-1379C; CONF-820926-1) Avail NTIS HC A02/MF A01

Two criteria, geologic stability and barrier effectiveness, form the basis of the Subseabed Disposal Program's site qualification plan to evaluate the ocean basins and identify those regions having characteristics most favorable for containment of radioactive waste. Stability criteria are used to define those regions least likely to be disturbed by tectonic forces or oceanographic changes during the lifetime of a waste repository. Barrier criteria define those lithologies most likely to form an effective barrier to the release of radionuclides. Two north Pacific regions and three north Atlantic regions were selected for further investigation based on the site qualification plan. The PAC I region, centered on the Shatsky

Rise in the northwest Pacific, was subdivided into areas and locations on the basis of an exhaustive review of data. DOE

N83-34758# Institute of Oceanographic Sciences, Wormley (England).
RESEARCH IN CONNEXION WITH THE POSSIBLE DISPOSAL OF HIGH LEVEL RADIOACTIVE WASTE ON OR BENEATH THE OCEAN FLOOR Status Report, Mar. 1982
Mar. 1983 67 p refs
(Contract DGR-481/179; EEC-257-81-7-WAS-UK)
(IOS-153; DOE/RW-82/089) Avail NTIS HC A04/MF A01

Selection and evaluation of areas and sites for the disposal of high level radioactive waste; properties of ocean sediments in relation to the disposal of radioactive waste; biological transfer of materials between seabed and surface, the benthic boundary layer in relation to the disposal of radioactive waste; and dispersion in the Northeast Atlantic are discussed. On the seabed and below the seabed disposal are considered Author (ESA)

N83-34836# Stuttgart Univ. (West Germany). Sonderforschungsbereich 85.
TRANSONIC AND SUBSONIC COMPRESSORS [TRANSCHALL- UND UEBERSCHALLVERDICHTER]
H. H FRUEHAUF *In its* Thermodyn. and Flow Mech. Problems in Aircraft and Spacecraft Devices: Summary of Work and Results for 1980, 81, 82 p 394-483 1982 refs In GERMAN
Avail. NTIS HC A99/MF A01

A three-dimensional numerical method was developed to compute the flow through turbomachine blade cascades in order to increase the efficiency of turbine components and to reduce the power comsumption The turbulent transonic cascade flow is calculated in the case of strong interaction between main flow and boundary layer flow, resulting in an efficient and precise solution of the thin layer Navier-Stokes equations Time-dependent Euler equations are obtained for subsonic and transonic flow through blade cascade subject to strong rotation. The frictionless aerodynamic quasi-two-dimensional interaction between two fixed cascades is accurately computed. A three dimensional computation of absolutely rotation-free subsonic and transonic flow through cascade is made Author (ESA)

N83-34858# Argonne National Lab., Ill. Energy and Environmental Systems Div
TOTAL ENERGY-USE ANALYSIS OF URBAN TRANSPORTATION ENERGY-CONSERVATION STRATEGIES
M. K. SINGH and S. J LABELLE Jan 1983 25 p refs Presented at the Transportation Research Board Ann. Meeting, Washington, D C., 17 Jan 1983
(Contract W-31-109-ENG-38)
(DE83-009444, CONF-830131-1) Avail: NTIS HC A02/MF A01

Total energy consumption, by fuel type, resulting from local travel (by urban households) in 1980, 1990, and 2000, in two scenarios and three alternative policies was evaluated Energy consumed in vehicles operation, fuel production, vehicle production, and infrastructure construction was projected, and the relative impact of each policy was also evaluated. A substantial decline in total energy use in national urban passenger travel from 1980 to 2000 was projected for both scenarios and all three policies. It is also indicated that indirect energy use required to support the policies is offset some of the policies' direct energy savings The resulting scenario in the greatest total energy savings does not save the greatest amount of petroleum. DOE

N83-35058# Argonne National Lab., Ill. Energy and Environmental Systems Div.
ENERGY TRADEOFFS IN AUTOMOTIVE USE OF STEEL, FIBER-REINFORCED PLASTICS AND ALUMINUM
J CUMMINGS-SAXTON 1982 9 p refs Presented at the Soc. of Automotive Engr. Intern. Congr. and Exposition, Detroit, 22 Feb. 1982
(Contract W-31-109-ENG-38)
(DE83-009555; CONF-820203-7) Avail NTIS HC A02/MF A01

The embodied energy, structural weight, and transportation energy (fuel requirement) characteristics of steel, fiber-reinforced plastics, and aluminum were assessed to determine the overall energy savings of materials substitution in automobiles. In body panels, a 1.0-lb steel component with an associated 0 5 lb in secondary weight is structurally equivalent to a 0.6-lb fiber-reinforced plastic component with 0.3 lb in associated secondary weight or a 0 5-lb aluminum component with 0.25 lb of secondary weight. The total energy requirements of structurally equivalent body panels (including their embodied and life cycle transportation energies) are. steel (211,600 Btu), fiber-reinforced plastics (126,700 Btu), and aluminum (174,300 Btu) Fiber-reinforced plastics offer greatest improvements in embodied and total energy requirements, while aluminum achieves greatest savings in transportation energy DOE

N83-35276# Argonne National Lab , Ill. Energy and Environmental Systems Div
REGIONAL ANALYSIS OF POTENTIAL IMPACTS OF ELECTRIC AND HYBRID VEHICLES ON ELECTRIC UTILITIES
R. F. GIESE, M K SINGH, and M. J. BERNARD 1982 18 p Presented at the Society of Automotive Engineers Intern. Congr. and Exposition, Detroit, 22 Feb. 1982
(Contract W-31-109-ENG-38)
(DE83-008622; CONF-820203-6) Avail. NTIS HC A02/MF A01

The impact of electric and hybrid vehicle (EHV) charging requirements on electric utilities is analyzed. The impact for the five EHV scenarios examined generally is small, with total FHV electricity consumption in the HIGH scenarios representing approx. 3% of projected US electricity demand in 2000 However, in several areas, EHV electricity consumption in the HIGH scenarios represents a sizable fraction of electricity demand in 2000 and would have to be included in utility planning. DOE

N83-35401# Curtiss-Wright Corp , Wood-Ridge, N J. Power Systems Div.
HIGH-TEMPERATURE-TURBINE TECHNOLOGY PROGRAM: PHASE 2. TECHNOLOGY TEST AND SUPPORT STUDIES. UPDATE OF OVERALL PLANT-DESIGN DESCRIPTION-COMBINED-CYCLE ELECTRIC-POWER PLANT WITH INTEGRATED LOW-BTU-GAS PLANT
Apr. 1982 109 p
(Contract DE-AC01-76ET-10348)
(DE82-016298, CW-WR-76-020 81A; FE-2291-81A) Avail: NTIS HC A06/MF A01

Changes made to the preliminary design of a commercial combined cycle electric powerplant operating on low Btu gas fuel are described. Major elements changed were: gas turbine configuration, gas desulfurization system; gas cleanup system, and the steam system operating parameters. The net power output of this base load station was increased from 750 MW to 1032 MW, by increasing the size of the four gas turbines The gas turbine configuration was changed from a 2-spool, annular burner arrangement to a single shaft engine with can-type combustors Firing temperature is revised from 3000 to 2750 F. The free power turbine arrangement of the original powerplant concept which permits double-ending the electrical generators was retained. The steam system configuration is changed from an 1800/1000 single level system to a 2400/1000/1000 single reheat configuration which utilizes heat extraction from the hot flue gas down to 280 F, delivers gasifier steam and jacket water and provides fuel gas preheat. DOE

N83-35499*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NECAP 4.1: NASA'S ENERGY-COST ANALYSIS PROGRAM USER'S MANUAL
R. N JENSEN, R H. HENNINGER (Computer Sciences Corp.), and D. L. MINER (GARD, Inc.) Jul 1983 268 p refs
(NASA-TM-83238, NAS 1 15:83238) Avail: NTIS HC A12/MF A01 CSCL 10B

The Enery Cost Analysis Program (NECAP) is a powerful computerized method to determine and to minimize building energy consumption. The program calculates hourly heat gain or losses taking into account the building thermal resistance and mass, using hourly weather and a 'response factor' method. Internal temperatures are allowed to vary in accordance with thermostat settings and equipment capacity. A simplified input procedure and numerous other technical improvements are presented This Users Manual describes the program and provides examples. S.L

N83-35518# Electricite de France, Chatou. Dept Systemes Energetiques.
COMBINED CYCLE ENERGY PRODUCTION: OVERVIEW OF WORLDWIDE UTILIZATION AND TECHNIQUES [PRODUCTION D'ENERGIE PAR CYCLES COMBINES GAZ-VAPEUR PANORAMA DU PARC MONDIAL ET DES TECHNIQUES]
M ROCHE Jun 1982 41 p refs In FRENCH
(HP-51-D05) Avail NTIS HC A03/MF A01

The worldwide distribution of combined cycle generators using simple recuperation, supercharged boilers, post combustion, and parallel combustion and complex cycles is summarized. Clean energy, fuel oil, coal, fluidized bed, and gasification based processes are discussed. With clean energy systems, up to 46% efficiency is achieved using a single recuperation - double evaporation cycle. Using gas turbine output to feed a higher power steam turbine is also economically attractive, but no one system is an obvious choice. Around 100 combined generators are now operating. Author (ESA)

N83-35521# National Academy of Sciences - National Research Council, Washington, D C Board on Science and Technology for International Development
PROCEEDINGS OF ECONOMIC COMMUNITY OF WEST AFRICAN STATES (ECOWAS) ENERGY SYMPOSIUM: ENERGY FOR SURVIVAL Final Report
1982 64 p refs Symp. held at Freetown, Sierra Leone, 2-6 Nov. 1981
(Contract AID-DAN-5538-G-SS-1023)
(PB83-191353) Avail NTIS HC A04/MF A01 CSCL 10A

Severe energy problems plague the 16 member states of the Economic Community of West Africa States (ECOWAS), including those exporting petroleum. Two particular problems are characteristic of the region The first is deforestation which is leading to lower agriculture productivity, climatic changes, and reduced individual productivity because of the labor and time required to collect fuelwood. The second problem is the purchase of petroleum by countries, causing negative balance of payments, which in turn diverts financial resources from the other development programs. The objectives of the ECOWAS Energy Symposium were to bring these problems to the attention of policy makers and to decide a course of action. Author (GRA)

N83-35530# Lurgi Umwelt und Chemotechnik G.m.b.H , Frankfurt am Main (West Germany). Labor fuer Chemie, Verfahrens- und Abgastechnik
FLUE GAS DESULFURIZATION IN A SPRAY TOWER WITH DECOUPLED RECYCLING OF SODA ASH Final Report, May 1982
H. LIEBGOTT Bonn Bundesministerium fuer Forschung und Technologie May 1983 74 p refs In GERMAN, ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-073, ISSN-0340-7608) Avail: NTIS HC A04/MF A01, Fachinformationszentrum, Karlsruhe, West Germany DM 15,60

A dry process for the desulfurization of flue gases was developed. The process is based on a desulfurization step with a solution of soda ash which is sprayed into the flue gas The gas is cooled by evaporation so that its temperature is still higher than the dew point, reheating is not necessary. The product of the desulfurization is a dry mixture of sodium sulfite and carbonate. It was intended to reprocess this powder to soda in a central plant serving several power stations. Sulfite was oxidized to sulfate, which in turn reacted with calcium chloride to form calcium sulfate and sodium chloride. The latter was introduced into the Solvay soda ash process with calcium chloride as a by product. The desulfurization tests resulted in poor degrees of SO2 removal even with high stoichiometric ratios of soda ash to sulfur dioxide. Estimates of process economics made before start of experimental work could not be verified. The project was abandoned Author (ESA)

N83-35556# California Univ., Livermore. Lawrence Livermore Lab.
DENSER-THAN-AIR DISPERSION MODELING IN THE ATMOSPHERE
D L. ERMAK Feb 1983 17 p refs Presented at JANNAF Safety and Environ. Protection Meeting, Livermore, Calif., 8 Mar. 1983
(Contract W-7405-ENG-48)
(DE83-008407; UCRL-88782, CONF-830321-3) Avail. NTIS HC A02/MF A01

The representative types of models that were developed to simulate the atmospheric transport of a heavy gas release are described Emphasis is placed on describing the major differences between the various types of models and on the description of the FEM3 model. The FEM3 is a three dimension, time dependent model which predicts the dispersion of a heavy gas release over complex terrain by numerically solving the conservation equations of mass, momentum, energy and species Comparisons of FEM3 predictions with the results from large scale liquefied natural gas (LNG) vapor dispersion experiments and applications of FEM3 to the dispersion of ammonia aerosols are presented The model predictions compare very well with the LNG experimental results and the effects of terrain on the dispersing natural gas vapor cloud are clearly demonstrated. As the wind speed is lowered and the atmosphere becomes more stable, gravity spreading is shown to be the dominant phenomena affecting the dispersion of the heavy gas cloud DOE

N83-35761# Mons Univ (Belgium)
CONSUMPTION AND EFFICIENCY OF AUTOMOBILES [CONSOMMATION ET RENDEMENT DES VEHICULES AUTOMOBILES]
J. J. HANTON *In* Brussels Univ. Liber Amicorum Andre L. Jaumotte p 373-391 1983 refs In FRENCH
Avail NTIS HC A99/MF A01

The internal and external factors which influence automobile fuel consumption (vehicle weight, wind, etc) are described, and factors which influence engine efficiency are defined. It is shown that efficiency cannot be described as an inverse of consumption. Cases where efficiency increases as consumption increases are illustrated. Developments designed to reduce fuel consumption are discussed. Author (ESA)

N83-35765# Brussels Univ. (Belgium). Service de Genie Chimique
COMBINED HEAT AND ELECTRICITY PRODUCTION: TECHNICAL POSSIBILITIES, OUTLOOK AND OBSTACLES [LA PRODUCTION COMBINEE DE CHALEUR ET D'ELECTRICITE: POSSIBILITIES TECHNIQUES, PERSPECTIVES ET OBSTACLES]
R. JOTTRAND, E. TOMAS, and F. SOQUET *In its* Liber Amicorum Andre L. Jaumotte p 445-461 1983 refs In FRENCH
Avail NTIS HC A99/MF A01

The principles of combined heat and power production are outlined, and the utilization of cogeneration technology in Belgium is discussed Despite energy savings of up to 30%, cogeneration is not widely accepted, mainly for economic reasons, but also because of technical aspects, such as the need to assure a back up supply in case of cogeneration system failures Pricing, regulation, and marketing measures to overcome resistance are proposed Author (ESA)

N83-35770# Centre National de la Recherche Scientifique, Nancy (France). Lab. des Sciences du Genie Chimique.
COMPARISON OF THE EXERGETIC, ECOLOGICAL AND ECONOMIC PERFORMANCES OF A HEAT PUMP [COMPARISON DES PERFORMANCES EXERGETIQUE, ECOLOGIQUE, ET ECONOMIQUE D'UNE POMPE A CHALEUR]
P. LEGOFF and E. DIETRICH *In* Brussels Univ. Liber Amicorum Andre L. Jaumotte p 521-534 1983 refs In FRENCH
Avail: NTIS HC A99/MF A01

The energy valorization coefficient of heat pumps is defined as the ratio of the sum of energy values produced to the sum of energy values used The value is decided by an arbitrary scale chosen by the user. Coefficients derived from scales based on performance, exergy, global ecology, and national energy markets are presented These show that a performance based evaluation of heat pumps is too simplistic, since subjective factors must be taken into account in economic analyses Author (ESA)

N83-35816# Sandia Labs., Albuquerque, N Mex Fuel Cycle Risk Analysis Div
METHODOLOGY FOR ASSESSING THE RISK FROM THE DISPOSAL OF HIGH-LEVEL RADIOACTIVE WASTES IN DEEP GEOLOGIC FORMATIONS
R M. CRANWELL, N R ORTIZ, and G E. RUNKLE 1983 23 p refs Presented at the Intern. Conf on Radioactive Waste Management, Seattle, 16 May 1983 Sponsored in part by the Nuclear Regulatory Commission
(Contract DE-AC04-76DP-00789)
(DE83-009164, SAND-83-0465C; CONF-830523-5) Avail NTIS HC A02/MF A01

A risk assessment methodology for use in assessing the post closure, long term risk from the disposal of high level radioactive wastes in deep geologic formations This methodology consists of (1) techniques for selecting and screening scenarios, (2) models for use in simulating the physical processes and estimating the consequences associated with the occurrence of these scenarios; (3) probabilistic and statistical techniques for use in risk estimates and sensitivity and uncertainty analyses, (4) a procedure for utilizing these models and techniques to arrive at estimates of consequences and risk. The methodology was demonstrated by applying it to the analysis of a hypothetical site containing a bedded salt formation as the host medium for the waste repository In this demonstration analysis, consequences resulting from the occurrence of several hypothetical scenarios were determined. These consequences were expressed in terms of radionuclide discharges to the biosphere and health effects resulting from these discharges. DOE

N83-35818# Battelle Pacific Northwest Labs., Richland, Wash
THE NEA RESEARCH AND ENVIRONMENTAL SURVEILLANCE PROGRAMME RELATED TO SEA DISPOSAL OF LOW-LEVEL RADIOACTIVE WASTE
B. RUGGER (Organization for Economic Cooperation and Development, Paris), W. L TEMPLETON, and P GURBUTT (Ministry of Agriculture, Fisheries and Food, Lowestoft, England) May 1983 21 p refs Presented at the Intern. Conf. on Radioactive Waste Management, Seattle, 16-20 May 1983
(Contract DE-AC05-75RL-01830)
(DE83-013257, PNL-SA-11379; CONF-830523-13) Avail. NTIS HC A02/MF A01

Sea dumping operations of certain types of packaged low and medium level radioactive wastes have been carried out since 1967 in the North-East Atlantic under the auspices of the OECD Nuclear Energy Agency On the occasion of the 1980 review of the continued suitability of the North-East Atlantic site used for the disposal of radioactive waste, it was recommended that an effort should be made to increase the scientific data base relating to the oceanographic and biological characteristics of the dumping area. In particular, it was suggested that a site specific model of the transfer of radionuclides in the marine environment be developed, which would permit a better assessment of the potential radiation doses to man from the dumping of radioactive waste To fulfill these objectives a research and environmental surveillance program related to sea disposal of radioactive waste was set up in 1981 with the participation of thirteen Member countries and the International Laboratory for Marine Radioactivity of the IAEA in Monaco. The research program is focused on five research areas which are directly relevant to the preparation of more site specific assessments in the future. They are model development; physical oceanography; geochemistry; biology, and radiological surveillance Promising results have already been obtained and more are anticipated in the not too distant future. An interim description of the NEA dumping site has been prepared which provides an excellent data base for this area DOE

N83-35819# Language Services, Knoxville, Tenn
GLASSES FOR THE SOLIDIFICATION OF HIGH-LEVEL RADIOACTIVE WASTE: THEIR BEHAVIOR IN THE PRESENCE OF WATER
R. GRAUER Feb. 1983 141 p refs Transl. into ENGLISH of rept EIR-477 Eidgenoessische Inst fuer Reaktorforschung, Wuerlingen, Switzerland, Feb. 1983 157 p
(Contract W-7405-ENG-26)
(DE83-013402, ORNL-TR-4980; EIR-477) Avail· NTIS HC A07/MF A01

Because of their amorphous structure, glasses are particularly suitable for the solidification of the mixture of high level radioactive wastes resulting from reactor fuel reprocessing they are not sensitive to variations in the compositions of waste oxides and are resistant to the damaging effects of radiation The borosilicate glasses used for this purpose have been investigated for about 25 years, and a waste vitrification techniques have been tested on a commercial scale In view of possible accidents in a final waste repository, the chemical resistance of this type of glasses to attach by groundwaters is of special interest The present report deals with the corrosion behavior of glasses and discusses the most significant controlling parameters. The dissolution rates needed for safety analysis must be determined in relatively short term experiments. Since the results can depend strongly on the type of test procedures used, a critical assessment of these techniques is necessary. Experimental results are illustrated by means of selected examples. Particular emphasis is placed upon the effects of increased temperatures and of nuclear radiation The models which have been proposed for the estimation of the long term behavior of vitrified waste are not yet fully complete and require improvement. Furthermore, the actual dissolution rates which are used in such models should be revised: to be desired are values which take into account the actual environmental conditions at the storage site It should be noted, however, that even with current conservative input data on corrosion rates, a lifetime on the order of 10(5) years can be expected for the glass

blocks to be deposited. The report concludes with recommendations for further investigations. DOE

N83-35915# Joint Publications Research Service, Arlington, Va
MARCHUK ON TASKS FACING INVENTORS, INNORVATORS
G MARCHUK *In its* USSR Rept. Sci and Technol Policy, No. 16 (JPRS-84352) p 11-15 19 Sep 1983 Transl. into ENGLISH from Trud (Moscow), 25 May 1983 p 2
Avail. NTIS HC A05

There is one firm rule equipping with leading technology ensures a high level in the development of the national economy, and consequently in raising the rate of growth of the national income. There is a more capacious definition for leading technology, for everything new and possessing the essential difference of solving a task technically. This definition consists of one work invention, and the creators of inventions are called inventors The great contribution made by our inventors and rationalizers helps all sectors of the national economy move faster to advanced positions of science and technology, so that the use of manual labor would be reduced, that all resources would be used rationally and that quality of production would rise Author

N83-35952*# Jet Propulsion Lab., California Inst. of Tech., Pasadena
RAIL TRANSIT FARE COLLECTION: POLICY AND TECHNOLOGY ASSESSMENT Final Report, Jan. 1981 - Jun. 1982
G K. DESHPANDE, J. CUCCHISSI, and R. C. HEFT Dec. 1982 67 p refs
(Contract DTRS57-80-X-00071)
(NASA-CR-173116; NAS 1.26.173116, DOT-TSC-UMTA-82-49; UMTA-MA-06-0025-82-4) Avail NTIS HC A04/MF A01 CSCL 13F

The impact of fare policies and fare structure on the selection of equipment was investigated, fare collection systems are described, hardware and technology related problems are documented, and the requirements of a fare collection simulation model are outlined. Major findings include: (1) a wide variation in the fare collection systems and equipment, caused primarily by historical precedence; (2) the reliability of AFC equipment used at BART and WMATA discouraged other properties from considering use of similar equipment; (3) existing equipment may not meet the fare collection needs of properties in the near future; (4) the cost of fare collection operation and maintenance is high; and (5) the relatively small market in fare collection equipment discourages new product development by suppliers Recommendations for fare collection R&D programs include development of new hardware to meet rail transit needs, study of impacts of alternate fare policies increased communication among policymakers, and consensus on fare policy issues. Author

N83-35954# Sandia Labs., Albuquerque, N. Mex.
TECHNOLOGY TRANSFER AT SANDIA NATIONAL LABORATORIES Final Annual Report
R P STROMBERG Mar. 1983 33 p refs
(Contract DE-AC04-76DP-00780)
(DE83-010285) Avail NTIS HC A03/MF A01

Recent emphasis on new or alternative energy sources has greatly accelerated transfer which is valued in the millions of dollars and is now required by law. Several transfer methods were established, ranging from personal contact to written formal reports DOE

N83-36029* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPARATUS FOR IMPROVING THE FUEL EFFICIENCY OF A GAS TURBINE ENGINE Patent
G. A. COFFINBERRY, inventor (to NASA) (GE, Cincinnati) 20 Sep. 1983 7 p Filed 20 Mar. 1980 Supersedes N83-14130 (21 - 05, p 0622) Sponsored by NASA
(NASA-CASE-LEW-13142-1; US-PATENT-4,404,793, US-PATENT-APPL-SN-132364; US-PATENT-CLASS-60-39.07)
Avail: US Patent and Trademark Office CSCL 21E

An energy recovery system is provided for an aircraft gas turbine engine of the type in which some of the pneumatic energy developed by the engine is made available to support systems such as an environmental control system In one such energy recovery system, some of the pneumatic energy made available to but not utilized by the support system is utilized to heat the engine fuel immediately prior to the consumption of the fuel by the engine Some of the recovered energy may also be utilized to heat the fuel in the fuel tanks. Provision is made for multiengine applications wherein energy recovered from one engine may be utilized by another one of the engines or systems associated therewith
Official Gazette of the U.S. Patent and Trademark Office

N83-36247# Scientific Process and Research, Inc., Highland Park, N J.
NEW TECHNIQUE FOR PLASTICS PROCESSING
I KLEIN and R. KLEIN 16 Feb. 1983 323 p refs
(Contract NSF DAR-78-21356)
(PB83-218941; NSF/ECS-83001) Avail. NTIS HC A14/MF A01 CSCL 11I

The SDS screw, a plastics processing device incorporating a dual, concentrically mounted screw system is discussed. Unmelted plastic is drained from the discharge end of the outer screw and led upstream through the inner screw where melting is completed. Experiments confirm that the melting capacity of the extruder can be substantially increased by the installation of an SDS screw. Screws can therefore be designed much deeper than is customary with a correspondingly higher pumping capacity Deep screws which pump at higher rates also shear the plastic material less This effect results in lower melt temperature, higher energy efficiency, and absence of temperature fluctuation GRA

N83-36561# Oak Ridge National Lab., Tenn. Environmental Sciences Div.
ENERGY RELATED ENVIRONMENTAL STUDIES Annual Progress Report for period ending 30 Sep. 1982
Apr. 1983 253 p refs
(Contract W-7405-ENG-26)
(DE83-010394; ORNL-5999; ESDP-2090) Avail: NTIS HC A12/MF A01

Separate abstracts were prepared for 12 of the 14 sections of the Environmental Sciences Division annual progress report. The other 2 sections deal with educational activities. The programs discussed deal with advanced fuel energy, toxic substances, environmental impacts of various energy technologies, biomass, low-level radioactive waste management, the global carbon cycle, and aquatic and terrestrial ecology. DOE

N83-36890# Rockwell International Corp., Richland, Wash. Energy Systems Group.
LONG-TERM HIGH-LEVEL DEFENSE-WASTE TECHNOLOGY Progress Report, Apr. - Jun. 1982
Jul 1982 19 p
(Contract DE-AC06-77RL-01030)
(DE83-000375; RHO-WM-SR-82-1-3QP) Avail: NTIS HC A02/MF A01

In the residual liquid solidification effort, the primary alternative studied is the wiped film evaporator approach to solidifying salt well pumped liquids and returning the molten material to single shell tanks for microwave final stabilization to a hard dry product. Both systems analysis and experimental work are proceeding to evaluate this approach. The primary alternative for in situ

stabilization of in-tank wastes is microwave drying of wet salt cake and unpumped sludges. Experimental work was successfully conducted on a 1/12 scale tank containing wet synthetic salt cake Related systems analysis of a full scale system was initiated. DOE

N83-36891# Brookhaven National Lab., Upton, N Y. Dept of Nuclear Energy.
IRRADIATION EFFECTS IN THE STORAGE AND DISPOSAL OF RADIOACTIVE ION-EXCHANGE RESINS
K. J. SWYLER, C E. DODGE, R DAYAL, and A. J. WEISS 1982 9 p refs Presented at the 6th Intern Symp. on the Sci Basis for Radioactive Waste Management, Boston, 1 Nov 1982 (Contract DE-AC02-76CH-00016)
(DE83-0001311; BNL-NUREG-31894; CONF-821107-12) Avail· NTIS HC A02/MF A01

The effects of self irradiation on radwastes which may be generated when organic ion exchange media are used in water demineralization or decontamination operations at nuclear facilities are studied. External factors affecting the relation between laboratory evaluations and field performance are emphasized. Initial experiments do not yet indicate substantial radiation dose rate effects on radiolytic gas yields or acid product formation, when (fully swollen) sulfonic acid resins are irradiated in a sealed air environment. At the same time, oxygen gas is removed from the environment of irradiated resins. Interaction between mild steel coupons and acidic species produced in the irradiation induced decomposition of sulfonic acid resin results in irradiation enhanced corrosion Corrosion rates depend on radiation dose rate, moisture content and resin chemical loading. DOE

N83-37006# National Science Foundation, Washington, D C. Div. of Policy Research and Analysis
PROCEEDINGS OF A WORKSHOP ON THE ROLE OF BASIC RESEARCH IN SCIENCE AND TECHNOLOGY: CASE STUDIES IN ENERGY R AND D (RESEARCH AND DEVELOPMENT)
1983 141 p Workshop held in Washington, D C., 12-13 Mar 1983
(PB83-213645, NSF-83-30; NSF/PRA-83012) Avail: NTIS HC A07/MF A01 CSCL 05A

Meanings of the term basic research are provided and a common definition is sought. The direct impact of basic research on the advancement of energy technology and science and the indirect benefits of that research to society in general are evaluated. Research programs at the Department of Energy and in private industry are examined. Characteristics of industries involved in research and development (R&D) are discussed. These industries are said to be large, diversified, multinational corporations that are highly affected by government regulation and that carry on their R&D in diversified locations. Industry and university interactions are discussed. GRA

N83-37019# Department of Energy, Washington, D C. Office of Energy Markets and End Use.
MODEL DOCUMENTATION: SHORT-TERM INTEGRATED FORECASTING SYSTEM DEMAND MODEL
M. E RODEKOHR Mar. 1983 95 p refs
(DE83-011479; DOE/EIA-0391) Avail: NTIS HC A05/MF A01

The demand models used by the Short-term Integrated Forecasting System (STIFS) to produce the energy-demand forecasts published in the Short-Term Energy Outlook (Outlook) are documented The STIFS demand model is a set of individual energy product demand models which, when combined with electric utility fuel use and natural gas supply and demand estimates, produces projections of demand for total energy and individual energy products The geographical area of consideration is the United States, defined as the 50 States excluding the territories and islands The model forecasts on a monthly basis but only quarterly averages are published All forecasts are made six quarters into the future The structure of the individual models is summarized, beginning with the energy price models which are used to produce forecasts of the various retail energy prices used in the demand models. Most of these models are econometric, estimated by ordinary least squares for the Cochrane-Orcutt procedure which corrects for autocorrelation. Since all of the models are deterministic, no solution algorithm is used DOE

N83-37027# National Electrical Engineering Research Inst., Pretoria (South Africa).
COMPARISON OF TWO TYPES OF BATTERY VEHICLE DRIVE SYSTEMS WITH REGARD TO THE ENERGY CONSUMPTION DURING START/STOP DRIVING CONDITIONS
H. R. VANNIEKERK Mar. 1982 31 p refs
(CSIR-ELEK-238; ISBN-0-7988-17127) Avail. NTIS HC A03/MF A01

The results of calculations done on the energy consumption of multiple ratio and fixed ratio drive systems under operating conditions typical of town use are provided. N.W.

02

SOLAR ENERGY

Includes solar collectors, solar cells, solar heating and cooling systems, and solar generators.

A83-40667
A SOLAR CELL WITH ENHANCED PHOTOCURRENT
B. KAELLBAECK (Institute of Microwave Technology, Stockholm, Sweden) Solid-State Electronics (ISSN 0038-1101), vol 26, July 1983, p. 653-656.

Calculations have been performed on an n(+)p-solar cell structure with an added smaller bandgap extra layer. Continuity in the valence band is assumed between the two different semiconductor materials. In this way the usual requirement in a tandem cell of equal photo carrier generation in the different materials is relaxed Author

A83-40765
BUOYANCY EFFECTS AND THE MANIFOLDING OF SINGLE ENDED ABSORBER TUBES
B. WINDOW and G L HARDING (Sydney, University, Sydney, Australia) Solar Energy (ISSN 0038-092X), vol 31, no. 2, 1983, p. 153-157. refs

Measurements are reported on some manifolds of the fluid in glass type for evacuated all-glass tubular collectors Temperatures at the closed end of glass tubes were measured while heating the tubes electrically to simulate solar energy input. Both parallel and series connection of the tubes are considered. The results show that thermosiphon effects can be used to achieve balanced flows in the parallel configuration, and for both parallel and series configurations efficient heat extraction can be achieved from the tubes with no partitioning of the inner volume of the tubes Author

A83-41165
ANALYSIS OF SOLAR-RADIATION CHARACTERISTICS AT THE EURELIOS POWER PLANT OF ADRANO
F. BARBALISCIA (Fondazione Ugo Bordoni, Rome, Italy) and A LAVAGNINI (CNR, Istituto di Fisica dell'Atmosfera, Rome, Italy) Nuovo Cimento C, Serie 1, vol. 6, Jan.-Feb. 1983, p. 83-95 Research supported by the Ente Nazionale per l'Energia Elettrica.

A83-41286
SPECTROSCOPIC LASER SCANNING ANALYSIS OF PHOTO-INDUCED CURRENT ON A-SI SOLAR CELLS
H. TAKAKURA, C. COLUZZA, Y. HAMAKAWA (Osaka University, Osaka, Japan), K. FUJIMOTO, and K. OKUDA Japanese Journal of Applied Physics, Part 1 (ISSN 0021-4922), vol 22, April 1983, p. 569-574. Research sponsored by the Agency of Industrial Science and Technology. refs

The spatial homogeneity and surface and junction interfaces in amorphous silicon (a-Si) solar cells are presently characterized

by means of a spectroscopic analysis of laser beam-induced current, with attention to photocurrent inhomogeneities and fluctuation origins Three kinds of fluctuations are noted: spikes, which are due to dust and scratches on the a-Si film, aligned sinusoidal fluctuations of short period, caused by glass substrate thickness inhomogeneity, and a relatively long period oscillation, which has its basis in the characteristics of the a-Si junction interface. It has also been found that a spectroscopic technique which varies the wavelength of a probe light makes possible the study of the in-depth profile of optoelectronic properties, as well as of the optical properties of semiconductor devices. O C

A83-41351
SPACECRAFT TECHNOLOGY FOR DIRECT BROADCAST MISSIONS
H D. COHEN (TRW Space and Technology Group, Redondo Beach, CA) IN· ICC '82 - The digital revolution; International Conference on Communications, Philadelphia, PA, June 13-17, 1982, Conference Record Volume 1 New York, Institute of Electrical and Electronics Engineers, 1982, p 2A 3 1-2A 3.7 refs

This paper surveys the technologies required for presently conceived direct broadcast satellite (DBS) projects The technologies include launch vehicles, shaped beam antennas, high power traveling wave tubes (TWTs), electronic power conditioners for TWTs, lightweight, high power solar arrays, heat pipe radiators and output multiplexers. It is concluded that the technology is available and only detailed engineering development and testing are required for DBS construction. Author

A83-41518
INTRODUCTION TO SOLAR TECHNOLOGY
M J FISK and H. C. W ANDERSON (Solar Research and Engineering Corp , Yakima, WA) Reading, MA, Addison-Wesley Publishing Co, 1982, 436 p. refs

An introductory textbook of the basic theoretical, engineering, and architectural principles of solar energy conversion systems is presented, with an emphasis on building heating applications. Attention is given to solar radiation measurement and heat transfer by radiation, convection, and conduction The functional characteristics of flat plate collectors are explored, together with heat storage technologies, designs, and controls. Consideration is given to parameters affecting system design, selection, and optimization, and passive solar building heating systems are described, including architectural details. Concentrating solar collectors are discussed in conjunction with heat engines and air conditioning units Finally, solar energy electricity generating technologies are reviewed, as are factors affecting the future uses of solar energy Author

A83-41538
FLOW DISTRIBUTION IN PARALLEL CONNECTED MANIFOLDS FOR EVACUATED TUBULAR SOLAR COLLECTORS
R. C. MCPHEDRAN, D. J. M. MACKEY, D. R MCKENZIE, and R. E COLLINS (Sydney, University, Sydney, Australia) Australian Journal of Physics (ISSN 0004-9506), vol. 36, no. 2, 1983, p 197-219 refs

A model is presented for predicting the flow distribution in solar collector manifolds in which risers are connected in parallel between headers. Both frictional and Bernoulli effects are considered. The distributions resulting from flow in the manifold in which header streams are parallel and opposed are calculated and compared with experiment Parallel flow gives a more uniform distribution The outlet header is found to be more critical in balancing the flow distribution than the inlet header Conditions under which thermosiphon effects are important and flow reversal in risers may occur are discussed with reference to experiment Author

A83-41990
SOLAR RADIATION DATA; PROCEEDINGS OF THE CONTRACTOR'S MEETING, BRUSSELS, BELGIUM, NOVEMBER 20, 1981
W. PALZ, ED. (Commission of the European Communities, Brussels, Belgium) Meeting sponsored by the Commission of the European Communities. Dordrecht, D. Reidel Publishing Co. (Solar Energy R&D in the European Community, Series F. Volume 1), 1982, 149 p.

The results of a program to systematically define methodologies and standardize existing data on the solar energy illuminating Europe are presented Attention is given to calibration of the pyrheliometers and the pyranometers used by members of the Commission of the European Communities and to the documentation of reference years. The reference meteorological data will be used for designing solar energy conversion systems, calculating building heating loads, and for computer simulations of the performances of the solar systems Atlases and data books of the existing data are described, including estimates of global radiation on tilted planes and direct radiation Consideration is also devoted to upgrading national radiation measurement networks, with the goal of establishing solar radiation measuring stations for every 100 x 100 sq km area, as well as establishing earth stations for satellite solar radiation data No individual items are abstracted in this volume M S K.

A83-42011
PHOTOCONVERTERS USING EPITAXIAL LAYERS DEPOSITED ON SUBSTRATES OF METALLURGICAL SILICON [FOTOPREOBRAZOVATELI NA OSNOVE EPITAKSIAL'NYKH SLOEV, OSAZHDENNYKH NA PODLOZHKAKH IZ METALLURGICHESKOGO KREMNIIA]
B M. ABDURAKHMANOV, Z N. ALADINA, R. ALIEV, A N KONDRATEV, A E. ROMANOVSKII, M S. SAIDOV, and V P CHIRVA (Akademiia Nauk Uzbekskoi SSR, Institut Elektroniki, Tashkent, USSR) Geliotekhnika (ISSN 0130-0997), no 3, 1983, p 6-9. In Russian refs

The weak sensitivity of film photoconverters to changes in the electrophysical parameters and to the structural imperfections of the layer and substrate established by Abdurakhmanov et al (1982) and Koltun et al (1981) suggests the possibility of lowering costs by replacing the polycrystalline substrates with substrates of metallurgical silicon (M-Si) This is twin or large-block polycrystalline silicon having high concentrations of one or more homogeneous impurities It is also pointed out that with polycrystalline layers deposited on M-Si, the effect of the boundary charge states of individual grains is less pronounced. There are two reasons for this. The first is that the layers being grown repeat the large-block macrostructure of the M-Si substrates. The second is that the minimum size of the grains exceeds the critical value. C.R.

A83-42015
TESTS OF A SOLAR RECEIVER FOR A SOLAR GAS TURBINE MODULE WITH RE = 1500-4000 [ISPYTANIIA GELIOPRIEMNIKA DLIA SOLNECHNOI GAZOTURBINNOI USTANOVKI PRI RE = 1500-4000]
L M. DRABKIN and P. U. KHATAMOV (Akademiia Nauk Uzbekshoi SSR, Fiziko-Tekhnicheskii Institut, Tashkent, USSR) Geliotekhnika (ISSN 0130-0997), no 3, 1983, p 32-34 In Russian.

On the basis of earlier studies, the length of the cylindrical part of the receiver is shortened. Also, a hollow cylinder is placed inside the cylindrical part and is parallel to the cylindrical and conical parts The air flow is provided by a compressor The amount of heat imparted to the air is measured, with the temperature at the input of the module being 34 C The density of solar radiation is 615-740 W/sq m C R.

A83-42175
PHOTOVOLTAIC ENERGY SYSTEMS: DESIGN AND INSTALLATION
M BURESCH (MIT, Cambridge, MA) New York, McGraw-Hill Book Co, 1983, 347 p. refs

The characteristics of solar radiation, the design of solar cells, and the installation of Si solar cell arrays for various applications are described. The discussion is limited to medium-scale photovoltaic systems, from 0.1-100 kW peak output, mounted in fixed flat plate modules, the simplest, most maintenance-free concept. Solar cell functioning principles are outlined, including the parasitic mechanisms which reduce cell efficiency. The magnitude, variations, and distribution of the global solar energy input are quantified. Consideration is given to series and parallel connected solar arrays, and to performance under a variable load. Array protection and failure detection are explored, as are integrated array power conditioning equipment comprising energy storage, voltage regulation, and ac to dc converters. Attention is also devoted to array mounting and matching solar cell systems to load. M S K

A83-42299
CHARACTERIZATION OF GRAIN BOUNDARIES IN POLYCRYSTALLINE SOLAR CELLS USING A COMPUTERIZED ELECTRON BEAM INDUCED CURRENT SYSTEM
C. DONOLATO (CNR, Istituto di Chimica e Tecnologia dei Materiali e Componenti per Elettronica, Bologna, Italy) and R. O. BELL (Mobil Solar Energy Corp , Waltham, MA) Review of Scientific Instruments (ISSN 0034-6748), vol. 54, Aug. 1983, p 1005-1008. refs

The automatic evaluation of grain boundary activity in a polycrystalline solar cell can be carried out by interfacing a microcomputer to a scanning electron microscope operating in the electron beam induced current mode (EBIC). The grain boundary surface recombination velocity and diffusion length in the neighboring grains are obtained by digital acquisition and processing of the related EBIC profile The technique is applied to the evaluation of hydrogen passivation of ribbon solar cell. Author

A83-42352
THE CDS-CUINSE2 SOLAR CELL INTERFACE THERMODYNAMIC CONSIDERATIONS
J. F. WAGER, O. JAMJOUM, and L L KAZMERSKI (Solar Energy Research Institute, Golden, CO) Solar Cells (ISSN 0379-6787), vol 9, Aug. 1983, p 159-168. refs

Simple thermodynamic arguments are used to investigate the oxidation of CuInSe2 and the possible chemical reactions at the CdS-CuInSe2 interface. Reaction products are predicted for the oxidation of CuInSe2 and the oxidation of CdS and for reactions between CdS and CuInSe2, as well as between CdS and the CuInSe2 native oxide It is suggested that the oxidation of CdS is possibly associated with the partial improvement in the response of CdS-CuInSe2 solar cells with annealing treatments in an oxygen ambient Author

A83-42353
LOW COST PROCESS FOR OHMIC CONTACTS ON GAAS/GA(1-X)AL(X)AS CONCENTRATOR SOLAR CELLS BASED ON PALLADIUM AND GOLD DEPOSITION
C. FLORES (Centro Informazioni Studi ed Esperienze S.p.A., Milan, Italy) Solar Cells (ISSN 0379-6787), vol. 9, Aug. 1983, p. 169-177 refs

A new fabrication process for high concentration GaAs/Ga(1-x)Al(x)As solar cells is described that does not require any vapor deposition of the ohmic contacts. The process is based on the electroless deposition of palladium as a p-type contact, while electrolytic gold is used as an n-type contact. Palladium exhibits good ohmic behavior without any thermal alloying. From test patterns the specific resistance of the ohmic contacts turns out to be 1/10,000 ohm-sq cm for palladium on p-type GaAs and 7/1,000,000 ohm-sq cm for gold on n-type GaAs Several solar cells were fabricated and tested at 800 suns The devices have series resistances lower than 10 milliohm sq cm and thus are comparable with solar cells based on evaporated ohmic contacts. Author

A83-42354
CONTACT RESISTIVITY OF TIN ON P(+)-SI AND N(+)-SI
M FINETTI (California Institute of Technology, Pasadena, CA, CNR, Laboratorio di Chimica e Tecnologia dei Material, e Componenti per Electronica, Bologna, Italy), I. SUNI (California Institute of Technology, Pasadena, CA, Technical Research Centre of Finland, Espoo, Finland), and M.-A. NICOLET (California Institute of Technology, Pasadena, CA) Solar Cells (ISSN 0379-6787), vol. 9, Aug. 1983, p. 179-183 Research supported by the U.S. Department of Energy. refs

The accuracy of the derived value of the contact resistivity of TiN on an n(+)-Si solar cell was improved experimentally and compared with values for TiN on a p(+)-Si solar cell. The TiN diffusion barrier was deposited on heavily doped cells by RF sputtering and a layer of silver was laid down over the TiN pad. Electrical measurements were performed on two different test patterns. The contact resistivities for the n and p cells were 0.000015 ohm-sq cm and 0 00028 ohm-sq cm, respectively The differences were attributed to the barrier height and the surface dopant concentation. The results indicate that the TiN barrier does not degrade in concentrator contigurations of up to 50 suns for the n-type material and up to 100 suns for the p-type material. M.S.K.

A83-42355
X-RAY PHOTOELECTRON SPECTROSCOPY STUDIES OF COPPER DIFFUSION BEHAVIOR AND RELATED DEGRADATION PHENOMENA IN THIN FILM CDS:CU2S SOLAR CELLS
A. C. RASTOGI and S. SALKALACHEN (National Physical Laboratory of India, New Delhi, India) Solar Cells (ISSN 0379-6787), vol 9, Aug. 1983, p 185-202. Research sponsored by the Tata Energy Research Institute. refs

A83-42357
ON THE EFFECTIVE MINORITY CARRIER DIFFUSION LENGTH OF POLYCRYSTALLINE SILICON SOLAR CELLS
S. KUMARI, S. K. JAIN, B. K DAS, and G. C. JAIN (National Physical Laboratory of India, New Delhi, India) Solar Cells (ISSN 0379-6787), vol. 9, Aug. 1983, p 209-214. refs

Polycrystalline substrates can be characterized in terms of an 'effective' minority carrier diffusion length (Le) Based on a generalized expression, Le was computed for polycrystalline silicon solar cells in terms of the intragranular diffusion length L0, the grain size d and the distance beta-L0 up to which the grain boundary has an influence in accordance with a model suggested by Koliwad and Daud (1980), who have demonstrated that beta = 1. These theoretical computations were compared with the experimental results of diffusion length measurements on solar cells fabricated from solar grade polycrystalline silicon. The value of beta was found to vary randomly between 1.3 and 1.7, assuming uniform L0 in all the grains. This is thought to be due to impurity-induced effects. Nonuniform grain boundary enrichment with impurities such as iron, chromium, nickel and copper was observed using scanning Auger microscopy and secondary ion mass spectroscopy techniques Author

A83-42358
DEGRADATION OF THE PERFORMANCE OF CU2S/CDS SOLAR CELLS DUE TO A TWO-WAY SOLID STATE DIFFUSION PROCESS
K. MOITRA and S DEB (Jadavpur University, Calcutta, India) Solar Cells (ISSN 0379-6787), vol 9, Aug. 1983, p. 215-228. Research supported by the Tata Energy Research Institute. refs

A two-way model for diffusion in Cu2S/CdS solar cells is examained analytically and compared with experimental data The two-way diffusion of Cu and Cd atoms has been characterized as a factor degrading CdS cell performance It is shown that the two-way process produces a high recombination layer of Cu-Cd

complexes. Analyses of the diffusion and the photokinetic transport of free carriers yield formulations for predicting the time variations of the short-circuit current density. Heat treating the cells in a Cd-rich atmosphere slowed the rate of cell degradation, as does heat treatment in an H2 atmosphere The model is noted to be limited in the extent of time for which degradation may be accurately predicted. M.S K

A83-42360
OPTIMIZATION OF SUBSTRATE THICKNESS FOR INTERDIGITATED BACK CONTACT SILICON SOLAR CELLS
P VERLINDEN and F. VAN DE WIELE (Louvain, UniversiteCatholique, Louvain-la-Neuve, Belgium) Solar Cells (ISSN 0379-6787), vol 9, Aug 1983, p. 247-256 Research supported by the Institut pour l'Encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture refs

A computer model for the computation of the optimum substrate thickness of interdigitated-back-contact (IBC) Si solar cells is developed and demonstrated. The one-dimensional model assumes that solar-cell quantum efficiency is fully determined by minority-carrier diffusion length, surface recombination velocity, and substrate thickness, and hence unaffected by back-diffused layers. The maximum thickness allowable for a 10-percent reduction in short-circuit current density can also be determined. Optimum and maximum-allowable thicknesses are plotted as functions of diffusion length for different recombination velocities, using input parameters typical of lightly doped n-type and p-type backlit IBC cells under AM 1.5 illumination at 300 K. Good agreement is found with empirical parameter values determined by curve fitting T.K.

A83-42615
THE TOTAL ANODIZATION OF COPPER FILMS ON PLATINUM - USE AS SELECTIVE SURFACE ABSORBERS AT HIGH TEMPERATURE
A. A. MILGRAM (Weizmann Institute of Science, Rehovot, Israel) Journal of Applied Physics (ISSN 0021-8979), vol. 54, Aug. 1983, p. 4692, 4693. refs

Anodic copper films are formed from a layer of copper metal 150 to 250 nm thick and are deposited on an electrical conductor, platinum Measurements are made of the solar absorptance and the hemispherical total thermal emittance. It is shown that these totally anodized copper oxide films possess the superior selective surface properties of the usual passivated anodic copper oxide films and, what is more, that they are stable at temperatures up to 600 C. The totally anodized copper oxide film is easy to reproduce from one run to the next since the film thickness is essentially controlled by the copper thickness applied to the base C.R.

A83-42699
RADIATIVE TRANSFER IN AN ABSORBING AND ANISOTROPICALLY SCATTERING SLAB WITH REFLECTING BOUNDARIES - THE NON-AZIMUTHALLY SYMMETRIC CASE
P VESTRUCCI, G. SPIGA, F. SANTARELLI, and C. STRAMIGIOLI (Bologna, Universita, Bologna, Italy) IN: Heat transfer 1982; Proceedings of the Seventh International Conference, Munich, West Germany, September 6-10, 1982. Volume 2 Washington, DC, Hemisphere Publishing Corp , 1982, p. 565-570 refs

An integral formulation for azimuthally symmetric radiative transfer, taking into account the spherical harmonics moments of the angular radiation intensity, is extended to the case of anisotropic scattering. The radiation is treated as falling asymmetrically on a plane parallel medium with radiation transfer governed by the linear Boltzmann equation. Projectional methods are employed to account for the case where the radiation strikes the surface at an oblique angle, such as in the case of a solar flat plate collector The results of calculations for various angles of incidence are provided M S K.

A83-42829
PROJECT STARSEED - AN INTEGRATED PROGRAMME FOR NUCLEAR WASTE DISPOSAL AND SPACE SOLAR ENERGY
D. LUNAN British Interplanetary Society, Journal (Space Technology) (ISSN 0007-084X), vol. 36, Sept. 1983, p. 426-432 refs

Expended Shuttle liquid fuel tanks could be kept in orbit and connected to form Starseed, a modular living and working habitat. After 25-50 launches, biomass, propellant, and fittings could be brought to Starseed and used to make it habitable. A mass driver propulsion device would serve for lifting the habitat into lunar orbit, using compacted Al made from Shuttle tanks as fuel pellets. Once in lunar orbit, transport links would be established to the earth and the lunar surface, where a colony and mining facilities would be established Starseed would move to an orbit around L2 when the lunar surface operation is operational Minerals from the moon would be sent to a reoutfitted Starseed for processing and shaping to build solar power satellites for beaming energy to earth. The Starseed configuration would be replicated once a year with tanks brought to LEO by Shuttle launches carrying nuclear wastes into space. All terrestrial nuclear wastes could be disposed of by 2010 at a cost of $36 billion The external tanks from the launches would have been used to construct 486 power satellites, enough to satisfy terrestrial energy requirements into the 21st century M S.K.

A83-43107
OPTIMUM POWER FROM A SOLAR THERMAL POWER PLANT USING SOLAR CONCENTRATORS
T. C. KANDPAL, A. K. SINGHAL, and S. S MATHUR (Indian Institute of Technology, New Delhi, India) Energy Conversion and Management (ISSN 0196-8904), vol. 23, no 2, 1983, p. 103-106

In this paper, the optimum temperature of operation of a solar concentrator and thus the maximum power obtained from a solar thermal power plant has been calculated. Results are plotted graphically and discussed. Author

A83-43356
TWO-DIMENSIONAL MODELING OF THE MIS GRATING SOLAR CELL
P. DE VISSCHERE (Fonds National de la Recherche Scientifique, Brussels, Gent, Rijksuniversiteit, Ghent, Belgium) IEEE Transactions on Electron Devices (ISSN 0018-9383), vol. ED-30, July 1983, p 840-849 refs

The behavior of an MIS grating solar cell is simulated by means of a two-dimensional model, which solves a derived nonlinear boundary value problem using an integral equation technique. Attention is given to the MIS grating solar cell characteristics calculated, which are then explained in terms of underlying physical processes A space charge layer diffusion thickness concept is proposed for the grating solar cell collection mechanism. It is shown that for common values of the surface charge, the well known MIS inversion layer variety of grating solar cell, with a low base doping level, may not have as high an efficiency as a cell with a more heavily doped base in which the minority carrier flow is two-dimensional O.C

A83-43601
EFFECT OF BORON COMPENSATION ON THE PHOTOVOLTAIC PROPERTIES OF AMORPHOUS SILICON SOLAR CELLS
T. D. MOUSTAKAS, H. P MARUSKA, R. FRIEDMAN, and M. HICKS (Exxon Research and Engineering Co , Corporate Research Laboratory, Linden, NJ) Applied Physics Letters (ISSN 0003-6951), vol. 43, Aug. 15, 1983, p. 368-370
(Contract XZ-0-9219)

Intrinsic amorphous silicon films are normally slightly n type. As a result, in n(+)-i-metal and n(+)-i-p(+) solar cell structures the major potential barrier is at the i-m or i-p(+) interfaces. Low levels of boron compensation of the i layer move the Fermi level down to midgap. Further increases in boron render the i layer slightly p type, and move the major barrier to the i-n(+) interface. Therefore, it becomes possible to tailor the level of boron doping

throughout the i layer so as to achieve high electric fields in all regions of the layer, and thus maximize the short circuit current. Author

A83-43843
THE SPECTRAL RESPONSE OF BSF SILICON SOLAR CELLS FABRICATED THROUGH MASKED ION IMPLANTATION
A. SILARD, M TAZLAUANU (Bucuresti, Institutul Politehnic, Bucharest, Rumania), and R MARINESCU (Microelectronica, Bucharest, Rumania) IEEE Electron Device Letters (ISSN 0193-8576), vol. EDL-4, June 1983, p. 164-166.

The main peculiarities of the spectral response of back-surface-field (BSF) silicon solar cells fabricated through masked ion implantation of the n(+)-p junction are presented. The emphasis is on the shift of maximum responsivity toward the visible spectrum and on the large bandwidth of these n(+)-p-p(+) optical sensors. The dependence of these parameters on technological parameters are outlined. Author

A83-43853
A THREE-TERMINAL DOUBLE JUNCTION GAAS/GAALAS CASCADE SOLAR CELL
C FLORES (Centro Informazioni Studi ed Esperienze S.p.A., Milan, Italy) IEEE Electron Device Letters (ISSN 0193-8576), vol EDL-4, April 1983, p. 96-99. refs

This paper describes fabrication process and performance of a new type of monolithic solar cell with two junctions and bandgaps of 1.4 eV (GaAs) and 1.69 eV (GaAlAs) respectively, with the novel feature of only four epitaxial layers. The structure is a three-terminal device similar to a p-n-p transistor with a thick base For the first prototypes, an overall conversion efficiency of 20.5 percent has been measured at 80 suns. It is expected that further optimization steps can lead to a conversion efficiency of 25 percent AM 1 5 for this structure. Author

A83-43898
DEVELOPMENT OF A POINT FOCUSING COLLECTOR FARM SYSTEM
G SCHMIDT, P SCHMID, H. ZEWEN, and S MOUSTAFA (Messerschmitt-Boelkow-Blohm GmbH, Munich, West Germany) Solar Energy (ISSN 0038-092X), vol 31, no 3, 1983, p. 299-311.

A parabolic collector and thermal test loop has been operated and a small solar farm is under construction in Kuwait Some experiences gained in the analysis and design of solar farm systems are summarized. Derived from this experience, possible future development trends of such farm systems using point focusing paraboloid collectors are outlined. Author

A83-43900
A THERMOELECTRIC DETECTOR FOR HIGH RADIANT FLUX DENSITIES
J. W COCHRANE, H J. GOLDSMID, and R. J MOORE (New South Wales, University, Kensington, Australia) Solar Energy (ISSN 0038-092X), vol 31, no. 3, 1983, p. 327-329. Research supported by the National Energy Research Development and Demonstration Council.

The design of a thermoelectric radiant-flux-density detector for use at solar concentration factors from 1 to more than 100 is presented. Thermoelectric emf is measured across a 19 4 x 10 x 10-mm block cut from a single uniform Si crystal, to which a blackened Cu receiver plate and a heat sink are affixed. Calibration was performed with an Eppley radiometer in unconcentrated sunlight at 24 C, and the device was tested in the focal plane of a parabolic reflector. The temperature effect on the sensitivity of the device is plotted. The reliability of the temperature-corrected flux-density measurements obtained is considered good T.K.

A83-44149
LIMIT OF CONCENTRATION FOR CYLINDRICAL CONCENTRATORS UNDER EXTENDED LIGHT SOURCES
J. C. MINANO and A LUQUE (Madrid, Universidad Politecnica, Madrid, Spain) Applied Optics (ISSN 0003-6935), vol. 22, Aug 15, 1983, p. 2437-2443. refs

It is shown that an upper bound of the degree of isotropy below 1 exists for cylindrical solar concentrators that have a refractive membrane surrounding the collector. The optical concentration and the intercept factor were analyzed for several cylindrical concentrators located near Madrid, with the finding that inclusion of a dense medium in a compound parabolic concentrator (CPC) obstructs the device from a general upper bound of optical concentration. The degree of isotropy remains below unity, and the upper bound on the isotropy is a function of the concentrator's geometrical gain and the refraction index of the medium around the collector. The development of noncylindrical concentrators is recommended for closer approaches to optimized concentration, and a concentrator consisting of two intersecting transversal cylindrical CPCs is described. M.S.K

A83-44361
MATHEMATICAL ANALYSIS OF THE PERFORMANCE OF CYLINDRICAL-PARABOLIC SOLAR CONCENTRATORS
A J. AL-KHALILI (Concordia University, Montreal, Canada) and R A. AL-ASHOOR (University of Technology, Baghdad, Iraq) Applied Energy (ISSN 0306-2619), vol 15, no. 1, 1983, p. 43-55.

Attention is devoted to the application of cylindrical-parabolic solar concentrators in the intermediate temperature range for which wide receivers are used Suitable indices that describe the performance of the concentrator are defined and evaluated The effect of each individual parameter on total concentrator performance is investigated The results of the analysis are presented as a set of graphs which can be used easily when designing parabolic concentrators. Author

A83-44605
PROCESS CONTROL OF VACUUM-DEPOSITED CDS FOR THE FABRICATION OF REPRODUCIBLE 8 PERCENT EFFICIENT SOLAR CELLS
T. L. HENCH, J. A. BRAGAGNOLO, J. E. DELGADO, P. F LEYMAN, and P. F. MOTTA (SES, Inc , Newark, DE) Journal of Vacuum Science and Technology A (ISSN 0734-2101), vol. 1, Apr.-June 1983, pt. 1, p 360-363. refs

A high yield process for the fabrication of reproducibly high (eight percent) efficiency CdS/Cu2S devices is demonstrated and the properties of the resulting CdS layers are described. The heating schedules of the substrate and of each individual source are carefully adjusted and reproduced using programmable temperature controllers. The effusion rates from the CdS sources are equalized using a rate monitor to insure a uniform deposition rate for all points on the substrate. The composition of the ambient is controlled using a liquid nitrogen-cooled cryoshield around the CdS evaporation sources and is monitored with a residual gas analyzer. The resulting CdS layer quality and reproducibility were evaluated using photoluminescence, resistivity, optical, and structural analysis techniques, and the results are discussed. C.D.

A83-44607
ELECTRICAL AND OPTICAL PROPERTIES OF N-CDS/P-SI AND N(ZN(X)-CD(1-X))S/P-SI HETEROJUNCTION SOLAR CELLS
F. A. ABOU ELFOTOUH (King Saud University, Riyadh, Saudi Arabia) Journal of Vacuum Science and Technology A (ISSN 0734-2101), vol. 1, Apr.-June 1983, pt. 1, p 423-425. refs

A83-44612
FABRICATION OF OPTICALLY ENHANCED THIN FILM A-SIH(X) SOLAR CELLS
H W. DECKMAN, C R. WRONSKI, and H WITZKE (Exxon Research and Engineering Co., Linden, NJ) Journal of Vacuum Science and Technology A (ISSN 0734-2101), vol. 1, Apr.-June 1983, pt. 1, p. 578-582 refs

Fabrication techniques utilized to produce the first optically enhanced a-SiH(x) solar cells are described The theory and design of optically enhanced cells is first presented, and the texturing which serves to randomize and trap light in a one micron thick layer without shunting the cell is described Two different mechanisms to produce roughened surfaces were used, one of which exploits the naturally occurring texture on as-deposited transparent conductors, while the second creates the texture from a lithographic fabrication technique. The production of a reflector geometry which minimizes parasitic optical absorption is considered. Optical enhancement effects were studied by measuring the spectral response of the carrier collection efficiencies in equivalent enhanced and unenhanced cells. The fabricated cells yielded short circuit currents about 3 mA/sq cm greater than comparble unenhanced cells. C.D.

A83-44789
METHODS OF DETERMINING OPTICAL CONSTANTS OF THIN SEMICONDUCTOR FILMS USING NORMAL INCIDENCE REFLECTANCE AND TRANSMITTANCE DATA
D. R. MCKENZIE, R. C MCPHEDRAN, N. SAVVIDES (Sydney, University, Sydney, Australia), L. C. BOTTEN (New South Wales Institute of Technology, Broadway, Australia), P. J. MARTIN, and R. P. NETTERFIELD (Commonwealth Scientific and Industrial Research Organization, National Measurement Laboratory, Lindfield, New South Wales, Australia) IN The Max Born Centenary Conference, Edinburgh, Scotland, September 7-10, 1982, Proceedings . Bellingham, WA, SPIE - The International Society for Optical Engineering, 1983, p. 110-117. Research supported by the New South Wales Institute of Technology and National Energy Research, Development and Demonstration Program. refs

Techniques for determining the optical constants of thin absorbing films are described and applied to the evaluation of the optical constants of carbon and silicon semiconductor films prepared by magnetron sputtering and ion beam sputtering techniques. The results are discussed with emphasis on the nature and origin of the optical gaps Author

A83-45062#
ANALYSIS OF A COMBINED THERMAL-PHOTOVOLTAIC SOLAR SYSTEM BASED ON THE SPHERICAL REFLECTOR/TRACKING ABSORBER CONCENTRATOR
A. BAR-LEV, S WAKS, and G. GROSSMAN (Technion-Israel Institute of Technology, Haifa, Israel) ASME, Transactions, Journal of Solar Energy Engineering (ISSN 0199-6231), vol 105, Aug. 1983, p. 322-328. refs

A technique is explored for modifying a solar thermal parabolic dish to obtain both photovoltaic electricity and hot water The reflector has a metallized surface, is stationary, and a cylindrical absorber is placed at the segment of maximum solar concentration Analytical consideration is given to conditions of nonconstant concentration, the unilluminated region of the absorber, the angle of incidence, and optimal loading conditions when the absorber tube is covered with interconnected solar cells. It is found that the optimum absorber would have a cross-section that grows with distance from the reflector edge. The absorber would be required to rotate on its axis while tracking the sun to perpetually maintain the minimally-illumined side in an unillumined position, where it would function for heat absorption The solar cell would receive up to 40 percent of the radiation, while the heater side would receive 60 percent M.S.K.

A83-45063#
DUST STORM SIMULATION FOR ACCELERATED LIFE TESTING OF SOLAR COLLECTOR MIRRORS
R M. BETHEA, E G COLLIER, and J D REICHERT (Texas Tech University, Lubbock, TX) ASME, Transactions, Journal of Solar Energy Engineering (ISSN 0199-6231), vol. 105, Aug 1983, p. 329-335. refs
(Contract EY-76-C-04-3737)

A dust storm simulation chamber has been designed based on worst-case conditions to simulate the effects of blowing dust and sand on candidate solar concentrator materials. After evaluation with common glass mirrors, the system was used to simulate field exposure of Carolina glass mirrors in the West Texas environment in terms of loss of reflectivity System calibration was achieved by comparing actual exposure data over a three-year period to results obtained in the simulation chamber It was found that a twenty-year service life can be simulated by 80 hrs. exposure in the dust storm chamber Degradation of the Carolina glass mirrors has been shown to be primarily dependent on momentum transport to and kinetic energy deposition on the mirror surface during dust storms: annual reflectivity losses of 2 4 percent and 1 4 percent may be expected, respectively, from dust storm and the sum of all other effects. Author

A83-45178
PHOTOVOLTAIC PROPERTIES OF SPUTTERED N-CDO FILMS ON P-CU2O
L. PAPADIMITRIOU, N A. ECONOMOU (Salonika, University, Salonika, Greece), and D TRIVICH (Wayne State University, Detroit, MI) Solid-State Electronics (ISSN 0038-1101), vol 26, Aug 1983, p. 767-769 refs
(Contract DE-AC04-79ET-23010; DE-AC04-81ER-10285)

The heterojunction CdO/Cu2O was prepared by sputtering CdO films on Cu2O at room temperture The optical transmission of CdO films at a thickness of about 1000 A was about 85 percent. The analysis of the I-V characteristics at different temperatures gave information on the carrier transport mechanism at the junction The forward and reverse dark current is dominated by a tunneling process. Measurements of the open-circuit photovoltage resulted in a curve which indicates a sensitivity range from 2.25 to 2.48 eV, similar to that found in Cu2O MIS solar cells. Author

A83-45180
FORMATION OF NICKEL AND PALLADIUM SILICIDES BY A SHORT-PULSE LIGHT-FLASH AND ITS APPLICATION IN THE METALLIZATION OF SOLAR CELLS
J T LUE (National Tsinghua University, Hsinchu, Repbulic of China) Solid-State Electronics (ISSN 0038-1101), vol. 26, Aug 1983, p 787-793. refs

A83-45272
THE EFFECT OF THE DIODE PROPERTY OF HEAT PIPES ON THE THERMAL REGIME OF SOLAR COLLECTORS [VLIIANIE DIODNOGO SVOISTVA TEPLOVYKH TRUBOK NA TEPLOVOI REZHIM SOLNECHNYKH KOLLEKTOROV]
K. TOILIEV, M. PORSYEV, and B CHOLUKOV (Akademiia Nauk Turkmenskoi SSR, Ashkhabad, Turkmen SSR) Akademiia Nauk Turkmenskoi SSR, Izvestiia, Seriia Fiziko-Tekhnicheskikh, Khimicheskikh i Geologicheskikh Nauk (ISSN 0002-3507), no 2, 1983, p. 54-57 In Russian. refs

Models of a solar collector with and without heat pipes were tested in order to determine the effect of the diode property of heat pipes on the water temperature in the storage tank. When converted to a glazed area of 1 sq m, the experimental results show that in summer (maximum water temperature, 60 C, mass of the water, 85 l per sq m day), water temperature in the storage tank of the heat pipe solar collector is 10-11 C higher at the end of the cooling cycle than in the case of the solar collector without heat pipes. V.L.

A83-45493
HIGH-EFFICIENCY (21.4 PCT) GA0.75 IN0.25 AS/GAAS (EG = 1.15 EV) CONCENTRATOR SOLAR CELLS AND THE INFLUENCE OF LATTICE MISMATCH ON PERFORMANCE
M J. LUDOWISE, W. T DIETZE, R. BOETTCHER, and N. KAMINAR (Varian Corporate Solid State Laboratory, Palo Alto, CA) *Applied Physics Letters (ISSN 0003-6951), vol. 43, Sept. 1,* 1983, p. 468-470. refs
(Contract XP-9-8081-1)

A83-45851
SPACE INDUSTRIALIZATION. VOLUMES 1 & 2
B OLEARY, ED. Boca Raton, FL, CRC Press, Inc., 1982, Vol. 1, 174 p ; vol. 2, 233 p.

Detailed analyses of the political, economic, and technical requirements, benefits, and difficulties involved in the industrialization of space are presented. Near-term products and services that can be accomplished before the end of the century in information dissemination and handling, manufacturing, and scientific activities are identified In-depth analyses are directed toward the acquisition, extraction, and processing-refining of extraterrestrial material to build space factories and habitats in high, stable orbits. The materials could come from the moon, earth-approaching asteroids, or the Martian moon Phobos. Consideration is given to the relative economics of manufacturing various materials in space or on the earth, the economic benefits accruing because of the development of space activities, and the types of products that could be manufactured in space. M.S K

A83-45854
SPACE MANUFACTURING OF NONTERRESTRIAL MATERIALS
G K ONEILL (Institute for Space Studies, Princeton, NJ) and B. OLEARY IN: Space industrialization Volume 1 . Boca Raton, FL, CRC Press, Inc., 1982, p. 77-95. refs

The personnel, materials, and technology developments necessary to establish a system of space power supplies to earth and a space materials processing capability are described The technical personnel, the basic technologies, and the Shuttle are identified as three already existing parts of the four components necessary to accomplish the mission. The fourth segment is mass drivers for moving matter off the moon to a space manufacturing and farming facilities. The manufacturing facilities in space would be co-built with habitats in modular units, thus increasing the reliability of the whole operation An alternative to lunar materials would be those from an earth-approaching asteroid, which may have purer minerals than available on the moon. A step-by-step scenario for experimentation, proof-of-concept, implementation, and growth of activities and capabilities has been defined by the Universities Space Research Association. It has been realized that new launch systems, able to carry greater masses at lower costs than those affordable by the Shuttle, are necessary for the satellite solar power systems to be economical M.S.K.

A83-45915
ADVANCES IN SOLAR ENERGY. VOLUME 1
K W. BOER, ED. (Delaware, University; SES, Inc , Newark, DE) and J. A DUFFIE, ED. (Wisconsin, University, Madison, WI) New York, American Solar Energy Society, Inc., 1983, 317 p.

The state of the art in the development of solar and solar-derived technologies in Europe and the U S is assessed. The solar radiation data base is examined in terms of existing monitoring networks, instrumentation, and international calibration standards. The products, mechanisms, and rates of carbohydrate pyrolysis are explored, as recombinant genetics for ethanol production as a means of improving biomass technology. The techniques and cost-cutting approaches for utilization of crystalline Si for solar cells are discussed, together with the theoretical, experimental, resource characterizations, and prototype operational data for large wind turbine systems in the U.S and Europe. Finally, research in passive and hybrid solar cooling systems and passive solar heating systems is described. D.H.K.

A83-45918
CRYSTALLINE SILICON AS A MATERIAL FOR SOLAR CELLS
M. RODOT (CNRS, Meudon, Hauts-de-Seine, France) IN: Advances in solar energy. Volume 1 . New York, American Solar Energy Society, Inc , 1983, p 133-173. refs

As a material for solar cells, hyperpure single crystalline silicon is progressively replaced by less pure, polycrystalline materials. The various techniques of silicon purification and of ingot, ribbon and sheet growth are reviewed. The physical effects of impurities as well as those of grain boundaries and other crystalline defects are discussed, in order to define the material requirements to obtain efficient solar cells; it is shown that grain boundaries can getter impurities and that impurities can passivate grain boundaries, so that more impure and imperfect crystals, i e., cheaper materials than presently used, can be envisaged in future From a detailed comparison of the various proposed techniques, it is concluded that the present 'chemical route' consisting of halogenide purification and ingot growth may be challenged soon by a 'metallurgical route' in which the active layer is epitaxially grown on a wafer recrystallized from upgraded metallurgical grade silicon Author

A83-46089
DIRECTIONAL INTERCEPT FACTOR OF TRUNCATED CPCS
J. C MINANO (Escuela Tecnica Superior de Ingenieros de Telecommunicacion, Madrid, Spain) Applied Optics (ISSN 0003-6935), vol. 22, Sept 1, 1983, p 2747-2750. refs

The directional intercept factor of two types of cylindrical compound parabolic concentrators (CPCs) is given using a formula that depends on the characteristics of the nontruncated CPC and the truncation ratio. The factor, which is a function of the direction of the rays arriving at the entry aperture, gives the fraction of the area of the entry aperture corresponding to the region when a ray arriving in that direction is collected. Using this function, it is possible to calculate the power collected by the concentrator once the source that illuminates the concentrator is known This calculation can provide additional information about the proper truncation ratio The two types of CPCs considered here have different collectors; both are flat, but one is monofacial and the other bifacial It is noted that the procedure outlined here for obtaining the direction intercept factor can be used with CPCs having different collector shapes. C.R.

A83-46090
LIMIT OF CONCENTRATION UNDER EXTENDED NONHOMOGENEOUS LIGHT SOURCES
J. C. MINANO and A. LUQUE (Escuela Tecnica Superior de Ingenieros de Telecomunicacion, Madrid, Spain) Applied Optics (ISSN 0003-6935), vol. 22, Sept. 1, 1983, p. 2751-2760 refs

Static photovoltaic concentrators, which see the sky as an extended distribution of radiance, are analyzed in a general way. The rules for achieving the highest energy on the cell are derived and the appropriate figures of merit are defined It is concluded that casting increasingly high values of energy on the cell, which would be bifacial, requires collecting a lower portion of the total sky energy The corresponding figures of merit for the concentrators of the CPC family are analyzed, and it is concluded that a better type of concentrator should be developed for photovoltaic applications. Author

A83-46095* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PLASMA-ENHANCED CVD SILICON NITRIDE ANTIREFLECTION COATINGS FOR SOLAR CELLS
C. C. JOHNSON, T WYDEVEN (NASA, Ames Research Center, Moffett Field, CA), and K. DONOHOE (Tegal Corp., Novato, CA) Solar Energy (ISSN 0038-092X), vol 31, no 4, 1983, p. 355-358. refs

Multilayer plasma-enhanced chemical vapor deposition (PECVD) silicon nitride antireflection coatings were deposited on space quality silicon solar cells Preliminary experiments indicated that multilayer coatings decreased the total reflectance of polished silicon from 35 percent to less than 3 percent over the spectral

range 0.4-1.0 micron The solar cell energy conversion efficiency was increased from an average of 8 84 percent to an average of 12.63 percent Author

A83-46096
STATUS OF FLAT-PLATE PHOTOVOLTAIC SYSTEMS FOR APPLICATIONS IN DEVELOPING COUNTRIES
L. ROSENBLUM Solar Energy (ISSN 0038-092X), vol 31, no. 4, 1983, p 381-392. refs

The development of photovoltaic-powered service packages relevant to Third World rural needs, such as refrigeration and water pumping, is still in an early stage. This situation is seen as an opportunity for developing countries to enter into photovoltaic (PV) commercialization by encouraging and supporting the design, fabrication, and assembly of PV-powered service packages for rural development Flat-plate PV systems, diesel-generator, and central station electric grid systems are compared with respect to availability and voltage control A survey of obtainable information suggests that, in rural areas of developing countries, the service performance of PV systems is generally superior to the performance of competitor systems. An analysis of economic trends suggests that developing countries might reap greater financial and economic benefits by concentrating on the in-country manufacture of components and assembly and installation of PV systems rather than by manufacturing their own modules. C.R.

A83-46277
THEORETICAL ANALYSIS OF SOLAR CELLS BASED ON GRADED BAND-GAP STRUCTURES
G SASSI (Milano, Universita, Milan, Italy) Journal of Applied Physics (ISSN 0021-8979), vol 54, Sept 1983, p 5421-5427. refs

Hovel and Woodall (1973) have proposed to obtain an improvement of the spectral response of solar cells, and, consequently, an enhancement of the power conversion efficiency, by utilizing a window effect. Such a window effect arises in connection with an employment of semiconducting materials having graded energy gaps. Wolf (1960) proposed the use of such materials without performing the calculations which are necessary to obtain an estimate concerning the advantages of this proposal. It is one of the objectives of the present study to consider all the possible configurations of the energy-band diagram with graded gap structures which aid the minority carrier collection This analysis is to provide information regarding the relative advantages of the various configurations The spectral responses of the individual configurations are determined with the aid of numerical methods. Attention is also given to the heteroepitaxial systems pGa(0 14)Al(0.86)As-pGaAs-nGaAs considered by Hovel (1975). G.R.

A83-46580
OPTICAL COATINGS FOR ENERGY EFFICIENCY AND SOLAR APPLICATIONS; PROCEEDINGS OF THE SEMINAR, LOS ANGELES, CA, JANUARY 28, 29, 1982
C. M. LAMPERT, ED. (California, University, Berkeley, CA) Seminar sponsored by SPIE - The International Society for Optical Engineering Bellingham, WA, SPIE - The International Society for Optical Engineering (SPIE Proceedings. Volume 324), 1982, 206 p

Topics discussed include transparent heat mirror films, reflective materials research, selective absorber coatings, and absorber and general solar optical coatings Papers are presented on materials for transparent heat mirror coatings, on high-quality transparent heat reflectors of reactively evaporated indium tin oxide, on solar reflectors made from silver metallo-organic resinates, and on a catalytically deposited carbon solar selective absorber. Attention is also given to the optical properties of transparent heat mirrors based on thin films of TiN, ZrN, and HfN, to the agglomeration of thin metal films used in solar conversion devices, to the spectrally selective properties of reactively sputtered Ni-C and NiN(x) films, and to the optical selectivity of oxidized stainless steel C R.

A83-46581
LOW TEMPERATURE SELECTIVE ABSORBER RESEARCH
S. A HERZENBERG and R. SILBERGLITT (DHR, Inc , Washington, DC) IN Optical coatings for energy efficiency and solar applications, Proceedings of the Seminar, Los Angeles, CA, January 28, 29, 1982 Bellingham, WA, SPIE The International Society for Optical Engineering, 1982, p. 92-106 Research supported by the U S Department of Energy. refs

Research carried out since 1979 on selective absorbers is surveyed, with particular attention given to the low-temperature coatings seen as promising for flat plate and evacuated tube applications The most thoroughly investigated absorber is black chrome, which is highly selective and is the most durable low-temperature absorber. It is believed that other materials, because of their low cost and lower content of strategic materials, may eventually supplant black chrome. Among these candidates are chemically converted black nickel; anodically oxidized nickel, zinc, and copper composites, and nickel or other low-cost multilayer coatings. In reviewing medium and high-temperature research, black chrome, multilayer coatings and black cobalt are seen as best medium-temperature candidates For high temperatures, an Al2O3/Pt-Al2O3 multilayer composite or the zirconium diboride coating is preferred. C.R.

A83-46582
CATALYTICALLY DEPOSITED CARBON SOLAR SELECTIVE ABSORBER
J D. GARRISON (San Diego State University, San Diego, CA) IN: Optical coatings for energy efficiency and solar applications; Proceedings of the Seminar, Los Angeles, CA, January 28, 29, 1982 Bellingham, WA, SPIE The International Society for Optical Engineering, 1982, p. 107-111

This selective absorber consists of a number of thin layers on a supporting substrate, including a carbonaceous absorbing layer, a catalyst layer, and a metallic infrared reflecting layer. The catalyst layer serves to catalyze the pyrolysis of a carbon containing gaseous compound to form the carbonaceous layer Under proper conditions, the layer is black, strongly bonded to the surface, and very thin Author

A83-46583
DEVELOPMENT OF HIGH TEMPERATURE SOLAR SELECTIVE ABSORBERS UTILIZING RARE EARTH, TRANSITIONAL, AND GROUP METALS
E. ERBEN, A MUEHLRATZER (Maschinenfabrik Augsburg-Nuernberg AG, Munich, West Germany), B. A. TIHANYI, and B. CORNILS (Ruhrchemie AG, Oberhausen, West Germany) IN Optical coatings for energy efficiency and solar applications; Proceedings of the Seminar, Los Angeles, CA, January 28, 29, 1982 . Bellingham, WA, SPIE The International Society for Optical Engineering, 1982, p 112-116 Sponsorship: Bundesministerium fuer Forschung und Technologie.
(Contract BMFT-4-ET-4399-A, BMFT-4-ET-4392-A)

Development of new selective absorbers for high temperatures above 350-400 C and the application in solar farm and solar tower plants are discussed. Extensive theoretical work has been performed in order to examine the existing potential concerning the available materials and the possible coating methods. Concerning the materials new chemicals will be developed and their integration into high temperature photothermal stacks studied The new materials include the rare earth metals, transition metals and the elements of the 8th group of the periodic system. The coating methods are chemical vapor deposition (CVD), techniques of catalysis, electroplating, heterogeneous reactions between a gas and a solid phase and topochemic reactions. The characterization of these selective absorber coatings will be carried out by measuring the thermal optical data (alpha, epsilon), by X-ray examination, determination of the mechanical compatibility and chemical analysis. Author

A83-46584
FABRICATION OF ZRCX/ZR AND CR-CROX FILMS FOR PRACTICAL SOLAR SELECTIVE ABSORPTION SYSTEMS
Y NOGUCHI, K. NAKA, A. ISAO (Institute for Super Materials, Sanbu, Chiba, Japan), K. NAKAMURA (ULVAC Coating Corp., Chichibu, Japan), S. SAWADA, T. TANI, and S. GONDA (Ministry of International Trade and Industry, Electrotechnical Laboratory, Sakura, Ibaraki, Japan) IN: Optical coatings for energy efficiency and solar applications; Proceedings of the Seminar, Los Angeles, CA, January 28, 29, 1982 . Bellingham, WA, SPIE The International Society for Optical Engineering, 1982, p. 124-130 refs

A83-46585
SOLAR ABSORBER MATERIAL STABILITY UNDER HIGH SOLAR FLUX
A. IGNATIEV, G ZAJAC (Houston, University, Houston, TX), and G. B. SMITH (Houston, University, Houston, TX; New South Wales Institute of Technology, Broadway, Australia) IN: Optical coatings for energy efficiency and solar applications; Proceedings of the Seminar, Los Angeles, CA, January 28, 29, 1982 . Bellingham, WA, SPIE The International Society for Optical Engineering, 1982, p. 170-175 Research supported by the U.S. Department of Energy, University of Houston, and Solar Thermal Test Facilities Users Association. refs

Solar absorbing Black Chrome coatings have been exposed to high temperatures (350-400 C) under high solar fluxes (0.4 to 2 0 MW/sq m) to test for their stability under actual operating conditions. Field tests at the White Sands Solar Furnace have shown higher stability than expected from oven tested samples. Laboratory studies utilizing spectrally selective concentrated solar simulated radiation have indicated that the cause of the higher stability under solar irradiation is photo-stimulated desorption of oxygen bearing species at the absorber surface and resultant reduced oxidation of the absorber Author

A83-46586
LOW COST AND HIGH PERFORMANCE ANTIREFLECTIVE (AR) COATINGS FOR SOLAR CELLS
H. NAKANO, H. MORITA, H WASHIDA, T. KATO, S. HAYASHI, and A. ONOE (Toshiba Corp , Electron Device Engineering Laboratory, Kawasaki, Japan) IN Optical coatings for energy efficiency and solar applications; Proceedings of the Seminar, Los Angeles, CA, January 28, 29, 1982 Bellingham, WA, SPIE The International Society for Optical Engineering, 1982, p. 191-197. refs

Oxide coatings for solar cells deposited from organic solutions were studied. Among them, Al2O3 layer was found to decrease the surface recombination velocity of silicon by about one tenth. Thus new constitution was designed by inserting thin Al2O3 film between silicon substrate and AR coating. IR absorption and C-V characteristics indicated that the reduced surface recombination velocity corresponded to the decrease of surface state density by terminating action of H or OH. Instead of TiO2, Ta2O5 layer was introduced to improve the absorption of short wavelength. As the effect of Al2O3 layer the efficiency increased by about 5 percent Author

A83-46606
CASCADE ALGAAS-GAAS SOLAR CELL RESEARCH USING MOLECULAR BEAM EPITAXY
D L. MILLER, H. T. YANG, and S. W. ZEHR (Rockwell International Microelectronics Research and Development Center, Thousand Oaks, CA) IN. Semiconductor growth technology; Proceedings of the Meeting, Los Angeles, CA, January 26, 27, 1982. Bellingham, WA, SPIE - The International Society for Optical Engineering (SPIE Proceedings, Volume 323), 1982, p. 17-25. refs
(Contract F33615-78-C-2036, XS-9-8058-2)

Molecular beam epitaxy (MBE) facilitates the control of cascade solar cell layer thickness, composition, and doping, over wide value ranges even in the cases of the most complex cascade cell structures. MBE has been successfuly used in the growing of thin tunneling intercell ohmic contacts (IOCs) and high quality Al.3Ga:7As subcells, which are the key to the development of AlGaAs-GaAs cascade cells The assembling of these parts into a complete cell, however, has so far eluded success due to what appears to be dopant diffusion from the tunnelling IOC. O.C.

A83-46607
HIGH EFFICIENCY GAAS(1-X)P(X) SOLAR CELLS FABRICATED BY VACUUM METALORGANIC CHEMICAL VAPOR DEPOSITION
L. M. FRAAS (Chevron Research Co., Richmond, CA) IN Semiconductor growth technology; Proceedings of the Meeting, Los Angeles, CA, January 26, 27, 1982 Bellingham, WA, SPIE - The International Society for Optical Engineering (SPIE Proceedings. Volume 323), 1982, p 110-116 refs

A83-46685* California Univ , Riverside
PICOSECOND KINETICS OF EXCITED STATE DECAY PROCESSES IN INTERNALLY HYDROGEN-BONDED POLYMER PHOTOSTABILIZERS
A. L. HUSTON and G. W. SCOTT (California, University, Riverside, CA) IN: Picosecond lasers and applications, Proceedings of the Conference, Los Angeles, CA, January 26, 27, 1982 . Bellingham, WA, SPIE - The International Society for Optical Engineering, 1982, p. 215-223. Research supported by the University of California and NASA. refs

A construction of economically practical solar energy conversion devices could be based on the employment of inexpensive, visible-radiation transparent, durable, light-fast materials. Difficulties arise in connection with the availability of such materials. Plastics which are not particularly susceptible to solar ultraviolet degradation are, in general, expensive, while less expensive optically transparent films are susceptible to deterioration when exposed to solar radiation. However, techniques are known for protecting polymers from photochemical degradation. According to these techniques, the composition or structure of polymeric material is modified by incorporation of photostabilizers. Two classes of ultraviolet absorbers are used as commercial photostabilizers These classes include 2-hydroxybenzophenone (HB) and 2-(2-prime -hydroxyphenyl)benzotriazole (HPB). The present investigation is concerned with the results of spectroscopic and kinetics measurements related to the study of the mechanism of excited-state relaxation of polymer photostabilizers in the class HB and HPB. G.R.

A83-46733
SPUTTERED SCHOTTKY BARRIER SOLAR CELLS ON P-TYPE GAAS
M. E. EDWEEB, E. J. CHARLSON, and E. M CHARLSON (Missouri-Columbia, University, Columbia, MO) Applied Physics Letters (ISSN 0003-6951), vol. 43, Sept. 15, 1983, p. 572-574. Research sponsored by the University of Garyounis. refs

Schottky barrier solar cells have been produced on single crystal p-type GaAs by sputtering gold to form the barrier. The rectifying action of the gold sputtered p-type device is unique to the method since normal thermal evaporated gold onto p-type produced ohmic contacts. The opposite behavior was observed for n-type GaAs. Barrier heights have been measured for both p-type (sputtered) and n-type (thermal) diodes using current-voltage and capacitance-voltage methods and are 0.90 and 0.95 eV, respectively. The power conversion efficiencies without AR coatings have values of 6.56 percent (p) and 5.58 percent (n). Deep level transient spectroscopy has been used to identify the trap center concentrations and energy levels for both diodes to account for the relatively large dark currents in the p-type (sputtered) diodes. Author

A83-46734
DEEP LEVEL IMPURITIES AND CURRENT COLLECTION IN CDS/CDTE THIN-FILM SOLAR CELLS
L. C ISETT (Eastman Kodak Research Laboratories, Rochester, NY) Applied Physics Letters (ISSN 0003-6951), vol. 43, Sept. 15, 1983, p. 577-579 refs

Current collection in thin-film CdS/CdTe solar cells prepared by close-spaced sublimation is limited to the depletion region. The

width of the depletion region is altered by minority-carrier trapping under light bias. The deep levels responsible for this phenomenon have been identified by deep level transient spectroscopy (DLTS). Heat treatment at 373 K changes the energy distribution of the deep levels Heat treatment with illumination produces an energy level distribution greatly different from that produced by heat treatment without illumination The observed photocapacitance changes are understood in terms of the emission rates measured in DLTS Author

A83-46735
WAVELENGTH-SELECTIVE ABSORPTION ENHANCEMENT IN THIN-FILM SOLAR CELLS
P SHENG, A N. BLOCH, and R. S. STEPLEMAN (Exxon Research and Engineering Co , Linden, NJ) Applied Physics Letters (ISSN 0003-6951), vol. 43, Sept. 15, 1983, p. 579-581 refs

The general principle of wavelength-selective enhancement of absorption in thin-film solar cells by a periodic grating substrate is presented By exact numerical calculation, it is demonstrated that substantial short-circuit current gains are realizable in thin film amorphous silicon a-SiH(x) solar cells In particular, for a 0 5-micron thick a-SiH(x) solar cell, optimal texturing of an Ag substrate to form a one-dimensional reflective grating can yield a 2-mA/sq cm enhancement over the flat substrate case For a two-dimensional cross-hatched grating substrate,the enhancement is estimated to be 3 5-4 mA/sq cm. Author

A83-46772
DYNAMIC BEHAVIOR OF A CLASS OF PHOTOVOLTAIC POWER SYSTEMS
O. WASYNCZUK (Purdue University, West Lafayette, IN) (Institute of Electrical and Electronics Engineers, Winter Meeting, New York, NY, Jan 30-Feb. 4, 1983) IEEE Transactions on Power Apparatus and Systems (ISSN 0018-9510), vol. PAS-102, Sept 1983, p 3031-3037. Research supported by Sandia National Laboratory. refs

An important consideration in the operation of grid connected photovoltaic power systems is a means of adjusting the photovoltaic array voltage so that maximum output power is achieved for the given atmospheric conditions. The dynamic behavior of a specific photovoltaic power system which utilizes the well known perturb and observe method of power tracking is examined Using measured insolation data, it is demonstrated that the perturb and observe method of control migrates considerably from peak power whenever the insolation varies randomly as a result of cloud cover. An alternate method of power tracking is also examined It is shown that the photovoltaic power system, utilizing the proposed method of power tracking, is able to track accurately peak power conditions during periods of randomly varying insolation Author

A83-46773
CONCEPTUAL DESIGN OF A 50 MW CENTRAL STATION PHOTOVOLTAIC POWER PLANT
A J. STRANIX and A. H. FIRESTER (RCA Laboratories, Princeton, NJ) (Institute of Electrical and Electronics Engineers, Winter Meeting, New York, NY, Jan 30-Feb. 4, 1983) IEEE Transactions on Power Apparatus and Systems (ISSN 0018-9510), vol PAS-102, Sept. 1983, p. 3218-3223; Discussion, p 3224, 3225. refs

The conceptual design of a 50 MW photovoltaic powerplant based on thin film amorphous silicon panels is presented, in a context of installation, operation and maintenance at a site in central New Jersey which allows the evaluation of performance on the basis of actual insolation data. The design criterion employed minimizes the installed plant cost/annual kW-hr of electricity generated The cost performance values obtained are compared with a value analysis conducted for the present design in conjunction with the utility company operating in the region of the study O.C.

A83-46787
PAL(X)GA(1-X)ASPGAAS-NGAAS HETEROSTRUCTURE CONCENTRATOR PHOTOCELLS SYNTHESIZED BY LIQUID-GAS-PHASE EPITAXY
A M. ALLAKHVERDIEV, V M ANDREEV, I I MOKAN, R ROMERO, O. V. SULIMA, and B S IAVICH (Pis'ma v Zhurnal Tekhnicheskoi Fiziki, vol. 8, Nov. 12, 1982, p 1335-1339) Soviet Technical Physics Letters (ISSN 0360-120X), vol. 8, Nov. 1982, p 575-577 Translation. refs

Liquid- and gas-phase epitaxy, as well as vapor phase diffusion for the junctions, were us{ed to manufacture heterostructure pAlGaAs-pGaAs-nGaAs photovoltaic cells The n-GaAs layer was formed by liquid-phase epitaxy, the wide-gap AlGaAs layer by gas-phase epitaxy, and the p-n junction by zinc diffusion from the vapor phase The acceptor concentration realized during zinc diffusion lowered the resistivity to 0.002 ohm-cm. Spectral response comparisons were made with cells fabricated by uniform gas-phase and liquid-phase epitaxial methods Combined methods yielded higher efficiencies in the shorter spectral regions due to an increase in the effective electron diffusion length Additionally, the cells displayed a fill factor near the theoretical limit It was concluded that the techniques are viable candidates for mass production of solar cells. D H.K

A83-46794
CATALYSIS IN SOLAR ENERGY
T. H MAUGH, II Science (ISSN 0036-8075), vol 221, Sept 30, 1983, p 1358-1361. refs

The progress of technologies to convert solar energy into useful work is reviewed, with particular attention given to the functional principles of solar cells and photoelectrochemical cells The current in a solar cell is completely electronic, while in a photoelectric cell (PC) the current is partially ionic, i.e , the electrical contact between electrodes is accomplished chemically The PC can be activated by photons to perform photoassisted electrolysis in the presence of an external potential, thus producing hydrogen fuel. Various materials are under study as photoanodes, with layered metal dichalcogenide semiconductors the best performers so far. The chalcogenides include MoS2, WS2, MoSe2, and WSe2, which could be applied to photochemical synthesis of redox products. Employment of Pt or Rh on the electrode surface has increased H2 production efficiency to 13 3 percent M.S.K.

A83-47169
NEODYMIUM LASER GLASSES AS OPTICAL MEDIA FOR LUMINESCENT SOLAR CONCENTRATORS [NEODIMOVYE LAZERNYE STEKLA KAK OPTICHESKIE SREDY DLIA LIUMINESTSENTNYKH SOLNECHNYKH KONTSENTRATOROV]
V V. VEREVKIN, M. B. ZAKS, and V V POPOV Zhurnal Prikladnoi Spektroskopii (ISSN 0514-7506), vol. 39, July 1983, p. 142-145. In Russian. refs

Optical characteristics are presented for a series of commercially manufactured neodymium laser glasses Luminescent solar concentrators of planar geometry based on neodymium laser glasses are compared in terms of conversion efficiency for the case where the concentrators are coupled with silicon solar cells. It is shown that the use of luminescent concentrators based on neodymium laser glasses makes it possible to increase the efficiency of the photovoltaic conversion of solar radiation by several times V L.

A83-47251#
RADIATION-PROOF SATELLITE TECHNOLOGY
V. POULEK (Ceske Vysoke Vceni Technicke, Prague, Czechoslovakia) International Astronautical Federation, International Astronautical Congress, 34th, Budapest, Hungary, Oct. 10-15, 1983 7 p. refs
(IAF PAPER 83-69)

The damages to solar arrays sustained during use on satellites can be repaired by laser annealing Regeneration of damaged solar arrays has been accomplished in the laboratory. It is proposed that laser equipment be included in satellites to perform this

operation in orbit. Spin-stabilized satellites are particularly suited to this repair operation. Here, a laser device placed on the stabilized platform will irradiate the rotating surface of the satellite. During each revolution of the satellite, the laser on the stabilized platform will irradiate a narrow strip on the periphery of the satellite By gradually shifting the laser from the upper end of the rotating covering to the lower end, the entire surface of the solar arrays will be irradiated. It is pointed out that the efficiency of the regenerated solar arrays can attain 95 percent of the initial value. C R.

A83-47380#
COMPACT SPACE POWER STATION - BUILDING UP SCENARIO
M. POSPISIL and L POSPISILOVA International Astronautical Federation, International Astronautical Congress, 34th, Budapest, Hungary, Oct 10-15, 1983. 4 p. refs
(IAF PAPER 83-429)

Design features and the construction scenario for a compact satellite solar power station (SPS) are described. It is assumed that the SPS would be built from lunar materials, that lunar and space manufacturing facilities would be constructed, and that space transportation systems servicing and travelling from the SPS would use energy from the high power density beam The SPS would be configured so that the entire structure functioned as the energy beaming antenna. A LEO way station for assembly would also be built, and the LEO and GEO installations could double for experimentation in communications, remote sensing, meteorology, and navigation Experiments would be carried out on the optimal frequency, shape, power density, and time and space dependency of the transmitting beam. A nuclear reactor and solar cells would be delivered to the moon for startup before the crew arrives. The first power produced by the SPS would be directed toward the moon as an additional power supply, with no power density limitations on the beam Solette mirrors would ensure that eclipse conditions never occur at the SPS, either at L1 or in GEO M S.K.

A83-47563
INVESTIGATION OF COMPLEMENTARY P-N-P AND N-P-N SOLAR CELL STAGES
V M ANDREEV, O O IVENTEVA, E. P. ROMANOVA, and V. S. IUFEREV (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR) (Zhurnal Tekhnicheskoi Fiziki, vol. 53, Feb 1983, p 320-324) Soviet Physics - Technical Physics (ISSN 0038-5662), vol. 28, Feb 1983, p 196-198 Translation. refs

Theoretical and experimental test results are reported for solar cell stages with complementary p-n-p and n-p-n heterostructures. Calculations reveal that efficiencies of 40-45 percent are attainable in such photocells The parameters of the heterostructures corresponding to equal currents in the different stages are calculated, so that complementary pairs of photocells can be combined in a battery GaAs-AlAs heterostructures were used to fabricate p-n-p and n-p-n solar cell stages, and the calculated parameters have been confirmed by test results Author

A83-47564
IN2O3 HETEROJUNCTION PHOTOCELLS USING COMPOUNDS OF TYPE A(II)B(IV)C2(V)
A A. ABDURAKHIMOV, IU. V RUD, K V SANIN, M. SERGINOV, and V E SKORIUKIN (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR) (Zhurnal Tekhnicheskoi Fiziki, vol 53, Feb. 1983, p. 325-328) Soviet Physics - Technical Physics (ISSN 0038-5662), vol. 28, Feb 1983, p 199-201. Translation. refs

The present study examines the photoelectric properties of n-p heterojunction solar cells consisting of a wide-gap (Eg = 3 6 eV, T = 300 K) In2O3 layer combined with crystals of ternary compounds of the form Group II B-IV A-V A (e.g , CdSnAs2, ZnSnP2, and ZnGeP2) The photosensitivity of such structures is investigated both in unpolarized light and linearly polarized light. It is demonstrated that such heterojunction cells can be used as wide-gap photosensitive structures at photon energies exceeding 0.3 eV and that these structures have polarimetric properties It is concluded that In2O3 layers can be employed to design matrix converters of linearly polarized light using anisotropic semiconductors. B.J

A83-47565
STUDIES OF ELECTROLUMINESCENCE IN PALGAAS-PGAAS-NGAAS HETEROPHOTOCELLS WITH DISTRIBUTED PARAMETERS
KH. K ARIPOV, N. S KOROLEVA, V. R. LARIONOV, T A NULLER, and V. D. RUMIANTSEV (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR) (Zhurnal Tekhnicheskoi Fiziki, vol 53, Feb. 1983, p 329-332) Soviet Physics - Technical Physics (ISSN 0038-5662), vol. 28, Feb 1983, p 202-204 Translation refs

Electroluminescence techniques for studying defects and internal resistive losses are illustrated using pAlGaAs-pGaAs-nGaAs heterophotocells which convert unconcentrated sunlight into electricity. A laboratory technique for testing heterophotocells is proposed which involves measuring the photocurrent when the cell is illuminated by simulated low-intensity sunlight (in order to find the absolute photosensitivity of the p-n junction) and observing the spatial electroluminescence intensity distribution at the normal working current while simultaneously measuring the forward voltage over the cell Author

A83-47823* Jet Propulsion Lab , California Inst. of Tech , Pasadena
POLYMERS IN SOLAR ENERGY UTILIZATION
R H. LIANG, D. R. COULTER, C. DAO, and A. GUPTA (California Institute of Technology, Jet Propulsion Laboratory, Pasadena,CA) IN: Polymers in solar energy utilization, Proceedings of the Symposium, Las Vegas, NV, March 28-April 2, 1982. Washington, DC, American Chemical Society , 1983, p. 265-273 Research sponsored by the U S. Department of Energy and NASA refs

A laser photoacoustic technique (LPAT) has been verified for performing accelerated life testing of outdoor photooxidation of polymeric materials used in solar energy applications Samples of the material under test are placed in a chamber with a sensitive microphone, then exposed to chopped laser radiation The sample absorbs the light and converts it to heat by a nonradiative deexcitation process, thereby reducing pressure fluctuations within the cell. The acoustic signal detected by the microphone is directly proportional to the amount of light absorbed by the specimen. Tests were performed with samples of ethylene/methylacrylate copolymer (EMA) reprecipitated from hot cyclohexane, compressed, and molded into thin (25-50 microns) films. The films were exposed outdoors and sampled by LPAT weekly. The linearity of the light absorbed with respect to the acoustic signal was verified.Correlations were established between the photoacoustic behavior of the materials aged outdoors and the same kinds of samples cooled and heated in a controlled environment reactor. The reactor tests were validated for predicting outdoor exosures up to 55 days M S.K.

A83-47824* Jet Propulsion Lab , California Inst. of Tech., Pasadena
PHOTOCHEMICAL STABILITY OF UV-SCREENING TRANSPARENT ACRYLIC COPOLYMERS OF 2-(2-HYDROXY-5-VINYLPHENYL)-2H-BENZOTRIAZOLE
A. GUPTA (California Institute of Technology, Jet Propulsion Laboratory, Materials Research and Biotechnical Section, Pasadena, CA), G. W. SCOTT (California, University, Riverside, CA), D KLIGER (California, University, Santa Cruz, CA), and O. VOGL (Massachusetts, University, Amherst, MA) IN: Polymers in solar energy utilization; Proceedings of the Symposium, Las Vegas, NV, March 28-April 2, 1982. Washington, DC, American Chemical Society , 1983, p. 293-306. Research sponsored by the U.S Department of Energy. refs

The mechanism of photodegradation of certain hydroxyphenyl benzotriazole based ultraviolet absorbers has been investigated and a new polymerizable ultraviolet absorber in this group has been synthesized. The photoreactivity is entirely confined at the surface of polymethylmethacrylate films containing the ultraviolet

absorbers as pendant groups A mechanism involving sensitized photooxidation has been proposed to interpret the data Author

A83-48398
POLYCRYSTALLINE-SILICON SOLAR CELLS WITH ISOTYPIC POTENTIAL BARRIERS ALONG THE SEPARATION BOUNDARIES [SOLNECHNYE ELEMENTY NA OSNOVE POLIKRISTALLICHESKOGO KREMNIIA S IZOTIPNYMI POTENTSIAL'NYMI BAR'ERAMI VDOL' GRANITS RAZDELA]
S A. AZIMOV, F. A. AKHMEDOV, T. M. KASYMOVA, Z. MIRSAIDOVA, and R. A. MUMINOV (Akademiia Nauk Uzbekskoi SSR, Fiziko-Tekhnicheskii Institut, Tashkent, Uzbek SSR) Geliotekhnika (ISSN 0130-0997), no. 4, 1983, p. 13-16 In Russian

A technique for reducing the influence of interboundary states in polycrystalline silicon on the conversion efficiency of a solar cell is proposed which is based on the formation of isotypic potential barriers along the grain-separation boundaries It is shown that the isotypic potential barrier considerably reduces the effect of *grain-separation boundaries on the basic solar-cell parameters and* leads to an increase in the conversion efficiency of polycrystalline cells almost to values characteristic of single-crystal cells B.J

A83-48399
MODULAR ENERGY INSTALLATIONS WITH QUASI-PARABOLOIDAL SOLAR-ENERGY CONCENTRATORS [ENERGETICHESKIE USTANOVKI MODUL'NOGO TIPA S KVAZIPARABOLOIDAL'NYMI KONTSENTRATORAMI SOLNECHNOI ENERGII]
V K. BARANOV (Gosudarstvennyi Opticheskii Institut, Leningrad, USSR) Geliotekhnika (ISSN 0130-0997), no. 4, 1983, p. 17-22. In Russian. refs

A brief review of the published literature on a certain type of modular solar energy installation is presented. In these installations, each module includes a quasi-paraboloidal concentrator and, located near the focus of the latter, a unit containing a cavity receiver, motor, and generator B J.

A83-48400
CALCULATION OF THE PARAMETERS OF A SYMMETRIC RHOMBIC DRIVE FOR A ONE-CYLINDER STIRLING ENGINE [RASCHET PARAMETROV SIMMETRICHNOGO ROMBICHESKOGO PRIVODA DLIA ODNOTSILINDROVOGO DVIGATELIA STIRLINGA]
B ORUNOV, V S. TRUKHOV, and I. A. TURSUNBAEV (Akademiia Nauk Uzbekskoi SSR, Fiziko-Tekhnicheskii Institut, Tashkent, Uzbek SSR) Geliotekhnika (ISSN 0130-0997), no 4, 1983, p. 29-33 In Russian. refs

A method for calculating the parameters of a symmetric rhombic drive and cylinder-piston group for a one-cylinder Stirling engine is developed on the basis of Schmidt's isothermal method. It is shown that the proper choice of optimal parameters for the drive and cylinder-piston group enhances efficiency and improves the weight and size characteristics of the energy converter, which is of significance for improving the characteristics of an autonomous solar-energy installation as a whole B.J.

A83-48612* California Univ., Los Angeles.
MULTIWAVELENGTH ANALYZER FOR THE DETERMINATION OF DIFFUSION LENGTHS
O. M. STAFSUDD, G E DAVIS, and M JANSEN (California, University, Los Angeles, CA) Solar Cells (ISSN 0379-6787), vol. 9, Sept. 1983, p 269-280. NASA-supported research. refs

The minority carrier diffusion length Ln in the base or substrate region is an important parameter which governs a solar cell's performance The present investigation is concerned with the development of a multiwavelength analyzer (MWA) technique for the nondestructive spatial testing of polycrystalline solar cells. The MWA method is based on the utilization of the short-circuit current generated by two or more light-emitting diodes (LEDs) operating at different wavelengths and modulated 180 deg out-of-phase For a determination of Ln by the MWA technique, it is necessary to know the value of the absorption coefficient. G.R.

A83-48615
QUALITY FACTORS OF SOLAR CELL ARRAYS
M. SHECHTER (Tel Aviv University, Tel Aviv, Israel), G. YEKUTIELI (Weizmann Institute of Science, Rehovot, Israel), and J. APPELBAUM Solar Cells (ISSN 0379-6787), vol 9, Sept. 1983, p 295-309

Analytical quality factors are defined for solar cell arrays made of dissimilar cells. Attention is given to an array matching factor (AMF), the relative power loss (RPL), and the array curve fill factor (ACFF). It is demonstrated numerically that the array photocurrent varies with load and is bounded by the minimal and maximal values of the cell photocurrents The AMF is formulated to include the variations in the load and the insolation, and used to calculate the I-V characteristics. It is found that the AMF, RPL, and ACFF can be calculated for a parallel array, but not in closed form for a series array Examples are furnished in terms of a series array made of two nonidentical cells and a 100 cell array Greater cell diversity increases the significance of the AMF and RPL and decreases the importance of the ACFF, which is related to the I-V curve shape, and thus the distribution of the cell photocurrents. M.S.K

A83-48616
ALGAAS/GAAS CASCADE SOLAR CELL COMPUTER MODELING UNDER HIGH SOLAR CONCENTRATION
M. F. LAMORTE (Research Triangle Institute, Research Triangle Park, NC) and D. H ABBOTT (Bell Telephone Laboratories, Inc., Holmdel, NJ) Solar Cells (ISSN 0379-6787), vol. 9, Sept. 1983, p. 311-326. refs
(Contract XM-9-8136-1, DE-FG02-79ET-00083; EG-77-C-01-4042)

A computer modeling program was used to study a two-junction AlGaAs/GaAs cascade solar cell under air mass 1.5 spectral conditions, up to 500 suns solar concentration and in a temperature range 300-600 K The cascade structure used in the study is one of a number that are currently under development. Computer modeling results are graphically presented showing the behavior of the efficiency, photovoltage, photocurrent density and forward current density under the combined influence of high solar concentration and temperature. In addition, normalized temperature coefficients, current mismatch parameters and the power utilization ratio are determined and their behavior discussed The major conclusions drawn from the study are that the band gap combination of this structure is very nearly optimum for operation in the 450-550 K temperature range and that the normalized temperature coefficient of efficiency improves significantly with increasing solar concentration. Author

A83-48617
GRATING SOLAR CELLS - AN EXPERIMENTAL COMPARISON OF ALTERNATIVE STRUCTURES
D. J. THOMSON and H C. CARD (Manitoba, University, Winnipeg, Canada) Solar Cells (ISSN 0379-6787), vol. 9, Sept 1983, p. 337-344. Research supported by the Natural Sciences and Engineering Research Council refs
(Contract NSERC-G-0442)

An experimental investigation of majority carrier grating solar cells has been made and a comparison is drawn with minority carrier cells fabricated and tested under identical conditions. The collecting junctions between the metal grid and the silicon represent 'peaked' Schottky barriers in the majority carrier devices Active area efficiencies for air mass 1 solar illumination (both simulated and natural sunlight) are 11.4 percent and 14 0 percent respectively for majority and minority carrier cells of about 1 sq cm area on crystalline silicon. Spectral response data are also presented, and further comparisons are made with cast polycrystalline silicon grating solar cells and with commercial diffused p-n junction solar cells. Author

A83-48702
A STUDY OF BUILT-IN POTENTIAL IN A-SI SOLAR CELLS BY MEANS OF BACK-SURFACE REFLECTED ELECTROABSORPTION
S. NONOMURA, H OKAMOTO, and Y. HAMAKAWA (Osaka University, Toyonaka, Japan) Applied Physics A - Solids and Surfaces (ISSN 0721-7250), vol. A 32, Sept 1983, p 31-38 Research supported by the Ministry of Education and Agency of Industrial Science and Technology. refs

The electroreflectance (ER) signal has been studied for the purpose of identifying the built-in field in practical amorphous silicon (a-Si:H) solar cells. Through both theoretical and experimental considerations, it has been confirmed that the ER signal essentially comes from the light which is reflected at the back surface and hence experiences the internal electric field within the a-Si:H layer By analyzing the ER signal, which is really the back-surface reflected electroabsorption signal, the built-in potential V(b) can be evaluated. This method has been applied to various types of p-i-n junction a-Si solar cells V(b) of a usual homojunction solar cell was about 0.85 V. Increases of V(b) by 50-130 mV have been found in heterojunction solar cells constructed with p-type amorphous silicon carbide (a-SiC:H) and/or n-type microcrystalline silicon as compared with homojunction p-i-n solar cells Moreover, a clear dependence of V(b) on the substrate materials has been observed. These experimental results are described in connection with cell performances. Author

A83-48787
NEW TYPES OF HIGH EFFICIENCY SOLAR CELLS BASED ON A-SI
Y. HAMAKAWA, S. NONOMURA, H OKAMOTO (Osaka University, Toyonaka, Japan), K FUJIMOTO, K. OKUDA, and Y. KASHIMA Applied Physics Letters (ISSN 0003-6951), vol. 43, Oct 1, 1983, p. 644-646. refs

Three types of new structure a-Si solar cells having more than 9 percent efficiency are presented The first one has a high optical reflection back electrode metal alloyed with optically transparent n-type micro-c-Si deposited on the conventional glass substrate a-SiC/a-Si heterojunction solar cell The second type structure is an inverted p-i-n solar cell having Ag/TiO2/a-Si metal-insulator-semiconductor type back surface electrode which more efficiently collects longer wavelength photocarriers just above the band edge The third structure demonstrated here has a-Si/polycrystalline tandem junction to pick up the energy of longer wavelength photons passing through the front side of the a-Si solar cell. All key technologies proposed here are practical and offer more promised real alternatives for the fabrication of high efficiency a-Si solar cells. Author

A83-48790
HETEROJUNCTION FORMATION IN (CDZN)S/CUINSE2 TERNARY SOLAR CELLS
R. K. AHRENKIEL, L. L KAZMERSKI, R. J. MATSON, C. OSTERWALD, T. P. MASSOPUST (Solar Energy Research Institute, Golden, CO), R A. MICKELSEN, and W. S. CHEN (Boeing Aerospace Co , Seattle, WA) Applied Physics Letters (ISSN 0003-6951), vol. 43, Oct. 1, 1983, p. 658-660. refs

The electrical properties of (CdZn)S/CuInSe2 solar cells have been investigated by combining electron beam induced current measurements and capacitance-voltage measurements on the same device. In the as-grown device, the CuInSe2 is lightly doped n type After baking to about 225 C in vacuum, the CuInSe2 converts to p type forming the heterojunction. Oxygen does not appear to be necessary for type conversion to occur. Author

A83-48791
HIGH-EFFICIENCY SI SOLAR CELLS BY BEAM PROCESSING
R T. YOUNG (Heliotics, Inc., San Diego, CA; Oak Ridge National Laboratory, Oak Ridge, TN), G. A. VAN DER LEEDEN, R. L SANDSTROM (Heliotics, Inc., San Diego, CA), R F. WOOD, and R. D. WESTBROOK (Oak Ridge National Laboratory, Oak Ridge, TN) Applied Physics Letters (ISSN 0003-6951), vol. 43, Oct. 1, 1983, p. 666-668. Research supported by the Solar Energy Research Institute. refs
(Contract W-7405-ENG-26)

Utilizing two recently developed beam processing techniques, i e., gas discharge implantation and XeCl excimer laser annealing, p-n junction silicon solar cells with total area AM1 efficiencies as high as 16.5 percent have been made. These cells are of a particularly simple structure, fabricated without any sophisticated processing steps, and subjected to no high-temperature treatment. Author

A83-48808
FUELS FROM SOLAR ENERGY - HOW SOON?
T. H. MAUGH, II Science (ISSN 0036-8075), vol 222, Oct 14, 1983, p. 151-153.

A prototype photoelectrochemical cell that employs polycrystalline spherical Si particles as electrodes is described The particles are dropped in a molten state onto a rotating disk that throws off droplets that cool in free fall. Dopants are added to the spheres to form n-type and p-type semiconductors. Each electrode is embedded in glass and receives a metal electrical contact The system lends itself to automation The photoelectrodes are used in a closed system with hydrogen and bromine which are separated photoelectrochemically, stored, and then recombined in a fuel cell to produce electricity as needed System efficiencies of 7 percent have been achieved, and commercial scale output of 8-10 percent efficiency are projected for 1990. Other systems being developed, involving GaAs photoelectrodes, photoelectrochemical diodes, and catalytical systems to convert CO2 to methanol with the addition of sunlight are discussed
M S.K

A83-48862
METAL-OXIDE-N-P-P(+) SOLAR CELLS ON SILICON TAPE
N V. ABROSIMOV, A. V BAZHENOV, V. B BARANIUK, S. K. BRANTOV, A. I. MALIK, V. A. MANASSON, and V. A TATARCHENKO (Akademiia Nauk SSSR, Institut Fiziki Tverdogo Tela, Moscow, USSR) (Pis'ma v Zhurnal Tekhnicheskoi Fiziki, vol. 8, Dec. 12, 1982, p. 1454-1457) Soviet Technical Physics Letters (ISSN 0360-120X), vol. 8, Dec 1982, p. 625, 626. Translation. refs

MO-n-p-p(+) solar cells fabricated on silicon ribbons grown from the melt by the Stepanov method with a dense graphite form wettable by the melt were investigated. The spectral characteristic and photocarrier collection coeffcient were determined along with the volt-ampere characteristics. It is shown that, when the proposed method is used to fabricate solar cells from 'profiled' silicon crystals containing a large number of structural defects in the form of boundaries, the photoelectric characteristics of the resulting cells are similar to those of mass-produced solar cells made from silicon single crystals The conversion efficiency, however, is quite nonuniform over the area of the silicon tape
B.J

A83-48912
PHOTOVOLTAIC EFFECT IN GOLD-INDIUM SELENIDE SCHOTTKY BARRIERS
M DI GIULIO, G. MICOCCI, A. RIZZO, and A. TEPORE (Lecce, Universita; CNR, Gruppo Nazionale di Struttura della Materia, Lecce, Italy) Journal of Applied Physics (ISSN 0021-8979), vol 54, Oct. 1983, p 5839-5843. refs

Photovoltaic effect has been extensively investigated in gold-indium selenide Schottky barriers, realized by vacuum evaporation of gold on freshly cleaved surfaces of indium selenide single crystals Continuous and pulsed excitation has been used to determine the fundamental parameters governing the

photovoltaic effect. A barrier height of 0 65 eV has been found from current-voltage (I-V) and capacitance-voltage (C-V) characteristics, and by means of the spectral dependence of the photoemission current A diffusion length of about 10 microns and a lifetime of about 15 microseconds of the minority carriers have been determined by measuring both the spectral response of the short-circuit current and the transient photocurrent decay. Finally, a photovoltaic efficiency for solar energy conversion of about 2 percent has been evaluated. Author

A83-48916
BULK MINORITY CARRIER DIFFUSION LENGTH AND PHOTOGENERATED CARRIER PROFILE IN SILICON PHOTOVOLTAIC CELLS
C. T HO and J. D. MATHIAS (Mobil Solar Energy Corp , Waltham, MA) Journal of Applied Physics (ISSN 0021-8979), vol. 54, Oct. 1983, p. 5993-6001 refs

The bulk minority carrier diffusion length of single-crystal and polycrystalline ribbon silicon photocells was measured with monochromatic light of various wavelengths and flux densities. We noted that the diffusion length shows a gradual reduction as the illumination wavelength becomes shorter in both types of cells In addition, the light enhancement phenomenon of the diffusion length in the ribbon cells diminished when shorter wavelength lights were used. In the single-crystal cells, however, no enhancement effect was observed for any wavelength. The interpretation of these results is based on the examination of the photogenerated minority carrier profile as a function of diffusion length and wavelength in the bulk region of the cell. We correlate the measured diffusion length with the depth in which a positive minority carrier concentration gradient exists Author

A83-48958
COMBINED SOLAR-WIND POWER PLANTS [KOMBINIROVANNYE GELIOVETROELEKTRICHESKIE AGREGATY]
S. SEITKURBANOV (Akademiia Nauk Turkmenskoi SSR, Nauchno-Proizvodstvennoe Ob'edinenie Solntse, Turkmen SSR) Akademiia Nauk Turkmenskoi SSR, Izvestiia, Seriia Fiziko-Tekhnicheskikh, Khimicheskikh i Geologicheskikh Nauk (ISSN 0002-3507), no 3, 1983, p. 49-55. In Russian. refs

The advantages offered by the combined use of wind energy and solar energy are described, and schemes for the regular electrical supply of autonomous users are proposed. Particular consideration is given to the characteristics of the energy storage units, and to recommendations on the choice and optimization of solar-wind power plants. B.J

A83-49324
ESTIMATED POWER QUALITY FOR LINE COMMUTATED PHOTOVOLTAIC RESIDENTIAL SYSTEM
B. W. MCNEILL and M A. MIRZA (Arizona State University, Tempe, AZ) IEEE Transactions on Power Apparatus and Systems (ISSN 0018-9510), vol PAS-102, Oct 1983, p. 3288-3294. refs
(Contract DE-AC02-76ET-20279)

A residential photovoltaic system using a line commutated inverter is modeled using a single diode model for the solar cells and a four switch model for the inverter The model predicts power factor and total harmonic distortion as a function of solar radiation, array voltage, inverter output voltage, and inverter filter capacitor and inductor size The model was run using parameter values appropriate for the John F Long PV System and the predicted results compared well with measured results from the system The model shows that improvements in total harmonic distortion are made at the expense of the power factor The harmonic distortion is least when the inverter is operating at just continuous conduction The total harmonic distortion can be kept to less than 0 17 all day if a variable inductor is used in the inverter's input filters. Author

A83-49623
SOLAR INSOLATION UPON THE YEMEN ARAB REPUBLIC
M K. AL-MOTAWAKEL (Sana'a University, Sana'a, Yemen Arab Republic), B NORTON, S. D. PROBERT (Cranfield Institute of Technology, Cranfield, England), and J. C MCVEIGH (Brighton Polytechnic, Brighton, Sussex, England) Applied Energy (ISSN 0306-2619), vol. 15, no 2, 1983, p 139-152. Research supported by the Sana'a University and British Council refs

A83-49649
NET ENERGY ANALYSIS OF DISTRICT SOLAR HEATING WITH SEASONAL HEAT STORAGE
P. D. LUND and M T KANGAS (Helsinki University of Technology, Espoo, Finland) Energy (UK) (ISSN 0360-5442), vol 8, Oct 1983, p. 813-819 refs

A net energy analysis of district solar heating using seasonal heat storage has been performed. The use of seasonal heat storage is of great importance in northern latitudes when the solar contribution is to be increased. Different system alternatives were considered. Net energy ratios for the most favorable options were found to be between 3 and 5 Author

A83-49670
MATHEMATICAL MODEL OF A MOVING SYSTEM WITH LOW-STIFFNESS ELASTIC ELEMENTS [MATEMATICHESKAIA MODEL' DVIZHUSHCHEISIA SISTEMY S UPRUGIMI ELEMENTAMI NIZKOI ZHESTKOSTI]
V. F IASHCHENKO Kosmicheskie Issledovaniia na Ukraine (ISSN 0321-4508), no 16, 1982, p 74-78 In Russian. refs

An investigation is made of the motion of a mechanical system consisting of a rigid bearing body and attached elastic elements in the form of flat cantilever panels Equations of motion are obtained with allowance for the deformation of the elastic elements. The system considered can serve as a model of a spacecraft body with a deployable-retractable thin-film solar array. B.J

A83-49834
A METHOD FOR THE MEASUREMENT OF SOLAR CELL SERIES RESISTANCE
V. N. SINGH and R P SINGH (Banaras Hindu University, Varanasi, India) Journal of Physics D - Applied Physics (ISSN 0022-3727), vol 16, Oct 14, 1983, p. 1823-1825. refs

Use of the I-V curve at a moderate light intensity level is demonstrated to be sufficient for characterizing the series resistance of a solar cell. A relationship is defined between the maximum power output and the I-V curve, and its reciprocal yields the series resistance. The results of the method are compared with a two-curve method and a high-intensity technique. It is found that the I-V curve method does not have a dark mode limitation, requires no graphic interpretation, and requires no cooling apparatus in order to obtain acceptable measurements. M S K.

A83-50063
MATERIALS FOR PHOTOTHERMAL SOLAR ENERGY CONVERSION
W F. BOGAERTS (Leuven, Katholieke Universiteit, Louvain, Belgium) and C. M. LAMPERT (California, University, Berkeley, CA) Journal of Materials Science (ISSN 0022-2461), vol 18, Oct. 1983, p. 2847-2875 EURATOM-supported research. refs

Commercially or potentially available selective and non-selective absorber surfaces for solar heat collectors are reviewed and the state-of-the-art of solar collector corrosion processes is outlined. The review of available published literature has indicated that a lack of quantitative information exists, relative to corrosion of collector surfaces. Available information (mostly qualitative) on durability aspects and corrosion of solar receiver surfaces is described to indicate potential corrosion problem areas and corrosion prevention possibilities. An outline of appropriate durability tests is presented. Author

A83-50176
INVESTIGATION OF COPPER OXIDE COATINGS FOR SOLAR SELECTIVE APPLICATIONS
A. SCHERER, O. T. INAL, and A J SINGH (New Mexico Institute of Mining and Technology, Socorro, NM) Solar Energy Materials (ISSN 0165-1633), vol 9, July-Sept. 1983, p. 139-158 refs (Contract DE-ER78-0442-66)

In a number of cases, it has been attempted to generate selective copper oxide coatings for use as solar collector surfaces The present investigation is concerned with an attempt to compare the thermally produced copper oxide coatings to those obtained through chemical and electrochemical oxidation. The chemical oxidation process was optimized, and a study of the thermal degradation was conducted. The composition of the coatings was characterized with the aid of X-ray diffusion analysis, and the microstructure was investigated by means of scanning electron microscopy It was found that a solar selective surface can be produced by procedures based on the chemical and electrochemical oxidation of copper, while thermally produced copper oxide coatings exhibit solar absorptances less than 0 7 at comparatively high emittances G.R.

A83-50177
SURFACE MODIFICATION OF POLYCRYSTALLINE P-CUINS2 AND P-CUINSE2 ELECTRODES FOR IMPROVED SOLAR CELL PERFORMANCE
H. J LEWERENZ, H. GOSLOWSKY (Institut fuer Kernforschung Berlin GmbH, Berlin, West Germany), and F. A. THIEL (Bell Telephone Laboratories, Inc., Murray Hill, NJ) Solar Energy Materials (ISSN 0165-1633), vol 9, July-Sept. 1983, p. 159-166. refs

A83-50178
INFLUENCE OF HYDROGEN REDUCTION ON PHOTOELECTRO-CHEMICAL BEHAVIOR OF ANODIC OXIDIZED N-TIO2 LAYERS
K. J. HARTIG, N. GETOFF (Wien, Universitaet, Wienna, Austria), K. D KOCHEV, and S. KNEV (B'lgarska Akademiia na Naukite, Tsentralna Laboratoriia po Sl'ncheva Energiia i Novi Energiini Iztochnitsi, Sofia, Bulgaria) Solar Energy Materials (ISSN 0165-1633), vol 9, July-Sept 1983, p. 167-176. Research supported by the Bundesministerium fuer Wissenschaft und Forschung and B'lgarska Akademiia na Naukite. refs

The behavior of polycrystalline n-TiO2 photoanodes produced by anodic oxidation of Ti metal foils and subsequently reduced in hydrogen atmosphere at various temperatures and different times was investigated The employed methods for their characterization were: scanning electron microscopy, X-ray diffraction, thickness determination, open-circuit voltage and capacitance/voltage studies as well as photoelectrochemical measurements The reduction process results in an increase of oxygen deficiencies and a decrease of the amount of recombination centers and of grain-boundary energy barriers between the crystallites All these parameters lead to a significant increase of the photoefficiency The best photoanodes were obtained when the anodically oxidized samples were reduced under hydrogen at 800-850 C for 15 min (conversion of anatase to rutile crystal structures). Author

A83-50179
INVESTIGATIONS OF SODIUM ACETATE TRIHYDRATE FOR SOLAR LATENT HEAT STORAGE, CONTROLLING THE MELTING POINT
A. ULMAN (Weizmann Institute of Science, Rehovot, Israel) and B. VALENTIN (Electra (Israel Ltd), Rishon Lezion, Israel) Solar Energy Materials (ISSN 0165-1633), vol. 9, July-Sept. 1983, p. 177-181. refs

The addition of different acetate salts and acetamide lowers the melting point of sodium acetate trihydrate. Between 0 and 10 percent of lithium acetate dihydrate a linear relationship was observed between the melting point and the molal concentration, and the cryoscopic constant of Kf = -6.8 C (+ or - 10 percent) was evaluated Information on dissociation or dimerization of the various additives could be deduced from the results The positive properties of sodium acetate trihydrate were retained. Author

A83-50181
STRUCTURAL AND OPTICAL STUDIES OF TOPOTAXIALLY-GROWN CU2S FROM SPRAYED CDS THIN FILMS
B REZIG, J BOUGNOT, M. EL HAMMOUTI, M. PEROTIN, V. BAY, and M. SAVELLI (Monpellier II, Universite, Monpellier, France) Solar Energy Materials (ISSN 0165-1633), vol 9, July-Sept. 1983, p 189-198 refs

The structural and optical properties of Cu(x)S films are examined The fabrication of the films is briefly described, and X-ray diffraction is used to study the layer structure of the films, including the stoichiometry, thickness effect, and orientation and lattice parameters. The as-grown Cu(x)S layer is predominantly chalcocite with orthorhonbic structure built around two 'preferred' orientations corresponding to (106) and (024) planes The (024) peak intensity, strongly correlated to the layer thickness, leads to a calibration curve which is very useful in estimating the layer thickness The optical properties of Cu2S are studied for a dipped Cu2S formed on sprayed CdS solar cell using the Shiozawa (1967) method and for completely dipped Cu2S thin films. C.D.

A83-50183
FLUORESCENT WINDOW AS WAVELENGTH SHIFTER FOR A POLYSULFIDE CONTAINING PHOTOELECTROCHEMICAL CELL
J MANASSEN (Weizmann Institute of Science, Rehovot, Israel) and N MULLER Solar Energy Materials (ISSN 0165-1633), vol 9, July-Sept 1983, p 207-216. refs

Appropriate selection of the reaction conditions is demonstrated to yield higher conversion efficiencies when organic dyes are used in photoelectrochemical cells to shift the wavelengths of incoming light to more usable bands An experimental study was performed with CdSe and CdSeTe thin-film electrodes and fluorescein and rhodamine 6G dyes, as well as polysulfide and polyiodide solutions *Efficiency gains of up to 6 percent were obtained with the CdSeTe* electrode and up to 10 percent with the CdSe electrode It was concluded that the small Stokes shift is not an inhibiting factor in the use of the phase-shifting dyes, but the instability of the organic dyes is It is noted that stable dyes do not afford the efficiency gains due to their low oscillator strength M S.K.

N83-25497*# Kansas Univ Center for Research, Inc., Lawrence Flight Research Lab.
STUDY OF NOISE REDUCTION CHARACTERISTICS OF DOUBLE-WALL PANELS Progress Report, 1 Nov. 1982 - 30 Apr. 1983
R NAVANEETHAN, B. QUAYLE, S. STEVENSON, and M GRAHAM May 1983 181 p refs
(Contract NCC1-6)
(NASA-CR-170308; NAS 1 26·170308; KU-FRL-417-21) Avail NTIS HC A09/MF A01 CSCL 20A

The noise reduction characteristics of general aviation type, flat, double-wall structures were investigated The experimental study was carried out on 20-by-20 inch panels with an exposed area of 18 by 18 inches A frequency range from 20 to 5000 Hz was covered. The experimental results, in general, follow the *expected trends. At low frequencies the double-wall structures* are no better than the single-wall structures However, for depths normally used in the general aviation industry, the double-wall panels are very attractive The graphite-spoxy skin panels have higher noise reduction at very low frequencies (100 Hz) than the Kevlar skin panels. But the aluminum panels have higher noise reduction in the high frequency region, due to their greater mass. Use of fiberglass insulation is not effective in the low frequency region, and at times it is even negative. But the insulation is effective in the high-frequency region. The theoretical model for predicting the transmission loss of these multilayered panels is also discussed. M.G.

N83-30491*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SILICON SOLAR CELL CHARACTERIZATION AT LOW TEMPERATURES AND LOW ILLUMINATION AS A FUNCTION OF PARTICULATE IRRADIATION
A. F WHITAKER, S A. LITTLE, and C L. PEACOCK, JR. *In* AGARD Environ Effects on Mater for Space Appl 9 p Mar. 1983 refs
Avail: NTIS HC A10/MF A01 CSCL 10A

Various configurations of back surface reflector silicon solar cells including small (2 x 2) cm and large (approx 6 x 6) cm cells with conventional and wraparound contacts were subjected to 1 MeV electron irradiation and characterized under both Earth orbital and deep space conditions of temperatures and illuminations. Current-Voltage (I-V) data were generated from +65 C to -150 C and at incident illuminations from 135 3 mW/sq cm to 5.4 mW/sq cm for these cells. Degradation in cell performance which is manifested only under deep space conditions is emphasized In addition, the effect of particle irradiation on the high temperature and high intensity and low temperature and low intensity performance of the cells is described. The cells with wraparound contacts were found to have lower efficiencies at Earth orbital conditions than the cells with conventional contacts Author

N83-30771# General Electric Co , Philadelphia, Pa Space Div
SINGLE-POINT RANDOM AND MULTI-SHAKER SINE SPACECRAFT MODAL TESTING
M FERRANTE, C. V STAHLE, and D. G BRESKMAN *In* Shock and Vibration Information Center The Shock and Vibration Bull., no 50, part 2 p 191-198 Sep. 1980 refs 4 Vol
Avail: NTIS HC A12/MF A01 CSCL 22B

The modal test of the launch configuration of the DSC-3 spacecraft which consists of a tandem spacecraft configuration with a DSCS-2 atop a DSCS-3 is described Single-Point Random (SPR) was used as the basic test technique, and a new Multi-Shaker Sine (MSS) testing technique was used to validate it by measuring selected modes. Although the two DSCS-3 solar arrays were removed and tested separately to eliminate clustered modes, the spacecraft exhibited a high modal density making accurate modal measurements difficult. The MSS results for these 15 modes were comparable with the SPR results except for two MSS modes which showed a marked improvement. During the test, major improvements in SPR procedures and data processing times were obtained by hardware and software changes Data processing time was reduced by an order of magnitude. However, it is felt that additional refinements are needed before the SPR technique can be confidently applied to spacecraft testing. It does appear that SPR can be more cost effective than the MSS technique even for complex spacecraft modal testing. Author

N83-30826# National Bureau of Standards, Washington, D.C National Engineering Lab
THERMAL COMFORT CONDITIONS IN THE NBS/DOE DIRECT GAIN PASSIVE SOLAR TEST FACILITY
S T. LIU Dec. 1982 50 p refs
(Contract DE-AI01-76PR-06010)
(PB83-162032; NBSIR-82-2621) Avail: NTIS HC A03/MF A01 CSCL 13A

The thermal comfort conditions in a direct gain cell of passive solar test facility were analyzed It was found that the daytime operative temperature as measured by the black globe temperature sensors in an area near the large south glazing exceeded the upper boundary of the ASHRAE comfort envelope by a large amount in a clear day during both the thermal transition month of October and the cold winter month of January The reflected solar radiation from the interior surfaces and the snow covered ground plays a significant role on the measured black globe temperature and should be included in the computation of the mean radiant temperature for a space with large glazed areas. GRA

N83-30827# Connecticut Dept of Transportation, Wethersfield.
PASSIVE SOLAR-HEATING RETROFIT OF A MAINTENANCE FACILITY: FIRST-YEAR PERFORMANCE Research Report, May 1981 - Jun. 1982
D. R. JACKSON and J. M. CALLAHAN Sep. 1982 95 p refs
(PB83-171009; FHWA/CT-724-2-82/10) Avail: NTIS HC A05/MF A01 CSCL 13A

A 12,000 sf maintenance facility in Connecticut was retrofitted with a 1,500 sf passive solar Trombe wall, 2 in of foam roof insulation and a new control system that allows night/weekend temperature setback A new separate boiler was installed to heat an office/locker wing of the facility An energy-consumption monitoring system was installed and collected data for 11/2 years before the retrofit and one complete year after the retrofit. Actual energy consumption for the facility was very close to that predicted using simple analytic methods After the solar wall was installed and other energy-conservation measures implemented the yearly oil consumption was reduced to 2744 gallons/year. GRA

N83-31109# National Bureau of Standards, Washington, D.C
WEATHERING PERFORMANCE OF COVER MATERIALS FOR FLAT PLATE SOLAR COLLECTORS Final Technical Note
E. J CLARK and W E. ROBERTS Nov 1982 84 p refs Sponsored in part by DOE
(PB83-164988, NBS-TN-1170) Avail: NTIS HC A05/MF A01 CSCL 10A

Weathering studies were performed to obtain data on the performance and durability of cover plate materials for flat plate solar collectors used in solar heating and cooling systems Ten materials were evaluated to assess their durability after natural weathering and artificial weathering with a xenon arc light. The materials were weathered for four years on small mini-collectors in Arizona, Florida, and Maryland after which the solar energy transmittance and the effect of dirt on the transmittance were measured The tensile properties of selected film materials were also assessed after weathering. The effects of the natural weathering are compared for materials exposed as inner and outer cover plates for each weathering site, for the three weathering sites, and with materials artificially weathered with a xenon arc light. Author (GRA)

N83-31110# Battelle Pacific Northwest Labs., Richland, Wash.
PRELIMINARY ASSESSMENT OF THE USE OF HEAT TRANSFER FLUIDS FOR SOLAR THERMAL ENERGY SYSTEMS Final Report, May 1981 - Apr. 1982
S E. PETTY, B. A. GARRETT-PRICE, and G. L. MCKOWN Feb. 1983 75 p refs
(PB83-170597; PNL-4182, EPA-600/7-83-021) Avail: NTIS HC A04/MF A01 CSCL 10A

A preliminary assessment, based on available data, on the extent to which various materials will be used as heat transfer media in solar energy systems and of mechanisms for their release to the environment is given. The emphasis is on solar thermal energy systems for industrial, agricultural and electrical production applications over the next 5-10 years. An assessment is given of consequences associated with transport and fate of the materials in the environment Available pollution control techniques are identified and areas where further research may be required are cited. GRA

N83-31466# California Univ , Berkeley. Lawrence Berkeley Lab.
ADVANCED OPTICAL AND THERMAL TECHNOLOGIES FOR APERTURE CONTROL
S E SELKOWITZ, C. M. LAMPERT, and M RUBIN Sep. 1982 10 p refs Presented at Passive and Hybrid Solar Energy Update Conf., Washington, D.C., 15 Sep 1982
(Contract DE-AC03-76SF-00098)
(DE83-003663; LBL-15131; CONF-820940-8) Avail NTIS HC A02/MF A01

Control of heat transfer and radiant energy flow through building apertures is essential for maximizing thermal and daylighting benefits and minimizing undesired heating and cooling loads.

Architectural solutions based on current technology generally add devices such as louvers, shutters, shades, or blinds to the glazing system. The objectives and initial accomplishments of a research program the goal of which is to identify and evaluate advanced optical and thermal technologies for controlling aperture energy flows, thus reducing building energy requirements are outlined. Activities are described in four program areas: (1) low-conductance, high-transmittance glazing materials (e.g., heat mirrors, aerogels); (2) optical switching materials (e.g., electrochromic, photochromic), (3) selective transmitters, and (4) daylight enhancement techniques. DOE

N83-31474*# Colorado State Univ., Fort Collins. Dept. of Physics.
CURRENT COLLECTION FROM THE SPACE PLASMA THROUGH DEFECTS IN HIGH VOLTAGE SOLAR ARRAY INSULATION Ph.D. Thesis. Final Report
R. P STILLWELL Jan. 1983 103 p refs
(Contract NSG-3196)
(NASA-CR-168148, NAS 1.26:168148) Avail: NTIS HC A06/MF A01 CSCL 20I

For spacecraft operation in the near Earth environment, solar cell arrays constitute the major source of reliable long term power. Optimization of mass and power efficiency results in a general requirement for high voltage solar arrays. The space plasma environment, though, can result in large currents being collected by exposed solar cells The solution of a protective covering of transparent insulation is not a complete solution, inasmuch as defects in the insulation result in anomalously large currents being collected through the defects Tests simulating the electron collection from small defects in an insulation have shown that there are two major collection modes. The first mode involves current enhancement by means of a surface phenomenon involving the surrounding insulator In the second mode the current collection is enhanced by vaporization and ionization of the insulators materials, in addition to the surface enhancement of the first mode A model for the electron collection is the surface enhanced collection mode was developed The model relates the secondary electron emission yield to the electron collection It correctly predicts the qualitative effects of hole size, sample temperature and roughening of sample surface The theory was also shown to predict electron collection within a factor of two for the polymers teflon and polyimide Author

N83-32074# Klein, Schanzin und Becker A.G., Frankenthal (West Germany).
DEVELOPMENT AND TESTING OF A SUBMERSIBLE MOTOR PUMP DRIVEN BY A SOLAR CELL GENERATOR Final Report, Dec. 1981
E PICHMAUS and V FLECKENSTEIN (Siemens AG, Munich) Bonn Bundesministerium fuer Forschung und Technologie May 1983 35 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-081; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 7,50

A submersible motor pump driven by a solar cell is described The pump and motor efficiency of a submersible motor pump of series standard was improved by 10 points using an asynchronous motor similar to series To convert the DC current delivered by solar cells into ac current of variable frequency and voltage, a pulse converter with MOS power transistors and a control device were developed. The unit consists of an on-off automatic device and a maximum power point control device. For testing the single components and the total system, a test appliance was installed. A total efficiency of 43% at nominal load and of 33% at 1/4 load is obtained. Author (ESA)

N83-32177* National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio
HIGH VOLTAGE V-GROOVE SOLAR CELL Patent
J. C. EVANS, JR., A T CHAI, and C. P. GORADIA, inventors (to NASA) 15 Mar. 1983 6 p Filed 18 Mar. 1982 Supersedes N82-24717 (20 - 15, p 2122)
(NASA-CASE-LEW-13401-2, US-PATENT-4,376,872; US-PATENT-APPL-SN-359388, US-PATENT-CLASS-136-249, US-PATENT-CLASS-357-30) Avail US Patent and Trademark Office CSCL 10A

A high voltage multijunction solar cell comprises a number of discrete voltage generating regions, or unit cells, which are formed in a single semiconductor wafer and are connected together so that the voltages of the individual cells are additive. The unit cells comprise doped regions of opposite conductivity types separated by a gap. The method includes forming V-shaped grooves in the wafer and orienting the wafer so that ions of one conductivity type can be implanted in one face of the groove while the other face is shielded. A metallization layer is applied and selectively etched away to provide connections between the unit cells.
Official Gazette of the U.S Patent and Trademark Office

N83-32184# AEG-Telefunken, Frankfurt am Main (West Germany) Forschungsinst.
SCHOTTKY AND MIS TYPE AMORPHOUS-SILICON SOLAR CELLS Final Report, Jun. 1981
M MILLEVILLE, D. LEIDICH, E. NIEMANN, and R. FISCHER Bonn Bundesministerium fuer Forschung und Technologie Apr 1983 62 p refs In GERMAN, ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-043; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13

Thin films of hydrogenated amorphous silicon were prepared by reactive plasma deposition in a high frequency glow discharge of silane Structural, electrical and optical properties of these films were investigated in order to ensure the quality required for the fabrication of solar cells Two types of solar cell structure were prepared, Schottky barrier cells and MIS cells with a thin insulating layer of SiOx. The cells were optimized with respect to type and sheet resistance of the substrate, thickness of the active layer, and thickness of the insulating layer Author (ESA)

N83-32973 Polish Academy of Sciences, Warsaw.
SECTION OF THERMODYNAMIC FOUNDATIONS OF NEW METHODS FOR ENERGY CONVERSION
In its Sci. Activities of the Polish Acad. of Sci. p 55-61 1983 Avail: Issuing Activity

The topics of elastic and elastic-plastic behavior of porous material, design of vibro-insulators, equations for the coordinates of stress and strain rate tensors, use of solar energy, mathematical models for storage of thermal energy, and heat exchange were discussed B.G

N83-32988# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
MARKET AND ECONOMIC ANALYSIS OF RESIDENTIAL PHOTOVOLTAIC SYSTEMS Final Report
R. D TABORS Jun 1982 43 p refs
(Contract DE-AC02-76ET-20279)
(DOE/ET-20279/216) Avail: NTIS HC A03/MF A01

The overall structure of a project to evaluate the U.S. residential photovoltaic market or markets is reviewed and experience obtained before cuts in federal funding for the project were reduced is summarized. Topics covered include residential worth analysis, (including retrofit applications); evaluation of presently available regional, econometric models which could be used to project housing stocks; and the analysis of retrofit potential for residential photovoltaic power systems given available roof area. A.R.H.

N83-33313# Hawaii Natural Energy Inst , Honolulu.
HAWAII NATURAL ENERGY INSTITUTE REPORT ON THREE INNOVATIVE PHOTOVOLTAIC APPLICATIONS FOR RESIDENCES EXPERIMENTS Final Report
D. R NEILL and G D. CURTIS Jun. 1982 61 p Prepared for Lincoln Lab., MIT, Lexington, Mass
(Contract DE-AC02-76ET-20279)
(DOE/ET-20279/211) Avail· NTIS HC A04/MF A01

A research program to install utility-backed photovoltaic (PV) power systems in three lived-in residences in Hawaii is discussed Solutions to problems related to PV installation were developed, system performance in real world situations was demonstrated, and penetration of PV to the utilities was analyzed. The PV systems and their installation are described as well as the data collection systems used to monitor performance. The project is evaluated and costs are summarized. S L

N83-33314# New Mexico State Univ., Las Cruces Solar Energy Inst
ESTABLISHMENT AND OPERATION OF THE SOUTHWEST RESIDENTIAL EXPERIMENT STATION
Aug. 1982 189 p refs Prepared for Lincoln Lab , MIT, Lexington, Mass
(Contract DE-AC02-76ET-20279)
(DOE/ET-20279/213) Avail NTIS HC A09/MF A01

The establishment of the Southwest Residential Experiment Station (SW RES) and the construction and initial testing of the eight photovoltaic (PV) Prototype Systems are described. Problems are described, histograms are presented, and an economic analysis of monthly utility bills is presented. Author

N83-33315*# Optical Coating Lab , Inc., City of Industry, Calif. Photoelectronics Div.
SILICON SOLAR CELL PROCESS DEVELOPMENT, FABRICATION AND ANALYSIS
P. A ILES and D C. LEUNG 31 Dec. 1982 93 p refs Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-955089)
(NASA-CR-172983; DOE/JPL-955089-81/12, JPL-9950-834; NAS 1 26 172983) Avail. NTIS HC A05/MF A01 CSCL 10A

For UCP Si, randomly selected wafers and wafers cut from two specific ingots were studied For the randomly selected wafers, a moderate gettering diffusion had little effect Moreover, an efficiency up to 14% AMI was achieved with advanced processes. For the two specific UCP ingots, ingot #5848-13C displayed severe impurity effects as shown by lower 3sc in the middle of the ingot and low CFF in the top of the ingot Also the middle portions of this ingot responded to a series of progressively more severe gettering diffusion Unexplained was the fact that severely gettered samples of this ingot displayed a negative light biased effect on the minority carrier diffusion length while the nongettered or moderately gettered ones had the more conventional positive light biased effect on diffusion length On the other hand, ingot C-4-21A did not have the problem of ingot 5848-13C and behaved like to the randomly selected wafers The top half of the ingot was shown to be slightly superior to the bottom half, but moderate gettering helped to narrow the gap. Author

N83-33316*# Cornell Univ., Ithaca, N Y. Dept of Materials Science and Engineering.
EBIC INVESTIGATION OF HYDROGENATION OF CRYSTAL DEFECTS IN EFG SOLAR SILICON RIBBONS Quarterly Report, 1 Jan. - 31 Mar. 1983
T SULLIVAN and D G. AST May 1983 98 p refs Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-956046)
(NASA-CR-172975, DOE/JPL-956046-83/5; JPL-9950-844, NAS 1 26:172973) Avail: NTIS HC A05/MF A01 CSCL 10A

Changes in the contrast and resolution of defect structures in 205 Ohm-cm EFG polysilicon ribbon subjected to annealing and hydrogenation treatments were observed in a JEOL 733 Superprobe scanning electron microscope, using electron beam induced current (EBIC) collected at an A1 Schottky barrier The Schottky barrier was formed by evaporation of A1 onto the cleaned and polished surface of the ribbon material Measurement of beam energy, beam current, and the current induced in the Schottky diode enabled observations to be quantified. Exposure to hydrogen plasma increased charge collection efficiency. However, no simple causal relationship between the hydrogenation and charge collection efficiency could be inferred, because the collection efficiency also displayed an unexpected thermal dependence Good quality intermediate-magnification (1000X-5400X) EBIC micrographs of several specific defect structures were obtained Comparison of grown-in and stress-induced dislocations after annealing in vacuum at 500 C revealed that stress-induced dislocations are hydrogenated to a much greater degree than grown-in dislocations The theoretical approximations used to predict EBIC contrast and resolution may not be entirely adequate to describe them under high beam energy and low beam current conditions. Author

N83-33318*# Spire Corp., Bedford, Mass
EVALUATION OF THE ION IMPLANTATION PROCESS FOR PRODUCTION OF SOLAR CELLS FROM SILICON SHEET MATERIALS Quarterly Report, 1 Jan. - 1 Apr. 1983
M B. SPITZER Apr 1983 14 p
(Contract JPL-956381)
(NASA-CR-172959; JPL-9950-832, NAS 1 26:172959, CDRL-181; QR-10085-01, QR-1) Avail NTIS HC A02/MF A01 CSCL 10A

For the ion implantation tooling was fabricated with which to hold dendritic web samples. This tooling permits the expeditious boron implantation of the back to form the back surface field (BSF) Baseline BSF web cells were fabricated. Author

N83-33319*# Kayex Corp., Rochester, N Y
CONTINUOUS CZOCHRALSKI GROWTH. DEVELOPMENT OF ADVANCED CZOCHRALSKI GROWTH PROCESS TO PRODUCE LOW COST 150 KG SILICON INGOTS FROM A SINGLE CRUCIBLE FOR TECHNOLOGY READINESS Final Report, Oct. 1980 - Apr. 1982
1982 134 p refs
(Contract JPL-955733)
(NASA-CR-172965; DOE/JPL-955733-6, NAS 1.26:172965; DRL-136, DRD-SE-7) Avail NTIS HC A07/MF A01 CSCL 10A

The improvement of growth rates using radiation shielding and investigation of the crucible melt interaction for improved yields were emphasized. Growth runs were performed from both 15 and 16 inch diameter crucibles, producing 30 and 37 kg ingots respectively. Efforts to increase the growth rate of 150 mm diameter ingots were limited by temperature instabilities believed to be caused by undesirable thermal convections in the larger melts. The radiation shield improved the growth rate somewhat, but the thermal instability was still evident, leading to nonround ingots and loss of dislocation-free structure. A 38 kg crystal was grown to demonstrate the feasibility of producing 150 kg with four growth cycles. After the grower construction phase, the Hamco microprocessor control system was interfaced to the growth facility, including the sensor for automatic control of seeding temperature, and the sensor for automatic shouldering Efforts focused upon optimization of the seeding, necking, and shoulder growth automation programs S.L.

N83-33320*# Hughes Aircraft Co., Long Beach, Calif Support Systems.
MODULAR PHOTOVOLTAIC STAND-ALONE SYSTEMS: PHASE 1 Final Report
G J. NAFF and N A. MARSHALL Feb. 1983 298 p
(Contract DEN3-207; DE-AI01-79ET-20485)
(NASA-CR-168075, DOE/NASA/0207-1; NAS 1 26.168075; HAC-F107-500) Avail NTIS HC A13/MF A01 CSCL 10A

A family of modular stand-alone power systems that covered the range in power level from 1 kw to 14 kw was developed. Products within this family were required to be easily adaptable to different environments and applications, and were to be both reliable and cost effective Additionally, true commonality in

hardware was to be exploited, and unnecessary recurrence of design and development costs were to be minimized; thus improving hardware availability. Assurance of compatibility with large production runs, was also an underlying program goal A secondary objective was to compile, evaluate, and determine the economic and technical status of available, and potentially available, technology options associated with the balance of systems (BOS) for stand-along photovoltaic (PV) power systems. The secondary objective not only directly supported the primary but additionally contributed to the definition and implementation of the BOS cost reduction plan Author

N83-33321*# Toronto Univ (Ontario).
MODELING OF PHOTODEGRADATION IN SOLAR CELL *MODULES OF SUBSTRATE AND SUPERSTRATE DESIGN MADE* WITH ETHYLENE-VINYL ACETATE AS POTTANT MATERIAL Annual Report
A. C SOMERSALL and J E GUILLET 1981 17 p refs Sponsored by NASA Prepared for JPL, Pasadena, Calif.
(Contract JPL-955591)
(NASA-CR-172981, DOE/JPL-955591-83/6, JPL-9950-830; NAS 1 26:172981) Avail: NTIS HC A02/MF A01 CSCL 10A

The rates of hydrogen abstraction by peroxy radicals were proven to be too slow for significant oxidation of the alkane substrate to be important. The numerical procedure, independent of our particular data base was verified by reproducing concentration time profiles for a model reaction set describing the cesium flare system in the upper atmosphere Simulation was identical to that given in the literature Experimental verification of the data base is to be attempted by weatherometry studies in the coming year Work on the new diagnostic techniques was completed. The adapted automated viscometer was demonstrated to be an efficient and reliable tool for routine measurements of viscosity (molecular weight) changes in solid samples after batch solutions have been made up The laser photolysis GC method for monitoring extremely low levels of oxidation in polymers proved to be impractical because the yields of carbon monoxide were too low for quantification Much progress was made with the computer model. The reaction matrix was completely revised, resulting in a new scheme of 31 reactions and time, lifetimes in excess of ten years The results to date lead us to some tentative observations. Author

N83-33322*# Solarelectronics, Inc., Bellingham, Mass
INVESTIGATION OF THE HYDROCHLORINATION OF SICL4 Final Report, 9 Jul. 1981 - 8 Apr. 1983
J. Y P MUI 15 Apr. 1983 207 p refs Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif
(Contract JPL-956061)
(NASA-CR-172980; DOE/JPL-956061-7, JPL-9550-847; NAS 1 26:172980) Avail. NTIS HC A10/MF A01 CSCL 10A

The hydrochlorination of silicon tetrachloride with hydrogen and metallurgical grade (m g) silicon metal, 3 SiCl4 + 2 H2 + Si yields 4 SiHCl3 was shown to be an efficient process to produce trichlorosilane. A research and development program was carried out to study the hydrochlorination reaction over a wide range of reaction conditions Equilibrium constant and reaction kinetics measurements were made to provide the basis for a theoretical study on the hydrochlorination process. Thermodynamic properties of the hydrochlorination reaction were also measured. The effects of temperature, pressure, and concentration on the equilibrium constant, K sub p, were studied Author

N83-33323*# Solarex Corp., Rockville, Md.
PROCESS RESERACH ON POLYCRYSTALLINE SILICON MATERIAL (PROPSM) Quarterly Report, 1 Mar. - 30 Jun. 1982
J. H. WOHLGEMUTH and J. S. CULIK 1982 20 p Sponsored in part by DOE Prepared for JPL
(Contract JPL-955902)
(NASA-CR-172982; JPL-9950-838; DOE/JPL-955902-82/6, NAS 1.26:172982; DRL-156, DRD-SE-3; QR-6) Avail: NTIS HC A02/MF A01 CSCL 10A

The mechanisms limiting performance in polycrystalline silicon was determined. The initial set of experiments in this task entails the fabrication of cells of various thicknesses for four different bulk resistivities between 0.1 and 10 omega-cm. The results for the first two lots are presented S.L.

N83-33324*# Westinghouse Electric Corp., Pittsburgh, Pa Advanced Energy Systems Div.
LOW COST SOLAR ARRAY PROJECT: CELL AND MODULE FORMATION RESEACH AREA. PROCESS RESEARCH OF NON-CZ SILICON MATERIAL Quarterly Report, 1 Mar. - 31 May 1983
31 May 1983 34 p Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif
(Contract JPL-955909)
(NASA-CR-172984, DOE/JPL-955909-83/10; JPL-9950-846; NAS 1 26:172984; WAESD-TR-83-1005; QR-5) Avail NTIS HC A03/MF A01 CSCL 10A

Meniscus coates tests, back junction formation using a new boron containing liquid, tests of various SiO2 and boron containing liquids, pelletized silicon for replenishment during web growth, and ion implantation compatibility/feasibility study are discussed. Author

N83-33326*# Applied Concepts Corp., Woodstock, Va
AIR FORCE LOGISTICS COMMAND (AFLC) SOLAR THERMAL PLANT Final Report
15 Apr 1983 65 p Prepared for JPL, Pasadena, Calif
(Contract NAS7-100; JPL-956231)
(NASA-CR-172975; JPL-9950-840, NAS 1 26:172975; K10-01-83-FR) Avail. NTIS HC A04/MF A01 CSCL 10B

The plant proved its capability to deliver the desired energy product in a USAF industrial environment. The collector proved capable of energy conversion at insolation levels up to 25% below design minimum. The plant and the project were negatively affected by severe winter weather, with total insolation during the test period 60 percent less than the expected value. Environmental effects reduced plant availability to 55 percent Only five, minimally good operating days were experienced during the test period. The subsequent lack of performance data prohibits the drawing of general conclusions regarding system performance. System operability was rated generally high The only inhibiting factor was the difficulty in procuring replacement parts for rapid repair under USAF stockage and procurement policies No inherently serious system failures were recorded, although a thermostatic valve malfunction in the freeze protection system ultimately took 30 days to repair. Author

N83-33327*# Toronto Univ. (Ontario). Dept. of Chemistry.
MODELLING OF POLYMER PHOTODEGRADATION FOR SOLAR CELL MODULES Quarterly Technical Progress Report, 1 Apr. - 30 Jun. 1983
A C SOMERSALL and J E. GUILLET 30 Jun. 1983 7 p Sponsored by NASA Prepared for JPL, Pasadena, Calif
(Contract JPL-955591)
(NASA-CR-172976; DOE/JPL-955591-83/3; JPL-9950-851, NAS 1 26:172976) Avail: NTIS HC A02/MF A01 CSCL 10A

The photooxidation process was modelled with input data consisting of Arrhenius parameters A (the preexponential factor) and E (the activation energy). Author

N83-33328*# Applied Solar Energy Corp , City of Industry, Calif
MICROCRYSTALLINE SILICON GROWTH FOR HETEROJUNCTION SOLAR CELLS Quarterly Report, 1 Nov. 1982 - 31 Mar. 1983
P. A ILES, D. C LEUNG, and P. H. FANG (Boston Coll.) 31 Mar. 1983 51 p refs Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif
(Contract JPL-956369)
(NASA-CR-172979; DOE/JPL-956369-83/01; JPL-9950-848, NAS 1.26:172979; QR-1) Avail· NTIS HC A04/MF A01 CSCL 10A

A total of sixteen runs of e-beam vacuum deposition of p type microcrystalline Si (m-Si) films were attempted on n type or p-n junction single crystalline Si (C-Si) substrates. The m-Si film thickness varied from .15 to .7 um and metal contacts were deposited after plasma hydrogenation. The p-m-Si on n-c-Si structure had a Voc of up to 490 m V while no Voc improvements were observed in the p-m-Si on p-n C-Si structure against p-n controls. Both CFF and Jsc were lower than control. Possible problem areas were interfaced between m-Si and C-si and the back contacts due to lack of sintering for fear of dehydrogenation. Author

N83-33329*# Toronto Univ. (Ontario).
MODELLING OF PHOTODEGRADATION IN SOLAR CELL MODULES OF SUBSTRATE AND SUPERSTRATE DESIGN MADE WITH ETHYLENE-VINYL ACETATE AS POTTANT MATERIAL
A C. SOMERSALL and J. E. GUILLET 1982 26 p refs Sponsored in part by DOE Prepared for JPL
(Contract NAS7-100, JPL-955591)
(NASA-CR-172978, DOE/JPL-955591-83/7; JPL-9950-852; NAS 1.26:172978) Avail· NTIS HC A03/MF A01 CSCL 10A

A computer model which simulates, in principle, the chemical changes in the photooxidation of hydrocarbons using as input data a set of elementary reactions, corresponding kinetic rate data and appropriate initial conditions was developed The Model was refined and exploited to examine more closely the photooxidation and photostabilization of a hydrocarbon polymer. The results lead to the following observations (1) The time to failure, tau sub f (chosen as the level of 5% C-H bond oxidation which is within the range anticipated for marked change in mechanical properties) varies as the inverse square root of the light intensity However, tau sub f is almost unaffected by both the photoinitiator type and concentration (2) The time to failure decreases with the rate of abstraction of C-H by peroxy radicals but increases with the rate of bimolecular radical termination controlled by diffusion. (3) Of the various stabilization mechanisms considered, the trapping of peroxy radicals is distinctly the most effective, although the concommitant decomposition of hydroperoxide is also desirable
S L

N83-33330*# Spectrolab, Inc., Sylmar, Calif.
DEVELOPMENT OF METALLIZATION PROCESS: FSA PROJECT, CELL AND MODULE FORMATION RESEARCH AREA Quarterly Technical Progress Report, period ending 31 Mar. 1983
A GARCIA, III May 1983 15 p Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif
(Contract JPL-956205)
(NASA-CR-172969, DOE/JPL-956205-83/4; JPL-9950-849; NAS 1 26:172969; QTPR-6329-12) Avail: NTIS HC A02/MF A01 CSCL 10A

The use of CO in place of H2 for the reducing step did not appreciably increase solderability of interconnects Cells were also made printing the pastes on top of ITO coatings. Some of these cells were the best electrically but the metallization was still not adhering. Sequential use of H2 and CO had no effect on adhesion (or lack of it). Author

N83-33331*# Pennsylvania Univ , Philadelphia.
ANALYSIS AND EVALUATION IN THE PRODUCTION PROCESS AND EQUIPMENT AREA OF THE LOW-COST SOLAR ARRAY PROJECT Final Report
M WOLF 30 Aug. 1982 69 p refs Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-956034)
(NASA-CR-172972; DOE/JPL-956034-81/1; JPL-9950-822, NAS 1.26:172972) Avail· NTIS HC A04/MF A01 CSCL 10A

It was found that the Solarex metallization design and process selection should be modified to yield substantially higher output of the 10 cm x 10 cm cells, while the Westinghouse design is extremely close to the optimum. In addition, further attention to the Solarex pn junction and base high/low junction formation processes could be beneficial. For the future efficiency improvement, it was found that refinement of the various minority carrier lifetime measurement methods is needed, as well as considerably increased sophistication in the interpretation of the results of these methods. In addition, it was determined that further experimental investigation of the Auger lifetime is needed, to conclusively determine the Auger coefficients for the direct Auger recombination at high majority carrier concentrations. Author

N83-33332*# Westinghouse Research and Development Center, Pittsburgh, Pa
LARGE-AREA SHEET TASK ADVANCED DENDRITIC WEB GROWTH DEVELOPMENT Quarterly Report, 23 Oct. - 31 Dec. 1982
C S. DUNCAN, R. G SEIDENSTICKER, and J. P MCHUGH 22 Mar. 1983 26 p refs Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif
(Contract JPL-955843)
(NASA-CR-172971; DOE/JPL-955843-83/9; JPL-9950-823; NAS 1.26:172971) Avail NTIS HC A03/MF A01 CSCL 10A

The thermal stress models were used to test the effect of melt level on stress generation and growth velocity The results indicate that melt level has only small effects on stresses but significant effects on growth velocity These results are consistent with experimental growth from measured melt levels. A new low-stress design concept is being evaluated with the models A width-limiting version of the low-stress J460 configuration was tested experimentally with results consistent with the design goals. Author

N83-33333*# Pioneer Engineering and Mfg Co., Inc., Warren, Mich
COST ANALYSIS OF AN AIR BRAYTON RECEIVER FOR A SOLAR THERMAL ELECTRIC POWER SYSTEM IN SELECTED ANNUAL PRODUCTION VOLUMES Final Report
18 Dec. 1981 76 p Sponsored by NASA Prepared for JPL, Pasadena, Calif
(Contract JPL-955791)
(NASA-CR-172970, JPL-9950-829, NAS 1.26:172970) Avail NTIS HC A05/MF A01 CSCL 10B

Pioneer Engineering and Manufacturing Company estimated the cost of manufacturing and Air Brayton Receiver for a Solar Thermal Electric Power System as designed by the AiResearch Division of the Garrett Corporation. Production costs were estimated at annual volumes of 100; 1,000, 5,000, 10,000; 50,000, 100,000 and 1,000,000 units These costs included direct labor, direct material and manufacturing burden. A make or buy analysis was made of each part of each volume. At high volumes special fabrication concepts were used to reduce operation cycle times. All costs were estimated at an assumed 100% plant capacity Economic feasibility determined the level of production at which special concepts were to be introduced Estimated costs were based on the economics of the last half of 1980. Tooling and capital equipment costs were estimated for ach volume Infrastructure and personnel requirements were also estimated. B.W.

N83-33336*# Spectrolab, Inc., Sylmar, Calif.
DEVELOPMENT OF METALLIZATION PROCESS Quarterly Technical Progress Report
A. GARCIA, III Apr. 1983 10 p
(Contract JPL-956205)
(NASA-CR-172958; JPL-9950-824; NAS 1.26:172958; DOE/JPL-956205-83/3; QTPR-6329-9; DRL-175) Avail. NTIS HC A02/MF A01 CSCL 10A

Solar cells were produced using a Mo/Sn/TiH screen printed paste with a lead/borosilicate frit that are electrically comparable to control silver cells. The process is currently unsuccessful because the soldering of interconnects to these cells has proved difficult. Future work will investigate using CO instead of H2 as the reducing gas and putting an ITO coating on the cell prior to metallization. Author

N83-33337*# Toronto Univ (Ontario). Dept. of Chemistry.
MODELING OF POLYMER PHOTODEGRADATION FOR SOLAR CELL MODULES Quarterly Technical Progress Report, 1 Jan. - 31 Mar. 1983
A C SOMERSALL and J E. GUILLET 1982 6 p Sponsored by NASA
(NASA-CR-172968, DOE/JPL-955591-83/2, NAS 1 26:172968; DRL-119; DRD-SE-5) Avail. NTIS HC A02/MF A01 CSCL 10A

It was shown that many of the experimental observations in the photooxidation of hydrocarbon polymers can be accounted for with a computer simulation using an elementary mechanistic model with corresponding rate constants for each reaction For outdoor applications, however, such as in photovoltaics, the variation of temperature must have important effects on the useful lifetimes of such materials. The data bank necessary to replace the isothermal rate constant values with Arrhenius activation parameters: A (the pre-exponential factor) and E (the activation energy) was searched. The best collection of data assembled to data is summarized. Note, however, that the problem is now considerably enlarged since from a theoretical point of view, with 51 of the input variables replaced with 102 parameters. The sensitivity of the overall scheme is such that even after many computer simulations, a successful photooxidation simulation with the expanded variable set was not completed Many of the species in the complex process undergo a number of competitive pathways, the relative importance of each being often sensitive to small changes in the calculated rate constant values. S.L.

N83-33338*# Solarex Corp , Rockville, Md
PROCESS RESEARCH ON POLYCRYSTALLINE SILICON MATERIAL (PROPSM) Quarterly Report
J S CULIK 1982 48 p refs
(Contract JPL-95590)
(NASA-CR-172963, JPL-9950-842; DOE/JPL-955902-83/9; NAS 1.26:172963; QR-9) Avail NTIS HC A03/MF A01 CSCL 10A

The investigation of the performance limiting mechanisms in large grain (greater than 1-2 mm in diameter) polycrystalline silicon was continued by fabricating a set of minicell wafers on a selection of 10 cm x 10 cm wafers. A minicell wafer consists of an array of small (approximately 0.2 sq cm in area) photodiodes which are isolated from one another by a mesa structure The junction capacitance of each minicell was used to obtain the dopant concentration, and therefore the resistivity, as a function of position across each wafer. The results indicate that there is no significant variation in resistivity with position for any of the polycrystalline wafers, whether Semix or Wacker. However, the resistivity of Semix brick 71-01E did decrease slightly from bottom to top. Author

N83-33339*# Jet Propulsion Lab., California Inst of Tech., Pasadena.
HANDBOOK OF PHOTOTHERMAL TEST DATA ON ENCAPSULANT MATERIALS
R. H. LIANG, K. L. ODA, S. Y CHUNG, M. V SMITH, and A. GUPTA 1 May 1983 159 p refs Sponsored in part by NASA
(Contract DE-AI01-76ET-20356)
(NASA-CR-172989, DOE/JPL-1012/86; JPL-PUB-83-32, NAS 1.26.172989) Avail: NTIS HC A08/MF A01 CSCL 10A

Laboratory tests performed to characterize candidate encapsulation materials with respect to changes in their physical and chemical properties caused by photothermal aging are described Several key material properties relating directly to material degradation and deterioration of performance were identified and were monitored as functions of aging conditions and time A status report on accelerated testing activities is provided and experimental data are presented. It will be updated periodically as more data become available Author

N83-33342*# Jet Propulsion Lab., California Inst. of Tech , Pasadena.
PROCEEDINGS OF THE 21ST PROJECT INTEGRATION MEETING Progress Report, Apr. 1982 - Jan. 1983
Jan. 1983 511 p Meeting held at Pasadena, Calif., 12-13 Jan. 1983
(Contract NAS7-918; DE-AI01-76ET-20356)
(NASA-CR-172994, DOE/JPL-1012/88, JPL-PUB-83-48, JPL-5101-222; NAS 1.26 172994; PR-21) Avail: NTIS HC A22/MF A01 CSCL 10A

Progress made by the Flat Plate Solar Array Project during the period April 1982 to January 1983 is described. Reports on polysilicon refining, thin film solar cell and module technology development, central station electric utility activities, silicon sheet growth and characteristics, advanced photovoltaic materials, cell and processes research, module technology, environmental isolation, engineering sciences, module performance and failure analysis and project analysis and integration are included Author

N83-33345# Midwest Research Inst , Golden, Colo Solar Energy Research Inst
SIMPLE ENERGY-CALCULATION METHOD FOR SOLAR INDUSTRIAL-PROCESS-HEAT STEAM SYSTEMS
R C. GEE Jan 1983 11 p refs Presented at the 6th Ann. ASME Tech. Conf. on Commercial Bldg Heating and Cooling Appl , Orlando, Fla , 19 Apr. 1983
(Contract DE-AC02-77CH-00178)
(DE83-007214; SERI/TP-253-1871, CONF-830405-16) Avail· NTIS HC A02/MF A01

Designing a solar industrial process heat (IPH) system, sizing its components and predicting its annual energy delivery requires a method for calculating solar system performance A calculation method that is accurate, easy to use, accounts for the impact of all important system parameters, and does not require use of a computer is described Only simple graphs and a hand calculator are required to predict annual collector field performance and annual system losses. The energy calculation method is applicable to a variety of solar system configurations. The calculation method applied only to parabolic trough steam generation systems that do not employ thermal storage is described. Both flash tank and unfired boiler steam systems are covered. DOE

N83-33346# Battelle Columbus Labs., Ohio
USER'S GUIDE TO SOLREL: A SIMULATION OF RELIABILITY AND AVAILABILITY OF PHOTOVOLTAIC SYSTEMS
L. H. STEMBER and W. R. HUSS Jan 1983 105 p refs Prepared in cooperation with Sandia Labs., Albuquerque, N Mex.
(Contract DE-AC04-76DP-00789)
(DE83-007581; SAND-82-7152) Avail: NTIS HC A06/MF A01

The SOLREL is a computer based simulation for analyzing the reliability and availability of PV systems. It provides a tool to model their functional behavior and the effects of component and system

reliability. It predicts annual maintenance costs and the annual production of power for photovoltaic power systems. The effects are measured by the resulting change in life cycle costs or life cycle energy costs The Guide's contents are as follows. It summarizes problems SOLREL can address and provides a description of the potential impact and use of the model; overviews the modeling approach, including how it incorporates degradation, failures and repairs, sample outputs from SOLREL are included; results of the application of SOLREL to a commercial concentrator and a residential flat panel PV system are presented, the use of SOLREL in sensitivity analysesl is discussed, several approaches to testing various design alternatives are given, format information to guide the preparation of input data and a comprehensive, annotated listing of the SOLREL software for a flat panel system are included. DOE

N83-33347# Solarex Corp , Rockville, Md.
DESIGN AND FABRICATION OF A PROTOTYPE SYSTEM FOR A PHOTOVOLTAIC RESIDENCE IN THE SOUTHWEST Final Report
R. GIBSON (Mueller Assoc.) Nov 1982 95 p refs Sponsored in part by New Mexico Solar Energy Inst and MIT
(Contract DE-AC02-76ET-20279)
(DE83-008128; DOE/ET-20279/235) Avail. NTIS HC A05/MF A01

The design of an energy efficient, photovoltaic, single family residence suitable for construction in the Southwest and the fabricating and testing of a prototype system based on that residence design is discussed The Prototype contains the power conditioning unit, test equipment, and load simulation equipment. The standoff photovoltaic array, consisting of 78 Sclarex Powerline series modules, produces 5 kilowatts peak. The photovoltaic system is connected to the utility. DOE

N83-33349# Electric Power Research Inst., Palo Alto, Calif Advanced Power Systems Div.
ELECTRIC-UTILITY SOLAR-ENERGY ACTIVITIES: 1982 SURVEY UPDATE
J R SPELMAN Dec. 1982 118 p
(DE83-901447, EPRI-AP-2850-SR) Avail: NTIS HC A06/MF A01

The scope of electric utility participation in solar energy projects in the United States was determined The projects for 1982 are described and significant changes from 1981 in ongoing projects are summarized A total of 930 projects were reported by 235 utility companies An index of projects by category, a statistical summary, a list of participating utilities with information contacts and addresses, a list of utilities organized by state, and a list of new reports on utility sponsored projects are included DOE

N83-33356# Technische Univ , Munich (West Germany) Bayerische Landesanstalt fuer Landtechnik.
DEVELOPMENT, TESTING AND APPLICATION OF SIMPLE SOLAR AIR HEATERS FOR AGRICULTURE AND INDUSTRY Final Report, Mar. 1982
K MEUREN, M REUSS, S. VOGT, and H SCHULZ Bonn Bundesministerium fuer Forschung und Technologie May 1983 124 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-078, ISSN-0340-7608) Avail. NTIS HC A06/MF A01, Fachinformationszentrum, Karlsruhe, West Germany DM 26

The thermal efficiency and other technical and economic data of solar air heaters for drying agricultural products was determined A plant was built for parallel testing of 10 collectors. The efficiency curve, evaluated from data of bright and sunny days, shows the efficiency versus the reduced parameter and is valid under steady state or quasi-steady state conditions For a period of 3 months in summer, the total amount of heat collected by the solar air heaters and the drying capacity of the warm air are evaluated The pressure drop over the collectors and the degradation of the optical properties of the plastic covers are measured
Author (ESA)

N83-33358# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France)
SOPHOCLE 2000 IN MALI [SOPHOCLE 2000 AU MALI]
F LEGRAND 1982 15 p refs In FRENCH Presented at Colloq sur l'Energie Solaire, Trieste, Italy, Sep. 1982
(SNIAS-831-422-116) Avail: NTIS HC A02/MF A01

It is argued that technical improvements capable of making the kilowatt hour of photovoltaic power economically feasible are only possible using concentration, rather than flat collector technology. The SOPHOCLE 2000 generator, with 2 kw output, for 28 sqm captor area, using Fresnel lenses, is described. The SOPHOCLE was tested in an intertropical site, subject to high humidity, large temperature variations, dust and sandstorms, and a cloudy sky Improvements to the system are suggested
Author (ESA)

N83-33659# Tokyo Denki Univ. (Japan)
AMORPHOUS SILICON SOLAR CELLS
K. EBARA, K. HOMMA, T FUKAMI, Y KOBAYASHI, Y ABE, and T AONO *In its* Res Repts of the Fac. of Eng., Tokyo Denki Univ , No. 30 p 23-40 Dec. 1982 refs In JAPANESE, ENGLISH summary
Avail NTIS HC A08/MF A01

Theoretical study is made on the effect of localized states and internal field upon the conversion efficiency in graded-bandgap amorphous silicon solar cells. The distribution of localized states in the bandgap is approximated by two expressions, symmetrical and asymmetrical U shape The internal electric field is assumed to be formed by doping a proper amount of impurity atoms. The space charge and the internal field are calculated by using the Poisson's equations Collection efficiency of photo-generated carriers and photovoltaic conversion efficiency are obtained by solving a continuity equation. The result of the analysis indicates that the concentration of doping impurity atoms required to produce a high internal field depend strongly on the density of localized states and then distribution In addition, the collection and the conversion efficiency depend on the distribution of the internal field *In the case of constant distribution of the field, efficient* collection of photo-generated carriers is shown Author

N83-33794# Automation Industries, Inc , Silver Spring, Md. Vitro Labs Div
AVAILABILITY OF SOLAR ENERGY REPORTS FROM THE NATIONAL SOLAR DATA PROGRAM
Jan 1983 74 p
(Contract DE-AC01-79CS-30027)
(DE83-011084; SOLAR/0020-83/43) Avail NTIS HC A04/MF A01

The various types of reports published by the National Solar Data Program are discussed The reports identified include: performance reports, bulleting on special solar topics, environmental data reports, solar project description reports and cost reports, program information reports, comparative reports, and reliability and material assessment reports DOE

N83-33985# Midwest Research Inst , Golden, Colo. Solar Energy Research Inst.
KINETICS OF SILICON ELECTRODEPOSITION
J. M. OLSON and K CARLETON Sep 1982 11 p refs Presented at the Sci. of Silicon Mater Prepn Workshop, Phoenix, Ariz , 23-25 Aug 1982
(Contract DE-AC02-77CH-00178, EG-77-C-01-4042)
(DE83-002094; SERI/TP-212-1726; CONF-820879-1) Avail: NTIS HC A02/MF A01

After a brief overview of the process of electrorefining of silicon using a silicon permeable Si Cu3Si anode, some of the theoretical aspects of electrochemical nucleation and growth kinetics are covered Finally, results for the electrodeposition of silicon on carbon substrates are presented It is shown that the rate of electrodeposition of silicon from a molten salt electrolyte is limited by a combination of mass transfer diffusion in the electrolyte phase; interfacial reaction kinetics, and, possibly, charge transfer kinetics. The initial stages of heterogeneous deposition are found to be

characterized by the instantaneous nucleation of three dimensional model. DOE

N83-34306*# Old Dominion Univ., Norfolk, Va Dept. of Physics.
THEORETICAL STUDIES OF SOLAR-PUMPED LASERS Progress Report, 16 Jan. - 15 Jul. 1983
W. L. HARRIES Jul 1983 38 p refs
(Contract NSG-1568)
(NASA-CR-173016; NAS 1.26 173016; PTR-83-4) Avail: NTIS HC A03/MF A01 CSCL 20E

Metallic vapor lasers of Na2 and Li2 are examined as solar energy converters. The absorbed photons cause transitions to vibrational-rotational levels in an upper electronic state. With broad band absorption the resultant levels can have quantum numbers considerably higher than the upper lasing level. The excited molecule then relaxes to the upper lasing level which is one of the lower vibrational levels in the upper electronic state. The relaxation occurs from collisions, provided the molecule is not quenched into the ground level electronic state. Lasing occurs with a transition to a vibrational level in the lower electronic state Rough estimates of solar power efficiencies are 1 percent for Na2 and probably a similar figure for Li2 The nondissociative lasers from a family distinct from materials which dissociate to yield an excited atom Author

N83-34350*# College of William and Mary, Newport News, Va.
THE EFFECT OF ATMOSPHERIC DRAG ON THE DESIGN OF SOLAR-CELL POWER SYSTEMS FOR LOW EARTH ORBIT
A C KYSER Jun 1983 77 p refs
(Contract NAS1-16042)
(NASA-CR-166020, NAS 1 26.166020) Avail: NTIS HC A05/MF A01 CSCL 20K

The feasibility of reducing the atmospheric drag of low orbit solar powered satellites by operating the solar-cell array in a minimum-drag attitude, rather than in the conventional Sun pointing attitude was determined The weights of the solar array, the energy storage batteries, and the fuel required to overcome the drag of the solar array for a range of design life times in orbit were considered. The drag of the array was estimated by free molecule flow theory, and the system weights were calculated from unit weight estimates for 1990 technology. The trailing, minimum drag system was found to require 80% more solar array area, and 30% more battery capacity, the system weights for reasonable life times were dominated by the thruster fuel requirements.
E.A K.

N83-34448* National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif.
HIGH TEMPERATURE GLASS THERMAL CONTROL STRUCTURE AND COATING Patent
D A STEWART (Stanford Univ), H E GOLDSTEIN (Stanford Univ), and D B LEISER, inventors (to NASA) (Stanford Univ) 26 Apr 1983 6 p Filed 2 Oct 1981 Supersedes N82-10228 (20 - 01, p 0035) Sponsored by NASA
(NASA-CASE-ARC-11164-1, US-PATENT-4,381,333; US-PATENT-APPL-SN-308007; US-PATENT-CLASS-428-312 6, US-PATENT-CLASS-350-166, US-PATENT-CLASS-428-325; US-PATENT-CLASS-428-428; US-PATENT-CLASS-428-427)
Avail. US Patent and Trademark Office CSCL 10A

A high temperature stable and solar radiation stable thermal control coating is described which is useful either as such, applied directly to a member to be protected, or applied as a coating on a re-usable surface insulation (RSI) It has a base coat layer and an overlay glass layer The base coat layer has a high emittance, and the overlay layer is formed from discrete, but sintered together glass particles to give the overlay layer a high scattering coefficient. The resulting two-layer space and thermal control coating has an absorptivity-to-emissivity ratio of less than or equal to 0.4 at room temperature, with an emittance of 0.8 at 1200 F. It is capable of exposure to either solar radiation or temperatures as high as 2000 F without significant degradation When used as a coating on a silica substrate to give an RSI structure, the coatings of this invention show significantly less reduction in emittance after long term convective heating and less residual strain than prior art coatings for RSI structures.
Official Gazette of the U.S. Patent and Trademark Office

N83-34449* National Aeronautics and Space Administration Langley Research Center, Hampton, Va.
VARIABLE ANODIC THERMAL CONTROL COATING Patent
C. S. GILLILAND and J. DUCKETT, inventors (to NASA) 9 Aug. 1983 8 p Filed 9 Apr. 1982 Supersedes N82-31508 (20 - 22, p 3111)
(NASA-CASE-LAR-12719-1, US-PATENT-4,397,716, US-PATENT-APPL-SN-367134; US-PATENT-CLASS-204-33, US-PATENT-CLASS-204-35N; US-PATENT-CLASS-126-901)
Avail: US Patent and Trademark Office CSCL 10A

A process for providing a thermal control solar stable surface coating for aluminum surfaces adapted to be exposed to solar radiation wherein selected values within the range of 0.10 to 0 72 thermal emittance (epsilon sub tau) and 0.2 to 0 4 solar absorptance (alpha subs) are reproducibly obtained by anodizing the surface area in a chromic acid solution for a selected period of time The rate voltage and time, along with the parameters of initial epsilon sub tau and alpha subs, temperature of the chromic acid solution, acid concentration of the solution and the material anodized determines the final values of epsilon/tau sub and alpha sub S 9 Claims, 5 Drawing Figures
Official Gazette of the U S Patent and Trademark Office

N83-34450*# Michigan Univ, Ann Arbor.
PRACTICAL ASPECTS OF PHOTOVOLTAIC TECHNOLOGY, APPLICATIONS, AND COST
L. ROSENBLUM Dec 1982 249 p
(Contract NAG3-185)
(NASA-CR-168025, NAS 1 26 168025) Avail NTIS HC A11/MF A01 CSCL 10A

Background, understanding, and computational tools needed to master the practical aspects of photovoltaic (PV) technology, application, and cost are presented Stand alone silicon solar cell, flat plate systems in the range of 1 to 25 kWH/day output are discussed Topics covered include: operation and performance of each of the major system components, safety, installation, operation and maintenance, and electrical loads. Application experience and trends are presented Indices of electrical service performance are reliability, availability, and voltage control are discussed, and the known service performance of central station electric grid, diesel generator, and PV stand alone systems are compared The PV system sizing methods are reviewed and compared, and a procedure for rapid sizing is described and illustrated by the use of several sample cases. The rapid sizing procedure yields an array and battery size that corresponds to a minimum cost system for a given load requirement, insolation condition, and desired level of service performance The PV system capital cost and levelized energy cost are derived as functions of service performance and insolation. E A.K.

N83-34454*# General Dynamics Corp., St. Louis, Mo Convair Div.
ANALYSIS OF THE REFLECTIVE MULTIBANDGAP SOLAR CELL CONCEPT
T. G STERN Jul. 1983 42 p refs
(Contract NAS3-22252)
(NASA-CR-168186, NAS 1.26:168186, GDC-SP-83-041) Avail: NTIS HC A03/MF A01 CSCL 10A

A new and unique approach to improving photovoltaic conversion efficiency, the reflective multiband gap solar cell concept, was examined. This concept uses back surface reflectors and light trapping with several physically separated cells of different bandgaps to make more effective use of energy from different portions of the solar spectrum Preliminary tests performed under General Dynamics Independent Research and Development (IRAD) funding have demonstrated the capability for achieving in excess of 20% conversion efficiency with aluminum gallium arsenide and silicon This study analyzed the ultimate potential for high

conversion efficiency with 2, 3, 4, and 5 different bandgap materials, determined the appropriate bandgaps needed to achieve this optimized efficiency, and identified potential problems or constraints. The analysis indicated that an improvement in efficiency of better than 40% could be attained in this multibandgap approach, compared to a single bandgap converter under the same assumptions Increased absorption loss on the back surface reflector was found to incur a minimal penalty on efficiency for two and three bandgap systems Current models for bulk absorption losses in 3-5 materials were found to be inadequate for explaining laboratory observed transmission losses. Recommendations included the continued development of high bandgap back surface reflector cells and basic research on semiconductor absorption mechanisms Author

N83-34457# Research Triangle Inst., Research Triangle Park, N.C. Semiconductor Research Dept.
DEVELOPMENT OF HIGH EFFICIENCY, STACKED MULTIPLE BANDGAP SOLAR CELLS Final Report, 1 Oct. 1979 - 31 Mar. 1982
S M. BEDAIR, R J MARKUNAS, J. P. C CHIANG, and J. A. HUTCHBY Wright-Patterson AFB, Ohio AFAPL Sep 1982 248 p refs
(Contract F33615-78-C-2077, AF PROJ. 3145)
(AD-A126588, AFAPL-TR-79-2116-VOL-2; RTI/1678/00-F-VOL-2) Avail NTIS HC A11/MF A01 CSCL 10B

The development of a high efficiency two function cascade solar cell suitable for space applications and the use of the AlGaAs/GaAs material system is reported. The technology developed for the LPE growth of the planar cascade structure is presented which includes doping studies, and the development of optimum growth procedures for obtaining high quality LPE layers Ohmic contact and AR coating technologies are discussed. Experimental results are presented for individual top cells, bottom cells, connecting junctions, and for monolithic cascade structures The experimental results are correlated with modeling results to determine the factors limiting the performance of these cells GRA

N83-34475# Automation Industries, Inc , Silver Spring, Md.
ENVIRONMENTAL DATA FOR SITES IN THE NATIONAL SOLAR DATA NETWORK, JUNE 1982
Jun. 1982 105 p refs
(Contract DE-AC01-79CS-30027)
(DE82-019028, SOLAR/0010-82/06) Avail NTIS HC A06/MF A01

Environmental information collected at the sites of the National Solar Data Network is presented in the form of tables for each solar site. The sites are grouped into 12 zones, each of which consists of several adjacent states. The insolation table presents the total, diffuse, direct, maximum, and extraterrestrial radiation for the solar site It also shows the ratio of total to extraterrestrial radiation as a percent The temperature table gives the average, daytime, nighttime, maximum, minimum, and inlet-water temperatures for the solar site All of the passive and some of the active solar sites are equipped with wind sensors which provide information for two wind tables furnishing wind speed and direction. For some sites, a humidity table provides relative humidity values for day and night It also gives values for the maximum and minimum humidity for each day A technology discussion of the instruments and measurements used to obtain these data tables is included. DOE

N83-34476# Vitro Labs , Silver Spring, Md
ENVIRONMENTAL DATA FOR SITES IN THE NATIONAL SOLAR DATA NETWORK
Apr. 1982 127 p
(Contract DE-AC01-79CS-30027)
(DE82-015995, SOLAR/0010-82/04) Avail: NTIS HC A07/MF A01

Environmental information collected at the sites of the National Solar Data Network is presented in the form of tables for each solar site The sites are grouped into 12 zones, each of which consists of several adjacent states. The insolation table presents the total, diffuse, direct, maximum, and extraterrestrial radiation for the solar site. It also shows the ratio of total to extraterrestrial radiation as a percent. The temperature tables gives the average, daytime nighttime, maximum, minimum and inlet-water temperatures for the solar site. All of the passive and some of the active solar sites are equipped with wind sensors which provide information for two wind tables furnishing wind speed and direction. For some sites, a humidity tables provides relative humidity values for the maximum and minimum humidity for each day. A technical discussion of the instruments and measurements used to obtain these data tables is included. DOE

N83-34854# California Univ , Livermore Lawrence Livermore Lab.
STANDARDIZED DATA-ACQUISITION SYSTEM PROJECT Final Report
G. BUSH Jun 1982 47 p refs
(Contract DE-AC02-76CH-00016)
(DE82-018758; UCRL-53253) Avail: NTIS HC A03/MF A01

The purpose of this project was to select a standard data-acquisition system to measure the performance of the Solar Industrial Process Heat (SIPH) Program field tests The task of performance monitoring implies a system that can measure insolation, system temperatures, heat flows, and parasitic and backup energy use Presently used SIPH data-acquisition systems and the proposed system that corrects these problems are described The methodology selecting a standard data-acquisition system is described, from defining the needs, writing a specification, selecting prototypes for evaluation, testing these prototype units in the laboratory and then in the field, evaluating the results, and making the final selection. Some interesting untested data-acquisition systems are briefly described. DOE

N83-35145*# Jet Propulsion Lab., California Inst. of Tech , Pasadena
POLYCRYSTALLINE SILICON MATERIAL AVAILABILITY AND MARKET PRICING OUTLOOK STUDY FOR 1980 TO 88: JANUARY 1983 UPDATE
E COSTOGUE and R PELLIN Feb. 1983 45 p refs Sponsored by NASA
(NASA-CR-173123; DOE/JPL-1012-79A; JPL-PUB-83-9, JPL-5230-10, NAS 1 26 173123) Avail: NTIS HC A03/MF A01 CSCL 11G

Photovoltaic solar cell arrays which convert solar energy into electrical energy can become a cost effective, alternative energy source provided that an adequate supply of low priced materials and automated fabrication techniques are available. Presently, silicon is the most promising cell material for achieving the near term cost goals of the Photovoltaics Program. Electronic grade silicon is produced primarily for the semiconductor industry with the photovoltaic industry using, in most cases, the production rejects of slightly lower grade material Therefore, the future availability of adequate supplies of low cost silicon is one of the major concerns of the Photovoltaic Program The supply outlook for silicon with emphasis on pricing is updated and is based primarily on an industry survey conducted by a JPL consultant. This survey included interviews with polycrystalline silicon manufacturers, a large cross section of silicon users and silicon solar cell manufacturers. Author

N83-35492*# Westinghouse Research and Development Center, Pittsburgh, Pa
LARGE-AREA SHEET TASK ADVANCED DENDRITIC WEB GROWTH DEVELOPMENT Quarterly Report, 1 Jan. - 31 Mar. 1983
C. S. DUNCAN, R. G. SEIDENSTICKER, and J. P. MCHUGH 15 Aug 1983 32 p refs Sponsored in part by DOE
(Contract JPL-955843)
(NASA-CR-173112; DOE/JPL-955843-83/10; NAS 1.26:173112; DRD-SE5; DRD-N-139) Avail: NTIS HC A03/MF A01 CSCL 10A

Modeling in the development of low stress configurations for wide web growth is presented. Parametric sensitivity to identify design features which can be used for dynamic trimming of the furnace element was studied Temperature measurements of experimental growth behavior led to modification in the growth system to improve lateral temperature distributions. E A K.

N83-35493*# Spire Corp., Bedford, Mass.
EVALUATION OF THE ION IMPLANTATION PROCESS FOR PRODUCTION OF SOLAR CELLS FROM SILICON SHEET MATERIALS Quarterly Report, 1 Apr. - 1 Jul. 1983
M. B. SPITZER Jun. 1983 19 p Prepared for JPL, Pasadena, Calif.
(Contract JPL-956381)
(NASA-CR-173126, JPL-9950-864; NAS 1.26:173126; QR-10085-02) Avail: NTIS HC A02/MF A01 CSCL 10A

The objective of this program is the investigation and evaluation of the capabilities of the ion implantation process for the production of photovoltaic cells from a variety of present-day, state-of-the-art, low-cost silicon sheet materials Task 1 of the program concerns application of ion implantation and furnace annealing to fabrication of cells made from dendritic web silicon. Task 2 comprises the application of ion implantation and pulsed electron beam annealing (PEBA) to cells made from SEMIX, SILSO, heat-exchanger-method (HEM), edge-defined film-fed growth (EFG) and Czochralski (CZ) silicon. The goals of Task 1 comprise an investigation of implantation and anneal processes applied to dendritic web. A further goal is the evaluation of surface passivation and back surface reflector formation In this way, processes yielding the very highest efficiency can be evaluated. Task 2 seeks to evaluate the use of PEBA for various sheet materials. A comparison of PEBA to thermal annealing will be made for a variety of ion implantation processes. Author

N83-35494*# Mobil Tyco Solar Energy Corp , Waltham, Mass.
STRESS STUDIES IN EFG Quarterly Progress Report, 1 Apr. - 30 Jun. 1983
15 Aug 1983 51 p refs Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-956312)
(NASA-CR-173127; DOE/JPL-956312-83/04, JPL-9950-868; NAS 1.26:173127; QPR-4) Avail. NTIS HC A04/MF A01 CSCL 10A

Stress distributions were calculated for a creep law to predict a rate of plastic deformation. The expected reduction in stresses is obtained Improved schemes for calculating growth system temperature distributions were evaluated. Temperature field modeling examined the possibility of using horizontal temperature gradients to influence stress distribution in ribbon. The defect structure of 10 cm wide ribbon grown in the cartridge system was examined. A new feature is identified from an examination of cross sectional micrographs It consists of high density dislocation bands extending through the ribbon thickness A four point bending apparatus was constructed for high temperature study of the creep response of silicon, to be used to generate defects for comparison with as grown defects in ribbon. The feasibility of laser interferometric techniques for sheet residual stress distribution measurement is examined. The mathematical formalism for calculating residual stress from changes in surface topology caused by an applied stress in a rectangular specimen was developed, and the system for laser interferometric measurement to obtain surface topology data was tested on CZ silicon. E.A.K.

N83-35495*# California Univ., Los Angeles. Dept. of Electrical Engineering.
SILICON SHEET WITH MOLECULAR BEAM EPITAXY FOR HIGH EFFICIENCY SOLAR CELLS Annual Report, 22 Mar. 1982 - 21 Mar. 1983
F G. ALLEN 1983 22 p refs Sponsored in part by DOE Prepared for JPL
(NASA-CR-173113; DOE/JPL-956223-83/1; NAS 1.26 173113; AR-1) Avail: NTIS HC A02/MF A01 CSCL 10A

The capabilities of the new technique of Molecular Beam Epitaxy (MBE) are applied to the growth of high efficiency silicon solar cells. Because MBE can provide well controlled doping profiles of any desired arbitrary design, including doping profiles of such complexity as built-in surface fields or tandem junction cells, it would appear to be the ideal method for development of high efficiency solar cells It was proposed that UCLA grow and characterize silicon films and p-n junctions of MBE to determine whether the high crystal quality needed for solar cells could be achieved. Author

N83-35500*# Spire Corp., Bedford, Mass
HERMETIC EDGE SEALING OF PHOTOVOLTAIC MODULES Final Technical Report
M J. NOWLAN Jul. 1983 29 p refs Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif
(Contract JPL-956352)
(NASA-CR-173125; DOE/JPL-956352/2, JPL-9950-853; NAS 1.26:173125; FR-10084) Avail: NTIS HC A03/MF A01 CSCL 10A

The feasibility of using an electrostatic bonding (ESB) and ultrasonic welding process to produce hermetic edge seals on terrestrial solar cell modules was investigated The fabrication sequence is to attach an aluminum foil 'gasket' to the perimeter of a glass sheet. A cell circuit is next encapsulated inside the gasket, and its aluminum foil back cover is seam welded ultrasonically to the gasket An ESB process for sealing aluminum to glass was developed in an ambient air atmosphere, which eliminates the requirement for a vacuum or pressure vessel. An ultrasonic seam welding process was also developed which did not degrade the quality of the ESB seal. Good quality welds with minimal deformation were produced. The effectiveness of the above described sealing techniques was tested by constructing 400 sq cm (8 x 8 s64 sq in) sample modules, and then subjecting them to nondestructive fine and gross leak tests The gross leak tests identified several different causes of leaks which were then eliminated by modifying the assembly process S.L.

N83-35501*# General Electric Co., Philadelphia, Pa Advanced Energy Programs Dept.
PHOTOVOLTAIC MODULE BYPASS DIODE ENCAPSULATION
N. J. SHEPARD, JR. 20 Jun. 1983 148 p Prepared for JPL
(Contract JPL-956254)
(NASA-CR-173110; DOE/JPL-956254/1, NAS 1.26:173110; DRL-176; DRD-MA-8) Avail: NTIS HC A07/MF A01 CSCL 10A

The design and processing techniques necessary to incorporate bypass diodes within the module encapsulant are presented. The Semicon PN junction diode cells were selected. Diode junction to heat spreader thermal resistance measurements, performed on a variety of mounted diode chip types and sizes, have yielded values which are consistently below 1 deg C per watt, but show some instability when thermally cycled over the temperature range from -40 to 150 deg C. Three representative experimental modules, each incorporating integral bypass diode/heat spreader assemblies of various sizes, were designed. Thermal testing of these modules enabled the formulation of a recommended heat spreader plate sizing relationship. The production cost of three encapsulated bypass diode/heat spreader assemblies were compared with similarly rated externally mounted packaged diodes. It is concluded that, when proper designed and installed, these bypass diode devices will improve the overall reliability of a terrestrial array over a 20 year design lifetime. E.A K.

N83-35503*# Illinois Univ., Urbana.
STUDY OF RELATIONSHIPS OF MATERIAL PROPERTIES AND HIGH EFFICIENCY SOLAR CELL PERFORMANCE ON MATERIAL COMPOSITION
C T SAH Jul. 1983 43 p refs Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-956289)
(NASA-CR-173105; DOE/JPL-956289-83/1; JPL-9950-873; NAS 1.26 173105; TR-1) Avail NTIS HC A03/MF A01 CSCL 10A

The performance improvements obtainable from extending the traditionally thin back-surface-field (BSF) layer deep into the base of silicon solar cells under terrestrial solar illumination (AM1) are analyzed. This extended BSF cell is also known as the back-drift-field cell. About 100 silicn cells were analyzed, each with a different emitter or base dopant impurity distribution whose selection was based on physically anticipated improvements The four principal performance parameters (the open-circuit voltage, the short-circuit current, the fill factor, and the maximum efficiency) are computed using a FORTRAN program, called Circuit Technique for Semiconductor-device Analysis, CTSA, which numerically solves the six Shockley Equations under AM1 solar illumination at 88 92 mW/cm, at an optimum cell thickness of 50 um The results show that very significant performance improvements can be realized by extending the BSF layer thickness from 2 um (18% efficiency) to 40 um (20% efficiency). Author

N83-35504*# Jet Propulsion Lab., California Inst of Tech , Pasadena
SOLAR THERMAL TECHNOLOGY DEVELOPMENT: ESTIMATED MARKET SIZE AND ENERGY COST SAVINGS. VOLUME 1: EXECUTIVE SUMMARY
W. R GATES Feb 1983 14 p Sponsored in part by DOE 2 Vol.
(Contract NAS7-918, JPL PROJ 5106-26)
(NASA-CR-173117, DOE/JPL-1060-60-VOL-1, JPL-PUB-83-14-VOL-1, NAS 1.26.173117) Avail: NTIS HC A02/MF A01 CSCL 10B

Estimated future energy cost savings associated with the development of cost-competitive solar thermal technologies (STT) are discussed Analysis is restricted to STT in electric applications for 16 high-insolation/high-energy-price states. The fuel price scenarios and three 1990 STT system costs are considered, reflecting uncertainty over future fuel prices and STT cost projections STT R&D is found to be unacceptably risky for private industry in the absence of federal support Energy cost savings were projected to range from $0 to $10 billion (1990 values in 1981 dollars), dependng on the system cost and fuel price scenario. Normal R&D investment risks are accentuated because the Organization of Petroleum Exporting Countries (OPEC) cartel can artificially manipulate oil prices and undercut growth of alternative energy sources Federal participation in STT R&D to help capture the potential benefits of developing cost-competitive STT was found to be in the national interest B W.

N83-35505*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SOLAR THERMAL TECHNOLOGY DEVELOPMENT: ESTIMATED MARKET SIZE AND ENERGY COST SAVINGS. VOLUME 2: ASSUMPTIONS, METHODOLOGY AND RESULTS
W R GATES Feb. 1983 99 p refs Sponsored in part by DOE 2 Vol.
(Contract NAS7-918, JPL PROJ. 5106-26)
(NASA-CR-173118; DOE/JPL-1060-60-VOL-2; JPL-PUB-83-14-VOL-2, NAS 1.26:173118) Avail NTIS HC A05/MF A01 CSCL 10B

Estimated future energy cost savings associated with the development of cost-competitive solar thermal technologies (STT) are discussed. Analysis is restricted to STT in electric applications for 16 high-insolation/high-energy-price states Three fuel price scenarios and three 1990 STT system costs are considered, reflecting uncertainty over future fuel prices and STT cost projections Solar thermal technology research and development (R&D) is found to be unacceptably risky for private industry in the absence of federal support Energy cost savings were projected to range from $0 to $10 billion (1990 values in 1981 dollars), depending on the system cost and fuel price scenario Normal R&D investment risks are accentuated because the Organization of Petroleum Exporting Countries (OPEC) cartel can artificially manipulate oil prices and undercut growth of alternative energy sources Federal participation in STT R&D to help capture the potential benefits of developing cost-competitive STT was found to be in the national interest. Analysis is also provided regarding two federal incentives currently in use The Federal Business Energy Tax Credit and direct R&D funding B.W.

N83-35507# Sandia Labs , Albuquerque, N Mex.
STATUS OF BLACK CHROME COATING RESEARCH
R B PETTIT and R. R SOWELL 1983 13 p refs Presented at Distributed Solar Collector Conf., Albuquerque, N. Mex , 15 Mar. 1983
(Contract DE-AC04-76DP-00789)
(DE83-008182, CONF-830316-2) Avail. NTIS HC A02/MF A01

The optimization of electrodeposited black chrome solar selective coatings for operation in solar collectors to temperatures up to 3000 C is summarized. Control of the electroplating bath composition and bath contamination are required to obtain coatings that will survive daily collector operation for tens of years. An accelerated temperature aging test is presented which can be used both to estimate the coating lifetime and to monitor the coating during production. The use of sol gel protective films to extend the lifetime of the black chrome coating is discussed DOE

N83-35510# Black Hawk Associates, Denver, Colo
PHOTOVOLTAIC APPLICATIONS FOR REMOTE-ISLAND NEEDS
D A SCHALLER and R. W LARSON Jan. 1983 202 p refs
(Contract DE-AC03-82SF-11597)
(DE83-008112, DOE/SF-11597/T1) Avail· NTIS HC A10/MF A01

Electric power supply options available to many of the central and south Pacific island governments are severely constrained by remoteness, limited infrastructures, a corrosive natural environment, and the high delivered costs of many conventional energy sources Photovoltaic energy systems offer a currently available, practical, and cost-effective source of electricity for many stand-alone applications in remote areas of the Pacific. Photovoltaic system definitions and cost analyses are provided for selected applications in the Republic of Palau, the Federated States of Micronesia, the Republic of the Marshall Islands, and the Territory of American Samoa GRA

N83-35511# Sandia Labs , Albuquerque, N Mex Photovoltaic Systems Development Div
ENERGY PRODUCTION TRADE-OFFS IN PHOTOVOLTAIC SYSTEM DESIGN
G. J. JONES Apr 1983 10 p refs
(Contract DE-AC04-76DP-00789)
(DE83-011468, SAND-82-2239) Avail: NTIS HC A02/MF A01

The energy per unit area produced annually by a photovoltaic system is a function of collector efficiency and incident solar radiation. The incident energy is determined by geographic location and type of mounting structures fixed or tracking. Because of significant differences in the solar energy available to various structure and tracking concepts, it is possible to achieve equal energy cost for widely varying array field prices An analysis (using recent estimates for balance of system costs) of several array options shows that two axis tracking of flat panel collectors results in lower energy cost than do fixed arrays, even at low module prices. It is also shown that concentrating collector modules and flat plate modules achieve the same energy cost at similar cost per square meter DOE

N83-35514# Brookhaven National Lab., Upton, N. Y. Dept. of Energy and Environment.
WORLDWIDE APPLICATIONS OF GROUND-COUPLED HEAT PUMPS, CONVENTIONAL AND SOLAR ASSISTED
J W. ANDREWS and P. D METZ 1982 30 p refs Presented at the 3rd Circum-Pacific Energy and Mineral Resources Conf., Honolulu, Hawaii, 22 Aug 1982
(Contract DE-AC02-76CH-00016)
(DE83-012074, BNL-32828; CONF-820834-6) Avail NTIS HC A03/MF A01

The use of the ground as a heat source, sink, or storage element in connection with a heat pump is discussed Both early research and that carried out more recently are surveyed. Cost goals for ground coupled systems are formulated on the basis of payback, cash flow, and life cycle costing. Design considerations and sizing of in-ground heat exchangers are considered. Some promising systems--both stand-alone systems and systems which use additional solar energy inputs--are described DOE

N83-35520# Electricite de France, Chatou Dept. Systemes Energetiques
SOLAR ENERGY: ACCOUNT OF A MISSION TO THE USA FROM 27 APRIL TO 3 MAY 1982 [ENERGIE SOLAIRE: COMPTE RENDU DE MISSION AUX U.S.A. DU 27 AVRIL AU 3 MAI 1982]
J. P. ALLARD, R. GENIER, and M. ROCHE May 1982 30 p refs In FRENCH
(HP-52-D89/82-06) Avail: NTIS HC A03/MF A01

The state of progress of the Solar One solar tower is described. The parabolic collectors program of the Jet Propulsion Laboratory is outlined. The Los Alamos National Laboratory research program on the geothermal characteristics of dry rocks is summarized The ASME solar energy conference is mentioned Author (ESA)

N83-35523# Ben Gurion Univ. of the Negev, Beersheva (Israel). Applied Research Inst
DEVELOPMENT OF FLAT-PLATE SOLAR PLATE COLLECTOR: EVAPORATOR Summary Report
B ABRAMZON and I YARON Nov 1981 55 p refs Sponsored in part by Israel Ministry of Energy and Infrastructure
(PB83-201970; BGUN-ARI-5-82) Avail: NTIS HC A04/MF A01 CSCL 10A

In the present study the thermal performance of a flat plate solar collector is analyzed theoretically for the case in which the working fluid may undergo a phase change within the tubes of the collector. In addition to the common domestic applications, such a collector - evaporator may be used as a generator of vapors for the production of mechanical or electrical energy, e g , solar water pumps, solar power stations, etc , as well as for solar - powered absorption refrigeration machines, distillation installations, etc. Author (GRA)

N83-35524# Sanders Associates, Inc , Nashua, N H.
PARAMETRIC ANALYSIS REPORT: HIGH TEMPERATURE SOLAR THERMAL RECEIVER
14 Sep. 1979 86 p Prepared for JPL, Pasadena, Calif
(Contract JPL-955454)
(NASA-CR-173129, JPL-9950-861, NAS 1.26:173129) Avail: NTIS HC A05/MF A01 CSCL 10A

A comparison of concept capabilities within the range of interest shows the optimal receiver to be a windowed matrix receiver. The design offers the probability of low production cost, low risk, and compatibility with the most likely indentified application, the powering of an advanced (ceramic) Brayton engine to 2600 F The design permits optional installation of additional thermal buffering mass or a hybrid burner behind the receiver matrix Thermal buffer (storage) performance would be the best of the several concepts because radiation losses from storage are virtually nonexistent Author

N83-35744# Technische Univ., Hanover (West Germany).
HYBRID MODE SOLAR POWER PLANT WITH GAS AND STEAM CYCLE
K. BAMMERT and H H. FINCKH (Kraftwerke Union A.G. Reaktortechnik) *In* Brussels Univ. Liber Amicorum Andre L. Jaumotte p 17-40 1983 refs
Avail: NTIS HC A99/MF A01

Thermodynamic improvement of combined gas and steam cycles by the addition of pressure stages is discussed. The terminal temperature difference between the gas turbine exhaust gas and the heated water/steam is reduced and the exhaust gas is cooled accordingly For solar power plants which feed constant power into the electric grid, supplementary fossil fuel energy input into the cycle in a combustion chamber downstream of the receiver is suggested The fuel energy, which is input at a higher temperature level than is possible with solar energy, is converted into mechanical and electric power at a higher degree of utilization than in a straight fossil fuelled power plant The solar energy, which is input at a relatively low temperature, is upgraded if the working fluid is heated in the tailing combustion chamber to a temperature higher than the limit imposed by the receiver Author (ESA)

N83-35830# Los Alamos Scientific Lab., N. Mex.
LOS ALAMOS OPTICAL-MATERIALS RELIABILITY, MAINTAINABILITY, AND EXPOSURE TESTING PROGRAM
S W. MOORE Apr 1983 24 p refs
(Contract W-7405-ENG-36)
(DE83-013220, LA-9735-MS) Avail NTIS HC A02/MF A01

Methods and results are presented of exposure testing of developmental or advanced materials, nonselective coatings, selective paints, antireflection-treated glass, and heat mirror glazing for the DOE Active Heating and Cooling Materials testing program Results of investigations of collectors from a number of solar facilities relative to the durability and degradation of their optical materials are also presented These include: black chrome durability study, Norton Air Force Base polycarbonate glazing study; Perl-Mac/Miromit black nickel study, and black paint investigations. DOE

N83-36209# ECA, Inc., Lisle, Ill.
METAL CORROSION ASSOCIATED WITH THERMAL CYCLING OF INHIBITED AND UNINHIBITED PROPYLENE GLYCOL/WATER SOLUTION IN SOLAR DHW SYSTEMS
C F. CHENG Apr. 1983 24 p
(Contract W-31-109-ENG-38)
(DE83-014266, ANL-83-33) Avail: NTIS HC A02/MF A01

As part of the Solar Reliability and Materials Program at Argonne National Laboratory, metal corrosion associated with thermal cycling at 82 C circulating and 176 C stagnating temperatures of propylene glycol and ASTM corrosive water mixture (50% v/o) was investigated. Preliminary data indicate that in a mixed metal system of copper, steel, and aluminum specimens stagnating together in a glycol solution, the copper randomly pits and the pitting stops when the pit depth extends to about 1-1/2 mil. The addition of 1% molybdate as an inhibitor to the glycol solution is slightly beneficial for steel, but the added expense of adding and maintaining the concentration of an inhibitor may not be warranted. Dissolved copper rapidly deposits on the aluminum surface and promotes severe galvanic corrosion. DOE

N83-36239# Sandia Labs., Albuquerque, N Mex
SOL-GEL DERIVED AR COATINGS
C J. BRINKER and R. B. PETTIT 1983 13 p refs Presented at the Distributed Solar Collector Conf., Albuquerque, N. Mex., 15 Mar. 1983
(Contract DE-AC04-76DP-00789)
(DE83-007031; SAND-83-1060C, CONF-830316-1) Avail NTIS HC A02/MF A01

Porous sol-gel derived films prepared from aged polymeric solutions were deposited on PYREX and etched to produce AR coatings with solar averaged transmittance values greater than 0.97 This process appeared to produce single layer interference films rather than graded index films. DOE

N83-36280# National Bureau of Standards, Washington, D C. National Engineering Lab.
ENERGY AND COST EVALUATION OF SOLAR WINDOW FILM USE IN AN OFFICE BUILDING Final Technical Note
S TREADO, J. BARNETT, and T KUSUDA Mar. 1983 130 p refs
(PB83-214692; NBS-TN-1174) Avail NTIS HC A07/MF A01 CSCL 13M

The impact of solar window film utilization on building HVAC system loads, energy consumption and costs, is examined for a typical office building. The evaluation includes characterization and measurement of important film properties, performance of single-glaxing window systems with and without film, simulation of annual building energy performance using the DOE-2 computer program, and a life-cycle cost analysis. Six window film options are compared to clear glass performance for seven climatic regions throughout the United States. Author (GRA)

N83-36284# Insights West, Inc., Los Angeles, Calif
SOLAR/GAS INDUSTRIAL PROCESS HEAT ASSESSMENT Final Report, Jan. - Dec. 1982
D. W. KEARNEY Dec. 1982 261 p refs Sponsored by Gas Research Inst
(PB83-217869; GRI-81/0123) Avail: NTIS HC A12/MF A01 CSCL 13A

An assessment was conducted of solar/gas industrial process heat systems, including consideration of market applications, the status and cost of applicable solar technologies, potential technical barriers to the efficient interfacing of solar with conventional gas fired equipment, and a detailed evaluation comparing solar/gas systems to competing options. GRA

N83-36361*# Spectrolab, Inc., Sylmar, Calif.
DESIGN, ANALYSIS AND TEST VERIFICATION OF ADVANCED ENCAPSULATION SYSTEMS Triannual Report, period ending 31 Jul. 1982
A GARCIA, III Nov 1982 41 p Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-955567)
(NASA-CR-174456; DOE/JPL-955567-82/9; JPL-9950-777; NAS 1 26·174456) Avail· NTIS HC A03/MF A01 CSCL 09C

An analytical methodology for advanced encapsulation designs was developed. From these methods design sensitivities are established for the development of photovoltaic module criteria and the definition of needed research tasks. Analytical models were developed to perform optical, thermal, electrical and analyses on candidate encapsulation systems. From these analyses several candidate systems were selected for qualification testing. Additionally, test specimens of various types are constructed and tested to determine the validity of the analysis methodology developed Identified deficiencies and/or discrepancies between analytical models and relevant test data are corrected. Prediction capability of analytical models is improved Encapsulation engineering generalities, principles, and design aids for photovoltaic module designers is generated S.L.

N83-36447# California Univ , Berkeley Lawrence Berkeley Lab. Solar Energy Group.
HOLOGRAPHIC WINDOW COATINGS FOR SOLAR CONTROL AND DAYLIGHTING: ASSESSMENT REPORT
A J HUNT Nov 1982 28 p refs
(Contract DE-AC03-76SF-00098)
(DE83-014797; LBL-15305) Avail NTIS HC A03/MF A01

Control of sunlight passing through windows based on the diffraction of light is investigated. In this approach, holographic optical elements (HOE's) intercept sunlight and diffract it in a desired direction. As a window coating that may be applied to an existing structure, a HOE can provide angular acceptance or rejection of the incoming sunlight, can direct sunlight deeply into a room to provide task lighting, and can select the portion of sunlight with the greatest visual efficacy Possible uses include daylighting, sunlight control and rejection, and solar heating. DOE

N83-36548*# Rockwell International Corp , Downey, Calif. Shuttle Integration and Satellite Systems Div.
LOW CONCENTRATION RATIO SOLAR ARRAY FOR LOW EARTH ORBIT MULTI-100 KW APPLICATION. VOLUME 1: DESIGN, ANALYSIS AND DEVELOPMENT TESTS Final Report
Jul 1983 201 p refs
(Contract NAS8-34214)
(NASA-CR-170869; NAS 1 26.170869, SSD-83-0075-1) Avail NTIS HC A10/MF A01 CSCL 10A

A preliminary design effort directed toward a low concentration ratio photovoltaic array system capable of delivering multihundred kilowatts (300 kW to 1000 kW range) in low earth orbit is described. The array system consists of two or more array modules each capable of delivering between 113 kW to 175 kW using silicon solar cells or gallium arsenide solar cells, respectively The array module deployed area is 1320 square meters and consists of 4356 pyramidal concentrator elements The module, when stowed in the Space Shuttle's payload bay, has a stowage volume of a cube with 3.24 meters on a side. The concentrator elements are sized for a geometric concentration ratio (GCR) of six with an aperture area of 25 sq m. The structural analysis and design trades leading to the baseline design are discussed It describes the configuration, as well as optical, thermal and electrical performance analyses that support the design and overall performance estimates for the array are described. Author

N83-36556# Sandia Labs , Albuquerque, N. Mex.
TECHNICAL ASPECTS OF FUTURE PHOTOVOLTAIC-POWER SYSTEMS
G. J JONES 1983 20 p refs Presented at the Am Solar Energy Soc Meeting, Minneapolis, 1 Jun. 1983
(Contract DE-AC04-76DP-00789)
(DE83-012868; SAND-83-1284C, CONF-830622-10) Avail NTIS HC A02/MF A01

Future photovoltaic systems which will need to be designed to increase acceptance by the potential system owner and the host utility are discussed. The systems will maximize their output of high signal quality electricity to the utility through a safe and controlled interconnection, while minimizing the total cost These systems will emphasize the use of modular array field designs and state of the art power conditioning equipment in all applications and tracking collectors wherever practical. The systems will be designed as a supplier of energy to the utility and only in the residential case will PV be colocated with a load. The major remaining hardware developments necessary to obtain these systems are the modular residential array design, modular tracking flat panel field development, and central station power conditioning definition DOE

N83-36913# Midwest Research Inst., Golden, Colo Solar Energy Research Inst.
TESTING OF A PROTOTYPE FRESNEL-LENS CONCENTRATOR FOR THERMAL APPLICATIONS
A. LEWANDOWSKI Feb 1983 8 p refs Presented at the 6th Ann. ASME Tech. Conf on Com. Building Heating and Cooling Appl., Orlando, Fla., 19 Apr. 1983
(Contract DE-AC02-77CH-00178)
(DE83-007312; SERI/TP-253-1893; CONF-830405-17) Avail: NTIS HC A02/MF A01

The data obtained from testing a fresnel-lens concentrator were presented and utilized by a subcommittee of the American Society for Testing and Materials (ASTM) in the development process for the standard Several tests were conducted on the concentrator using draft versions of the standard as guidance. Additional tests allowed but not required by the standard were conducted to determine the effect of the direct solar irradiance level on collector performance. It is the results of these additional tests that are of primary interest The data show that non-linear heat losses cause collector efficiency to be a function of both (RADICAL) t/I/sub DN/ and I/sub DN/ and that the efficiency when fluid temperature is near ambient is also a function of I/sub DN/. This latter result is a characteristic unique to this collector, whereas the former holds for any collector with non-linear with heat loss. DOE

03

HYDROGEN

Includes hydrogen production, storage, and distribution

A83-40850
METAL-HYDROGEN SYSTEMS; PROCEEDINGS OF THE MIAMI INTERNATIONAL SYMPOSIUM, MIAMI BEACH, FL, APRIL 13-15, 1981
T N. VEZIROGLU, ED. (Miami, University, Coral Gables, FL) Symposium supported by the International Association for Hydrogen Energy, International Atomic Energy Agency, International Solar Energy Society, Florida International University, Florida Solar Energy Center, and University of Miami Oxford, Pergamon Press, 1982, 738 p.

Results are presented on recent research concerning metal-hydrogen systems, including the diffusion of hydrogen in metals, the interaction of hydrogen with structure, embrittlement, hydride properties, hydride formation, hydrogen storage, and hydride utilization. Topics discussed include the development of hydrogen-permeable metal membranes for the Li/LiH process, the diffusion of hydrogen through binary noble metal solid solutions, the analysis of a cooperative model of hydrogen diffusion in a transition metal, hydrogen trapping behavior in plain carbon and Cr-Mo alloy steel, hydrogen embrittlement of a steam turbine disc alloy in aqueous environments, and hydrogen induced cracking in austenitic stainless steel weld metals Other aspects examined include the electronic properties and equilibrium lattice parameters of magnesium hydride, non-metal absorption by rare earth-silicon systems, the reaction kinetics of magnesium nickel alloys and hydrogen systems, the storage of tritium in metal hydrides, a chemical heat pump/heat transformer based on metal-hydrogen reactions, and a chemical compressor based on compacted metal hydrides No individual items are abstracted in this volume N B.

A83-42951
THE CASE FOR SOLAR/HYDROGEN ENERGY
W J D. ESCHER (E-F Technology, Inc., St. Johns, MI) (International Solar Forum, 4th, Berlin, West Germany, Oct. 6-9, 1982) International Journal of Hydrogen Energy (ISSN 0360-3199), vol 8, no. 7, 1983, p. 479-498 refs
(Contract DE-AC01-80CS-50093)

Available solar technologies for producing H2-based fuels for all uses by the turn of the century are discussed Although the annual global insolation is over 20 times the total remaining fossil fuels, the source is diffuse and variable, and areas of greatest input are not collocated with sites of greatest use. Therefore, the H2 supply must be transportable and storable, and the production facilities require large areas Hydrogen fuels have a naturally occurring, nearly limitless supply, water, are nonpolluting, recyclable, and have the highest energy conversion efficiency of all liquid fuels. The production energy sources feasible before the year 2000 are identified as thermal heat engines, solar cells, hydroelectric plants, and wind turbines. Water electrolysis is concluded to be the sole method available for solar/hydrogen systems, and it is shown that ocean cryotanker transport of H2 fuels could be accomplished at the same efficiency and cost as with LNG fuels Systems for production and/or storage of H2 fuels for the home, in automobiles, and on ocean platforms are described, and an international program to develop the H2-based fuel system is recommended. M.S K

A83-42954
THERMOCHEMICAL HYDROGEN PRODUCTION BASED ON MAGNETIC FUSION
O. H. KRIKORIAN (California, University, Livermore, CA) and L. C BROWN (General Atomic Co., San Diego, CA) International Journal of Hydrogen Energy (ISSN 0360-3199), vol. 8, no. 7, 1983, p 515-528. refs
(Contract W-7405-ENG-48)

Preliminary results of a DoE study to define the configuration and production costs for a Tandem Mirror Reactor (TMR) heat source H2 fuel production plant are presented. The TMR uses the D-T reaction to produce thermal energy and dc electrical current, with an Li blanket employed to breed more H-3 for fuel Various blanket designs are being considered, and the coupling of two of them, a heat pipe blanket to a Joule-boosted decomposer, and a two-temperature zone blanket to a fluidized bed decomposer, are discussed The thermal energy would be used in an H2SO4 thermochemical cycler to produce the H2. The Joule-boosted decomposer, involving the use of electrically heated commercial SiC furnace elements to transfer process heat to the thermochemical H2 cycle, is found to yield H2 fuel at a cost of $12-14/GJ, which is the projected cost of fossil fuels in 30-40 yr, when the TMR H2 production facility would be operable M.S.K

A83-42956
HYDROGEN ASPIRATION IN A DIRECT INJECTION TYPE DIESEL ENGINE ITS EFFECTS ON SMOKE AND OTHER ENGINE PERFORMANCE PARAMETERS
K. S. VARDE and G. A FRAME (Michigan, University, Dearborn, MI) International Journal of Hydrogen Energy (ISSN 0360-3199), vol. 8, no 7, 1983, p. 549-555 refs

A83-43640
FUEL CELL POWER PLANTS FOR ELECTRIC UTILITIES AND HYDROGEN
A P. FICKETT (Electric Power Research Institute, Paco Alto, CA) International Journal of Hydrogen Energy (ISSN 0360-3199), vol 8, no 8, 1983, p. 617-622

Phosphoric acid fuel cell power plants are nearing commercial status as multimegawatt electric power generators These power plants are being designed to use a wide range of utility fuels that are converted to hydrogen within the power plant This paper explores the status of fuel cell power plants and the prospects for pure hydrogen as the fuel Author

A83-43641
MODEL OF A CRYOGENIC LIQUID-HYDROGEN PIPELINE FOR AN AIRPORT GROUND DISTRIBUTION SYSTEM
L. JONES (Envirocon Eastern Ltd , Mississauga, Ontario, Canada), C. WUSCHKE (Gulf Canada Resources, Inc., Stettler, Alberta, Canada), and T Z. FAHIDY (Waterloo, University, Waterloo, Ontario, Canada) International Journal of Hydrogen Energy (ISSN 0360-3199), vol. 8, no. 8, 1983, p. 623-630 refs

The results of a numerical simulation of LH2 transport in an underground insulated pipeline for airport flight fuel are reported A mechanistic model was developed for LH2 flow, taking into account mass, momentum, and heat balances. Attention was given to the physical and chemical properties of LH2, the overall thermal conductance in gas, solid, and radiative modes, and a 6 km pipe length. A saturated vapor pressure/temperature relationship was defined for H2, and parameter sensitivity was examined It was found that the significant parameters of the LH2 fuel pipeline could be easily modeled by computer, thereby commending the model for use in designing LH2 transport at airports. M.S.K.

A83-45421
PRODUCTION OF HYDROGEN BY DIRECT THERMAL DECOMPOSITION OF WATER
J. LEDE, F. LAPICQUE, and J. VILLERMAUX (CNRS, Laboratoire des Sciences du Genie Chimique, Nancy, France) International Journal of Hydrogen Energy (ISSN 0360-3199), vol. 8, no. 9, 1983, p. 675-679 refs

Theoretical and experimental work on splitting H2O into its constituent molecules using solar energy concentrated on a refractory target followed by quenching to keep the products separated is reported Four elementary reactions were identified in the 2000-3000 K range, with equilibrium reached within 0 01, 0 001, and 0 0001 sec at 2200, 2500, and 3000 K, respectively Tests were performed with heated zirconia nozzles, through which a continuous stream of water flowed The partially dissociated steam was sprayed with argon gas at 400-450 K to inhibit recombination. Cylindrical, polytubular, and annular nozzle shapes were used, together with two quenching techniques four turbulent jets directed to produce a jet stirred reactor and a second configuration perpendicular to the steam stream. An energetic yield of 1 percent was obtained, with best results arising from the second quenching method and annular nozzles. M.S K

A83-45424
THE CHOICE OF LOW-TEMPERATURE HYDROGEN FUEL CELLS: ACIDIC - OR ALKALINE
K. KORDESCH (Graz, Technische Universitaet, Graz, Austria) International Journal of Hydrogen Energy (ISSN 0360-3199), vol. 8, no 9, 1983, p. 709-714. Research supported by the Fonds zur Foerderung der wissenschaftlichen Forschung. refs

A comparison of the major types of hydrogen-oxygen (air) fuel cells is given The criteria for the selection is the fuel availability, system performance, optimal cost and life expectancy in most suitable application areas. Special recommendations are given for designs of bipolar alkaline batteries for intermittent use in electric vehicles on the road, combining high conversion efficiency with long stand-by periods Such batteries with liquid alkaline electrolytes will have to compete with matrix-type cells using improved acidic- or membrane-type cells Hybrid systems will be discussed and their advantages from the economic point of view will be considered. In electric vehicles the combination with an advanced rechargeable battery system, like zinc-bromine, could be decisive for success. Unfortunately, there are not enough cost data available to compare the systems now. (Author)

A83-45425
PERFORMANCE STUDY USING NATURAL GAS, HYDROGEN-SUPPLEMENTED NATURAL GAS AND HYDROGEN IN AVL RESEARCH ENGINE
F. DUEBEL, K. SCHMILLEN (Aachen, Rheinisch-Westfaelische Technische Hochschule, Aachen, West Germany), and B NAGALINGAM International Journal of Hydrogen Energy (ISSN 0360-3199), vol 8, no. 9, 1983, p. 715-720. refs

Performance tests with natural gas, hydrogen-supplemented CH4, and H2-fueled configurations of the AVL research engine are reported. A comparison is made of the properties of H2 and natural gas, noting that natural gas benefits such as heating value, higher ignition energy, and narrow ignition limits are at least partially offset by H2 wide ignition limits which allow elimination of throttling, a higher flame velocity, and few harmful emissions The trials were performed on a single cylinder, four-stroke, spark ignition engine with two intake and two exhaust valves Varying gas/air ratios were explored, and 80:20 and 50 50 CH4:H2 mixtures were tested The engine was 23 percent less efficient when burning H2, which also displayed a 12 percent decrement in thermal efficiency. However, H2 was usable over a wider range of operating ratios of air mixtures Finally, water introduced into the intake manifold was more effective at high speeds in lowering NO emissions with the H2-fueled engine M.S.K

A83-45426
PARALLEL INDUCTION - A SIMPLE FUEL CONTROL METHOD FOR HYDROGEN ENGINES
F. E LYNCH (Hydride Energy Specialists, Denver, CO) International Journal of Hydrogen Energy (ISSN 0360-3199), vol 8, no. 9, 1983, p 721-730. refs

A simple, low-pressure fuel control system for hydrogen engines is explained Data are provided showing the performance of the system on two hydrogen engines, a Mitsubishi 2.4-1. spark-ignition engine in a bus and a Caterpillar 7-1. diesel from a mining vehicle converted to spark ignition Both engines were turbocharged with aftercooling and utilize excess combustion air to limit NO2 emissions Author

A83-46779
ADVANCED ELECTROLYSIS DEVELOPMENT FOR HYDROGEN-CYCLE PEAK SHAVING FOR ELECTRIC UTILITIES
R L. A FERNANDES (Niagara Mohawk Power Co , Syracuse, NY) and L. J. NUTTALL (General Electric Co., Wilmington, MA) IEEE, Proceedings (ISSN 0018-9219), vol. 71, Sept 1983, p. 1086-1088.

Preliminary results of operation of a hydrogen cycle peak shaving (HCPS) system are reported. The HCPS system has an electrolyzer to generate hydrogen in off peak hours for storage and later generation of electricity either through use in a fuel cell or as a replacement fuel for natural gas in turbines The H2 can be stored as a gas or in a hydride (more expensive) and burned with O2 in the fuel cell for power that would be inverted to utility-grade ac current Alternatively, the H2 could be fed directly into the natural gas pipelines up to a saturation concentration of 10-15 percent; a reformer would be installed to extract H2-rich gas from the pipeline, thereby making the auxiliary generator available at all times A 4.5 MW alkaline electrolysis fuel cell installation was scheduled for operation in New York City in 1983, and an advanced unit in the 250 kW-1 MW range could be functioning by 1985. M.S.K.

A83-48596
TECHNOLOGICAL ASPECTS OF SULFUR DIOXIDE DEPOLARIZED ELECTROLYSIS FOR HYDROGEN PRODUCTION
P W T LU (Westinghouse Electric Corp., Advanced Energy Systems Div., Pittsburgh, PA) International Journal of Hydrogen Energy (ISSN 0360-3199), vol. 8, no. 10, 1983, p. 773-781. Research sponsored by the U S Department of Energy. refs

Significant advancements in the SO2-depolarized electrolysis technology have been obtained through a series of technical improvements in the electrode structure and cell configurations Using carbon-supported platinum catalyst of loading 1 mg/sq cm, the currently achievable cell potentials are 680 and 910 mV at 200 and 400 mA/sq cm, respectively, in 50 w/o aqueous H2SO4 solution at 75 C and atmospheric pressure. To reduce further the electrical energy input for an SO2-depolarized cell, major experimental efforts will be made to investigate the performance characteristics of pressurized electrolyzers. An advanced concept, using a solid oxide electrolyte, has been proposed for the electrochemical oxidation of gas-phase SO2 Due to the elimination of aqueous electrolyte, this novel sulfur-based cycle is expected to result in a higher cycle efficiency and a lower corrosion environment than the conventional sulfur cycle hydrogen product process. Author

A83-48597
RESOURCE AND ENERGY MANAGEMENT OF SYNFUELS PRODUCTION WITH HYDROGEN AND OXYGEN REQUIREMENTS FROM ELECTROLYSIS
R H. SHANNON and R. D. RICHARDSON International Journal of Hydrogen Energy (ISSN 0360-3199), vol. 8, no 10, 1983, p. 783-792. refs

The Resource and Energy Management System (REM), which uses electrolytic H2 and O2 to produce synthetic crude and light oils from heavy hydrocarbons is described. The heavy hydrocarbon

feedstocks include heavy oils, tar sand bitumens, heavy residual oils, oil shale kerogens, liquefied coal, and pyrolytically-extracted coal liquids The system includes mini-upgraders, which can be implemented in modular form, to pump electrolytically-derived H2 into heavy oils to upgrade their energy content. Projected costs for the production of synthetic light oils using U S coal reserves with the REM process after liquefaction are $30-35/bbl, with the H2 costs being a controlling factor The modular systems could be built in a much shorter time frame than much larger projects, and would be instrumental in establishing the electrolytic H2 production infrastructure needed for eventual full conversion to an H2-based economy. M S.K.

A83-48598
AN AIRLINE VIEW OF LH2 AS A FUEL FOR COMMERCIAL AIRCRAFT
K G. WILKINSON International Journal of Hydrogen Energy (ISSN 0360-3199), vol. 8, no 10, 1983, p. 793-796

An investigation is conducted concerning the prospects for the use of liquid hydrogen as fuel for commercial air transport. It is concluded that important benefits might be attained by designing commercial transport aircraft which use liquid hydrogen fuel. However, there is an awareness of difficulties and problems which have to be solved The airlines need, therefore, an incentive before any drive for the required investment would be generated Fears about the availability of more conventional fuel might provide such an incentive At present, it appears to be assured that conventional fuel will be available for transport purposes until well into the next century. It is proposed that a modest program of carefully aimed research should be undertaken on an international basis to fill the most important gaps with respect to the needed technology and a knowledge of the economical aspects. G.R

A83-49778
CHARACTERISTICS OF THE SUPERSONIC COMBUSTION OF NONMIXED GASES IN DUCTS [OSOBENNOSTI SVERKHZVUKOVOGO GORENIIA NEPEREMESHANNYKH GAZOV V KANALAKH]
V L. ZIMONT, V. M. LEVIN, E. A MESHCHERIAKOV, and V A. SABELNIKOV (Vsesoiuznyi Simpozium po Goreniiu i Vzryvu, 7th, Chernogolovka, USSR, Oct. 1983) Fizika Goreniia i Vzryva (ISSN 0430-6228), vol. 19, July-Aug 1983, p. 75-78 In Russian refs

The supersonic combustion of nonmixed gases in ducts is determined by turbulent exchange, chemical kinetics, and gas-dynamic effects accompanying heat release. Under certain conditions, each of the above factors can become critical Experimental and analytical data are presented here which help to gain a better understanding of the role of these factors in the formation of flows Particular attention is given to the effects of the deceleration of the supersonic flow to subsonic velocities, concentration fluctuations, and finite chemical reaction rates V L.

N83-30573# Karlsruhe Univ. (West Germany). Inst fuer Chemische Technik.
INVESTIGATION OF THE INFLUENCE OF MINERAL MATTER OF COALS AND COKES ON THE KINETICS OF GASIFICATION WITH HYDROGEN AND WATER VAPOR Final Report, Jan. 1983
K. J HUETTINGER and W KRAUSS Bonn Bundesministerium fuer Forschung und Technologie Mar 1983 126 p refs In GERMAN, ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-009; ISSN-0340-7608) Avail. NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 26,50

Catalytic reaction kinetics were studied using coals of different rank, pretreated and doped coals and model carbons of similar preparation. Pure hydrogen, hydrogen/water vapor and inert gas/water vapor mixtures were used as gasifying agents. Pressure was varied between 0, 1 and 2 MPa and the temperature range extended from 790 to 1010 C. A decisive catalytic effect only results from iron This effect may control gasification with hydrogen and water vapor above 850 C Iron disulfide minerals have to be reduced to the catalytically active metal In water vapor gasification, the gaseous atmosphere has to be adjusted so that the iron is stable in the reduced state Sulfur of organic origin in coal lowers but does not prevent catalytic activity of iron. Alkaline metals can act as sulfur scavenger. Catalytic activity of iron in hydrogasification is recommended. Author (ESA)

N83-32182# Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering
HYDROGEN AND OXYGEN FROM WATER. PART 6: QUENCHING THE EFFLUENT FROM A SOLAR FURNACE Interim Technical Report
R. B. DIVER, S. PEDERSON, T KAPPAUF, and E A. FLETCHER 15 Apr. 1983 26 p refs Submitted for publication
(Contract N00014-82-K-0423; DE-AC02-82ER-12089; NR PROJ. 625-830, NR PROJ. 359-830)
(AD-A127457, TR-3) Avail: NTIS HC A03/MF A01 CSCL 07B

Numerical integration of a set of rate equations applicable to the hydrogen-oxygen system suggests that it should be possible to recover H2 and O2 by rapid cooling of low-pressure equilibrium mixtures from a solar furnace Using the University of Minnesota 4.2 m solar furnace, we were able to recover explosive mixtures of H2 and O2 from water which had been heated to about 2100K The numerical calculations and the experiment are described GRA

N83-32965# Silverstein (Calvin C.) Associates, Bethel Park, Pa
ASSESSMENT OF THE OHZ HYDROGEN PROCESS Final Report
C C. SILVERSTEIN Sep. 1982 86 p refs
(Contract DE-AC02-76CH-00016)
(DE83-011085; BNL-51651) Avail: NTIS HC A05/MF A01

The oxygen hydrogen zeolite (OHZ) process utilizes the strongly ionizing characteristics of cations exchanged into a crystalline zeolite lattice to catalytically decompose water in two distinct steps. These steps take place at two different temperatures in the same bed of zeolite particles. At the higher temperature, initially hydrated zeolite is dehydrated, and oxygen is generated from the remaining residual water When the zeolite is cooled to a lower temperature and rehydrated, hydrogen remaining in the lattice from the high temperature step is released. The OHZ process is characterized by process simplicity, temperatures below 14000 F, the absence of corrosive chemicals, relative ease of product separation, and environmental acceptability It is suggested that the OHZ process could require less development and have greater commercial potential than other developmental hydrogen processes. The purposes of the investigation are. (1) to survey the current state of knowledge on the OHZ hydrogen process and the cation exchanged zeolites which are used in the process, (2) to obtain preliminary data on process energy requirements, (3) to assess the commercial potential of the process through preliminary plant design studies; and (4) to identify process design and performance goals for commercial viability. DOE

N83-33803# Los Alamos Scientific Lab , N Mex
EXPERIMENTAL INVESTIGATION OF ONBOARD STORAGE AND REFUELING SYSTEMS FOR LIQUID-HYDROGEN-FUELED VEHICLES
W. F. STEWART Sep 1982 212 p refs
(Contract W-7405-ENG-26)
(DE83-010316, DOE/CE-0039) Avail NTIS HC A10/MF A01

A hydrogen fueled automotive vehicle project to evaluate state of the art capabilities in engine conversion for hydrogen operation, liquid-hydrogen onboard storage, and liquid hydrogen refueling was conducted It is indicated that liquid hydrogen storage to operate vehicle and routine refueling of the vehicle can be accomplished over an extended period Two different liquid hydrogen vehicle onboard storage tanks designed for vehicular applications were tested in actual road operation: the first was an aluminum Dewar with a liquid hydrogen capacity of 110 1; the second was a Dewar with an aluminum outer vessel, two copper, vapor cooled thermal radiation shields, and a stainless steel inner vessel with a liquid

hydrogen capacity of 155 l. The car was refueled with liquid hydrogen at least 65 times involving more than 8.1 kl of liquid hydrogen during the 17 months that the car was operated on liquid hydrogen The vehicle had a range without refueling of about 274 km with the first liquid hydrogen tank and about 362 km with the second tank. The vehicle achieved 2.4 km/l of liquid hydrogen which corresponds to 9 4 km/l gasoline on an equivalent energy basis. DOE

N83-33988# California Univ., Livermore Lawrence Livermore Lab
PRODUCING THERMOCHEMICAL HYDROGEN WITH THE TANDEM-MIRROR REACTOR
R W WERNER and R. G. HICKMAN 7 May 1982 8 p Presented at the 17th Intersoc. Energy Conversion Eng Conf , Los Angeles, 8-13 Aug. 1982 Submitted for publication
(DE82-016776, UCRL-87592, CONF-820814-16) Avail: NTIS HC A02/MF A01

Fusion power holds the promise to supply not only electricity but also fuels to meet the balance of our energy needs. An integrated power and breeding blanket design is described for tandem mirror reactors. The blanket incorporates features that make it suitable for synthetic fuel production In particular, it is matched to the thermal and electrical power requirements of the water-splitting process for production of hydrogen. Some improvements to the high temperature chemical process steps are described. DOE

N83-34780# California Univ , Livermore. Lawrence Livermore Lab.
THERMOCHEMICAL HYDROGEN PRODUCTION BASED ON MAGNETIC FUSION
O H. KRIKORIAN and L. C BROWN (General Atomic Co , San Diego, Calif.) 10 Jun. 1982 21 p refs Presented at the World Hydrogen Energy Conf , Pasadena, Calif , 13 Jun. 1982
(Contract W-7405-ENG-48)
(DE83-000739, UCRL-87718; CONF-820605-26) Avail NTIS HC A02/MF A01

Conceptual design studies were carried out on an integrated fusion/chemical plant system using a Tandem Mirror Reactor fusion energy source to drive the General Atomic Sulfur-Iodine Water-Splitting Cycle and produce hydrogen as a future feedstock for synthetic fuels Blanket design studies for the Tandem Mirror Reactor show that several design alternatives are available for providing heat at sufficiently high temperatures to drive the General Atomic Cycle The concept of a Joule-boosted decomposer is introduced in one of the systems investigated to provide heat electrically for the highest temperature step in the cycle (the SO3 decomposition step), and thus lower blanket design requirements and costs Flowsheeting and conceptual process designs have been developed for a complete fusion-driven hydrogen plant, and the information has been used to develop a plot plan for the plant and to estimate hydrogen production costs DOE

N83-35168# Department of Energy, Washington, D. C. Office of Energy Systems Research
HYDROGEN ENERGY COORDINATING COMMITTEE: SUMMARY OF DOE HYDROGEN PROGRAMS FOR FY 1982 Annual Report
Apr. 1983 39 p
(DE83-012520, DOE/CE-0034/1) Avail NTIS HC A03/MF A01

The FY 1982 Summary is the fifth consecutive yearly report on all hydrogen-related programs within DOE. The report provides an annual overview of the hydrogen-related programs of the DOE offices presented on the Hydrogen Energy Coordinating Committee A historical summary of the hydrogen budgets of these offices is given The distribution by program element for FY 1982 is tabulated. Total DOE funding in FY 1982 for hydrogen research was $28.9 million. The individual program elements of the DOE hydrogen programs are described in the body of this report. More specific program information is given in the Technology Summary Forms in Appendix A In some cases, these forms show funding levels beyond FY 1982 These figures reflect program planning estimates and should not be considered as final budgets DOE

N83-36134# Rochester Univ., N. Y. Dept. of Chemistry
STUDIES OF HYDROGEN PRODUCTION BY THE WATER GAS SHIFT REACTION AND RELATED CHEMISTRY Final Report, 1 Sep. 1980 - 31 Mar. 1983
R. EISENBERG 15 Apr 1983 18 p refs
(Contract DAAK70-80-C-0148)
(AD-A129920) Avail: NTIS HC A02/MF A01 CSCL 07D

Many systems have been investigated for the catalysis of the water gas shift reaction, H2O + CO yields H2 + CO2, and for electrocatalytic oxidation of CO, CO + H2O yields CO2 + 2H+ +2e-. These systems have involved precious metal complexes composed of Pt, Rh, and Ir, and reaction conditions for these systems have been especially mild· atmospheric pressures and low temperatures (80-100C). In addition aqueous acidic conditions for these systems have been pursued with particular interest in adopting water gas shift catalysts to act as electrocatalysts for the anode reaction of CO fuel cells. Under these conditions the best water gas shift catalysts observed have been PtCl42--SnC14-SnC14-SnC12, trans PtC12(SnC13)2-(SnC13)2-2, Rh(CO)2C12, Rh(CO)2C12-2, PtC12-4PbC12, and PtC13(C2H4)-. None of these electrocatalytically oxidized CO, however, RhC1(PPh3)3, Rh(dppe)(mnt)-, and Rh(dppe)2+, complexes known to bind CO, did exhibit some limited electrocatalytic CO oxidation behavior. Author (GRA)

04

FUELS AND OTHER SOURCES OF ENERGY

Includes fossil fuels, nuclear fuels, geothermal and ocean thermal energy, tidal energy, and wind energy

A83-41856* Lunar and Planetary Inst , Houston, Tex
INTRODUCTION - PROCESSES OF CONTINENTAL RIFTING
P MORGAN (Lunar and Planetary Institute, Houston, TX) and B H BAKER (Oregon, University, Eugene, OR) Tectonophysics (ISSN 0040-1951), vol. 94, 1983, p 1-10 refs
(Contract NASW-3389)

It is thought likely that thermal thinning and/or diapirism can cause the extensional stress required for rifting The rifting, however, will not occur unless the regional tectonic regime permits the sides of the rift to diverge. Whereas passive plate extension could cause rifting in isolation, the extension and rifting are likely to be localized where the lithosphere is weakest over an existing thermal anomaly. In those cases where asthenospheric diapirism occurs, which is essentially a response to thinning of the lithosphere by thermal thinning or plate extension, the effects of diapirism may completely mask the initiating mechanism It is believed that anomalous heat transfer into the lithosphere, diapirism, and magmatism must all figure in rifting, along with a deviatoric stress field that will permit extension in a developing rift. Even though the models are useful in permitting idealized processes to be quantified and tested, better knowledge of lithosphere properties is considered necessary, in particular knowledge of mantle viscosity and its temperature dependence C R.

A83-41868* Jet Propulsion Lab., California Inst of Tech , Pasadena.
COMPUTER MEASUREMENT OF LINE STRENGTHS WITH APPLICATION TO THE METHANE SPECTRUM
L. R BROWN, J S. MARGOLIS, R. H NORTON, and B. D. STEDRY (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA) Applied Spectroscopy (ISSN 0003-7028), vol. 37, no. 3, 1983, p. 287-292. refs
(Contract NAS7-100)

A83-42952
COAL GAS AS A FEED FUEL FOR PHOSPHORIC ACID FUEL CELL POWER PLANTS
B. R. KRASICKI and B. L. PIERCE (Westinghouse Electric Corp., Advanced Energy Systems Div., Pittsburgh, PA) International Journal of Hydrogen Energy (ISSN 0360-3199), vol 8, no. 7, 1983, p 499-508.

A83-43236
NEW APPROACH FOR ANALYSIS AND PREDICTION OF LIQUID-VAPOR COEXISTENCE DENSITIES INCLUDING THE CRITICAL REGION
W. M HAYNES (National Bureau of Standards, Boulder, CO) and L J VAN POOLEN IN Advances in cryogenic engineering Volume 27 - Proceedings of the Cryogenic Engineering Conference, San Diego, CA, August 11-14, 1981 . New York, Plenum Press, 1982, p. 839-847. refs

Accurate coexistence density data are required for many engineering systems A new parameter which can be used to analyze and predict coexistence data is the liquid volume fraction This parameter represents the fraction of the total volume in a two-phase system which is liquid The present investigation is concerned with the application of the liquid volume fraction in analyzing internal consistency of coexistence density data for argon and propane. Another application of this parameter is related to the prediction of orthobaric densities in regions in which accurate data are unavailable A prescription is presented of an experimental method for obtaining saturated liquid and vapor density data simultaneously. G.R.

A83-43239
OPERATION OF AN AIRCRAFT ENGINE USING LIQUEFIED METHANE FUEL
J. A. RAYMER (Beech Aircraft, Corp., Boulder, CO) IN. Advances in cryogenic engineering. Volume 27 - Proceedings of the Cryogenic Engineering Conference, San Diego, CA, August 11-14, 1981 New York, Plenum Press, 1982, p. 1001-1006; Discussion, p 1006.

In connection with the increasing prices of fuels derived from crude oil and the gradual exhaustion of petroleum resources, attention has been given to alternatives to gasoline One of these alternatives is methane, which is currently mainly obtained for natural gas. Sources of methane which are not being used at present include coal mine gas, land fill decomposition gas, and sewage treatment gas It is pointed out that methane has several advantages over gasoline for use in reciprocating engines It is cleaner burning, it produces less exhaust pollution, and it can extend engine life Other advantages are related to better cold weather starting characteristics and an equivalent octane rating of about 130. The present investigation has the objective to demonstrate the operation of a reciprocating aircraft engine on methane fuel A liquid storage system was used. System valving was designed to deliver only liquid methane to the engine supply line. The investigation shows that the conversion of an aircraft reciprocating engine to operate on liquid methane fuel is possible with very satisfactory results. G R.

A83-43316
AVIATION GASOLINE - ISSUES AND ANSWERS
C T. ZOOK (FAA, Office of Environment and Energy, Washington, DC) Society of Automotive Engineers, Business Aircraft Meeting and Exposition, Wichita, KS, Apr. 12-15, 1983. 10 p. refs
(SAE PAPER 830705)

The lowest grade of aviation gasoline (avgas) currently available for use in reciprocating aircraft engines is grade 80 avgas The present investigation is concerned with the availability of 80 octane avgas and the possible impact of the elimination of this grade of aviation gasoline on safety. Attention is given to aviation gasoline characteristics, availability and price, accidents related to use of improper grade of fuel (including an employment of jet fuel), and Federal Aviation Administration (FAA) and industry actions in this area. As a result of the decreasing availability of grade 80 avgas, some users are looking for a substitute, taking into account methanol, ethanol, and other alternative fuels. In the meantime, the use of grade 100LL is the preferable choice, but grade 100 is also an acceptable substitute for grade 80 avgas. G.R.

A83-43317
AUTOGAS FLIGHT TEST IN A CESSNA 150 AIRPLANE
H. ZEISLOFT (Experimental Aircraft Association, Inc., Hales Corners, WI) Society of Automotive Engineers, Business Aircraft Meeting and Exposition, Wichita, KS, Apr. 12-15, 1983 27 p. refs
(SAE PAPER 830706)

Because of the availability and cost problems in supplying 80 grade aviation gas to the users, and because of the high maintenance costs and lowered reliability when using 100LL aviation gasoline in 80 octane, aircraft engines, flight tests were conducted to determine airworthiness of the aircraft and compliance with Federal Air Regulations when using automobile gasoline. On the basis of these test, FAA approval has been given for the use of unleaded regular automobile gasoline for all Cessna 150 airplanes powered with Teledyne Continental Motors 100 hp engines. No changes were required to the airframe, engine or operation of the aircraft. Author

A83-44599* Lunar and Planetary Inst., Houston, Tex
REGIONAL GEOTHERMAL EXPLORATION IN EGYPT
P. MORGAN (Lunar and Planetary Institute, Houston, TX), F. K. BOULOS (Egyptian Geological Survey and Mining Authority, Cairo, Egypt), and C. A. SWANBERG (New Mexico State University, Las Cruces, NM) Geophysical Prospecting (ISSN 0016-8025), vol. 31, 1983, p 361-376. refs
(Contract NSF EAR-77-23354, NSF INT-78-16649, NASW-3389)

A study is presented of the evaluation of the potential geothermal resources of Egypt using a thermal gradient/heat flow technique and a groundwater temperature/chemistry technique. Existing oil well bottom-hole temperature data, as well as subsurface temperature measurements in existing boreholes, were employed for the thermal gradient/heat flow investigation before special thermal gradient holes were drilled. The geographic range of the direct subsurface thermal measurements was extended by employing groundwater temperature and chemistry data Results show the presence of a regional thermal high along the eastern margin of Egypt with a local thermal anomaly in this zone. It is suggested that the sandstones of the Nubian Formation may be a suitable reservoir for geothermal fluids These findings indicate that temperatures of 150 C or higher may be found in this reservoir in the Gulf of Suez and Red Sea coastal zones where it lies at a depth of 4 km and deeper. N.B.

A83-45711
ON THE EVALUATION OF WIND POWER FROM SHORT WIND RECORDS
V. R. BARROS and E. A. ESTEVAN (Consejo Nacional de Investigaciones Cientificas y Tecnicas, Centro Nacional Patagonico, Puerto Madryn, Chubut, Argentina) Journal of Climate and Applied Meteorology (ISSN 0733-3021), vol. 22, June 1983, p. 1116-1123. refs

The present method for the estimation of the meteorological mean wind power for a given site and year, on the basis of only three months of data, is predicated on the minimization of the rms errors between observations and a representation by means of empirical orthogonal functions that are calculated from a matrix formed by an annual series of wind screen data from stations belonging to the same region In the case of wind series from 20 stations, the method allowed the recovery of both the mean wind speed value and its variance with a small error. Using the Weibull-II distribution together with the present method and only 13 weeks of observations, estimates of true meteorological wind power were obtained with a 6-percent average relative error when only 11 central stations were computed. O.C.

A83-45786
INTRAPLATE STRESS ORIENTATIONS FROM ALBERTA OIL-WELLS
J S. BELL (BP Canada, Ltd , Calgary, Alberta, Canada) and D I GOUGH (Alberta, University, Edmonton, Canada) IN Evolution of the earth . Washington, DC/Boulder, CO, American Geophysical Union/Geological Society of America, 1981, p. 96-104. Research supported by the Natural Sciences and Engineering Research Council of Canada refs

New evidence is presented in support of the existence of a stress field in Alberta which causes systematically oriented elongations in oil wells due to spalling of the well walls The field appears to be essentially uniform over much of the Alberta sedimentary basin. The measurement of borehole ellipticity is discussed, exhibiting an uncomputed four-arm dipmeter log showing zones of borehole elongation or breakout The causes of such elongations are discussed in the context of a stress analysis, and the results of various crustal stress studies in Alberta are described, showing maps of horizontal stress orientations and mean azimuths of borehole elongations. C.D.

A83-45795
TERRESTRIAL HEAT FLOW HISTORY AND TEMPERATURE PROFILES
E. A LUBIMOVA and O. PARFENUK (Akademiia Nauk USSR, Institut Fiziki Zemli, Moscow, USSR) IN Evolution of the earth Washington, DC/Boulder, CO, American Geophysical Union/Geological Society of America, 1981, p 217-228 refs

An accretion model and convective heat transfer inside the melting layer that is followed by density differentiation are used in a numerical study of the earth's evolutionary thermal model. It is shown that global heat loss into space is controlled to a great extent by the lithosphere, which is mainly conductive A solid-state, or seismological, approach is taken in estimating the geotherms in the earth's interior A separate estimate is also made using an evolutionary thermal model based on heat flow data and heat generation-heat transfer models. For both approaches, a discrepancy between geotherms is pronounced. The solid-state approach gives concave curves in the C-layer, whereas the evolutionary thermal model gives convex curves and positive temperature gradients. C.R

A83-46130
GEOLOGIC THERMAL-INERTIA MAPPING USING HCMM SATELLITE DATA
K. WATSON, S. HUMMER-MILLER, and T OFFIELD (U.S. Geological Survey, Denver, CO) IN: 1982 International Geoscience and Remote Sensing Symposium, Munich, West Germany, June 1-4, 1982, Digest Volume 1 . New York, Institute of Electrical and Electronics Engineers, 1982, 6 p refs

Analytical and experimental results of several uses of thermal inertia mapping in regional geologic analysis with the Heat Capacity Mapping Mission (HCCMZ) satellite are presented A thermal inertia algorithm is developed, and data are provided from imaging of the Powder River Basin, WY, and Cabeza Prieta, AZ. Histograms generated for igneous rocks revealed distinctively varying thermal inertia signatures that were related to gneiss and schist, extrusive rocks of mafic composition, and extrusive rocks with less mafic composition The Powder River data demonstrated that soil moisture increases the thermal inertia, although no data was available on the possible relationships to lithologic content A night image of the same area exposed a previously unobserved lineament that exhibited a thermal inertia which varied significantly from its surrounds. The feature was correlated with previous aeromagnetic data Helium anomalies were observed and found to be associated with oil and gas fields. M S K.

A83-46203
USE OF REMOTE SENSING TECHNIQUES TO STUDY WATER RESOURCES IN LOS ANDES RANGES, CHILE
M F. ARAYA (Universidad de Chile, Santiago, Chile) IN 1982 International Geoscience and Remote Sensing Symposium, Munich, West Germany, June 1-4, 1982, Digest Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1982, 6 p refs

A83-46214
REMOTE SENSING AS A TOOL FOR RESOURCE DEVELOPMENT
R. MUEHLFELD (Bundesanstalt fuer Geowissenschaften und Rohstoffe, Hanover, West Germany) IN 1982 International Geoscience and Remote Sensing Symposium, Munich, West Germany, June 1-4, 1982, Digest. Volume 2 New York, Institute of Electrical and Electronics Engineers, 1982, 4 p. refs

Criteria for the selection of remote-sensing (RS) techniques to provide information for the development of mineral, hydrocarbon, water, and soil resources are summarized and illustrated. The relationship between the type of information required, the natural conditions prevalent in the area under study, and the possible use of satellite or airborne mapping techniques is explored. It is shown that geological and structural features, especially linear elements and crystalline rocks, are directly accessible to RS, whereas soil types and other features must be determined indirectly from vegetation distribution The spectral absorption/reflectance characteristics of different geological and plant features are reviewed, and the capabilities of available instruments are listed Adequate resolution is often obtainable only with airborne instruments. RS-image processing by computer methods is discussed, including geometric correction, image enhancement, data compression, and classification T K

A83-46233
MAPPING AND ANALYSIS OF AERIAL CONDUCTIVITY MEASUREMENTS FROM INPUT SYSTEM OVER GEOTHERMAL AREAS
V S. JORDON, D V SMITH (Geo-Centers, Inc., Newton, MA), and K. U. SIVAPRASAD (New Hampshire, University, Durham, NH) (International Geoscience and Remote Sensing Symposium, Munich, West Germany, June 1-4, 1982) IEEE Transactions on Geoscience and Remote Sensing (ISSN 0196-2892), vol GE-21, July 1983, p. 278-284 Sponsorship U.S. Geological Survey. refs
(Contract USGS-14-08-0001-18823)

Remotely sensed electromagnetic data taken with an INPUT system for the U S. Geological Survey in aerial surveys over a known geothermal resource area have been reduced and plotted in a gray scale format for two- and three-dimensional projections of the apparent subsurface conductance The apparent conductance is calculated using both the channel ratio method and the theoretical two-layer model of the earth. Matching the survey data to the two-layer model gave good results consistent with the ratio method of apparent conductance calculation and permited the construction of maps of horizontal slices of apparent conductance at different depths into the earth, from one to fifty meters. The channel ratio and horizontal slice maps of apparent conductance give a picture of the apparent conductance which is consistent with known topographical features of the regions
Author

A83-46268#
THE COLLISION HALF-WIDTH FOR THE R(0) LINE OF THE NU3 BAND OF METHANE
H. C. WALKER, JR and W. J PHILLIPS (Sverdrup Technology, Inc , Technology Dept., Arnold Air Force Station, IN) Journal of Applied Physics (ISSN 0021-8979), vol. 54, Sept. 1983, p. 4729-4733. refs

The collision half-width for the R(0) absorption line of the nu3 band of methane has been determined as a function of temperature with nitrogen and carbon dioxide as the broadening gases. The measurements were made in the temperature range from 300 to 1000 K with broadening gas pressures in the range from 5 to 15

psi (absolute). Methane partial pressures sufficient to produce approximately 60 percent absorption at line center for each condition were used. The line spectrum was produced with a Laser Analytic LS-3 tunable diode laser spectrometer. A best-fit Voigt profile to the experimental line shape was used to determine the broadening which is characterized by the collisional or Lorentz half-width. Author

A83-47183#
DEVELOPMENT OF NEW COMBUSTION CHAMBER TECHNOLOGIES FOR FUTURE ALTERNATIVE COMBUSTION FUELS [ENTWICKLUNG NEUER BRENNKAMMER-TECHNOLOGIEN FUER ZUKUENFTIGE ALTERNATIVE BRENNSTOFFE]
B. SIMON (Motoren- und Turbinen-Union Muenchen GmbH, Munich, West Germany) Bundesministerium fuer Forschung und Technologie, Statusseminar ueber Luftfahrtforschung und Luftfahrttechnologie, 3rd, Hamburg, West Germany, May 2-4, 1983, Paper 34 p In German. refs

New technological developments which will permit the reduction of flame tube wall temperatures, of smoke emissions, and of combustion chamber size are discussed New combustion material specifications resulting from the studies are briefly addressed, and aircraft gas turbine results are presented. Fuel injection systems, cooling film configurations, layering with heat-resistant materials, and developments in air atomization nozzles are discussed. C.D.

A83-47356#
HEAT RESISTANT EXPLOSIVES PRODUCED IN HUNGARY WITH POSSIBLE SPACE APPLICATIONS
GY BENCZ (Superintendence for Chemical and Explosives Industry, Budapest, Hungary) and J. DERES (National Trust of Petroleum and Gas Industry, Budapest, Hungary) International Astronautical Federation, International Astronautical Congress, 34th, Budapest, Hungary, Oct. 10-15, 1983 7 p. refs
(IAF PAPER 83-357)

The manufacture of explosive materials which meet the heat and cold-resistance, radiation-insensitivity, brisance, initiation-sensitivity, and permissibility requirements of rocketry, aircraft, and oil-exploration applications is discussed. The large-scale synthesis of 2,2', 4,4', 6,6'-hexanitrostilbene from TNT using the one-step process of Kompolthy et al. (1973) is described; a yield of 57.9 percent (referred to TNT) was achieved over a year of continuous production Washing and recrystallization from nitromethane is found to increase the temperature limit to 265 C Molecular-structure considerations which led to the choice of 2,5,8-triphenyl-tritriazolobenzene as an even higher temperature explosive are outlined The manufactured material is stable for 4 h at 300 C and has melting point = 422 C, density = 1 71 g/cu cm, detonation velocity = 5940 m/s at 1.34 g/cu cm, and Trauzl-test value = 10 25 cu cm at 1 23 g/cu cm. T K

A83-47793
USE OF THE FRAUNHOFER LINE DISCRIMINATOR (FLD) FOR REMOTE SENSING OF MATERIALS STIMULATED TO LUMINESCENCE BY THE SUN
W. R. HEMPHILL (U S Geological Survey, Reston, VA), A. F. THEISEN (U.S Geological Survey, Flagstaff, AZ), and R. D. WATSON IN: Optical and laser remote sensing Berlin, Springer-Verlag, 1983, p. 213-222 refs

Recent work using an airborne Fraunhofer line discriminator (FLD) to image materials luminescing in sunlight is presented Instrumentation used consists of an FLD capable of obtaining luminescence and reflectance values by a combination of sky-looking and earth-looking radiances, and a microprocessor-controlled imaging system providing a total scan angle of 37 deg. The system has been used to prospect for phosphate rock in the Sespe Creek area of California, and to observe marine oil seeps in the Santa Barbara Channel. An improved version of the imaging FLD has also been designed which will permit operation from aircraft at 3000 m and from the Space Shuttle in a circular orbit. A.L.W.

A83-47911#
MIXING AND FUEL ATOMISATION EFFECTS ON PREMIXED COMBUSTION PERFORMANCE
G E. ANDREWS, M. M. ABDUL AZIZ, and N. A AL-DABBAGH (Leeds University, Leeds, England) American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 28th, Phoenix, AZ, Mar. 27-31, 1983. 9 p. Research supported by the Science and Engineering Research Council of England and Ruston Gas Turbines refs
(ASME PAPER 83-GT-55)

The main objective was to compare a flame stabilizer at constant pressure loss and identical isothermal aerodynamics with three modes of fuel injection· premixed, direct propane injection and direct kerosene injection A Jet Mixing type of flame stabilizer was used at simulated gas turbine primary conditions. The influence of gaseous mixing effects was to deteriorate the combustion efficiency solely by increasing the CO emissions and to increase the NO(x) emissions The flame stability was increased and low CO emissions were achieved at weaker mixtures. Liquid fuel atomization effects resulted in a further deterioration in combustion efficiency due solely to unburnt hydrocarbons. However, the NO(x) emissions were reduced indicating that local stoichiometric burning around single droplets does not occur. Author

A83-47995#
EMERGENCY POWER FOR THE F-16 AIRCRAFT
D V. ALLEN, A C STANCLIFFE (AiResearch Manufacturing Co., Torrance, CA), and O. W. WHITE (General Dynamics Corp , Fort Worth, TX) American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 28th, Phoenix, AZ, Mar. 27-31, 1983 5 p
(ASME PAPER 83-GT-189)

The emergency power unit (EPU) for the General Dynamics F-16 'Fighting Falcon' aircraft provides electrical and hydraulic power in the event of main engine generator or hydraulic pump failure or an engine-out condition The unit is powered by main engine bleed air, or by the decomposition products of H-70 fuel (a hydrazine-water mixture), or a combination of both. This paper describes the emergency power unit and discusses the use of H-70 on the flight line Author

A83-48031*# Jet Propulsion Lab., California Inst of Tech., Pasadena
ECONOMIC ASPECTS OF ADVANCED COAL-FIRED GAS TURBINE LOCOMOTIVES
S G LIDDLE, B B BONZO, and B C HOUSER (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA) American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 28th, Phoenix, AZ, Mar 27-31, 1983. 6 p. refs
(Contract DE-AI01-78CS-55151, EM-78-1-01-5151; NASA TASK RD-152)
(ASME PAPER 83-GT-241)

Increases in the price of such conventional fuels as Diesel No. 2, as well as advancements in turbine technology, have prompted the present economic assessment of coal-fired gas turbine locomotive engines A regenerative open cycle internal combustion gas turbine engine may be used, given the development of ceramic hot section components. Otherwise, an external combustion gas turbine engine appears attractive, since although its thermal efficiency is lower than that of a Diesel engine, its fuel is far less expensive Attention is given to such a powerplant which will use a fluidized bed coal combustor A life cycle cost analysis yields figures that are approximately half those typical of present locomotive engines. O.C.

A83-48032*# Jet Propulsion Lab, California Inst of Tech, Pasadena
THE COAL-FIRED GAS TURBINE LOCOMOTIVE - A NEW LOOK
S. G LIDDLE, B B. BONZO (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA), and G. P PUROHIT (Pickard, Lowe, and Garrick, Inc., Irvine, CA) American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 28th, Phoenix, AZ, Mar 27-31, 1983 6 p refs
(ASME PAPER 83-GT-242)

Advances in turbomachine technology and novel methods of coal combustion may have made possible the development of a competitive coal fired gas turbine locomotive engine. Of the combustor, thermodynamic cycle, and turbine combinations presently assessed, an external combustion closed cycle regenerative gas turbine with a fluidized bed coal combustor is judged to be the best suited for locomotive requirements Some merit is also discerned in external combustion open cycle regenerative systems and internal combustion open cycle regenerative gas turbine systems employing a coal gasifier The choice of an open or closed cycle depends on the selection of a working fluid and the relative advantages of loop pressurization, with air being the most attractive closed cycle working fluid on the basis of cost. O C

A83-48115
THE ANALYSIS AND DEMARCATION OF OIL-AND-GAS-BEARING REGIONS BY THE SMOOTHING OF PHOTOGRAPHIC IMAGES FROM SPACE [ANALIZ I VYDELENIE NEFTEGAZONOSNYKH OBLASTEI PUTEM SGLAZHIVANIIA KOSMICHESKIKH FOTOIZOBRAZHENII]
M V. SMIRNOV and L. N. ROZANOV (Vsesoiuznyi Nauchno-Issledovatel'skii Neftianoi Institut, Leningrad, USSR) Issledovanie Zemli iz Kosmosa (ISSN 0205-9614), July-Aug 1983, p. 113-119. In Russian refs

The two approaches to the geological interpretation of space photographs are discussed One seeks to identify the spectral characteristics of the earth's surface registered in the photos with geological formations. The other, which is less direct, takes into account a number of topographical features. The optical properties of natural features on space photos are determined through the coefficient of spectral brightness when spectral-zone photos are used and through the overall brightness coefficient when the photos encompass the entire visible region. In general, photos do not give the brightness coefficients of individual objects; instead, the coefficients are integral and refer to an aggregation It is shown here how an allowance can be made for the factors that affect the optical characteristics of natural formations Attention is then given to a geological analysis of the results obtained from machine processing. C R

A83-48132#
EFFECTS OF EXTERNAL BURNING ON SPIKE-INDUCED SEPARATED FLOW
J. P. REDING and D. M JECMEN (Lockheed Missiles and Space Co, Inc., Sunnyvale, CA) Journal of Spacecraft and Rockets (ISSN 0022-4560), vol 20, Sept.-Oct. 1983, p 452, 453

Previously cited in issue 19, p. 2971, Accession no A82-39127

N83-30433# Naval Research Lab., Washington, D. C Inorganic and Electrochemistry Branch
HOT CORROSION IN GAS TURBINES Interim Report
R L JONES 27 Apr. 1983 26 p refs
(AD-A127425; NRL-MR-5070) Avail: NTIS HC A03/MF A01 CSCL 21E

A review is presented which gives a brief, largely chronological overview of the development of the different theories of hot corrosion This review was the Keynote Lecture for the Gas Turbine Session of the Symposium on Corrosion in Fossil Fuel Systems, Electrochemical Society Meeting, Detroit, MI, October 1982
Author (GRA)

N83-30558# Los Alamos Scientific Lab, N Mex
OPTICAL INSTRUMENTATION FOR ON-LINE ANALYSIS OF CHEMICAL PROCESSES
A. HARTFORD, JR., D. A. CREMERS, T. R. LOREE, and G P QUIGLEY 1983 6 p Presented at the SPIE Tech. Symp East '83, Arlington, Va., 4-8 Apr. 1983
(Contract W-7405-ENG-36)
(DE83-007557; LA-UR-83-409, CONF-830420-1) Avail: NTIS HC A02/MF A01

Optical diagnostics provide the capability for noninstrusive, on-line, real time analysis of chemical process streams Several laser based methods for monitoring fossil energy processes have been evaluated. Among the instrumentation techniques which appear quite promising are coherent anti-Stokes Raman spectroscopy (CARS), laser induced breakdown spectroscopy (LIBS), and synchronous detection of laser induced fluorescence (SDLIF). A CARS diagnostic was implemented on a coal gasifier and was successfully employed to measure species concentrations and temperatures within the process stream. The LIRS approach has been used to identify total trace impurities (e g, Na, K, and S) within a gasifier. Recently, individual components in mixtures of aromatics hydrocarbons have been resolved via the synchronous detection of laser induced fluorescence. DOE

N83-30560# Combustion Engineering, Inc, Windsor, Conn.
COMBUSTION ENGINEERING TWO-STAGE, ATMOSPHERIC-PRESSURE, ENTRAINED-FLOW COAL-GASIFICATION-PROCESS DEVELOPMENT-UNIT PROGRAM Final Report
S. L. DARLING, R. W. KOUCKY, and M. C TANCA Feb. 1983 393 p refs
(Contract DE-AC01-76ET-10204; EPRI PROJ 244-1)
(DE83-009252; EPRI-AP-2846) Avail NTIS HC A17/MF A01

A program was conducted to design, construct and operate a two stage, atmospheric pressure, entrained flow, low Btu coal gasification process development unit (PDU) having a capacity of 5 tons/h of coal. The program was jointly sponsored by the US Department of Energy, the Electric Power Research Institute, and Combustion Engineering, Inc The objectives of the program were: (1) to demonstrate the capability and suitability of the process and equipment to produce a clean low Btu gas from coal, and (2) to provide design information for scale up to commercial size plants. During the 3-y PDU test program, beginning in June 1978, a series of 12 runs was conducted Pittsburgh seam coal was fired for 5085 h and clean fuel gas was produced for 2746 h. Product gas higher heating values above 100 Btu/scf were observed during initial testing when gasifier thick wall refractory was intact However, refractory thickness decreased, causing higher vessel heat absorption and hence lower gas temperatures Lower than design gasification kinetics for Pittsburgh seam coal char and higher than design vessel heat absorption resulted in lower char gasification rates and decreased gas heating values. DOE

N83-30561# Mobil Research and Development Corp, Princeton, N.J Central Research Div.
FUNDAMENTAL STUDIES IN THE CONVERSION OF COALS TO FUELS OF INCREASED HYDROGEN CONTENT: THE CHEMISTRY AND MECHANISM OF COAL CONVERSION TO CLEAN FUEL Final Report
F. J. DERBYSHIRE, G. A ODOERFER, and P VARGHESE Mar. 1983 144 p refs Sponsored by EPRI
(Contract EPRI PROJ. 1655-1)
(DE83-902933, EPRI-AP-2912) Avail NTIS HC A07/MF A01

The pertinent aspects of two stage coal conversion in which a thermal dissolution step is followed by reaction in the presence of a catalyst were examined. The effects of solvent quality, the reaction sequence and the reaction conditions in two stages on the overall conversion and product distribution from the liquefaction of a subbituminous coal were investigated. Single stage catalytic coal conversions provide a basis from which to evaluate the relative effectiveness of two stage conversion and to identify measures for its improvement. The mechanisms of coal dissolution in high boiling compounds identified, polycondensed aromatics, and certain

basic nitrogen heterocycles as effective coal solvents. The conversion of a subbituminous coal in solvents containing 1,2,3,4,-tetrahydroguinoline and of the extent of coal solvent interactions in solvent chemistry are discussed. DOE

N83-30562# New York Univ., New York. Dept. of Applied Science.
EXPERIMENTAL STUDY OF THE EFFECT OF FUEL VAPORIZATION ON COMBUSTION EFFICIENCY
V ZAKKAY, A. AGNONE, and H. CLISSET May 1982 32 p refs
(Contract DE-FG22-81PC-40288)
(DE82-016419; NYU/DAS-82-05) Avail: NTIS HC A03/MF A01

A residential-scale vaporizing burner concept for No. 2 oil was developed. The design and construction of a prototype free-standing unit, complete with a recuperative air heat exchanger, a blue-flame sensor, and automatic controls for extended steady-state and cyclical operation, are presented The principal objective was to assess the effects of fuel vaporization on combustion efficiency and emission, and to assess its performance over extended operation on the order of a hundred hours. The vaporization scheme consists of spraying No. 2 oil onto a regeneratively heated surface at a temperature above the fuel-vaporization temperature (650 F). Operation near stoichiometric condition is demonstrated with zero soot formation, 15 1% carbon dioxide, 0.4% O2, and low CO levels (aproximately 200 ppM) at the stack. However, due to the high flame temperatures, the NO levels (approximately 400 ppM) of this single-stage burner are excessive. DOE

N83-30564# Pittsburgh Univ., Pa. Dept. of Civil Engineering.
ADVANTAGES/LIMITATIONS OF SOLVENT EXTRACTION, OZONATION, AND CARBON ADSORPTION FOR REDUCTION OF NONBIODEGRADABLE RESIDUALS IN METC FIXED-BED GASIFICATION WASTEWATERS Final Report
R D NEUFELD, J. PALADINO, C MORETTI, M PLAUTZ, and F. ALI 1 Dec. 1982 173 p refs
(Contract DE-AC21-81MC-16528)
(DE83-005594, DOE/MC-16528/1328) Avail NTIS HC A08/MF A01

This (second) year of effort examined the roll of solvent extraction, ozonation, and carbon adsorption for incorporation into the wastewater treatment scheme for purposes of enhancing process stability, decolorization, elimination of dilution water requirements, and minimization of nonbiodegradable residuals. This approach, while more costly, will better allow for direct discharge or reuse of gasification wastewaters Di-isopropylether (DIPE) and methyl-isobutyl ketone (MIBK) were incorporated into a pretreatment step with free and fixed ammonia stripping followed by activated sludge treatment. Solvent extraction did not result in a decrease of nonbiodegradable residuals from the bioreactor, but did result in a highly stable operation of the bioreactors with no dilution water requirements and a minimal tendency for foaming and biodeflocculation. Ozonation of biofeed resulted in phenol being kinetically favored for oxidation DOE

N83-30578# Colorado Univ., Boulder Dept. of Engineering
PHASE EQUILIBRIA: AN INFORMAL SYMPOSIUM
B. E. EATON, J. F. ELY, H. J. M HANLEY, R. D MCCARTY, and J. C. RAINWATER Jan. 1983 157 p refs Prepared in cooperation with Polish Academy of Sciences, Warsaw Sponsored by NBS
(PB83-174045; NBS-TN-1061) Avail NTIS HC A08/MF A01 CSCL 07D

Extended corresponding states, critical behavior, mixing rules, and, in general, the prediction of the phase behavior of simple mixtures were discussed. A survey of methods used in industry was also presented GRA

N83-30638# Idaho National Engineering Lab., Idaho Falls.
TEMPERATURE ESTIMATES FROM ZIRCALOY OXIDATION KINETICS AND MICROSTRUCTURES
C. S. OLSEN Oct. 1982 49 p refs
(Contract DE-AC05-76ID-01570)
(DE83-002626, NUREG/CR-2807, EGG-2207) Avail NTIS HC A03/MF A01

State of the art capability to determine peak zircaloy fuel rod cladding temperatures following an abnormal temperature excursion in a nucler reactor, based on postirradiation metallographic analysis of zircaloy microstructural and oxidation characteristics was reviewed. Results of a comprehesive literature search are presented to evaluate the suitability of available zircaloy microstructural and oxidation data for estimating anticipated reactor fuel rod cladding temperatures. Additional oxidation experiments were conducted to evaluate low temperature zircaloy oxidation characteristics for postirradiation estimation of cladding temperature by metallographic examination. Results of these experiments were used to calculate peak cladding temperatures of electrical heater rods and nuclear fuel rods that were subjected to reactor temperature transients

N83-30675# Tri-State Synfuels Co , Houston, Tex.
TRI-STATE SYNFUELS PROJECT REVIEW. VOLUME 8: COMMERCIAL STATUS OF LICENSED PROCESS UNITS
Jun. 1982 79 p
(Contract DE-FC05-81OR-20807)
(DE83-007434, DOE/OR-20807/T1-VOL-8) Avail: NTIS HC A05/MF A01

The commercial status of the process units to be used in the Tri-State Synfuels Project at Henderson, Kentucky was demonstrated. A configuration to produce gasoline via a methanol and methanol to gasoline process is discussed. To accomplish this change the synthol, oil workup and chemical workup units were eliminated and replaced by methanol synthesis and methanol to gasoline units. Certain other changes to optimize the Lurgi liquids processing eliminated the tar distillation and naphtha hydrotreater units which were replaced by the partial oxidation unit The coals to be gasified are moderately caking which necessitates the installation of stirring mechanism in the Lurgi dry bottom gasifier. This work is in the demonstration phase Process licenses either were obtained or must be obtained for a number of processes to be used in the plant. The commercial nature of these processes is discussed in detail DOE

N83-30676# EMCON Associates, San Jose, Calif.
UTILIZATION OF LANDFILL GAS FOR VEHICLE FUEL SYSTEM, ROSSMAN'S LANDFILL, CLACKAMAS COUNTY, OREGON: FEASIBILITY STUDY
Feb. 1982 221 p refs Prepared in cooperation with Cal Recovery Systems, Inc , Richmond, Calif., and Gas Recovery Systems, Inc., Pasadena, Calif
(Contract DE-FG01-80RA-50366)
(DE83-010622; DOE/RA-50366/1) Avail NTIS HC A10/MF A01

The feasibility of utilizing landfill gas for fuel production was analyzed. The areas addressed include: landfill gas yield and collection, including an estimate of production rates, a prediction of methane yield versus time, and development of a conceptual gas gathering system; gas processing, compressing, and storage, including a review of current state of the art and relevant case histories, development of alternative processing options, selection of an optimum system, and conceptual design; and methane fueled vehicle systems, which includes a review of the state of the art and evaluation of case histories, development of alternative fuel systems, and final selection of the optimum system. Cost estimates and a summary of total project costs and economic feasibility are presented DOE

N83-30678# Deutsche Shell A G , Hamburg (West Germany).
SHELL BRIEFING SERVICE: AIRCRAFT FUELS TODAY AND TOMORROW [SHELL BRIEFING SERVICE: FLUGKRAFTSTOFFE HEUTE UND MORGEN]
Nov. 1982 12 p refs In GERMAN
Avail: NTIS HC A02/MF A01

The worldwide increase of the demand for mineral oil products and the possible supply problem at the end of the eighties are reviewed. Author (ESA)

N83-30679# Massachusetts Inst. of Tech., Cambridge.
MIT-GRI LNB SAFETY AND RESEARCH WORKSHOP. VOLUME 1: RAPID-PHASE TRANSITIONS
R. C REID Jul. 1982 209 p Workshop held in Cambridge, Mass., 22-24 Mar. 1982 Sponsored by Gas Research Inst., Chicago, Ill 3 Vol
(PB83-171462; GRI-82/0019.2) Avail NTIS HC A10/MF A01 CSCL 21D

Safety issues dealing with rapidphase transitions (RPTs) are discussed. The RPT phenomenon is reviewed critically for cases of liquefied natural gas-water, molten smelt-water, and molten-metal explosions. GRA

N83-30680# Massachusetts Inst. of Tech., Cambridge Dept of Chemical Engineering
MIT-GRI LNG SAFETY AND RESEARCH WORKSHOP. VOLUME 2: DISPERSION OF DENSE VAPORS
J. A HAVENS (Arkansas Univ , Fayetteville) Jul. 1982 151 p refs Workshop held in Cambridge, Mass., 22-24 Mar. 1982 Sponsored by Gas Research Inst., Chicago, Ill 3 Vol.
(PB83-171470; GRI-82/0019 2) Avail NTIS HC A08/MF A01 CSCL 21D

Methods of prediction of dense vapor dispersion in the atmosphere are reviewed Panel presentations describe recent large scale vapor dispersion tests conducted by Lawrence Livermore Laboratories for DOE and planned large scale testing sponsored by the British Health and Safety Executive. Uncertainties in vapor dispersion modeling methods and regulatory needs for heavy gas dispersion models are discussed Supplemental comments are provided from panelists and from audience participation Findings of the workshop are summarized and recommendations are made for future research GRA

N83-30681# Technology and Management Systems, Inc., Burlington, Mass
MIT-GRI LNG SAFETY AND RESEARCH WORKSHOP. VOLUME 3: LNG FIRES-COMBUSTION AND RADIATION
P. K. RAJ Jul 1982 194 p refs Workshop held in Cambridge, Mass , 22-24 Mar. 1982 Sponsored by Gas Research Inst., Chicago, Ill 3 Vol.
(PB83-171488, GRI-82/0119.3) Avail: NTIS HC A09/MF A01 CSCL 21D

Details of a comprehensive review of the state of the art knowledge on liquefied natural gas (LNG) fires and vapor combustion, the presentations by a 6 member panel, and the discussions between the audience and the panel on various issues concerning LNG fire and combustion problems are given GRA

N83-30682# Battelle Pacific Northwest Labs., Richland, Wash
KINETICS AND CATALYSIS OF PRODUCING SYNTHETIC GASES FROM BIOMASS Final Report, 7 Dec. 1979 - 6 Dec. 1982
L J. SEALOCK, JR , D C ELLIOTT, and R T. HALLEN Dec 1982 92 p refs
(Contract GRI PROJ. 0129)
(PB83-188664; GRI-82/0038) Avail NTIS HC A05/MF A01 CSCL 21D

Basic research to provide a fundamental elucidation of the kinetics, reaction sequences and pathways involved in pyrolysis and catalytic steam gasification of wood and wood components is discussed A detailed data base describing the steam gasification in the presence and absence of catalysts was investigated in both systems This data base provides detailed information regarding gasification rates, char formation, degradation products, gas-phase reactions, reaction mechanisms and catalytic activity Results demonstrated that the use of a properly selected catalyst or combined catalyst systems can significantly influence the gasification of biomass GRA

N83-30683# Northwestern Univ., Evanston, Ill.
MECHANISTIC AND KINETIC STUDIES OF THE ELEMENTARY PROCESSES IN CATALYTIC COMBUSTION OF METHANE Annual Report, Sep. 1981 - Aug. 1982
H H. KUNG and J. B. BUTT Oct 1982 18 p Sponsored by Gas Research Inst
(PB83-188615; GRI-81/0127) Avail NTIS HC A02/MF A01 CSCL 21D

The progress towards determining the kinetics and the mechanism in the catalytic oxidation of methane by studying the reaction of some postulated intermediates on a well-characterized surface is discussed Current emphasis is on the intermediate methylene radical. Preparation of the precursor for methylene, diazomethane is briefly described An initial result suggested that diazomethane on adsorption on platinum decomposed readily to gaseous nitrogen and an adsorbed carbonaceous species On heating methane and ethylene are the major products in the absence of oxygen. In contrast, adsorbed ethylene does not undergo reaction before desorption. This evidence suggests that the decomposed product is the desired methylene radical GRA

N83-30970# California Univ , Livermore Lawrence Livermore Lab Earth Sciences Dept.
PARTICLE-DYNAMICS CALCULATIONS OF SHEAR FLOW
O R. WALTON Aug 1982 13 p refs Presented at US-Japan Seminar on New Models and Constitutive Relations in the Mech. of Granular Mater., Ithaca, N.Y., 22 Aug 1982 Submitted for publication
(Contract W-7405-ENG-48)
(DE83-005446; UCRL-88560; CONF-820843-3) Avail. NTIS HC A02/MF A01

Two dimensional discrete particle computer models are described The soft particle approach allows them to be applied over a wide range of conditions from static situations through rapid shear conditions. Surface friction between particles and with boundary walls is explicitly modeled The modeling of dynamic situations wherein the energy losses and momentum transfer during interparticulate collisions play important roles is emphasized The numerical techniques are verified and direct comparison with physical tests involving several particles have verified the models' ability to calculate the motion of real materials Direct shear tests on oil shale rubble and corresponding calculations indicate qualitatively similar circulation phenomena and both show large fluctuations in the magnitude of the shearing force. Incline chute flow calculations provide descriptions of individual particle paths in which shearing and size segregation phenomena are observed. DOE

N83-30972# Solar Turbines International, San Diego, Calif
CERAMIC-HEAT-EXCHANGER TECHNOLOGY Final Report
M E. WARD and A. J. KUBASCO Mar. 1983 103 p refs Sponsored by Electric Power Research Inst.
(DE83-901832; EPRI-AP-2883) Avail: NTIS HC A06/MF A01

Technology for pressurized, high temperature, ceramic tube heat exchangers was established by environmental, design, and fabrication studies. The design study includes the finite element stress analysis of the ceramic components contained in the DOE ceramic heat exchanger test module. This test module contains 28, 4.56-m long ceramic tubes with a 11 43-cm dia ceramic header. It was operated successfully for 125 h up to firing temperatures of 17000K (26000F) and outlet air temperatures of 15330K (23000F) at 689.4 kPa (100 psia) This unit was then fired with a pulverized coal burner under EPRI sponsorship for 25 h DOE

N83-31016# Central Electricity Generating Board, London (England).
THE DYNAMICS OF PISTON RING WEAR IN A SULZER 5BAH-22 ENGINE OPERATING ON HIGH-VISCOSITY FUEL
R. SMOLAK 1983 17 p refs Transl. into ENGLISH from Tech. Smarownicza - Trybologia (Poland), v 10, no 2, 1979 p 49-55
(BLL-CE-TRANS-7872-(9022 09)) Avail British Library Lending Div., Boston Spa, Engl.

In order to reduce fuel costs, work was carried out with the aim of burning cheaper fuels with a high viscosity in medium speed engines of the Sulzer BAH type. The results of comparative investigations of the wear of piston rings in this engine, using the radio-isotope method and employing a mixture of fuel oil and furnace oil is discussed S L.

N83-31027# Westinghouse Electric Corp., Concordville, Pa Combustion Turbine Systems Div.
COMBUSTION-TURBINE DESIGN GUIDELINES BASED ON DEPOSITION-CORROSION CONSIDERATIONS. VOLUME 1: RESIDUAL-FUEL-OIL STUDIES Final Report
T. P SHERLOCK, P. R. MULIK, G A. WHITLOW, S. Y. LEE, and R. A. WENGLARZ Feb. 1983 123 p refs
(Contract EPRI PROJ. 1345-1)
(DE83-901454; EPRI-AP-2739-VOL-1) Avail: NTIS HC A06/MF A01

The potential problems associated with the use of residual oil as a combustion turbine fuel are discussed. Two such problems are hot corrosion of the turbine blades and vanes and the deposition of ash on the vanes, leading to reduced operating efficiency. To assess these potential problems, and thereby develop guidelines for operating with these fuels, tests were conducted in a pressurized passage using simulated turbine operating conditions. It is shown that the use of properly treated fuel should not cause accelerated corrosion and that the use of untreated fuel would require very low metal temperatures to avoid corrosion. Deposited ash was measured and expressed as a fraction of the total available ash. Both residual oil and a doped distillate fuel using an in situ particulate probe were tested Significant differences were found in the size and shape of particles produced. Two deposition tests were conducted at a turbine inlet temperature of 23000 F, representative of advanced designs Severe deposition due to the large number of molten particles in the gas stream are indicated. DOE

N83-31072# *Bureau of Mineral Resources, Geology and* Geophysics, Canberra (Australia).
BMR 82: YEARBOOK OF THE BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS, CONTAINING A SUMMARY OF ACTIVITIES, AND ARTICLES ON SOME OF THE WORK OF BMR IN 1982
1983 66 p
Avail: NTIS HC A04/MF A01

Sedimentary basins and sedimentary systems which have continental development and which may be host to fossil fuels or mineral deposits; basic geochemical, petrological, and geochronological research of major rock suites, of the environments of metalliferous deposits, and of the deposits themselves, the structure and characteristics of the crust and upper mantle relevant to the understanding of the evolution of the Australian continent; and the geology of offshore regions are discussed. Author

N83-31080# California Univ , Berkeley. Lawrence Berkeley Lab. Earth Sciences Div.
RESISTIVITY MONITORING OF FLUID MIGRATION AT THE CERRO PRIETO GEOTHERMAL FIELD
N. E. GOLDSTEIN, K. PRUESS, M. J WILT, and G S. BODVARSSON 1982 13 p refs Presented at the 8th Workshop on Geothermal Reservoir Eng., Stanford, Calif., 14-16 Dec. 1982
(Contract DE-AC03-76SF-00098)
(DE83-009372; LBL-14979; CONF-821214-7) Avail NTIS HC A02/MF A01

Apparent resistivities, measured by repetitive, dipole/dipole dc resistivity surveys show significant and somewhat systematic changes over the area of the Cerro Prieto (-) reservoir These changes are attributed to temperature and salinity changes, consequences of production, and natural recharge. Reservoir simulation studies combined with the appropriate dc resistivity calculations were performed to determine the magnitude and form of resistivity change. We considered production from a liquid dominated reservoir with dimensions and parameters of the Cerro Prieto (-) reservoir and assumed lateral and vertical recharge of colder, less saline waters The associated apparent resistivities increase 10 to 20% over the production area during a 3 year period at the current rate of production. It is concluded that if properly conducted, dc resistivity monitoring appears capable of providing indirect information on fluid flow processes, including reinjection in a producing reservoir DOE

N83-31083# Department of Energy, Laramie, Wyo
DEPOSITIONAL ENVIRONMENTS, SUBSURFACE STRATIGRAPHY AND POST-BURN CHARACTERIZATION OF THE PALEOCENE-EOCENE HANNA FORMATION AT THE HANNA, WYOMING UNDERGROUND COAL-GASIFICATION SITE: HANNA 2, PHASE 1 EXPERIMENT
A. D YOUNGBERG, J E. MCCLURG (Wyoming Univ., Laramie), and J. G SCHMITT (Nevada Univ , Las Vegas) Feb 1983 166 p refs
(DE83-005592; DOE/LC/RI-83/2) Avail. NTIS HC A08/MF A01

During the summer of 1981, the Laramie Energy Technology Center conducted a post-burn coring program at the Hanna 2, Phase 1, Underground Coal Gasification site, Hanna, Wyoming. Detailed geologic studies were conducted on the altered and unaltered overburden as well as an analysis of the burn cavity. The overburden consists of about 80 meters of Paleocene-Eocene Hanna formation above the Hanna No 1 coal bed used in the burn. The overburden contains three basic lithologic units Unit A consists of very fine-grained sandstones, siltstones, and claystones deposited as a lacustrine delta. Unit A is immediately above the Hanna No 1 coal. Unit B is above Unit A and consists of carbonaceous shales and mudstones containing isolated lenticular and tabular sandstone bodies deposited in a meandering fluvial system. Unit C is above Unit B and contains coarse-grained sandstones and conglomerates deposited in a braided river system DOE

N83-31084# Sandia Labs., Albuquerque, N. Mex. Geotechnology Research Div.
MINERALOGY AND PETROLOGY ASPECTS OF THE MESAVERDE FORMATION AT RIFLE GAP, COLORADO, SPECIFIC TO THE SEDIMENTOLOGY AND GAS-BEARING INTERVALS IN THE SUBSURFACE
D. M. HEINZE Mar. 1983 39 p refs
(Contract DE-AC04-76DP-00789)
(DE83-009473; SAND-83-0287) Avail: NTIS HC A03/MF A01

Rifle Gap, situated on the eastern edge of the Piceance Creek Basin, northwestern Colorado, was the focus of sedimentological studies in an effort to understand the tight, gas-bearing intervals of the inner-basin subsurface. These Mesaverde Formation sandstone exposures were sampled and analyzed for mineral content and grain morphology. Varying detrital mineralogy supports a sedimentological model for the area which includes shoreline blanket, paludal, fluvial, and marine zones (from bottom to top). Observable mineralogical determinants for the depositional groups

include chert, organic and feldspar content, sorting, and grain size Statistical methods were successful in distinguishing groups in the data which correspond nicely to the model's environments of deposition Analcime, feldspar, clay, rock fragments, and organics are significant variables in group separation Time, stability, rock matrix relationships, and grain morphology are proposed as explanatory elements for correlations of variables. Author

N83-31122# Department of Energy, Morgantown, W. Va. Energy Technology Center
ADVANCED ENVIRONMENTAL CONTROL TECHNOLOGY
May 1982 53 p refs
(DE83-009222; DOE/METC-SP-194) Avail NTIS HC A04/MF A01

The advanced environmental control technology (AECT) program consolidated cleanup efforts in ongoing technology-specific programs with new projects initiated in a coordinated program that addresses cleanup technolgy development is discussed. The strategy of the AECT program is to develop flue gas cleanup, hot gas stream cleanup, process modifications, and associated waste management techniques that permit the conversion of existing utility or industrial energy systems to coal use or for the siting of new facilities Applied research, systems analysis, and instrumenation studies are included to support the main program thrust and to determine optimum combinations of control technologies and power systems components The projects within the three areas of AECT is described. DOE

N83-31144# Stanford Univ., Calif Dept. of Geophysics.
SONIC AND ELECTRICAL PROPERTIES OF PARTIALLY SATURATED TIGHT-GAS SANDS Final Report
A. NUR Mar. 1983 60 p refs
(Contract DE-AS19-81BC-10498)
(DE83-009472, DOE/BC-10498/5) Avail: NTIS HC A04/MF A01

The seismic and the electrical properties of tight gas rocks were related to their pore space geometry, permeability, and level of water saturation Results of a laboratory experimental study of wave propagation in Cotton Valley and Spirit River Sandstones were studied as a function of partial water saturation (SW) and wave frequency. It was found that wave velocities and the velocity ratio are sensitive to the presence of gas. Furthermore, wave attenuation is sensitive to the amount of gas in the pore space Ultrasonic measurements in tight gas sands tend to yield higher velocity values, due to the inability of the pore fluid pressure to homogenize during the passage of waves. Laboratory measurements were made also of the complex electrical response of selected tight rocks, and compared with normal permeability Berea Sandstone. The results show that the dielectric property of tight gas sands is very sensitive to partial water saturation, and may give not only insight into the nature of the pore space, but also provide a practical measure of S sub w in situ DOE

N83-31149# Foster Wheeler Corp., Livingston, N.J
LABORATORY ANALYSES OF OIL SHALES FOR US DEPARTMENT OF ENERGY, LARAMIE ENERGY TECHNOLOGY CENTER
Laramie, Wyo. DOE Mar. 1983 180 p
(Contract DE-AC20-82LC-10910)
(DE83-008498; DOE/LC-10910/T1) Avail: NTIS HC A09/MF A01

Analytical tests were performed on six samples of raw oil shale, two identified as Eastern, two identified as Colorado and the remaining two as Utah. This report covers the following aspects of this study: testing methods; sample preparation for specific tests; overall analytical summary tabulation, conclusions; specific enthalpy results; thermogravimetric analysis results; slag viscosity results; ash fusion temperature results, gross heating value results; elemental analysis results, and mineral analysis results. Procedures for drop calorimetry thermogravimetric analysis, differential thermal analysis and viscosity measurements are provided in the appendices DOE

N83-31151# Geological Survey, Bloomington, Ind.
FAULTING IN SOUTHWEST INDIANA
C. H. AULT and D M. SULLIVAN Oct. 1959 59 p refs
(DE83-900411, NUREG/CR-2908) Avail NTIS HC A04/MF A01; also Avail: SOD $4.75

Faults of the Wabash Valley Faults System, faults in Perry and Spencer Counties, Indiana, and the Mt. Carmel Fault are of the normal type and high angle and occur as single fault planes or as well defined compound faults as much as 50 miles long with displacements ranging from a few feet to more than 400 feet The Wabash faults and those in Perry and Spencer Counties were formally mapped, described, and named for the first time Although supporting deep drilling data are sparse, the Wabash and Mt. Carmel faults are probably present at depth, where they may form major structural alignments in basement rocks The Wabash and Perry and Spencer County faults are post-Pennsylvanian and pre-Pleistocene in age. The Wabash faulting is probably related to the regional tectonics that produced the New Madrid disturbance, but it is not a direct continuation of New Madrid faulting across the Rough Creek Fault Zone. DOE

N83-31252# Oregon State Univ., Corvallis Dept. of Atmospheric Sciences
REMOTE SENSING FOR WIND POWER POTENTIAL. A PROSPECTOR'S HANDBOOK
J. E WADE, P. A MAULE, G S. BODVARSSON, C L. ROSENFELD, S. G WOOLLEY, and M R. MCCLENAHAN Aug 1982 321 p refs
(Contract DE-AT06-76ET-20316)
(DE83-007037; DOE/ET-20316/81-1; PNL-3938) Avail NTIS HC A14/MF A01

Three case studies that employ remote sensing prospecting techniques are described Based on remotely sensed evidence, the wind power potential in three geographically and climatically diverse areas of the United States is estimated, and the estimates are compared to actual wind data in those regions In addition, the cost of each survey is discussed The results indicate that remote sensing for wind power potential is a quick, cost effective, and fairly reliable method for screening large areas for wind power potential. DOE

N83-31253# Freese-Notis Weather, Inc , Des Moines, Iowa
LEARNING TO FORECAST WIND AT REMOTE SITES FOR WIND-ENERGY APPLICATIONS Final Report
C NOTIS, D. W. TRETTEL, J. T. AQUINO, T R. PIAZZA, L E. TAYLOR, D. C. TRASK, H L. WEGLEY, and A. H. MILLER Jan 1983 239 p refs Prepared in cooperation with Murray and Trettel, Inc. and PNL
(Contract DE-AC06-76RL-01830)
(DE83-008756; PNL-4318) Avail: NTIS HC A11/MF A01

Observed wind patterns are correlated with synoptic or mescoscale weather systems Six sites selected for analysis include Montauk Point, New York; Boone, North Carolina, Ludington, Michigan, Clayton, New Mexico, Amarillo, Texas; and San Gorgonio Pass, California Objectives of the analysis are to identify synoptic and/or mesoscale weather patterns that are associated with recognizable wind events at the sites, to define a set of criteria that uniquely describes such weather patterns, to estimate the reliability (accuracy) of forecasting rules derived from the association of weather patterns and site winds, and to attempt to separate any mesoscale effects of local topography from the synoptic-scale effects. One-to-one mapping of wind regimes onto synoptic types was not found. It was concluded that four factors should be examined when stratifying wind regimes· synoptic situation, descriptive climatology, pressure gradient vector, and winds aloft The wind forecasting approach developed was intended for forecasting hourly average winds out to the 24 hour or possibly 36 hour time horizon DOE

N83-31458# California Univ., Livermore. Lawrence Livermore Lab.
LASER ISOTOPE SEPARATION IN NUCLEAR-WASTE BY-PRODUCT UTILIZATION
J W. DUBRIN Feb. 1983 7 p Presented at the Nucl Waste Management Symp., Tuscon, Ariz., 27 Feb. - 3 Mar 1983
(Contract W-7405-ENG-48)
(DE83-009243; UCRL-88167; CONF-830205-22) Avail: NTIS HC A02/MF A01

Various by-products in spent nuclear fuels including strategic metals are uniquely useful and of high intrinsic value. Isotope separation is necessary to achieve the full benefits of fission product partitioning, increasing the specific activity of radioactive modifications or reducing the intrinsic radiation associated with various elements. The atomic vapor laser isotope separation process, under large scale development of uranium enrichment, applies to most of the spent fuel nuclides and offers attractive benefit to costs DOE

N83-31604# Federal Aviation Administration, Atlantic City, N.J. Technical Center.
ENGINE PERFORMANCE COMPARISON ASSOCIATED WITH CARBURETOR ICING DURING AVIATION GRADE FUEL AND AUTOMOTIVE GRADE FUEL OPERATION Final Report, Jan. - Jul. 1982
W. CAVAGE, J. NEWCOMB, and K BIEHL May 1983 114 p refs Original contains color illustrations
(Contract FAA PROJ. 184-320-120)
(DOT/FAA/CT-82/110) Avail NTIS HC A06/MF A01

Sea-level-static test cell engine operations were conducted utilizing a Teledyne continental Motors 0-200A engine and a Cessna 150 fuel system to review engine operational characteristics on 100LL aviation grade fuel and various blends of automotive grade fuel as well as carburetor ice detectors/warning devices sensitivity/effectiveness during actual carburetor icing. The primary purpose of test cell engine operation was to observe real-time carburetor icing characteristics associated with possible automotive grade fuel utilization by piston-powered light general aviation aircraft. In fulfillment of this task, baseline engine operations were established with 100LL aviation grade fuel followed by various blend of automotive grade fuel prior to imposing carburetor icing conditions and assessing operational characteristics. Author

N83-31727# California Univ., Berkeley Lawrence Berkeley Lab.
HYDROCARBONS FROM PLANTS AND TREES
M. CALVIN Jul. 1982 35 p refs Presented at the Biomass Substitutes for Liquid Fuels Symp., Campinas, Brazil, 10 Feb. 1982
(Contract DE-AC03-76SF-00098)
(DE83-002228; LBL-14905; CONF-820269-1) Avail: NTIS HC A03/MF A01

The way energy was used in the US in 1980 was examined. A diagram shows the development of energy from its source to its end use. The following are described the carbon dioxide problem, the greenhouse effect, sugar cane as an energy source, hydrocarbon-producing plants and trees, and isoprenoids from plants and trees. DOE

N83-31743* National Aeronautics and Space Administration. Pasadena Office, Calif
HYDRODESULFURIZATION OF CHLORINIZED COAL Patent
J. J. KALVINSKAS (JPL, California Inst. of Tech., Pasadena) and N. K. ROHATGI, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) 5 Jul. 1983 10 p Filed 30 Oct. 1981 Supersedes N82-12240 (20 - 03, p 0318) Sponsored by NASA
(NASA-CASE-NPO-15304-1; US-PATENT-4,391,609; US-PATENT-APPL-SN-315587, US-PATENT-CLASS-44-1SR, US-PATENT-CLASS-201-17) Avail: US Patent and Trademark Office CSCL 07D

A method of desulfurization is described in which high sulfur coals are desulfurized by low temperature chlorinolysis of coal in liquid media, preferably water, followed by hydrodesulfunzation at a temperature above 500 C. The coals are desulfurized to an extent of up to 90% by weight and simultaneously dechlorinated to a chlorine content below 0.1% by weight. The product coals have lower volatiles loss, lower oxygen and nitrogen content and higher fixed carbon than raw coals treated with hydrogen under the same conditions. Heating the chlorinated coal to a temperature above 500 C. in inert gas such as nitrogen results in significantly less desulfurization.

Official Gazette of the U.S Patent and Trademark Office

N83-31749# Minnesota Univ., Minneapolis. Dept of Mechanical Engineering.
HYDROGEN AND SULFUR FROM HYDROGEN SULFIDE 2: AMBIENT TEMPERATURE ELECTROLYSIS USING OXIDATION OF HYDROGEN SULFIDE BY AIR AS THE PRIME ENERGY SOURCE Interim Report, 1 Jul. 1982 - 31 Oct. 1984
E A. FLETCHER 15 Apr. 1983 12 p refs
(Contract N00014-82-K-0523)
(AD-A127488; TR-2) Avail NTIS HC A02/MF A01 CSCL 07D

Hydrogen sulfide recovered from the sweetening of fossil fuels or sought as a mineral for its intrinsic value might be converted, in an electrolytic process which uses atmospheric oxygen, into pipeline pressure hydrogen and sulfur Such a process may be an alternative to the Claus Process, which recovers only sulfur and uses the hydrogen wastefully It is also suggested that electrolysis provides a mechanism by which other gaseous products, as well as hydrogen, may be brought to pipeline pressures easily.
Author (GRA)

N83-31760# Argonne National Lab , Ill
ADVANCED PRESSURIZED FLUIDIZED-BED COMBUSTION
W. F. PODOLSKI and J D MCCLUNG (Morgantown Energy Technology Center, W. Va.) 1982 13 p refs Presented at the Intern. Conf on Combustion of Tomorrow's Fuels, Santa Barbara, Calif., 8 Nov 1982
(Contract W-31-109-ENG-38)
(DE83-007641; CONF-821176-1) Avail NTIS HC A02/MF A01

The motivation for and driving force behind the development of advanced pressurized fluidized-bed combustion (DFBC) concepts in the areas of process improvements and economics improvements are discussed. Among the former are increased cycle efficiency, improved load following capability, simplified and improved coal feeding techniques, increased sorbent utilizations, and reduced NO sub x emissions. Potential economic improvements are in the areas of lowering capital costs and operating costs as a result of the process-related improvements. Such improvements are based on inherent limitations in the current design of PFBC systems, for example, in upper temperature limitations and processing capacity. Means to circumvent these limitations, primarily comprising development of two classes or types of advanced concepts were proposed DOE

N83-31763# Institute of Gas Technology, Chicago, Ill.
COAL-GASIFICATION RESEARCH STUDIES Quarterly Report, 20 Aug. - 19 Nov. 1982
Feb. 1983 21 p refs
(Contract DE-AC21-82MC-19301)
(DE83-006604; DOE/MC-19301/1) Avail NTIS HC A02/MF A01

Chemistry and physics of coal gasification are studied. The three areas under investigation are: coal ash behavior in gasification processes, high-pressure fluidization. The coal ash behavior studies attempt to gain a better understanding of low melting ash and ash agglomerate formation in coal gasifiers In that portion aimed at characterization of ash components, a 2 inch diameter fluidized bed is being used to study the ash formation as a function of temperature, gas composition and carbon conversion This apparatus was used to study ash formation of a Kentucky No. 9 plus a No 11 chair in a CO2/steam atmosphere at 1800 F. Design *and construction of the penetrometer viscometer to be used in* ash viscosity measurements proceded according to schedule with the design being completed and components ordered, most of which were received. DOE

N83-31876# Kepling and Associates, Inc , Tulsa, Okla
EVALUATION OF THE NORTH STANLEY POLYMER DEMONSTRATION PROJECT
K. J. HARPOLE and C. J. HILL Feb. 1983 38 p refs
(Contract DE-AC19-80BC-10033)
(DE83-006915; DOE/BC-10033/6) Avail: NTIS HC A03/MF A01

A review of the performance of the North Stanley Polymer Demonstration Project was completed The objective of the cost-project was to evaluate the technical efficiency and economic feasibility of polymer-enhanced waterflooding as a tertiary recovery process in a highly heterogeneous and vertically fractured sandstone reservoir that has been successfully waterflooded and is approaching the economic limits of conventional waterflooding recovery The ultimate incremental oil recovery from the project is estimated to be about 570,000 barrels (or approximately 1 4% of the original oil-in-place) This is significantly less than the original recovery predictions but does demonstrate that the project was technically successful. The lower-than-anticipated recovery is attributed principally to the extremely heterogeneous nature of the reservoir. The updated economic analysis under current (mid-1982) economic conditions indicates that the North Stanley project would be commercially feasible if polymer injection began in 1982, rather than in 1976. DOE

N83-31887# Naval Postgraduate School, Monterey, Calif Dept of Administrative Sciences
DECISION MODELS FOR CONDUCTING AN ECONOMIC ANALYSIS OF ALTERNATIVE FUELS FOR THE ICE ENGINE M.S. Thesis
C. F. GARRISON, JR. Mar. 1983 97 p refs
(AD-A127954) Avail NTIS HC A05/MF A01 CSCL 21D

An economic analysis is made of vehicles powered by compressed natural gas (CNG), alcohol, and electric vehicles (EV's) as possible replacements for gasoline-powered vehicles Advantages and disadvantages of vehicles powered by the various fuels are discussed and determinations of their suitability are made based on vehicle performance characteristics and fuel availability CNG and EV's are determined to be viable alternatives based on current state-of-the-art technology. Alcohol is not retained as a viable alternative because of limited fuel availability. Models are presented for determining the total life cycle cost for gasoline, CNG, and EV's. A fleet of seventy-two vehicles at the Naval Postgraduate School is used as an example to compare the cost of each alternative. A linear program is used to determine the mix of gasoline, CNG, and electric vehicles that satisfy mission requirements for the least total fleet life cycle cost and to perform sensitivity analysis on the cost determinants. A generalized formulation is also presented to allow a vehicle fleet manager to use the methodology of this thesis as an aid to evaluating the potential of alternatively-fueled vehicles in different situations. GRA

N83-31890# Sweany (Ralph S.), Crothersville, Ind
SMALL CONTINUOUS ETHANOL PLANT FOR FARM Final Report
R. S. SWEANY 27 Apr. 1982 37 p
(Contract DE-FG02-81AF-92009)
(DE82-014675, DOE/AF-92009/2) Avail: NTIS HC A03/MF A01

This project was designed to provide the farmer with sufficient information to build his own continuous production ethanol plant The plant description, schematic drawing, operation summary, and plant fabrication details are presented. DOE

N83-31891# Oak Ridge Y-12 Plant, Tenn.
TECHNICAL CONSIDERATIONS IN CHOOSING ALCOHOL FUELS FOR LESS-DEVELOPED COUNTRIES
J M GOOGIN, A. L. COMPERE, and W. L. GRIFFITH 1982 16 p refs Presented at the 5th Intern Conf on Alternative Energy Source, Miami Beach, Fla , 13 Dec. 1982 Prepared in cooperation with ORNL, Tenn
(Contract W-7405-ENG-26)
(DE83-004644, CONF-821213-2) Avail NTIS HC A02/MF A01

Current US and Latin American interest has focused on replacement and substitution of gasoline by ethyl alcohol. However, extending diesel fuel, which is used in agricultural engines and necessary transport, is the basic concern Three attractive methods, involving the use of vegetable or tree oils, alcohols, in some cases with water, can be successfully used to extend or replace diesel fuels: (1) fatty acid - alcohol - water microemulsions in diesel fuel, (2) higher alcohol esters of fatty acids, and (3) direct diesel fuel extension with higher alcohols All three methods of extending diesel fuel are amenable to an appropriate technology situation. DOE

N83-31892# Environmental Protection Agency, Ann Arbor, Mich Emission Control Technology Div
PRELIMINARY PERSPECTIVE ON PURE METHANOL FUEL FOR TRANSPORTATION Final Report
Sep. 1982 100 p refs
(PB83-180232, EPA-460/3-83-003) Avail: NTIS HC A05/MF A01 CSCL 21D

The relative advantages and disadvantages of the use of pure methanol fuel in motor vehicles designed for its use over conventional fuels was examined. The use of pure or neat methanol and not methanol gasoline blends for use in existing automobiles was specifically addressed. Five basic issues are discussed: (1) the availability of raw materials for methanol production such as coal, natural gas, wood, biomass, municipal waste and peat; (2) the relative availability of technology and environmental effects of producing methanol and conventional fuels from nonpetroleum domestic feedstocks; (3) the practicality of distributing a new fuel for use in motor vehicles, (4) the exhaust emissions and fuel efficiency of motor vehicles operating on pure methanol fuel relative to those of conventional vehicles, and (5) the economics of producing, distributing and using methanol as a motor vehicle fuel. GRA

N83-31893# Battelle Pacific Northwest Labs , Richland, Wash.
PACIFIC NORTHWEST REGIONAL BIOMASS PROGRAM Final Report, 15 Feb. - 15 Sep.
D E. EAKIN and L. J. SEALOCK, JR Chicago, Ill Gas Research Inst Oct 1982 81 p refs Sponsored by Gas Research Inst.
(PB83-188623, GRI-81/0136) Avail: NTIS HC A05/MF A01 CSCL 21D

Available background data and recent studies to determine the future potential of gaseous fuels derived from biomass in the Pacific Northwest were reviewed. In addition numerous individuals in government and industry were contacted regarding their interest in the program. It was concluded that the development and demonstration of technologies for producing gaseous fuels from biomass should have a high priority in the Northwest. Additional findings of the assessment are included A detailed program plan was developed which defined the goals, approach, and scope of work necessary for executing a Northwest Regional Biomass Program. The plan is based on the objectives of the Gas Research Institute and those of potential funding partners as well as the energy needs of the Northwest Region. GRA

N83-31894# Braun (C. F.) and Co., Alhambra, Calif.
FOSSIL FUEL GASIFICATION TECHNICAL EVALUATION SERVICES Topical Report, 1978 - 1980
R F DETMAN 30 Dec. 1982 293 p refs Sponsored by Gas Research Inst., Chicago, Ill.
(PB83-195107; GRI-80/0168) Avail: NTIS HC A13/MF A01 CSCL 07A

The Exxon, Mountain Fuel, Cities Service/Rockwell, Westinghouse, BGC slagging Lurgi and Peatgas processes for fossil fuel gasification were evaluated. The Lurgi and HYGAS processes were evaluated in earlier studies. For producing synthetic natural gas (SNG) from coal, only the Westinghouse conceptual design appeared competitive with HYGAS on eastern coal All coal gasification processes were competitive with or better than Lurgi on eastern coal The Mountain Fuel process was more costly than Lurgi or HYGAS on a western coal. GRA

N83-32024# Christian Michelsens Institutt for Videnskap og Andsfrihet, Bergen (Norway). Dept of Science and Technology.
TRANSMISSION OF AN EXPLOSION THROUGH AN ORIFICE
P THIBAULT, Y. K. LIU, C CHAN, J H LEE, R. KNYSTAUTAS, C. GURAP, B H. HJERTAGER, and K. FUHRE Sep 1982 28 p refs Presented at the 19th Intern Symp on Combustion, Haifa, Israel, 8-13 Aug. 1982 Sponsored by BP Petroleum Ltd , Elf Aquitaine Norge A/S, Esso Exploration and Production Norway, Inc , Mobil Exploration Norway, Inc., Norsk Hydro and Statoil Prepared in cooperation with McGill Univ.
Avail NTIS HC A03/MF A01 CSCL 19D

The problem of transmission of an explosion from one chamber to another through an orifice was studied for methane, propane, hydrogen and acetylene mixtures with air. Quenching diameters are determined for various regimes GRA

N83-32073# California Univ., Berkeley. Lawrence Berkeley Lab.
EMISSION CHARACTERISTICS OF A MEDIUM-SPEED DIESEL USING WATER-EMULSIFIED RESIDUAL FLUIDS
D D BREHOB, F. ROBERTS, R F SAWYER, and K R PEARCE Oct 1982 24 p refs Presented at Combust Inst Symp. on Western States Sect., Livermore, Calif , 11 Oct 1982
(Contract DE-AC03-76SF-00098)
(DE83-001552; LBL-14987, CONF-821035-5) Avail· NTIS HC A02/MF A01

Particulate and NO/sub x/ concentrations and thermal efficiency were measured on a medium speed, 2500 kW (3400-hp) diesel engine using diesel No 2 reference fuel and three high viscosity residual fuels The fuels were emulsified at 0% to 12% water addition with droplet diameters of 2 to 5, 5 to 10, and 10 to 20 micrometers. No effects were detected from different ranges of droplet diameter. Both NO/sub x/ concentration and thermal efficiency decreased as water level was increased about 10% to 15% for NO/sub x/ and less than 2% for thermal efficiency (at 12% water) The engine emits about 0.051 gm/MJ (0 14 gm/bhp-hr) particulate for diesel No 2 and about 0.25 gm/MJ (0 65 gm/bhp-hr) for both the 3500 and 5000 Seconds Redwood International (SRI) viscosity residual fuels Particulate formation with 12% water addition was higher than with 4% water addition or dry residual fuels. X-ray fluorescence analysis determined that the particulate matter contained about 9% ash when using diesel No.2 and 30% ash when using the residual fuels GRA

N83-32122# Joint Publications Research Service, Arlington, Va.
DRILLING AT ACCESSES TO EARTH'S MANTLE
L. N SHADRIN *In its* USSR Rept.: Earth Sci., No 26 (JPRS-83622) p 39-52 7 Jun. 1983 Transl. into ENGLISH from Priroda (Moscow), no 1, Jan. 1983 p 12-22
Avail: NTIS HC A05

Drilling into the deep layers of the Earth is discussed Present technology concerning shafts and boreholes is discussed in detail. L F.M.

N83-32140*# Earth Satellite Corp., Chevy Chase, Md.
GEOLOGIC EXPLORATION: THE CONTRIBUTION OF LANDSAT-4 THEMATIC MAPPER DATA
J. R. EVERETT, J. D. DYKSTRA, and C. A. SHEFFIELD 1983 13 p Sponsored by NASA ERTS
(E83-10387; NASA-CR-172929; NAS 1.26 172929) Avail: NTIS HC A02/MF A01 CSCL 08G

The major advantages of the TM data over that of MSS systems are increased spatial resolution and a greater number of narrow, strategically placed spectral bands The 30 meter pixel size permits finer definition of ground features and improves reliability of the photointerpretation of geologic structure. The value of the spatial data increases relative to the value of the spectral data as soil and vegetation cover increase. In arid areas with good exposure, it is possible with careful digital processing and some inventive color compositing to produce enough spectral differentiation of rock types and thereby produce facsimiles of standard geologic maps with a minimum of field work or reference to existing maps Hue-saturation value images are compared with geological maps of Death Valley, California, the Big Horn/Wind River Basin of Wyoming, the area around Cement, Oklahoma, and Detroit. False color composites of the Ontario region are also examined. A.R H

N83-32142*# Earth Satellite Corp., Chevy Chase, Md.
STUDY OF LANDSAT-D THEMATIC MAPPER PERFORMANCE AS APPLIED TO HYDROCARBON EXPLORATION Quarterly Progress Report, 7 Apr. - 7 Jul. 1983
7 Jul 1983 4 p ERTS
(Contract NAS5-27384)
(E83-10389, NASA-CR-172931, NAS 1 26 172931, QPR-3) Avail NTIS HC A02/MF A01 CSCL 05B

Many scenes of particular interest have a light dusting of snow cover. The possible use of hue-saturation-intensity transformations to reduce the effect of snow cover is being investigated A tape of the Greeley, Colorado scene was reviewed on the interactive system and image types to be produced (decorrelated 2,3,4; natural color 1,2,3,, hue separation value 5/2,5/7 eigen 1, 4,5,7 in two color combinations) were selected. In several instances, a 1,3,4 combination produces a more useful false color infrared version of TM data than the more common 2,3,4 arrangement, probably because band 1 is less highly correlated with the band 3 and 4 than is band 2 A review of spacecraft performance suggests that the standard corrections applied at GSFC are more complicated than necessary in some areas and insufficient in other cases The image motion compensation device on the TM works so well that bow-typing effects are very small; there are differences in the radiometry of forward and backward scans that make additional calibration necessary A R H

N83-32155# Pacific Northwest Lab , Richland, Wash.
WATEQ3 GEOCHEMICAL MODEL: THERMODYNAMIC DATA FOR SEVERAL ADDITIONAL SOLIDS
K. M. KRUPKA and E A JENNE Sep 1982 58 p refs
(Contract DE-AC06-76RL-01830)
(DE83-000896; PNL-4276) Avail. NTIS HC A04/MF A01

Geochemical models such as WATEQ3 can be used to model the concentrations of water-soluble pollutants that may result from the disposal of nuclear waste and retorted oil shale However, for a model to competently deal with these water-soluble pollutants, an adequate thermodynamic data base must be provided that includes elements identified as important in modeling these pollutants. To this end, several minerals and related solid phases were identified that were absent from the thermodynamic data base of WATEQ3. In this study, the thermodynamic data for the identified solids were compiled and selected from several published tabulations of thermodynamic data. For these solids, an accepted Gibbs free energy of formation was selected for each solid phase based on the recentness of the tabulated data and on considerations of internal consistency with respect to both the published tabulations and the existing data in WATEQ3. DOE

N83-32160# Bergbau-Forschung G m b H., Essen (West Germany).
SYSTEMATIC STUDIES ON COALS OF DIFFERENT DEPOSITS, INCLUDING THEIR MINERAL MATTER Final Report, Mar. 1982
L. KUEHN, H PLOGMANN, R. W. SCHLIEPHAKE, and E. WOLFF-FISCHER Bonn Bundesministerium fuer Forschung und Technologie Apr. 1983 84 p refs In GERMAN, ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-068; ISSN-0340-7608) Avail NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17,50

Coal petrology and mineralogy of coal samples from various deposits of different geological age are discussed. Degree of reflexion and maceral group composition, content of macerals and maceral-types of the vitrinite and inertinite group (coking and hydrogenation); degree of bituminization of vitrinites (coking and hydrogenation); and intergrowth of macerals in coal-grains (coking and gasification) were studied. Methods of determining mineral matter of coal were improved, especially for clay minerals An illite from the productive carboniferous of the Ruhr region was chemically characterized. The behavior of mineral matter during hydrogenation and allothermal gasification with water vapor was investigated on residues of pilot plants Author (ESA)

N83-32164# Utah State Univ., Logan Water Research Lab.
EVALUATION OF WATER CONSERVATION TECHNIQUES IN THE UPPER COLORADO RIVER BASIN
R. NARAYANAN and D. R. FRANKLIN Dec. 1982 50 p refs
(Contract DI-14-34-0001-9137)
(PB83-175315; UWRL/P-82/07, W83-02186; OWRT-B-185-UT(1)) Avail NTIS HC A03/MF A01 CSCL 08H

The Upper Colorado River Basin contains large deposits of oil shale, tar sands, crude oil, coal, and natural gas. Agriculture still accounts for 90 percent of the water depletions, but future development of these energy resources is expected to take increasing amounts of water. A mixed integer programming model was used to maximize returns to land, water, and mineral resources The results were used to assess the need for government sponsored water conservation measures to supplement water saving techniques employed by the private sectors in response to increased water prices. The feasibilities of various water saving techniques by industries and of various government sponsored water conservation measures were examined within a benefit cost analysis framework. Author (GRA)

N83-32193# KVB, Inc., Irvine, Calif.
NO-X EMISSIONS FROM PULVERIZED-COAL ARCH-FIRED BOILERS Final Report
T. W. SONNICHSEN Dec 1982 118 p refs Sponsored by EPRI
(Contract EPRI PROJ 1339-1)
(DE83-901472; EPRI-CS-2813) Avail: NTIS HC A06/MF A01

A study has been conducted to assess the NO/sub x/ emission characteristics of three subbituminous pulverized-coal arch-fired utility boiler configurations. These boiler arrangements are unique in that the coal is introduced downward from the arch into the furnace with the bulk of the combustion air added through the front wall perpendicular to the flame jet Inherent staged combustion conditions are thereby generated which have been shown to be conductive to low NO/sub x/ emissions The intent of the program was to evaluate these designs as alternatives to developing low NO/sub x/ combustion systems and, if appropriate, suggest adoption of the combustion conditions in these boilers to the design of modern utility boilers Field tests were conducted to determine as found NO/sub x/ emission levels and the influence of combustion modifications on these emissions. NO/sub x/ levels (corrected to 3% O2) ranged rom 200 ppM to 350 ppM DOE

N83-32224# California Univ, Livermore. Lawrence Livermore Lab.
AIRBORNE-TEMPERATURE-SURVEY MAPS OF HEAT-FLOW ANOMALIES FOR EXPLORATION GEOLOGY
N K DELGRANDE 9 Jul. 1982 4 p Presented at the 2nd Thematic Conf. Remote Sensing for Exploration Geology, Fort Worth, Tex, 6-10 Dec 1982
(Contract W-7405-ENG-48)
(DE82-019111; UCRL-87802, CONF-821204-1) Avail: NTIS HC A02/MF A01

Airborne temperature surveys were used to depict the small surface temperature differences related to heat flow anomalies. Zones with conductive heat flow differences of 45 + or - 16 micro cal/ sq cm had predawn surface temperature differences of 1.4 + or - 0.3 C. Airborne temperature surveys were coordinated with field temperature surveys at the site of a known geothermal resource area The airborne temperature surveys recorded redundant, predawn temperatures at two wavelengths and at two elevations Overall temperature corrections were determined by calibrating dry soil surface temperatures with thermistor probes. The probes measured air and soil temperatures within 2 cm of the surface, every twenty minutes, during the survey overflights DOE

N83-32573# Hanford Engineering Development Lab, Richland, Wash
ASSESSMENT OF SPENT-FUEL WASTE-FORM/STABILIZER ALTERNATIVES FOR GEOLOGIC DISPOSAL
R. E. EINZIGER and D. A HIMES Sep. 1982 171 p refs
(Contract DE-AC06-76FF-02170)
(DE83-002458; HEDL-TME-81-43) Avail NTIS HC A08/MF A01

The possibility of burying canisterized unreprocessed spent fuel in a deep geologic repository is studied One aspect is an assessment of the possible spent fuel waste forms. The fuel performance portion was to evaluate five candidate spent fuel waste forms for postemplacement performance with emphasis on their ability to retard the release of radionuclides to the repository geology Spent fuel waste forms under general consideration were: (1) unaltered fuel assembly, (2) fuel assembly with end fittings removed to shorten the length, (3) rods vented to remove gases and resealed; (4) disassembled fuel bundles to close pack the rods, and (5) rods chopped and fragments immobilized in a matrix material DOE

N83-32624# SRI International Corp, Menlo Park, Calif
IDENTIFICATION AND CLEAVAGE OF BREAKABLE SINGLE BONDS BY SELECTING OXIDATION, REDUCTION AND HYDROLYSIS Quarterly Report, 1 Jul. - 31 Oct. 1982
A S HIRSCHON, J. ZEVELY, and F. R. MAYO 14 Jan. 1983 25 p refs
(Contract DE-AC22-78ET-11423)
(DE83-005312; DOE/ET-11423/T6; QR-16) Avail: NTIS HC A02/MF A01

Efforts were made to establish the presence of diarylmethane groups in coal by oxidations of the corresponding ketones with m-chloroperbenzoic acid. No evidence of such groups was found. Black acids from a nitric acid oxidation of EDA/DMSO-extracted coal were examined for ketone groups, using the oxime and infrared absorption; no ketone or oxime was found Reactions of a TIPS fraction with pyridine hydroiodide in pyridine, hydrogen iodide (HI) in toluene, and by aqueous hydrogen iodide were examined using molecular weight changes, vapor-phase osmometry (VPO), gel permeation chromatography (GLC), and iodine incorporation. Reactions with pyridine hydroiodide were complete and fairly consistent, with incorporation of about one iodine atom for each new molecule formed. Reactions in toluene and water were incomplete. DOE

N83-32874# Argonne National Lab , Ill. Chemical Technology Div.
EXPLORATORY AND BASIC FLUIDIZED-BED COMBUSTION STUDIES Annual Report, Oct. 1980 - Sep. 1981
I JOHNSON, K. M. MYLES, D. C. FEE, D. C. MOULTON, J A. SHEARER, G. W. SMITH, C. B. TURNER, and W I WILSON Dec. 1982 80 p refs
(Contract W-31-109-ENG-38)
(DE83-008725; ANL/FE-82-4) Avail: NTIS HC A05/MF A01

Development work was done in support of atmospheric and pressurized fluidized bed combustion Sulfur retentions obtained in fluidized bed combustors were compared with results obtained by thermogravimetric analysis to identify the reasons for discrepancies in results from the two sulfation devices. In other work, basic studies and engineering studies were performed on the process for enhancing limestone sulfation by hydrating partially sulfated stone. Other laboratory studies were carried out to determine the effect of attrition on the particle size distribution of sorbents in a pneumatic transport system and why some stones exhibit popping (explosive disintegration) when subjected to shock calcination and some do not DOE

N83-32876# California Univ., Livermore. Lawrence Livermore Lab
HIGH-PRESSURE PYROLYSIS OF COLORADO OIL SHALE
A. K. BURNHAM and M. F. SINGLETON Oct. 1982 22 p refs Presented at Am Chem Soc Meeting, Seattle, 20 Mar 1982 Revised
(Contract W-7405-ENG-48)
(DE83-001496; UCRL-88127-REV-1; CONF-820399-1-REV-1)
Avail NTIS HC A02/MF A01

Rates of oil evolution and oil yields and compositions are reported for heating rates from 1 to 100 C/min and pressures up to 27 atm. Pyrolysis occurs in an autogenous atmosphere and generated products are allowed to escape the pyrolysis region continuously. Both higher pressures and lower heating rates cause a decrease in oil yield, although the effects are not additive. The lowest oil yield was approximately 72 wt% or 79 vol% of Fischer assay. Lower oil yield is generally accompanied by lower nitrogen content and density and higher H/C ratios The high pressure/slow heating rate oils are a clear amber color instead of the usual opaque brown. The effect of pyrolysis conditions on biological markers and other diagnostic hydrocarbons was demonstrated. DOE

N83-32877# Argonne National Lab., Ill. Chemical Engineering Div
DISCHARGE AND HANDLING OF SOLIDS FROM PRESSURIZED FLUIDIZED-BED COMBUSTORS
J. E. HANWAY and W. F PODOLSKI Oct. 1982 63 p refs
(Contract W-31-109-ENG-38)
(DE83-005941, ANL/CEN/FE-81-3) Avail: NTIS HC A04/MF A01

The discharge and handling of spent solids from pressurized fluidized bed combustors (PFBCs) are important functional aspects of operating units. If PFBC technology is to be readily accepted commercially, simple, functional, and reliable methods fo the discharge and handling of solids from pressurized vessels must be available. The status of solids discharge and handling in pressurized fluidized bed systems is assessed It traces the historical evolution of solids discharge and handling methods, relates these developments to present usage, evaluates the commercial suitability of current and proposed methods, and outlines the effort believed necessary to develop commercially acceptable systems. DOE

N83-32879# Oak Ridge National Lab., Tenn
EXAMINATION OF SHORT-CONTACT-TIME COAL LIQUEFACTION PRODUCT STABILITY
R M. WHAM, B. R RODGERS, and G. C FRAZIER 1982 24 p refs Presented at Ann Meeting of Heat Transfer and Energy Conversion, Los Angeles, 14 Nov 1982
(Contract W-7405-ENG-26)
(DE83-003415, CONF-821106-17-DRAFT) Avail: NTIS HC A02/MF A01

An experimental apparatus for producing short contact time (SCT) coal liquefaction material was assembled to replace tubing bomb microreactors. The apparatus consists of a 300 cubic autoclave, coal delivery equipment, temperature monitoring and control equipment, and gas traps for venting gaseous reaction products. Additionally, methods for evaluation of short contact time liquefaction products were reviewed and evaluated for applicability to this project. The results of elemental analysis; time-temperature profiles; fractionation into oils, asphaltenes, preasphaltenes, and residue, and high performance liquid chromatography are discussed The applicability of the analysis methods to developing correlations relating short contact time liquefaction products to process conditions is also discussed. Finally, preliminary data from 19 cubic tubing bomb microreactors are discussed Differences in operation of the 300 cm autoclave and the 19 microreactors are compared. DOE

N83-32887# Brookhaven National Lab., Upton, N. Y. Process Sciences Div
FLASH METHANOLYSIS OF WOOD FOR THE PRODUCTION OF FUELS AND CHEMICALS
M STEINBERG, P T FALLON, and M S SUNDARAM 1983 26 p refs Presented at the Energy from Biomass and Wastes Symp., Lake Buena Vista, Fla , 24 Jan 1983
(Contract DE-AC02-76CH-00016)
(DE83-006218, BNL-32400; CONF-830114-4) Avail: NTIS HC A03/MF A01

Biomass in the form of less than 1000 micron oven dried fir wood particles was flash pyrolyzed in the presence of methane (methanolysis) in a downflow 1 in I.D. tubular reactor at pressures of 20 to 200 psi and temperatures between 800 and 1050 C. The major products were benzene, toluene and xylene (BTX), a heavy oily liquid, ethylene and carbon monoxide As much as 12% of the available carbon in the wood was converted to BTX, 21% to the ethylene and 48% to carbon monoxide at 50 psi and 1000 C. The maximum heavier oil yield of 11% was observed at 50 psi and 800 C. Wood particle residence times for all experiments were calculated to be less than 1 second at 20 and 50 psi and up to 2.8 sec at 200 psi The yields were found to be greatly influenced by the methane to wood feed ratio Experiments were conducted to insure the results to be that produced from the wood and methane and not a catalytic effect of the reactor wall of foreign matter DOE

N83-32889# Sandia Labs., Livermore, Calif Combustion Sciences Directorate
TEMPERATURE AND REACTION RATE OF BURNING PULVERIZED FUELS
R E MITCHELL and W. J. MCLEAN Nov. 1982 29 p refs Presented at the 19th Intern. Symp on Combustion, Haifa, Israel, 8-13 Aug 1982
(Contract DE-AC04-76DP-00789)
(DE83-004128; SAND-82-8657; CONF-820801-14) Avail: NTIS HC A03/MF A01

A two-color pyrometer technique has been used to measure the temperature of burning pulverized fuel particles flowing in dilute suspension on the centerline of a laminar flow reactor. The transparent reactor is fed by a premixed flat flame fueled with CH4-H2O2-N2 mixtures, which permit widely variable post-flame temperatures and oxygen concentrations to be obtained Planck's law and the gray body assumption (verified here by measurements) are used to compute particle temperatures, and the average temperature is then determined by averaging the values for some 500 individual particles Particle temperatures have been

determined for various gas temperatures over a range of oxygen mole fractions from 0 to 0 2 for size-graded (90 micron mean diameter) samples of a petroleum coke and a flash pyrolysis char Particle burning rates per unit external surface area were determined from the measured temperatures by a heat balance analysis. DOE

N83-32894# California Univ , Berkeley Lawrence Berkeley Lab Materials and Molecular Research Div.
HIGH-PRESSURE PHASE EQUILIBRIA FOR THE WATER/METHANE SYSTEM
E. R. LARSEN and J M PRAUSNITZ Jan 1983 56 p refs Presented at the Am. Inst of Chem. Engrs. Natl. Meeting, Houston, Tex., 27-31 Mar. 1983
(Contract DE-AC03-76SF-00098)
(DE83-009055, LBL-15501, CONF-830308-7) Avail: NTIS HC A04/MF A01

A semitheoretical method was established for superimposing the residual thermodynamic properties of pure methane and of pure water over wide rangs of pressure (0 01 to 1000 MPa) and temperature (triple point to twice the critical temperature) Using reasonable mixing rules with two binary parameters, this superposition also gives mixture properties, including high pressure vapor liquid equilibria DOE

N83-32896# Los Alamos Scientific Lab , N. Mex.
NONLINEAR OPTIMIZATION APPLIED TO CHEMICAL-EQUILIBRIUM PROBLEMS
W J PARKINSON and J. G. SANDERSON Mar. 1983 36 p refs
(Contract W-7405-ENG-36)
(DE83-009631, LA-9670-MS) Avail NTIS HC A03/MF A01

Computational procedures for solving nonlinear complex chemical equilibrium problems were investigated Two problems were chosen Problem 1 dealt with the methanation reaction and the water gas shift reaction. Problem 2 dealt with three coal gasification reactions, hydrogen and oxygen reacting with pure carbon. The problem solution is equilibrium composition at a given temperature and pressure Each problem was posed in three different ways (1) the K value method solved by Newton's method, (2) minimization of Gibbs free energy as a constrained minimization problem with Lagrange multipliers using Newton's method to find the roots, and (3) minimization of the system Gibbs free energy as an unconstrained optimization problem, with constraints added as penalty functions. The function minimum was sought using a quasiNewton method Problem 1 was solved by methods 1 and 2, but could not be solved by method 3. Problem 2 was solved by method 1 only if simplifying assumptions were made. Method 2 solved problem 2 if the initial guess was close to the solution. Method 3 sometimes found an approximate solution to Problem 2. DOE

N83-32901# California Univ , Berkeley Lawrence Berkeley Lab.
VACUUM ETHANOL DISTILLATING TECHNOLOGY
B L MAIORELLA, B W BLANCH, and C. B WILKE Mar. 1983 166 p refs Sponsored in part by Midwest Research Inst.
(Contract DE-AC03-76SF-00098)
(DE83-011082, LBL-15752) Avail: NTIS HC A08/MF A01

The design principles for one particularly efficient distillation arrangement employing available technology are illustrated The newly developed temperature dependent UNIQUAC vapor/liquid equilibrium computation methods are utilized in the design of a minimum cost distillation plant for the production of 100 million liters per year of 96 wt % ethanol product. Vacuum distillation and vapor reuse methods are employed These methods combine synergistically to reduce the distillation energy requirement in concentrating dilute beer feeds The vapor reuse methods are then extended to demonstrate how 99 9 wt % ethanol are then produced at virtually no additional energy cost DOE

N83-32905# Illinois Inst of Tech , Chicago. Dept of Chemical Engineering.
FLUIDIZATION USING NON-EQUILIBRIUM THERMODYNAMICS Final Report, 1 Jul. 1981 - 30 Jun. 1982
D GIDASPOW Jun 1982 115 p refs Sponsored by Gas Research Inst
(PB83-195438; GRI-81/0131) Avail NTIS HC A06/MF A01 CSCL 21B

A hydrodynamic theory of fluidization was developed and compared with experimental evidence. A hydrodynamic theory of fluidization will permit a more rational scale up of many coal conversion processes In this approach the mixing of the solids and gases is theoretically determined rather than expressed in terms of empirically determined transfer coefficients as is done in most modeling studies dealing with reactor scale up and design GRA

N83-32961# Tate and Lyle Technical Services Ltd., Coral Gables, Fla
A REPORT ON THE ENGINEERING AND ECONOMICS OF AN ETHANOL/GASOHOL JOINT-VENTURE PROJECT WITH CALDWELL SUGARS CO-OP, INC. AT THIBODAUX, LOUISIANA. VOLUME 4: SUPPORTING DOCUMENTATION
Apr. 1982 126 p Prepared in cooperation with Independence Energy Co., Inc.
(Contract DE-FG07-81RA-50338)
(DE83-001200, DOE/RA-50338/1-VOL-4) Avail NTIS HC A07/MF A01

Supporting documentation is given for a project for producing ethanol/gasohol at a Louisiana sugar factory. Areas covered include: project manpower and organization, the market for gasohol in Louisiana, socio-economic impact assessment, feasibility study approach, commercial viability, environmental, health, safety, and socio-economic assessments DOE

N83-32962# Midwest Research Inst , Golden, Colo. Solar Energy Research Inst
MEMBRANE RESEARCH SUBTASK, ALCOHOL-FUELS PROGRAM. REPORT: FY 1982
P SCHISSEL Apr. 1983 46 p refs
(Contract DE-AC02-77CH-00178)
(DE83-010324) Avail: NTIS HC A03/MF A01

A first step toward the evaluation of membranes is to separate ethanol/water mixtures over a range of feed composition, temperature, and pressure. This has been accomplished for an initial set of commercially available membranes using reverse osmosis and pervaporation. Two membrane types (UOP, Inc RC100 and FilmTec FT30) have performed well Under reverse osmosis conditions the trends of product fluxes and separation factors are similar for the two types, however, FT30 is somewhat better in both categories. The flux and separation factors decrease rapidly as the wt % ethanol is increased, and water is always selectively permeated Fluxes remain at an acceptable level over a wide concentration range, however, the separation factor becomes unacceptably low as the effects of osmotic pressure become predominant (15 to 30 wt % ethanol). This report discusses several methods that can overcome the limitations by osmotic pressure. Pervaporation apparatus was designed, fabricated, installed, and used to test the membrane set. DOE

N83-32964# Air Products and Chemicals, Inc., Allentown, Pa
LIQUID PHASE METHANOL PROCESS DEVELOPMENT UNIT: INSTALLATION, OPERATION, AND SUPPORT STUDIES Annual Technical Progress Report, 28 Sep. 1981 - 30 Sep. 1982
20 Oct. 1982 468 p refs Prepared in cooperation with Chem Systems, Inc., N Y.
(Contract DE-AC22-81PC-30019)
(DE83-010228; DOE/PC-30019/T5; ATPR-4) Avail: NTIS HC A20/MF A01

The technical feasibility of indirect coal liquefaction using the Liquid Phase Methanol (LPMeOH) process is discussed. A unified design strategy was adopted to allow the Process Development Unit (PDU) to be capable either of liquid-fluidized or liquid-entrained

operation Heat and material balances were calculated for eight design cases. The final PDU design basis was established. A Design Hazards Review was conducted. The Texas Air Control Board granted an exemption from construction and operating permits. The data acquisition system and 80% of all equipment items required are on hand or in the procurement stage. Eighteen (18) items are being reused from the Chicago Liquid Phase Methanation Unit (LPM) or the Bruceton Synthoil Facility Equipment being reused from the Chicago LPM unit was shipped to LaPorte. For the CSI Laboratory PDU modifications, the piping and instrumentation diagram equipment layout, and piping drawings were completed and major equipment was ordered Testing of in situ catalyst reduction/activation was completed on the first commercial catalyst candidate. DOE

N83-32967# ESCOR, Inc , Northfield, Ill.
LANDFILL METHANE RECOVERY. PART 2: GAS CHARACTERIZATION Final Report, Dec. 1981 - Dec. 1982
G. R LYTWYNYSHYN, R. E ZIMMERMAN, N. W FLYNN, and R WINGENDER Dec 1982 146 p refs Sponsored in part by Gas Research Inst. *Prepared in cooperation with Argonne National Lab*
(Contract W-31-109-ENG-38)
(PB83-195420, GRI-81/0105-PT-2) Avail NTIS HC A07/MF A01 CSCL 21D

This study developed standardized landfill gas sampling and analytical procedures, and evaluated the feasibility of implementing the procedures at different laboratories. It developed a data base on the the amounts of volatile organic compounds and violatile mercury in raw, processed and surface landfill gas; and determined whether human pathogenic viruses and bacteria are present in the gas. Surface gas flux measurements were also made Results from this project provide an information base for the landfill methane recovery industry from which an increased understanding and resolution of the environmental issues can be achieved GRA

N83-32968# SRI International Corp , Menlo Park, Calif
ELEMENTARY PROCESSES IN THE CATALYTIC COMBUSTION (MECHANISM, INTERMEDIATES AND CONTROLLING REACTIONS) Annual Report, Oct. 1981 - Sep. 1982
H. WISE Dec. 1982 52 p refs Sponsored by Gas Research Inst.
(PB83-194944; GRI-81/0121; PYH-3671) Avail NTIS HC A04/MF A01 CSCL 21D

The surface reactions involved in the catalytic oxidation of methane were examined on a molecular scale by Auger electron microscopy, and on a macroscopic scale by transient experiments. In platinum and nickel, oxygen adatoms are necessary to initiate the conversion of methane by hydrogen abstraction an iridium surface hydrogen abstraction occurs without the participation of oxygen adatoms Nickel has two types of oxygen adspecie. The relative distribution is governed by the degree of surface coverage with oxygen. GRA

N83-33128*# Life Systems, Inc., Cleveland, Ohio
INVESTIGATION OF THE APPLICABILITY OF USING THE TRIPLE REDUNDANT HYDROGEN SENSOR FOR METHANE SENSING Final Report
J B. LANTZ and R. A. WYNVEEN Apr. 1983 62 p refs
(Contract NAS9-16638)
(NASA-CR-171694; NAS 1 26:171694, LSI-TR-530-4) Avail: NTIS HC A04/MF A01 CSCL 14B

Application specifications for the methane sensor were assembled and design guidelines, development goals and evaluation criteria were formulated. This was done to provide a framework to evaluate sensor performance and any design adjustments to the preprototype sensor that could be required to provide methane sensitivity Good response to hydrogen was experimentally established for four hydrogen sensor elements to be later evaluated for methane response Prior results were assembled and analyzed for other prototype hydrogen sensor performance parameters to form a comparison base. The four sensor elements previously shown to have good hydrogen response were experimentally evaluated for methane response in 2 5% methane-in-air. No response was obtained for any of the elements, despite the high methane concentration used (50% of the Lower Flammability Limit). It was concluded that the preprototype sensing elements were insensitive to methane and were hydrogen specific. Alternative sensor operating conditions and hardware design changes were considered to provide methane sensitivity to the preprototype sensor, including a variety of different methane sensing techniques. Minor changes to the existing sensor elements, sensor geometry and operating conditions will not make the preprototype hydrogen sensor respond to methane. New sensor elements that will provide methane and hydrogen sensitivity require replacement of the existing thermistor type elements. Some hydrogen sensing characteristics of the modified sensor will be compromised (larger in situ calibration gas volume and H2 nonspecificity). The preprototype hydrogen sensor should be retained for hydrogen monitoring and a separate methane sensor should be developed Author

N83-33137*# National Aeronautics and Space Administration Pasadena Office, Calif.
PORTABLE LASER REMOTE SYSTEM FOR METHANE GAS DETECTION Patent Application
W B. GRANT (JPL, Pasadena, Calif) and E D. HINKLEY, JR , *inventors (to NASA) (JPL, Pasadena, Calif)* 24 Sep. 1982 30 p Sponsored by NASA
(NASA-CASE-NPO-15790-1, US-PATENT-APPL-SN-423016)
Avail NTIS HC A03/MF A01 CSCL 20E

The transmitter for a portable system for the remote detection of methane gas leaks and concentrations includes two lasers, tuned respectively to a wavelength coincident with a strong absorption line of methane and a reference wavelength which is weakly absorbed by methane gas The lasers are aimed at a topographical target along a system axis and the beams successively interrupted by a chopper wheel The system receiver includes a spherical mirror for collecting the reflected laser radiation and focusing the collected radiation through a narrowband optical filter onto an optical detector The filter is tuned to the wavelength of the two lasers, and rejects background noise to substantially improve the signal-to-noise ratio of the detector The output of the optical detector is processed by a lock-in detector synchronized to the chopper, and which measures the difference between the first wavelength signal and the reference wavelength signal NASA

N83-33168*# Santa Clara Univ., Calif
AN ANALYTICAL INVESTIGATION OF NO SUB X CONTROL TECHNIQUES FOR METHANOL FUELED SPARK IGNITION ENGINES
L. H. BROWNING and L. A ARGENBRIGHT 1983 8 p refs
(Contract NAG3-143)
(NASA-CR-172847; NAS 1.26:172847) Avail: NTIS HC A02/MF A01 CSCL 13I

A thermokinetic SI engine simulation was used to study the effects of simple nitrogen oxide control techniques on performance and emissions of a methanol fueled engine As part of this simulation, a ring crevice storage model was formulated to predict UBF emissions. The study included spark retard, two methods of compression ratio increase and EGR The study concludes that use of EGR in high turbulence, high compression engines will both maximize power and thermal efficiency while minimizing harmful exhaust pollutants. Author

N83-33303# Sandia Labs , Albuquerque, N. Mex.
STRATEGIC PETROLEUM RESERVE (SPR) OIL STORAGE CAVERN SULPHUR MINES 2-4-5 CERTIFICATION TESTS AND ANALYSIS. PART 1: 1981 TESTING. PART 2: 1982 TESTING
R. R BEASLEY Dec. 1982 143 p refs
(Contract DE-AC04-76DP-00789)
(DE83-005347; SAND-81-2070) Avail: NTIS HC A07/MF A01

Well leak tests and a cavern pressure were conducted. The tests did not indicate conclusively that there was no leakage from the cavern, but the data indicate that cavern structural failure during oil storage is unlikely The test results indicated that retesting and well workover were desirable prior to making a decision on the cavern use Further tests indicated that there was no significant leakage from wells 2 and 4 ut that the leakage from wells 2A and 5 exceeded the DOE criterion Because of the proximity of cavern 2-4-5 to the edge of the salt, this cavern should be considered for only one fill/withdrawal cycle prior to extensive reevaluation.
DOE

N83-33304# Department of Energy, Dallas, Tex. Energy Information Administration.
PRODUCTION DECLINE OF US SURVEILLANCE OIL FIELDS
J. H. WOOD and M. CARRALES, JR. Aug. 1982 129 p refs
(DE83-006532; DOE/EIA-0352) Avail: NTIS HC A07/MF A01

An analysis is presented of the oil production from the larger domestic fields (surveillance fields), post-1973 fields, smaller fields and lease condensate from gas fields, and total fields at the national, state, and district level. The resulting estimates of oil production for 1981, 1982, and 1983 are included. Estimates were developed separately for the North Slope, subarctic Alaska, each of the 21 states, and for each Texas Railroad Commission district. The individual states and subarctic Alaska estimates were summed to get the subarctic US estimates. The estimates for the North Slope of Alaska were added to this sum to get the US total.
DOE

N83-33308# Department of Energy, Laramie, Wyo. Energy Technology Center.
PRIMARY OIL-SHALE RESOURCES OF THE GREEN RIVER FORMATION IN THE EASTERN UINTA BASIN, UTAH
L. G TRUDELL, J. W SMITH, T N. BEARD, and G. M MASON Apr. 1983 138 p refs
(DE83-009081; DOE/LC/RI-82/4) Avail: NTIS HC A07/MF A01

Resources of potential oil in place in the Green River Formation were measured and estimated for the primary oil shale resource area east of the Green River in Utah's Uinta Basin. The area evaluated includes most of Utah's oil shale resource. For resource evaluation the principal oil shale section is divided into 10 stratigraphic units which are equivalent to units previously evaluated in the Piceance Creek Basin of Colorado. Detailed evaluation of individual oil shale units sampled by cores, plus estimates by extrapolation into uncored areas indicate a total resource of 214 billion barrels of shale oil in place in the eastern Uinta Basin.
DOE

N83-33309# Department of Energy, Washington, D. C. Office of Oil and Gas
PETROLEUM RESOURCES OF THE NORTH SEA
W. D. DIETZMAN, N R. RAFIDI, and T. A ROSS Feb. 1983 100 p refs
(DE83-010200; DOE/EIA-0381) Avail: NTIS HC A05/MF A01

The potential future oil supply capability from the North Sea was analyzed. Presented herein are estimates of: (1) original oil in place; (2) ultimate recovery; (3) remaining recoverable oil, and (4) projected supply patterns over time. It is indicated that the estimated remaining recoverable oil in the area from known deposits is about 25.6 billion barrels as of January 1, 1982, and the total undiscovered recoverable oil has an estimated statistical mean value of 19.9 billion barrels with 12.7 billion barrels of that amount occurring below the 62nd parallel Substantial additional producing capacity might be developed, about 2 0 million barrels of oil per day and perhaps higher, especially from the United Kindgom and Norwegian sectors of the northern North Sea basin Cumulative production to January 1, 1982, was 3 6 billion barrels, giving a total estimated ultimate oil recovery of 29 1 billion barrels and a recovery efficiency of 30.5 % of the original oil in place. From an estimated total resource base of 41.9 billion barrels of recoverable oil below the 62nd parallel, an estimated theoretical peak production rate of 4.3 million barrels of oil per day could be obtained and might occur as early as 1990 It is estimated that a theoretical peak production rate of 5.1 million barrels of oil per day might be obtained with the peak occurring in 1991. DOE

N83-33311# Virginia Univ., Charlottesville. School of Engineering and Applied Science.
DEVELOPMENT OF THE SCHLADITZ OIL BURNER
H. J. SCHLADITZ May 1982 28 p Prepared for Brookhaven National Lab., Upton, N.Y
(Contract DE-AC02-76-CH-00016)
(BNL-51549) Avail: NTIS HC A03/MF A01

Two conventional residential oil burners were successfully modified using the Schladitz heat exchanger technology so that they burn with a stable, highly efficient flame. One burner operates at a fixed rate of 0.2 gph. The other can be operated at any flow rate from 0.1 to 0.6 gph Author

N83-33312# Foster-Miller Associates, Inc , Waltham, Mass
A LOW INPUT, VARIABLE FIRING RATE, OIL-FIRED BURNER Final Report
C F. MARIANO May 1982 35 p Prepared for Brookhaven National Lab., Upton, N.Y.
(Contract DE-AC02-76CH-00016)
(BNL-51558) Avail: NTIS HC A03/MF A01

A prototype low input, VFR oil burner was developed which vaporizes the fuel and mixes it with air prior to combustion. The resulting flame is sootless, odorless, quiet, and efficient (only 5 to 10% excess air). The turndown range is 6:1 and could be extended to 12:1. At 14.25% CO2, the NOx level is typical for a standard gas burner firing at 12% CO2, this is a slight improvement, considering the higher flame temperature of the prototype burner.
Author

N83-33317*# Physical Sciences, Inc., Andover, Mass
ADVANCED COAL GASIFIER-FUEL CELL POWER PLANT SYSTEMS DESIGN Final Report
M. E. HELLER Jan 1983 91 p refs
(Contract NAS7-918; JPL-956332)
(NASA-CR-172986; JPL-9950-789; NAS 1.26:172986; PSI-TR-360)
Avail: NTIS HC A05/MF A01 CSCL 10B

Two advanced, high efficiency coal-fired power plants were designed, one utilizing a phosphoric acid fuel cell and one utilizing a molten carbonate fuel cell Both incorporate a TRW Catalytic Hydrogen Process gasifier and regenerator. Both plants operate without an oxygen plant and without requiring water feed; they, instead, require makeup dolomite Neither plant requires a shift converter; neither plant has heat exchangers operating above 1250 F. Both plants have attractive efficiencies and costs. While the molten carbonate version has a higher (52%) efficiency than the phosphoric acid version (48%), it also has a higher ($0.078/kWh versus $0.072/kWh) ten-year levelized cost of electricity. The phosphoric acid fuel cell power plant is probably feasible to build in the near term. questions about the TRW process need to be answered experimentally, such as weather it can operate on caking coals, and how effective the catalyzed carbon-dioxide acceptor will be at pilot scale, both in removing carbon dioxide and in removing sulfur from the gasifier. Author

N83-33341*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CALIFORNIA METHANOL ASSESSMENT. VOLUME 2: TECHNICAL REPORT
R. OTOOLE, E. DUTZI, R. GERSHMAN, R. HEFT, W KALEMA, and D. MAYNARD Mar. 1983 646 p refs Sponsored by NASA Prepared in cooperation with California Inst of Tech, Pasadena 2 Vol
(NASA-CR-172991; JPL-5030-562-VOL-2; JPL-PUB-83-18-VOL-2; NAS 1.26:172991) Avail: NTIS HC A99/MF A01 CSCL 10A

Energy feedstock sources for methanol; methanol and other synfuels; transport, storage, and distribution; air quality impact of methanol use in vehicles, chemical methanol production and use; methanol utilization in vehicles, methanol utilization in stationary applications; and environmental and regulatory constraints are discussed. Author

N83-33344# Oak Ridge Associated Universities, Tenn. Manpower Education, Research and Training Div
ASSESSMENT OF BENEFIT-COST ANALYSIS FOR COAL-EXTRACTION R AND D
J. G. BAKER, W. STEVENSON, and S. E. REYNOLDS Oct. 1982 38 p refs
(Contract DE-AC05-76OR-00033)
(DE83-004749; ORAU-207) Avail NTIS HC A03/MF A01

This report has two purposes: (1) to discuss guidelines for applying traditional benefit-cost analysis to coal extraction R and D based on a literature review; and (2) to present a critique of Benefit-Cost Analysis of the Coal Extraction R and D Program, a study by the Mitre Corporation completed in 1976. The guidelines include the strengths, weaknesses, omissions, and limitations of benefit-cost methods as a means to rank coal extraction R and D, including those characteristics that are common to all benefit-cost studies and those that are uniquely related to coal extraction R and D. Suggestions are made for solutions to problems and limitations of the traditional benefit-cost method, and the usefulness of benefit-cost methods as a means of ranking competing coal R and D programs is assessed. DOE

N83-33348# Cornell Univ., Ithaca, N.Y. Dept. of Entomology.
ENERGETIC AND ENVIRONMENTAL ASPECTS OF UTILIZING CROP AND FOREST RESIDUES FOR BIOMASS ENERGY Final Report
D. PIMENTEL, S. FAST, D GALLAHAN, and M. A. MORAN Feb. 1983 119 p refs
(Contract DE-AC02-81ER-60002)
(DE83-008178; DOE/ER-60002/1) Avail: NTIS HC A06/MF A01

Crop and forest residues which are essential to protect the soil from erosion and rapid water runoff and to maintain soil organic matter and nutrients are discussed. Only an estimated 20% of the total residues remaining after harvest can be utilized for fuel conversion because of environmental limitations and the impracticality of harvesting residues on some lands The residues available for biomass energy could produce a maximum amount of gross energy equal to either 232 million barrels of high grade liquid fuel, 5% of the electrical energy, or 1.5% of total US energy if residues were used as heat. The net yields of energy from the residues, however, would range from only 10 to 50% of the gross because of the large energy inputs for harvesting, hauling, nutrient replacement, and processing. Although these potential contributions to US energy needs are relatively small, it is renewable energy and therefore has some long term value to the nation's energy program. DOE

N83-33352# Deutsche Shell A.G., Hamburg (West Germany). Aktuelle Wirtschaftsanalysen.
FUELS FOR THE MARKETS OF TOMORROW [KRAFTSTOFFE FUER DEN MARKT VON MORGEN]
Dec. 1982 25 p In GERMAN
Avail: NTIS HC A02/MF A01

The possibilities and limitations of gasoline, diesel fuels, and alternative fuels for motor vehicles are reviewed. Author (ESA)

N83-33353# Kraftwerk Union A.G. Reaktortechnik, Erlangen (West Germany). Hauptbereich Vertrieb.
DEVELOPMENT OF WEAR RESISTANT GAS TURBINES DOWNSTREAM OF A PRESSURIZED FLUIDIZED BED COMBUSTOR Final Report, Feb. 1982
B. RUKES Bonn Bundesministerium fuer Forschung und Technologie Apr. 1983 162 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-045; ISSN-0340-7608) Avail: NTIS HC A08/MF A01, Fachinformationszentrum, Karlsruhe, West Germany DM 32,60

The development of a wear resistant gas turbine, suitable for use in the aggressive gas atmosphere downstream of a pressurized fluidized bed combustor, is studied. The parameters which influence the wear characteristics of gas turbine blades in strongly erosive and corrosive gas atmospheres were investigated. Results show that it is possible, with a corresponding hot gas cleanup system, to construct a wear resistant gas turbine. A test program which includes heating tests, wear-test, and blade cooling tests is outlined. A design for a wear-test facility which permits the study of the combined erosion/corrosion attack on a rotating specimen-carrying disk is suggested. Author (ESA)

N83-33476# Los Alamos Scientific Lab., N. Mex.
QUARTZ DISSOLUTION AND SILICA DEPOSITION IN HOT-DRY-ROCK GEOTHERMAL SYSTEMS Thesis
B. A. ROBINSON Jul 1982 144 p refs
(Contract W-7405-ENG-36)
(DE83-004997; LA-9404-T) Avail: NTIS HC A07/MF A01

The kinetics of quartz dissolution control the produced fluid dissolved silica concentration in geothermal systems in which the downhole residence time is finite. The produced fluid of the Phase I, Run Segment 5 experimental Hot Dry Rock (HDR) geothermal system at Fenton Hill, NM, was undersaturated with respect to quartz in one pass through the reservoir; suggesting that the rate of granite dissolution governed the outlet dissolved silica concentration in this system. The literature data for the rate of quartz dissolution in water from 65 to 625 C is correlated using an empirical rate law which is first order in quartz surface area and degree of undersaturation of the fluid. The Arrhenius plot (in k vs T minus) is linear over eight orders of magnitude of the rate constant, verifying the validity of the proposed rate expression Carefully performed quartz dissolution experiments duplicated the literature data and completed the data base in the temperature range from 150 to 250 C. DOE

N83-33477# Sandia Labs, Albuquerque, N. Mex.
LATERAL VARIABILITY IN THE CORCORAN AND COZZETTE BLANKET SANDSTONE AND ASSOCIATED MESAVERDE ROCKS, PICEANCE CREEK BASIN, NORTHWESTERN COLORADO
J. C. LORENZ 1983 10 p refs Presented at SPE Symp. on Low Permeability, Denver, 14 Mar. 1983
(Contract DE-AC04-76DP-00789)
(DE83-006299; SAND-82-2351C; CONF-830305-2; SPE-PAPER-11608) Avail: NTIS HC A02/MF A01

The widespread sandstone members of the Lower Mesaverde Group (the Iles Formation) in the Piceance Creek basin have significant lateral variability within an overall blanket morphology. This variability is seen in the Corcoran and Cozzette Sandstone members in the closely-spaced Multi-Well Experiment (MWX) wells, and is interpreted from nearby outcrops along the Grand Hogback. Much of the lateral variability consists of thickness changes of both the sandstones and the interbedded lithologies. The locations of the thickest blanket deposits (the best potential reservoirs) may be a function of the locations of principal distributary systems. For the delta plain deposits, the main source of natural gas is the interbedded coals which should be thickest where distributaries were least abundant. DOE

N83-33481# California Univ., Berkeley. Lawrence Berkeley Lab. Earth Sciences Div.
INVESTIGATION OF THE CONDUCTIVITY DISTRIBUTION IN THE VICINITY OF A CASCADE VOLCANO Ph.D. Thesis
E. C. MOZLEY Nov. 1982 394 p refs
(DE83-012478; LBL-15671) Avail: NTIS HC A17/MF A01

Magnetotelluric and telluric data were acquired in the vicinity of Mount Hood Oregon as part of a multidisciplinary exploration program to evaluate the geothermal potential of this stratocone volcano. Eleven field components were acquired simultaneously over the frequency band of 50. to .001 hertz. These data consisted of one five component magnetotelluric base site, two sets of two component remote electric field measurments and one set of remote horizontal magnetic field measurements. The data were recorded digitally in the field and processed later using the remote electric and magnetic signals to obtain unbiased tensor impedance and geomagnetic transfer function (tipper) estimates. DOE

N83-33483# Research Inst. of National Defence, Stockholm (Sweden)
SEISMOLOGY 1982. NUCLEAR TEST BAN VERIFICATION EARTHQUAKE AND EARTH RESOURCE INVESTIGATION Progress Report, 1982
H. OHLSSON May 1983 87 p refs In ENGLISH, SWEDISH summary
(FOA-C-20492-T1) Avail: NTIS HC A05/MF A01

Seismological projects are reported, including nuclear explosion monitoring, the development of international data centers, seismic risk estimation for nuclear power plants, oil exploration using seismic methods, and crystalline rock investigation using seismic cross hole measurements. The Swedish seismic network is described. In 1982 France conducted 5 nuclear tests, Britain 1, the US 18, and the USSR 31. The explosions were underground and within the 150 kton limit Author (ESA)

N83-33763# Princeton Univ., N. J Plasma Physics Lab
THE DIFFUSIVITY OF HYDROGEN ISOTOPES IN LIQUID LITHIUM AND IN SOLID YTTRIUM
R E. BUXBAUM and E. F. JOHNSON Dec. 1982 16 p refs
(Contract DE-AC02-76CH-03073)
(DE83-005050; PPPL-1960) Avail. NTIS HC A02/MF A01

The separation of tritium from liquid lithium at low concentrations is an important problem for fusion technology. One of the most promising techniques for effecting this separation involves sorbing the tritium on solid yttrium metal Reliable diffusivity data are essential for a realistic evaluation of this technique. The bodies of relevant experimental diffusivity data, i.e., data on protium diffusion in liquid lithium, protium diffusion in solid yttrium, and the isotope effect in metals, are reviewed. DOE

N83-33771# Sandia Labs., Albuquerque, N. Mex.
TIME-RESOLVED MEASUREMENTS OF HYDROGEN AND DEUTERIUM IN THE ASDEX PLASMA BOUNDARY
J. ROTH (Technische Univ.), P. VARGA, A. P. MARTINELLI, B. M U. SCHERZER, C. K. CHEN (Academia Sinica), W. R WAMPLER, and E. TAGLAUER 1982 23 p refs Presented at the 5th Intern. Conf. on Plasma Surface, Gatlinburg, Tenn., 3 May 1982
(Contract DE-AC04-76DP-00789)
(DE82-017025; SAND-82-1269C; CONF-820545-9) Avail: NTIS HC A02/MF A01

Hydrogen and the plasma boundary of ASDEX usng graphite collector probes. Time resolution of the order of 100 ms can be obtained by rotating the cylindrical probes behind an aperture during the discharge The trapped amount of hydrogen was determined by subsequent thermal desorption; in the analyses of deuterium the D((3)Ee,p) (4)He nuclear reaction was used. Both methods yield quantitative results Measurements were done for limiter and divertor discharges in the range of 4 to 20 cm outside the limiter or separatrix. The time distributions show a maximum flux at the beginning and the end of the discharge. The relatively lower fux during the plateau phase of the discharge is in the range 10(15) to 2 x 10(17) cm(+2) sec(+1), depending on the radial probe position; the maximum values are higher by a factor of 5 to 50. During neutral hydrogen injection, an additional maximum can be observed The radial 1/e-decay length is about 0.9 cm in front and 0.4 cm behind the fixed limiter. The results are compared with independent measurements in ASDEX and other plasma machines DOE

N83-33836# Federal Aviation Administration, Washington, D.C. Office of Environment and Energy.
EXISTING WIND OBSERVATION NETWORK
D E. WINER *In* NASA. Marshall Space Flight Center Proc · 6th Ann Workshop on Meteorol. and Environ Inputs to Aviation Systems p 56-60 Apr 1983
Avail· NTIS HC A07/MF A01 CSCL 04B

A real time wind observations of which the purpose is fuel efficient flight planning and air traffic control is discussed The possibilities of travelling several ways, including a great circle route, a more or less straightline route and following wind circulation patterns was investigated. It is found that the longest route actually uses the least fuel, some 14% less than the great circle route. It is suggested that improving the observation system has an enormous potential and probably could easily pay for itself in a year. The profiler instrumentation is developed. Some broad characteristics of the instrumentation and of the program are shown. The instrumentation can function in clear air as well as cloudy air. E.A.K.

N83-33872# Sandia Labs, Albuquerque, N. Mex. Guidance and Control Div.
INERTIAL NAVIGATION SYSTEM FOR DIRECTIONAL SURVEYING
S. M. KOHLER Sep. 1982 31 p
(Contract DE-AC04-76DP-00789)
(DE83-000406; SAND-82-1668) Avail: NTIS HC A03/MF A01

A Wellbore Inertial Navigation System (WINS) was developed and tested. Developed for directional surveying of geothermal, oil, and gas wells, the system uses gyros and accelerometers to obtain survey errors of less than 10 ft (approximately 3 m) in a 10,000 ft (approximately 300 m) well. The tool, which communicates with a computer at the surface, is 4 in. (approximately 10 cm) in diameter and 20 ft (approximately 6 1 m) long. The concept and hardware is based on a system developed for flight vehicles. DOE

N83-33883*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE NASA HIGH ACCURACY FUEL FLOWMETER (HAFF) DEVELOPMENT PROGRAM
H. F. HOBART 1983 6 p refs Presented at CECON '83, Cleveland, 4-5 Oct 1983; sponsored by IEEE
(NASA-TM-83484, E-1807; NAS 1.15:83484) Avail· NTIS HC A02/MF A01 CSCL 01D

The high accuracy fuel flowmeter development program is described A flightworthy meter that measures mass flowrate of aircraft fuels to within + or - 0.25% of reading over a 50.1 range of flow is developed. A study of measurement techniques to achieve this goal yielded three candidates: (1) a dual turbine flowmeter with density and viscosity compensation, (2) an angular momentum flowmeter with a motor-driven, spring-restrained turbine and viscosity shroud, and (3) a vortex precission flowmeter with density and viscosity compensation An experimental study of each technique was completed and the first two candidates were selected for prototype development. S.L.

N83-33891*# Princeton Univ., N. J Dept. of Mechanical and Aerospace Engineering.
A FUEL-EFFICIENT CRUISE PERFORMANCE MODEL FOR GENERAL AVIATION PISTON ENGINE AIRPLANES Ph.D. Thesis. Final Report
R. C. H. PARKINSON Aug. 1983 400 p refs
(Contract NGL-31-001-252)
(NASA-CR-172188; NAS 1.26:172188; REPT-1527-T) Avail: NTIS HC A17/MF A01 CSCL 21E

A fuel-efficient cruise performance model which facilitates maximizing the specific range of General Aviation airplanes powered by spark-ignition piston engines and propellers is presented. Airplanes of fixed design only are considered. The uses and limitations of typical Pilot Operating Handbook cruise performance data, for constructing cruise performance models suitable for maximizing specific range, are first examined. These data are found to be inadequate for constructing such models. A new model of General Aviation piston-prop airplane cruise performance is then developed. This model consists of two subsystem models: the airframe-propeller-atmosphere subsystem model; and the engine-atmosphere subsystem model. The new model facilitates maximizing specific range; and by virtue of its implicity and low volume data storge requirements, appears suitable for airborne microprocessor implementation. Author

N83-33986# Pacific Northwest Lab , Richland, Wash.
ANALYSIS AND COMPARISON OF PRODUCTS FROM WOOD LIQUEFACTION
D C. ELLIOT Aug. 1982 25 p refs Presented at the Intern. conf. on Fundamentals of Thermochem. Biomass Conversion, Estes Park, Colo., 18 Oct. 1982
(Contract DE-AC06-76RL-01830)
(DE83-002047; PNL-SA-10293; CONF-821051-2) Avail NTIS HC A02/MF A01

The results of the analtical effort dealing with the products from the Biomass Liquefaction Experimental Facility at Albany, Oregon are described. This facility produce approximately eighty barrels of wood derived oil in the period from August 1979 to March 1981. The oil was produced by two variations of the basis CO-Steam process One variation involved recycle of a portion of the product so that a wood flour in oil slurry system was used. The other variation was a once through process wherein the wood was prehydrolyzed and then processed in a water slurry mode. both variations operated at about 340 C and 3000 psig with aqueous sodium carbonate as the catalyst and CO/H2 as the cover gas. Both processes were tested in a number of reactor configurations. The actual plant operation time is therefore broken into a number of test runs; products from runs 7 through 12 are discussed. DOE

N83-33987# Sandia Labs , Livermore, Calif.
OPTIMAL MEASUREMENTS OF SOOT FORMATION IN PREMIXED FLAMES
W. L. FLOWER Oct. 1982 28 p refs Presented at the Fall Meeting of the Western States Sect., Livermore, Calif., 11-12 Oct. 1982
(Contract DE-AC04-76DP-00789)
(DE83-002212; SAND-82-8812; CONF-821035-2) Avail NTIS HC A03/MF a01

The growth of soot particles in rich premixed flames was measured using the diffusion broadening particle sizing technique. This dynamic light scattering technique eliminates the strong dependence of size measurement on particle complex index of refraction which is a problem with most light scattering size measurements Size measurements were made in fuel rich premixed methane oxygen flat flames with fuel oxidizer ratios ranging from 2 2 to 2 9 times stoichiometric values and in propane oxygen flames at an equivalence ratio of 2.6. Particles as small as 23 nm in diameter were observed 5 mm above the burner surface (within about a millimeter of the flame front), growing to 60 to 120 nm (depending on the equivalence ratio) 14 nm above the burner. Measurements of the intensity of scattered light were used in conjunction with the size measurements to determine the soot number density in the methane oxygen flames, which was found to be decreasing with height above the burner at positions 5 mm above the burner and higher. DOE

N83-33989# Duke Univ., Durham, N. C. Dept. of Chemistry.
REACTION CALORIMETRY FOR COAL CHEMISTRY AND CATALYSIS Quarterly Reporting Period Report, 1 Aug. - 31 Oct. 1982
E. M. ARNETT 1982 13 p refs
(Contract DE-FG22-820C-50807)
(DE83-001773; DOE/PC-50807/1) Avail: NTIS HC A02/MF A01

Calorimetric equipment for performing high temperature thermochemistry (and kinetics) and for analyzing the reaction products is discussed. An important conclusion from studies is that heats of protonation for a series of bases, most of which are coal tar components, do not vary significantly between 25 deg and 200 C in the non-basic, non-acidic, nonaqueous solvent, Sulfolane. If this fact can be generalized it should make extrapolations of acid-base data from room temperatures to high temperatures much more dependable than is presently the case Our proposed method for comparing acid base properties of solids with homogeneous analogues continues to be highly promising although the water content of the acid must be carefully controlled DOE

N83-33990# Duquesne Univ., Pittsburgh, Pa. Dept. of Chemistry.
HYDROGEN BONDING IN ASPHALTENES AND COAL LIQUIDS Quarterly Report, 1 Aug. - 31 Oct. 1982
N. C. LI, L. JONES, N. F. YAGGI, and L. J. YOUNG 1982 22 p refs Presented at the ACS Meeting, Kansas City, Sep. 1982 Submitted for publication
(Contract DE-AC22-80PC-30252)
(DE83-001044; DOE/PC-30252/T8, QR-9) Avail. NTIS HC A02/MF A01

Upgraded coal derived liquids obtained from catalystic hydroprocessing of SRC-II and H-coal syncrudes were studied by IR, PMR, GC/MS, and silica gel chromatography. With increase in residence time, nitrogen, oxygen, and aromatics decrease, accompanied by a large increase in naphthenes Negligible hydrogen bonded material was found in the ungraded liquids. All the upgraded liquids show low viscosity at 298 K (1.3 to 1.4 mNs/sq m), even though saturate and aromatic fractions varied with processing severity. In the aromatic-I fraction, 1-ring aromatics increase, and 3-ring aromatics decrease, wind an increase in severity of hydroprocessing GC/MS analyses indicate a remarkable qualitative similarity for saturate and aromatic fractions irrespective of syncrude source. Only the heavier end of the aromatic-I fraction is noticeably different. DOE

N83-33991# Utah Univ., Salt Lake City. Dept. of Mining and Fuels Engineering
CHEMISTRY AND CATALYSIS OF COAL LIQUEFACTION CATALYTIC AND THERMAL UPGRADING OF COAL LIQUID AND HYDROGENATION OF CO TO PRODUCE FUELS Quarterly Progress Report, Jan. - Mar. 1982
W. H. WISER Jun. 1982 91 p refs
(Contract DE-AC22-79ET-14700)
(DE82-020554; DOE/ET-14700/10) Avail: NTIS HC A05/MF A01

Studies on Mo-supported catalysts showed that a high degree of dispersion of the Mo phase is associated with a specific interaction with alumina. Changes in catalytic activity for hydrogenation with different supports are explained by differences in the monolayer cluster size. When alumina is absent from the support, three dimensional MoS2 crystallites are formed, which exhibit lower catalytic activity. DOE

N83-33992# Alabama Univ , University. Dept. of Chemical and Metallurgical Engineering.
USE OF ALABAMA LIGNITE IN THE PRODUCTION OF LIGHTWEIGHT AGGREGATE
L. Y. SADLER, III Oct. 1982 78 p refs
(DE83-901157; NP-3901157) Avail: NTIS HC A05/MF A01

Production of lightweight aggregate from Porter's Creek clay was chosen as a model process to be used in demonstrating the feasibility of using lignite fuel for rotary kiln mineral processing operations in or near the lignite belt. Pilot-scale rotary kiln testing and computer simulation of a commercial-scale operation using data from the pilot-scale tests demonstrated that lignite was a good fuel, requiring no auxiliary flame, for the processes provided the lignite fuel moisture content was less than about 20%. It was shown that hot kiln exhaust gases could be used to dry the raw lignite from about 50% moisture to 10% moisture, prior to lignite grinding and combustion, without the need for additional fuel for drying Lignite could be delivered to the plant at a cost of 12.25/ton of lignite and would require an incremental investment of $128,500 in mining equipment. DOE

N83-33994# Foreign Resources Associates, Fort Collins, Colo.
PROCESS FOR REGENERATION OF DESULFURIZING AGENTS
H. INABA and K. YASUDA Dec. 1982 8 p Transl. into ENGLISH of Japanese Patent no. Sho-49-17373 (1974)
(Contract DE-AC04-76DP-03533)
(DE83-005020; RFP-TRANS-367) Avail: NTIS HC A02/MF A01

A manganese ferrite absorbent which has been used for desulfurization of sulfur containing gases is heated at 670 to 900 C in an inert gas or reducing gas atmosphere to eliminate the sulfur content from the absorbent and at the same time to regenerate manganese ferrite. DOE

N83-33996# Department of Energy, Grand Forks, N. Dak Energy Technology Center.
ANALYSIS OF LIGNITE LIQUEFACTION PRODUCTS PROCESSED WITH SYNGAS AND HYDROGEN SULFIDE
B. W. FARNUM, S. A. FARNUM, and E F. BITZAN 1983 6 p refs Presented at 185th Am Chem. Soc. Natl Meeting, Seattle, 20 Mar. 1983
(DE83-001281; DOE/FC-1001; CONF-830303-1) Avail: NTIS HC A02/MF A01

A method for monitoring the presence of elemental and organic sulfur compounds in distillable low-rank coal liquefaction products utilizing column chromatography and dual detection (flame ionization detector/flame photometric detector) capillary gel column chromatography was developed. The addition of H2S to the continuous processing of Beulah, North Dakota lignite does not increase the amount or variety of sulfur-containing organic compounds in the recycle slurry ASTM-D1160 vacuum distillate products. It does, however, introduce sulfur and a variety of volatile sulfur-containing organics into the light oils condensed from the vapor phase in the reactor The presence and variety of sulfur compounds after 12 to 14 reactor passes reflects the introduction of these components in the startup solvent. No increased mutagenicity was observed with the coal liquids processed with H2S. The production of H-donors in the recycle slurry ASTM D-1160 distillates was enhanced by the presence of H2S DOE

N83-33999# Sandia Labs , Albuquerque, N. Mex.
ROLE OF INSTRUMENTATION IN UCG PROCESS DEVELOPMENT
P. J. HOMMERT 1982 37 p refs Presented at Am. Inst. of Chem. Engr. Spring Meeting, Anaheim, Calif , 8 Jun. 1982
(Contract DE-AC04-76DP-00789)
(DE82-016397; SAND-81-2484C, CONF-820610-9) Avail: NTIS HC A03/MF A01

Underground coal gasification field test results obtained since 1976 are reviewed, illustrating the important role that the UCG process feature of a varying reactor geometry has on resource recovery and gas quality The different instrumentation used on these tests is then reviewed, particularly as to its effectiveness, or lack of, in defining process geometry. Instrumentation such as thermocouples, HFEM, acoustic and surface resistivity are discussed with respect to concept, cost, resolution, data acquisition and data analysis. Results indicate that when instrumentation is appropriately deployed it can provide significant insight into the dynamics of reactor growth. DOE

N83-34018# Central Electricity Generating Board, London (England).
CORROSION TEST ON HIGH-ALLOY STEELS
W. M M. HUIJBREGTS 2 Jun 1983 26 p Transl. into ENGLISH from Elektrotech. (Netherlands), no. 11, 1981 p 663-670
(BLL-CE-TRANS-7952(9022 09)) Avail: British Library Lending Div., Boston Spa, Engl

Pitting, cracking, and stress corrosion were studied in ferritic, austenitic, and duplex steels used in nuclear reactors, coal gasific gasifiers, and flue gas desulfurization plants. Electrochemical measuring techniques can determine resistance to pitting and cracking corrosion. The constant strain rate tensile test and the steam blanketing autoclave test appear well suited for determining resistance to stress corrosion and the effects of the chloride environment. Stress corrosion can occur in incoloy 800 in free caustic soda and in trisodium phosphate. The stress corrosion fracture takes place in an intercrystalline manner A R.H.

N83-34065# Materials Research Labs., Melbourne (Australia).
QUALITATIVE ASSESSMENT OF THE IGNITION OF HIGHLY FLAMMABLE FUELS BY PRIMARY EXPLOSIVES
P. P. ELISCHER and L DEYONG Jun. 1983 17 p refs
(MRL-R-889; AR-003-302) Avail NTIS HC A02/MF A01

An assessment of the ignition of fuel/air mixtures and of fabrics soaked with different fuels (ethanol, n-hexane and diethyl ether) by primary explosives has been carried out Author

N83-34067# United Technologies Corp., South Windsor, Conn. Power Systems Div.
EVALUATION OF SYNTHETIC-FUEL CHARACTER EFFECTS ON RICH-LEAN STATIONARY GAS-TURBINE COMBUSTION SYSTEMS. VOLUME 2: FULL-SCALE TEST PROGRAM Final Report, May 1983
P. RUSSEL, G. BEAL, J. B. KENNEDY, J B. MCVEY, and T J. ROSFJORD May 1983 105 p refs Prepared in cooperation with Pratt and Whitney Aircraft Group, West Palm Beach, Fla
(Contract EPRI PROJ. 1898-1)
(DE83-902337; EPRI-AP-2822-VOL-2) Avail NTIS HC A06/MF A01

The results of the full-scale test effort are described Full-scale hardware evaluations were conducted to investigate the effect of burner geometric scale on emissions and performance produced by rich-lean combustion systems. Evaluations were conducted using a 10-inch diameter burner, and the results were compared with the results obtained in the subscale effort, which used a similar but smaller (5-inch diameter) burner. Scale effects are of concern in staged, rich-lean combustors because of the suspected critical importance of certain design parameters in translating laboratory performance into commercial hardware performance Author

N83-34068# Falcon Research and Development Co., Englewood, Colo.
CORRELATION OF FLAMMABILITY TEST DATA ON ANTIMISTING FUELS Final Report, Aug. 1980 - 1981
L. MAHOOD and R. L. TALLEY Atlantic City FAA Dec. 1982 147 p refs
(Contract DTFA03-80-C-0061)
(AD-A127142; DOT/FAA-CT-81/14; FALCON-TR-364010) Avail: NTIS HC A07/MF A01 CSCL 21D

As a part of a comprehensive FAA program to minimize post-crash fire hazards of jet transport aircraft, a correlation study was conducted on flammability test data of neat Jet A fuel, and the same fuel with various antimisting additives. The data were from full-scale aircraft crash tests, large-scale fuel spillage/ignition tests, and several small-scale flammability tests. Various rheometric

tests were also considered The ability of certain antimisting fuels of eliminate large fireballs during occupant-survivable aircraft crashes was amply supported. Large-scale crash simulations were found to be highly developed, and provide essential credibility on a given antimisting fuel near the end of its development. Small-scale flammability test rigs used for screening antimisting fuels were found generally effective, but with some conflicting data between rigs, and with some deviations from large-scale results. GRA

N83-34071# Westinghouse Electric Corp., Golden, Colo. Advanced Systems Technology Div.
REFORMED ALCOHOL FUELS FOR COMBUSTION TURBINES: TECHNICAL AND ECONOMIC FEASIBILITY ASSESSMENT Final Report
N. H. WOODLEY, D A. NORDMAN, J. R LEGRO, and D. G. DAVIES Apr. 1982 57 p refs
(Contract DE-AC02-77CH-00178, EG-77-C-01-4042)
(DE82-013921; SERI/TR-11290-1) Avail: NTIS HC A04/MF A01

Likely problems and advantages of burning reformed alcohol fuels in combustion turbines are identified. An analysis of the costs of converting new and existing combustion turbines for alcohol fuels is given as well as an economic comparison of various fuel options. DOE

N83-34252# California Univ , Livermore. Lawrence Livermore Lab.
EFFECTS OF A DENSE VAPOUR CLOUD ON TURBULENCE NEAR THE GROUND
R. T. CEDERWALL, H. C. RODEAN, and J. H. SHINN Nov 1982 4 p refs Presented at 6th Am Meteorol. Soc. Symp. on Turbulence and Diffusion, Boston, 22 Mar. 1983
(Contract W-7405-ENG-48)
(DE83-004308; UCRL-87973; CONF-830307-7) Avail: NTIS HC A02/MF A01

The transport and dispersion of vapor from the LNG spills was studied. An extensive array of instrumentation was deployed to collect micrometeorological and gas concentration data. Wind velocity data were processed to describe the mean wind field and levels of turbulence. Most experiments were run under neutral to unstable atmospheric stability, with wind speeds greater than 5 m/s Under these conditions, the mean wind field and ambient turbulence level were relatively unaffected by the presence of the vapor cloud. One experiment was done in low wind speed, slightly stable conditions. In this instance, the mean wind and ambient turbulence were modified within about 100 m downwind of the spill point by the cloud. DOE

N83-34333# United Technologies Corp., East Hartford, Conn.
OPTICAL DIAGNOSTICS FOR DIESEL-ENGINE APPLICATIONS
J. J. SANGIOVANNI, G. M. DOBBS, and P A. BONCZYK Jan 1983 72 p refs
(DE83-007201, DOE/AL-17575/T1) Avail: NTIS HC A04/MF A01

The applicability and limitations of coherent anti stokes raman spectroscopy (CARS) and a combination of laser light extinction and Mie scattering, respectively, to measurements of thermometry and species concentrations and of particulate size and concentration in sooty combustion environments typical of diesel combustion processes. The experimental methods used, and the difficulties in discriminating between soot particles and fuel droplets when using these methods are discussed The viability of CARS as a diagnostic technique for diesel combustion is assessed. In the wick fed, diesel fueled flame there were regions of the flame in which gas breakdown could not be avoided. Under these conditions, the CARS signal was unobtainable using the high spatial resolution configuration. The atmospheric pressure flames used in these model experiments are only partially successful in emulating diesel combustion recommended is that in assessing the potential use of CARS for routine diesel applications, similar investigations be carried out under conditions which simulate diesel conditions more closely and explore geometries which control the optical field intensities well enough to control breakdown. DOE

N83-34390# Geological Survey, Washington, D. C.
US GEOLOGICAL SURVEY PROGRAM OF OFFSHORE RESOURCE AND GEOENVIRONMENTAL STUDIES, ATLANTIC-GULF OF MEXICO REGION, FROM SEPTEMBER 1, 1976 TO DECEMBER 31, 1978
D. W. FOLGER and S. W. NEEDELL 1982 71 p refs
(GS-CIRC-870; LC-82-600244) Avail: NTIS HC A04/MF A01

The scope and goals of offshore resource and geoenvironmental studies and topical investigations along the Atlantic and Gulf of Mexico coasts are described. Author

N83-34434# Energy Information Administration, Washington, D.C Office of Coal, Nuclear, Electric and Alternate Fuels.
COAL PRODUCTION: 1980
May 1982 104 p
(DE83-006475; DOE/EIA-0118/80) Avail. NTIS HC A06/MF A01

US coal production and related data are reported for the year 1980, with similar data for 1979 given for comparison. The data here collected on Form EIA-7A, coal production report, from 3969 US mines that produced, processed, or prepared 10,000 or more short tons of coal in 1980 Among the items covered are production, prices, employment, productivity, stocks, and recoverable reserves. Data are reported by state, county, coal producing district, type of mining, and by type of coal (anthracite, bituminous, subbituminous, and lignite) Also included are a glossary of coal terms used, a map of the coal producing districts, and form EIA-7A with instructions DOE

N83-34435# Rhode Island Univ., Kingston Dept. of Geology.
PEAT RESOURCE ESTIMATION FOR RHODE ISLAND Final Report
C. R. PETERS, J C BOOTHROYD, and W. D. HUGHES Oct 1982 322 p refs Prepared for Governor's Energy Office, Providence, R.I.
(Contract DE-FG01-81FE-05108)
(DE83-005210; DOE/FE-05108/T1; TR-4-SRG) Avail NTIS HC A14/MF A01

The objective of this study is to provide geological resource information pertinent to the fuel-potential of freshwater peat deposits in Rhode Island. Results of the study include: an estimate of Rhode Island's peat resources along with wetland maps, peat distribution and thickness maps, stratigraphic cross-section, fuel analysis of peat samples and fuel-grade peat isopach maps of 12 wetlands studied in detail. Approximately 26,640 ha or 9% of the total area in Rhode Island is comprised of freshwater wetlands and deepwater habitats. Peat in 8 of the 12 wetlands meets fuel-grade criteria and totals 1,629,030 moisture-free tons (2,506,200 air-dried tons-35% moisture). A 3 MW peat-fueled electrical generating plant would consume 13,900 tons of air-dried peat per year. The calorific value of air-dried peat is 6256 Btu/lb. An alternate application is for home heating in modified wood stoves. DOE

N83-34438# Bendix Field Engineering Corp., Grand Junction, Colo
NATIONAL URANIUM RESOURCE EVALUATION. THERMOPOLIS QUADRANGLE, WYOMING
K. K. HESSE Jun. 1982 135 p refs
(Contract DE-AC13-76GJ-01664)
(DE82-017078; PGJ/F-030-82) Avail: NTIS HC A07/MF A01

The Thermopolis Quadrangle of Wyoming was evaluated to define areas favorable for the occurrence of uranium deposits. Surface geologic and radiometric surveys were done in selected environments within the quadrangle. Geophysical logs, where available, were used to evaluate the subsurface. Uranium occurrences reported from the literature were investigated. Aerial radiometric data were analyzed, and followup studies of anomalies were field checked. As a result of the investigations, the upper facies of the Eocene Wind River Formation is considered favorable for sandstone uranium deposits, and the Precambrian rocks near Copper Mountain are though favorable for authigenic deposits. DOE

N83-34439# Bendix Field Engineering Corp., Grand Junction, Colo.
NATIONAL URANIUM RESOURCE EVALUATION, RENO QUADRANGLE, NEVADA AND CALIFORNIA
B. W. HURLEY, C L. JOHNSON, G. M. CUPP, D. L MAYERSON, P. A. DODD, and J. C. BERG Jul. 1982 196 p refs
(Contract DE-AC13-76GJ-01664)
(DE82-017580; PGJ/F-037-82) Avail NTIS HC A09/MF A01

The Reno Quadrangle, Nevada and California, was evaluated using National Uranium Resource Evaluation criteria to identify and delineate areas favorable for the occurrence of uranium deposits Investigations included reconnaissance and detailed surface geologic and radiometric studies, geochemical sampling and evaluation, analysis and ground-truth followup of aerial radiometric data, and subsurface data evaluation. The results of these investigations indicate environments favorable for Wyoming roll-type sandstone uranium deposits in the middle Tertiary basins of the Red Rock, Winnemucca, Warm Springs, Hungry, and Spanish Springs Valleys. Environments favorable for authigenic deposits are present in the porphyritic quartz monzonite of the Singatse Range. The Petersen, Seven Lakes, Dogskin, Virginia, and Pah Rah Mountains area and the southern Nightingale Mountains are favorable for hydroallogenic uranium deposits DOE

N83-34440# Geological Survey, Laramie, Wyo.
REVIEW OF REPORTED TARSAND OCCURRENCES AND RECENT PROJECTS IN WYOMING
M. CLARK and G B. GLASS May 1983 52 p refs
(Contract DE-AS20-82LC-10916)
(DE83-011736; DOE/LC-10916/T1; WGS-82-5) Avail: NTIS HC A04/MF A01

A synopsis is presented of 78 reported occurrences of shallow, oil impregnated rocks in Wyoming many of which may be tar sands. (Appendices A and B). In most cases, there are only sketchy descriptions of these occurrences, scattered throughout the literature. This paper is a prelude to much needed studies and evaluations of these individual deposits. In addition, brief descriptions of three recent extractive operations are presented DOE

N83-34453*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SUMMARY OF SYNFUEL CHARACTERIZATION AND COMBUSTION STUDIES Final Report
D. F SCHULTZ Aug. 1983 57 p refs
(Contract DE-AI01-77ET-13111)
(NASA-TM-83066; DOE/NASA/13111-15; E-1537; NAS 1.15:83066) Avail: NTIS HC A04/MF A01 CSCL 21B

Combustion component research studies aimed at evolving environmentally acceptable approaches for burning coal derived fuels for ground power applications were performed at the NASA Lewis Research Center under a program titled the "Critical Research and Support Technology Program" (CRT) The work was funded by the Department of Energy and was performed in four tasks. This report summarizes these tasks which have all been previously reported. In addition some previously unreported data from Task 4 is also presented The first, Task 1 consisted of a literature survey aimed at determining the properties of synthetic fuels. This was followed by a computer modeling effort, Task 2, to predict the exhaust emissions resulting from burning coal liquids by various combustion techniques such as lean and rich-lean combustion. The computer predictions were then compared to the results of a flame tube rig, Task 3, in which the fuel properties were varied to simulate coal liquids Two actual SRC 2 coal liquids were tested in this flame tube task. Author

N83-34455# Junta de Energia Nuclear, Madrid (Spain)
ACID PREHYDROLYSIS OF THE LIGNOCELLULOSIC BIOMASS FROM THISTLE ONOPORDUM NERVOSUM BOISS
C. SUAREZ, D. PAZ, and A. DIAZ 1983 29 p refs In SPANISH, ENGLISH summary
(JEN-547; ISSN-0081-3397) Avail. NTIS HC A03/MF A01

The acid prehydrolysis of the lignocellulosic biomass from thistle O. nervosum has been conducted to determine the conditions for maximum yield of pentoses with minimum yield of hexoses. Variables studied were acid concentration (H2SO4, 1, 3, 4 and 5%), temperature (100 C and 120 C) time, solid to liquid ratio and degree of fineness of thistle (4 to 65 mesh). Author

N83-34459# Oak Ridge National Lab., Tenn. Engineering Technology Div.
TECHNICAL ANALYSIS OF THE USE OF BIOMASS FOR ENERGY PRODUCTION
I. SPIEWAK, J P. NICHOLS, D ALVIC, J G DELENE, B. H. FITZGERALD, J. R. HIGHTOWER, O H. KLEPPER, J R. KRUMMEL, and J. B. MILLS Aug 1982 107 p refs
(Contract W-7405-ENG-26)
(DE82-019854; ORNL/TM-7919) Avail: NTIS HC A06/MF A01

Results of a technical and economic evaluation of the use of biomass for energy production are presented. Estimates are made of the current and projected production and uses of biomass in the forms of wood, crop residues, grass and herbage, special crops, and animal wastes in various sectors of the US energy market. These studies indicate that because of its higher-value uses, bulkiness, diffuseness, and high water content, biomass is generally not competitive with conventional energy sources and is expected to have only limited application for energy production in the major market sectors - including the commercial sector, manufacturing, transportation, and electric utilities The use of biomass for energy production is increasing in the forest-products industry, in farm applications, and in home heating because it is readily available to those users. DOE

N83-34461# Kent Associates, Lake Oswego, Oreg.
CITY OF NORTH BONNEVILLE, WASHINGTON: GEOTHERMAL EXPLORATION PRODUCTION TEST WELL Final Report
Jun. 1982 532 p refs
(Contract DE-FG07-80R-000099)
(DE83-008984; DOE/OR-00099/T1) Avail: NTIS HC A23/MF A01

Based on discussions with the City of North Bonneville, the production test well was drilled to a depth that would also explore for ground water temperatures near 130 F (54 4 C). Depth projections to a 130 F bottom hole temperature were made by assuming a constant ground water temperature rise greater than 50 C per kilometer, and by assuming that essentially homogeneous or equivalent conductive rock units would be encountered Minimum water production requirements were not set, although the City determined that about 800 gpm would be acceptable. Larger upper casing diameters of 16 and 12 inches were installed in order to provide the future use of either a vertical turbine or submersible pump, as desired by the city. The scope of work included interpretation of well characteristics, evaluation of ground water as a geothermal resource, geologic analysis of data from drilling and testing, drilling supervision, daily drilling cost accounting, and preparation of a final report. The report includes geologic evaluation of the drilling and test data, ground water and geothermal potential. DOE

N83-34469# Hagler, Bailly and Co , Washington, D.C.
THE INDUSTRIAL MARKET FOR SULFUR DIOXIDE EMISSION-CONTROL SYSTEMS Final Report
Aug. 1982 155 p refs Prepared for Science Applications, Inc., McLean, Va.
(Contract DE-AC21-80MC-14729)
(DE83-002440, DOE/MC-14729/1243) Avail. NTIS HC A08/MF A01

Under the postulated EIA medium world oil price scenario, in which oil prices are projected to rise at a real rate of 2.2% per

year, coal will represent from 78 to 91% of MFBI fuel consumption by the year 2000, up from the present 16%. This increase would occur even in the absence of FUA, because the cost of coal is substantially lower than the cost of oil or gas. Much of this market will develop in the relatively near to intermediate term (before 1990). Annual installations will be much lower (by about 40%) after that period, reflecting a lower overall steam demand growth rate and the fact that much of the discretionary conversion of gas and oil boilers to coal will have been completed. About 22% of the sales will be for discretionary conversion of oil and gas boilers still having some useful life; the rest will be for nondiscretionary expansion or replacement of worn-out boilers. DOE

N83-34471# Engineering-Science, Inc , Atlanta, Ga.
PROCESS MODIFICATIONS AND WASTE-MANAGEMENT PRACTICES AFFECTING DISPOSAL, UTILIZATION, AND RECOVERY OF COAL-COMBUSTION WASTES
Oct. 1982 243 p refs Prepared in cooperation with Webster and Associates, Norristown, Pa.
(Contract DE-AC01-79ET-13543)
(DE83-001840; DOE/ET-13543/T2) Avail: NTIS HC A11/MF A01

This topical report summarizes modifications and practices affecting disposal, utilization and recovery of coal combustion wastes under RCRA regulations The primary concern of the power industry is the quantity and characteristics of ash and sludge to be disposed in the future and the potential of their being declared hazardous under RCRA and related legislation. To address the wide range of modifications and practices available to the utility industry, it was necessary to organize this report into five major groupings as follows: coal cleaning; selected power plant modifications; utilization options; scrubber sludge stabilization/fixation; and resource recovery options. This report is not intended to provide a complete technical assessment of the modifications and practices explored; rather it concentrates on: waste disposal cost of the practices employed; energy impacts; regulatory problems; and handling properties or hazard potential. The contents of this topical report are based on literature reviews, data reviews and selected personal contacts. DOE

N83-34472# North Carolina State Univ., Raleigh. Dept of Chemical Engineering.
POLLUTANTS FROM COAL-CONVERSION PROCESSES Progress Report, 1 Jun. - 31 Aug. 1982
J K FERRELL and R. M FELDER 1982 36 p refs
(Contract DE-FG22-80PC-30232)
(DE83-000584; DOE/PC-30232/T4; PR-4) Avail: NTIS HC A03/MF A01

A New Mexico subbituminous coal and a North Carolina peat were gasified in a pilot-scale fluidized bed reactor, and the gases were subjected to various cleaning operations All gaseous and condensed-phase effluent streams in the plant were analyzed, and potentially hazardous species in these streams were identified and quantified. The results are summarized. DOE

N83-34505# California Univ , Livermore. Lawrence Livermore Lab.
AIRBORNE-TEMPERATURE-SURVEY MAPS OF HEAT-FLOW ANOMALIES FOR EXPLORATION GEOLOGY
N. K DELGRANDE 10 Nov. 1982 14 p refs Presented at the Intern. Symp. on Remote Sensing of Environ., Ft Worth, Tex., 6-10 Dec 1982
(Contract W-7405-ENG-48)
(DE83-003018; UCRL-87802-REV-1, CONF-821204-1-REV-1)
Avail: NTIS HC A02/MF A01

Precise airborne temperature surveys depicted small predawn surface temperature differences related to heat flow anomalies at the Long Valley, California, KGRA. Zones with conductive heat flow differences of 45 + or - 16 nu cal/sq cm(s) has predawn surface temperature differences of 1 4 + or - 0.3 C The warmer zones had hot water circulating in a shallow (less than 60-m-deep) aquifer Hot wate is a useful geochemical indicator of geothermal and mineral resource potential. The precise airborne temperature survey method recorded redundant infrared scanner signals at two wavelengths (10 to 12 micrometers and 4.5 to 5.5 micrometers) and two elevations (0.3 km and 1.2 km). Ground thermistor probes recorded air and soil temperatures during the survey overflights. Radiometric temperatures were corrected for air path and reflected sky radiation effects. Corrected temperatures were displayed in image form with color coded maps which depicted 0.24 C temperature differences DOE

N83-34824# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany).
ELEMENTARY REACTIONS DURING CXHY BURNING [ELEMENTARRIAKTIONEN BEI CXHY-VER-BRENNUNG]
T. JUST and H. H. GROTHEER *In* Stuttgart Univ. Thermodyn. and Flow Mech. Problems in Aircraft and Spacecraft Devices· Summary of Work and Results for 1980, 81, 82 p 17-46 1982 refs In GERMAN
Avail: NTIS HC A99/MF A01

Methanol oxidation reactions were investigated for flame optimization by modeling, in order to assess the emission of toxic agents. Measurements on methanol elementary reactions are especially influenced by consecutive reactions. In the case of H3COH+O systems this is taken into account by an extensive reaction model The velocity coefficient of the reaction H3COH+O is accurately obtained with this model. Laser induced fluorescence was used for the investigation of the reaction H3COH+OH. The velocity coefficient is deduced from the measurements, providing the temperature dependence. The HOCOH radical was observed with a mass spectrometer flow reactor. The measurements show that this radical reacts very slowly with O2. Author (ESA)

N83-35010# Rocketdyne, Canoga Park, Calif
INJECTOR SELECTION AND DESIGN FOR HIGH PRESSURE OXYGEN/HYDROCARBON GAS GENERATOR TECHNOLOGY
V. W. JAQUA and A. W. HUEBNER *In* APL The 1983 JANNAF Propulsion Meeting, Vol. 1 p 1-6 Feb. 1983
Avail: NTIS HC A15/MF A01 CSCL 21H

The requirements of gas generator or preburner combustion performance to support the type of large engine cycles anticipated for spacecraft propulsion applications are discussed. Design and evaluation of high performance injector elements and patterns in subscale experiments are emphasized. Both single-element and multiple-element programs were considered, and it was decided that a multiple element program was the most productive approach, and a 50.8-mm (2-inch) diameter multiple-element configuration was selected for development testing. Two propellant combinations were explored, utilizing liquid oxygen, and either RP-1 or gaseous methane fuel. Both fuel-rich and oxidizer-rich gas generator operation conditions were employed. Eight different injector patterns were designed and fabricated, three each for the fuel-rich conditions with the two fuels, and one each for the oxidizer-rich conditions. Injection elements utilized included coax, like-impinging doublets, unlike-impinging triplets and pentads, and one fan former. Element selection and sizing was primarily based on the physical properties of the reactants, the predicted characteristics of combustion, and the design flowrates. R J.F.

N83-35064*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
FLUIDIZED BED COAL DESULFURIZATION Final Report
M. RAVINDRAM Aug. 1983 97 p refs
(Contract NAS7-100)
(NASA-CR-173102, JPL-PUB-83-44; NAS 1.26:173102) Avail: NTIS HC A05/MF A01 CSCL 07D

Laboratory scale experiments were conducted on two high volatile bituminous coals in a bench scale batch fluidized bed reactor Chemical pretreatment and posttreatment of coals were tried as a means of enhancing desulfurization. Sequential chlorination and dechlorination cum hydrodesulfurization under modest conditions relative to the water slurry process were found to result in substantial sulfur reductions of about 80%. Sulfur forms as well as proximate and ultimate analyses of the processed coals are included. These studies indicate that a fluidized bed reactor

process has considerable potential for being developed into a simple and economic process for coal desulfurization. Author

N83-35071# Oak Ridge National Lab., Tenn.
STATUS OF COAL LIQUEFACTION IN THE UNITED STATES AND RELATED RESEARCH AND DEVELOPMENT AT THE OAK RIDGE NATIONAL LABORATORY
R. SALMON, H. D. COCHRAN, JR., and L. E. MCNEESE 5 Oct. 1982 43 p refs Presented at the 3rd Tsukuba Symp., Japan, 5 Oct. 1982
(Contract W-7405-ENG-26)
(DE83-001887, CONF-821047-1) Avail NTIS HC A03/MF A01

Coal liquefaction processes are divided into four categories: (1) indirect liquefaction, such as Fischer-Tropsch and methanol synthesis; (2) direct liquefaction processes, typified by H-Coal, Exxon Donor Solvent (EDS), and SRC-1 and 2; (3) two stage liquefaction, such as Conoco's CSF process; and (4) pyrolysis and hydropyrolysis processes. Pilot plant experience with the various processes is reviewed (including equipment problems, corrosion and abrasion, refractory life, heat recovery, coke deposits, reactor kinetics, scale up problems, health hazards, environmental impacts, upgrading products, economics, etc.). Commercialization possibilities are discussed somewhat pessimistically in the light of reduction of US Oil imports, weakening oil prices, conversion to coal, smaller automobiles, economics and finally, some uncertainty about SFC goals and policies DOE

N83-35078# Brookhaven National Lab., Upton, N. Y.
SEPARATION OF HELIUM-METHANE MIXTURES BY PRESSURE-SWING ADSORPTION
H. C. CHENG and F. B. HILL 1983 38 p refs Presented at the Am Inst. of Chem Engr. Natl. Meeting, Houston, Tex., 27-31 Mar. 1983
(Contract DE-AC02-76CH-00016)
(DE83-011623; BNL-32898; CONF-830308-12) Avail: NTIS HC A03/MF A01

The separation of mixtures of helium and methane using a single column of activated carbon in a pressure swing adsorption process was studied experimentally. Process performance was predicted with an average error of 10% or less by a local equilibrium well-stirred cell model in which dead volumes at the feed and product ends of the column were accounted for. Systematic differences between experiment and model were ascribed to omission from the model of flow resistance and heat release. DOE

N83-35084# Montana State Univ., Bozeman. Dept of Chemical Engineering.
CATALYTIC HYDROGENATION OF COAL-DERIVED LIQUIDS Interim Report, Mar. - May 1982
L. BERG and F. P MCCANDLESS Jun. 1982 14 p
(Contract DE-AC22-76ET-10495; EX-76-C-01-2034)
(DE82-019125; FE-2034-27) Avail: NTIS HC A02/MF A01

The use of partially hydrogenated creosote oil had little beneficial effect in the catalytic up-grading of SRC-2. Increasing the pressure from the 1000 to 1300 psi range to 2000 psi enabled the catalytst to perform in excess of 160 hours without regeneration. The yield of liquid product was reduced from about 90% to about 83% and the research octane number of the gasoline fraction was reduced from 90.3 to 79 7 Seven new catalysts were prepared all containing the same total metal loading with varying proportions of Co, Mo, Ni and W. Runs with these in the coming months should point toward the optimum combination of the metals. Six different catalyst base materials were evaluated relative to the effect of pore size and surface area of performance No great differences in performance were noted probably because all of them were of sufficiently large pore diameter as well as ample surface area. DOE

N83-35085# California Univ., Berkeley. Lawrence Berkeley Lab Energy and Environment Div.
ORGANOMETALLIC GEOCHEMISTRY. ISOLATION AND IDENTIFICATION OF ORGANOARSENIC AND INORGANIC ARSENIC COMPOUNDS FROM GREEN RIVER FORMATION OIL SHALE
R. H. FISH Jun. 1983 15 p refs Presented at the Am. Chem. Soc. Symp. on Geochem and Chem. of Oil Shale, Seattle, 25-29 Mar. 1983 Submitted for publication
(Contract DE-AC03-76SF-00098)
(DE83-012956; LBL-15937-1, CONF-830364-1) Avail· NTIS HC A02/MF A01

The molecular characterization of methylarsonic acid, phenylarsonic acid and the inorganic anion, arsenate, found in a methanol extract of a Green River Formation oil shale sample was accomplished by HPLC-GFAA analysis In addition, derivatization of the acids, HPLC purified, by reaction with 3-methylcatechol to form the five coordinate organoarsenic catecholates as well as reaction, via trimethylsilylation, of the ammonium salt of arsenate to form tristrimethylsilylarsenate was followed by GC-EIMS analysis to provide unequivocal evidence for the presence of these organometallic and inorganic compounds of arsenic as natural products in oil shale. DOE

N83-35086# University of Western Michigan, Kalamazoo. Dept. of Chemistry.
FUNDAMENTALS OF NITRIC OXIDE FORMATION IN FOSSIL-FUEL COMBUSTION Quarterly Progress Report, 29 Jun. - 28 Sep. 1982
T. HOUSER and M. E. MCCARVILLE May 1983 19 p refs
(Contract DE-FG22-81PC-40805)
(DE83-013605; DOE/PC-40805/4; QPR-4) Avail: NTIS HC A02/MF A01

Experiments examining the oxidation of HCN and pyridine were continued using an atmospheric pressure flow system in order to determine the mechanism of NO formation from fuel nitrogen combustion. In addition, several experiments with cyanogen, as well as a few with N2O as fuels were run. The results with cyanogen were significantly different than those with HCN in terms of reactivity and NO/sub x/ yields, thus it does not appear to be representative of fuel nitrogen during combustion. The few experiments with N2O gave a preliminary indication that if formed, it will not be a major contributor to NO/sub x/ formation subsequently; less than 15% conversion was observed. A large group of experiments between 575 and 6750 C with HCN/CO mixtures at low to moderate extents of reaction were run to determine the rate parameters of N2O formation. It was evident that N2O increased with fraction HCN reacted. The kinetic equation that has described some of the data best at this intermediate stage of evaluation was derived from two first order sequential reactions The kinetic evaluation is continuing. DOE

N83-35141*# Solarex Corp., Rockville, Md
PROCESS RESEARCH ON POLYCRYSTALLINE SILICON MATERIAL (PROPSM) Quarterly Report, 1 Apr. - 30 Jun. 1983
J. S CULIK 10 Jun 1983 60 p refs Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-955902)
(NASA-CR-173106; DOE/JPL-955902-83/10; JPL-9950-866; NAS 1.26:173106; QR-10) Avail: NTIS HC A04/MF A01 CSCL 11G

The performance limiting mechanisms in large grain (greater than 1-2 mm in diameter) polycrystalline silicon was investigated by measuring the illuminated current voltage (I-V) characteristics of the minicell wafer set. The average short circuit current on different wafers is 3 to 14 percent lower than that of single crystal Czochralski silicon. The scatter was typically less than 3 percent. The average open circuit voltage is 20 to 60 mV less than that of single crystal silicon. The scatter in the open circuit voltage of most of the polycrystalline silicon wafers was 15 to 20 mV, although two wafers had significantly greater scatter than this value. The fill factor of both polycrystalline and single crystal silicon cells was typically in the range of 60 to 70 percent; however several polycrystalline silicon wafers have fill factor averages which are

somewhat lower and have a significantly larger degree of scatter S.L.

N83-35153# Ruetgerswerke A.G., Frankfurt am Main (West Germany).
CHEMICALLY AND PHYSICALLY MODIFIED COAL TAR PITCHES AND THEIR APPLICATION Final Report, Jun. 1981
R. ZELLERHOFF Bonn Bundesministerium fuer Forschung und Technologie May 1983 106 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung and Technologie
(BMFT-FB-T-83-072; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 22,30

Thermolysis of coal tar fractions (pitches, aromatic oils) in presence of plastics (polystyrene, polystyrene waste), cracked at temperatures between 300 and 400 C into oligomers and monomers (benzene homologues) which induce radical polycondensation reactions for aromatic tar oils is described. Depending on the tar feedstock, binder materials for carbon electrodes (electrode binder) and precursors for isotropic carbon (nuclear graphite) are obtained. Conversion of coal tar fractions with dehydrogenating agents such as sulfur, sulfur compounds and atmospheric oxygen into potential binder material for road construction is treated. Separation of pitch fractions according to their thermal reactivity by charge transfer complexation (picric acid) for flash carbonization is outlined. Author (ESA)

N83-35154# Veba Oel Entwicklungs G m.b.H., Gelsenkirchen-Buer (West Germany).
UPGRADING OF HEAVY OILS BY HYDROGENATION Final Report, Jan. 1982
U. GRAESER, K. NIEMANN, and K. KRETSCHMAR Bonn Bundesministerium fuer Forschung und Technologie May 1983 50 p In GERMAN, ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-090; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21,50

In bench experiments, vacuum residues and heavy crudes were processed by VEBA LQ and VEBA Combicracking to low boiling products such as naphtha, middle distillate and vacuum gas oil. Residue conversions higher than 90% were easily obtained without addition of one-way-catalysts. In a directly linked gas phase reactor the products were extensively desulfurized and dentrified by the use of hydrotreatment catalysts. The influence of different parameters on the degree of conversion and on the product quantity/quality was tested. For the VEBA cracking processes and the LURGI-DSV-Process, a 1 ton/hr pilot plant was designed. Author (ESA)

N83-35159*# United Technologies Research Center, East Hartford, Conn.
DEPOSIT FORMATION IN HYDROCARBON ROCKET FUELS: EXECUTIVE SUMMARY Summary Report, Apr. 1980 - May 1981
R. ROBACK, E. J. SZETELA, and L. J. SPADACCINI Cleveland NASA. Lewis Research Center Sep. 1981 23 p refs
(Contract NAS3-22277)
(NASA-CR-165492; NAS 1.26:165492; P81-915216-2) Avail: NTIS HC A02/MF A01 CSCL 21I

An experimental program was conducted to study deposit formation in hydrocarbon fuels under flow conditions that exist in high-pressure, rocket engine cooling systems. A high pressure fuel coking test apparatus was designed and developed and was used to evaluate thermal decomposition (coking) limits and carbon deposition rates in heated copper tubes for two hydrocarbon rocket fuels, RP-1 and commercial-grade propane. Tests were also conducted using JP-7 and chemically-pure propane as being representative of more refined cuts of the baseline fuels. A parametric evaluation of fuel thermal stability was performed at pressures of 136 atm to 340 atm, bulk fuel velocities in the range 6 to 30 m/sec, and tube wall temperatures in the range 422 to 811K. In addition, the effect of the inside wall material on deposit formation was evaluated in selected tests which were conducted using nickel-plated tubes. The results of the tests indicated that substantial deposit formation occurs with RP-1 fuel at wall temperatures between 600 and 800K, with peak deposit formation occurring near 700K. No improvements were obtained when de-oxygenated JP-7 fuel was substituted for RP-1. The carbon deposition rates for the propane fuels were generally higher than those obtained for either of the kerosene fuels at any given wall temperature. There appeared to be little difference between commercial-grade and chemically-pure propane with regard to type and quantity of deposit. The results of tests conducted with RP-1 indicated that the rate of deposit formation increased slightly with pressure over the range 136 atm to 340 atm. Finally, plating the inside wall of the tubes with nickel was found to significantly reduce carbon deposition rates for RP-1 fuel Author

N83-35161*# Wisconsin Univ., Madison.
MEASUREMENT OF THE LINEAR VISCOELASTIC BEHAVIOR OF ANTIMISTING KEROSENE Final Report
J D. FERRY 20 May 1983 21 p refs Prepared for JPL, Pasadena, Calif.
(Contract NAS7-100; JPL-956206; NSF DMR-78-16954)
(NASA-CR-173108; JPL-9950-855; NAS 1.26:173108) Avail: NTIS HC A02/MF A01 CSCL 21D

Measurements of dynamic viscoelastic properties in very small oscillating shear deformations was made on solutions of a jet fuel, Jet A, containing an antimisting polymeric additive, FM-9. A few measurements were also made on solutions of FM-9 in a mixed solvent of mineral oil, Tetralin, and 0-terphenyl. Two samples of FM-9 had approximate number-average molecular weights of 12,000,000 and 8,100,000 as deduced from analysis of the measurements. The ranges of variables were 2.42 to 4.03 g/1 in concentration (0.3 to 0.5% by weight), 1 to 35 in temperature, 1.3 to 9 4 cp in solvent viscosity, and 103 to 6100 Hz in frequency. Measurements in the Jet A solvent were made both with and without a modifying carrier. The results were compared with the Zimm theory and the viscoelastic behavior was found to resemble rather closely that of ordinary non-polar polymers in theta solvents. The relation of the results to the antithixotropic behavior of such solutions a high shear rates is discussed in terms of intramolecular and intermolecular interactions. Author

N83-35162# Ashland Petroleum Co., Ky.
REFINING OF MILITARY JET FUELS FROM SHALE OIL. VOLUME 3, PART 2: ABOVE GROUND SHALE OIL PROCESS DATA Interim Report, 15 Jun. - 30 Oct. 1980
H. F. MOORE, L. M HENTON, C. A. JOHNSON, and D. A. FABRY Mar 1982 225 p refs
(Contract F33615-78-C-2080; AF PROJ. 2480; AF PROJ. 3048)
(AD-A128635; AFWAL-TR-81-2056-VOL-3-PT-2) Avail: NTIS HC A10/MF A01 CSCL 21D

The effect of operating conditions on materials quality, energy balances, product composition and economics was evaluated and scale-p data were obtained and are tabulated for those unit operations of the Phase I process requiring laboratory data to confirm preliminary estimates. GRA

N83-35170# Tri-State Synfuels Co , Houston, Tex
TRI-STATE SYNFUELS PROJECT REVIEW. VOLUME 4B: DESIGN ENGINEERING
Jun. 1982 136 p Prepared in cooperation with Fluor Engineers and Constructors, Inc.
(Contract DE-FC05-81OR-20807)
(DE83-007451; DOE/OR-20806/T1-VOL-4B) Avail: NTIS HC A07/MF A01

Volume 4B contains a general discussion of environmental pollution control and general plant mechanical engineering; all pollution control (sulfur compounds, nitrogen oxides, particulates, carbon monoxide and hydrocarbon (spills and vapor losses)), emission (at start up and small vent disposals); solid waste management (ashes, fly ash, sludges, spent catalysts, etc.); liquid effluents (runoff, blowdown, waste water, sanitary wastes);

hydrocarbon vapors from tanks (including procedures for purging and ventilating tanks for safety). This mechanical engineering work was accomplished by the several Fluor operations: including the engineering of all mechanical equipment, such as compressors, turbines, blowers and pumps, heat exchangers, furnaces, heaters, cooling towers and cooling systems; material handling systems; pressure vessel and tanks; fire protection systems; and associated metallurgical and welding engineering. Specific areas of involvement included the development of narrative specifications for mechanical engineering systems and equipment, the preliminary design of the coal and ash handling systems for the plant and the general support of all engineering disciplines with regard to mechanical engineering items DOE

N83-35172# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst

PHOTO/BIOLOGICAL HYDROGEN PROGRAM Progress Report

Dec 1982 163 p refs Presented at the SERI Biomass Program Rev Meeting, Washington, 23-25 Jun. 1982

(Contract DE-AC02-77CH-00178; EG-77-C-01-4042)

(DE83-005811, SERI/CP-231-1873, CONF-820676) Avail: NTIS HC A08/MF A01

Achievements are listed for two major technological avenues being pursued for the photoproduction of hydrogen Whole cell systems are being studied using photosynthetic bacteria and algae in an effort to achieve solar energy conversion efficiency of approximately 10 to 15%. A solar energy conversion efficiency of approximately 25% is the goal in studying free cell systems which are obtained by isolating the stable, photochemically active portions of cells photosynthetic complex and recombining these components outside the cell to yield a water splitting system. A.R H

N83-35173# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst

REFORMED METHANOL VEHICLE SYSTEM CONSIDERATIONS

J G. FINEGOLD May 1983 10 p refs Presented at the 18th Intersoc. Energy Conversion Eng Conf., Orlando, Fla., 21-24 Aug. 1983

(Contract DE-AC02-77CH-00178, EG-77-C-01-4042)

(DE83-009401; SERI/TP-235-1982; CONF-830812-23) Avail: NTIS HC A02/MF A01

The design of a reformed methanol vehicle is discussed based on the results of 19 months of testing and debugging. Each major component is considered in the context of system design options Control of the system is also covered. DOE

N83-35174# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.

CROSSED REACTION NETWORKS IN THE CATALYTIC HYDRODENITROGENATION OF SYNTHESIS LIQUID FUELS Quarterly Report, 1 Feb. - 30 Apr. 1983

C. N. SATTERFIELD, C M. SMITH, and M. INGALLS 1983 16 p refs

(Contract DE-AC22-80PC-30075)

(DE83-012026; DOE/PC-30075/13) Avail NTIS HC A02/MF A01

Studies at 3750 C and 6 9 MPa revealed complex interactions between H2O and H2S which significantly affect the rate of overall hydrodenitrogenation In the absence of H2S, addition of H2O (generated in situ from decanol) produces an increase in the overall HDN rate that is rapidly reversible When H2S is present, a comparable increase in overall rate is observed upon the addition of H2O; however, most of this increase in maintained for a long period after the H2O is removed. A standard resulfiding procedure reduces the catalyst activity to the level it had before addition of water. DOE

N83-35405# Advanced Mechanical Technology, Inc., Newton, Mass.

EVALUATION OF IMPROVED MATERIALS FOR STATIONARY DIESEL ENGINES OPERATING ON RESIDUAL AND COAL-BASED FUELS Final Report

A I. WEST, F. J. CARIGNAN, W. D. SYNIUTA, and R. M. CANNON, JR. Mar. 1983 95 p refs

(Contract DE-AC19-80BC-10362)

(DE83-007003; DOE/BC-10362/10) Avail NTIS HC A05/MF A01

Materials which must function in present and future diesel engines were investigated. The quality of the petroleum based fuels available for stationary engines is steadily declining, and the engine ratings are steadily increasing. Ceramic coatings and monolithic ceramics which can be incorporated into the design of stationary piston engines to allow: the use of fuels which are considerably below current standards as regard to corrosive and abrasive contaminants are evaluated These fuels include low grade residual oils from petroleum stocks, coal based liquid fuels, and coal-oil slurries; operation at higher mean effective pressure to increase the efficiency and reduce the size of the engine, and a reduction in wear of critical components to thereby increase the engine's service life Recognizing the complexity of a subject such as friction and wear in a reciprocating engine with the many possible interactions of wear mechanisms, materials, lubricants, surface condition and finish, operating conditions, and the identification and characterization of potential materials which might be incorporated into existing engine designs; screening of these materials with relatively simple laboratory apparatus especially designed for this purpose, SEM analysis of the wear surfaces; and the development of an accelerated wear test utilizing a single cylinder diesel engine burning a coal-oil mixture are included. DOE

N83-35474# Geological Survey, University, Ala

PEAT RESOURCE ESTIMATION IN ALABAMA Summary Progress Report, 1 Oct. 1981 - 29 Sep. 1982

R. L. BARNETT and O M. CLARKE, JR Mar. 1983 85 p refs

(Contract DE-FG18-81FC-10501)

(DE83-009747, DOE/FC-10501/3) Avail: NTIS HC A05/MF A01

The objective of this study is to determine the location and amount of fuel grade peat in Alabama The results of field investigations conducted in twenty-two 7-1/2' and four 15' topographic quadrangles in Mobile and Baldwin Counties are presented in this report. Proximate chemical analyses and Btu determinations were run on 297 samples, and ultimate analyses were run on 106 of the 297 samples The north Mobile area contains the only fuel grade peat found in this study. Total areal extent and thickness of the deposit has not been determined; however, the thickness of the peat is greater than 5 5 ft for approximately 160 acres of this region Preliminary estimates of reserves are 154,000 tons of dry peat DOE

N83-35484# National Academy of Sciences - National Research Council, Washington, D. C. Board on Mineral and Energy Resources

ESTIMATING THE SHORT-TERM PRODUCIBILITY OF OIL AND GAS Final Report

Mar 1983 133 p refs

(Contract DE-AC01-81EI-10724)

(PB83-191155) Avail NTIS HC A07/MF A01 CSCL 08I

This report presents a methodology to EIA to use in collecting estimates of the emergency productive capacity of oil and gas in the United States. The technical report addresses the following topics: (1) the concepts of productive capacity used by others in the past, their attributes and facilities; and the development of recommended concepts likely to provide the most useful data to EIA; (2) the data needed to develop estimates of productive capacity and the availability, accuracy, and propriety of such data; (3) data gathering and analysis methods appropriate to EIA's need to obtain, analyze, and verify information on productive capacity;

and (4) the major constraints to and opportunities for increased domestic oil and gas production. Two basic methods were suggested: one survey plan to estimate the short term producibility of oil; and one method, using data already being collected, for estimating the short term producibility of natural gas GRA

N83-35502*# United Technologies Corp., South Windsor, Conn.
THE STUDY OF INTEGRATED COAL-GASIFIER MOLTEN CARBONATE FUEL CELL SYSTEMS Final Technical Report
10 Jul. 1983 90 p refs Prepared for JPL, Pasadena, Calif.
(Contract NAS7-100)
(NASA-CR-173104, JPL-9950-871; NAS 1.26:173104; FCR-5208)
Avail: NTIS HC A05/MF A01 CSCL 10A

A novel integration concept for a coal-fueled coal gasifier-molten carbonate fuel cell power plant was studied. Effort focused on determining the efficiency potential of the concept, design, and development requirements of the processes in order to achieve the efficiency. The concept incorporates a methane producing catalytic gasifier of the type previously under development by Exxon Research and Development Corp., a reforming molten carbonate fuel cell power section of the type currently under development by United Technologies Corp., and a gasifier-fuel cell recycle loop. The concept utilizes the fuel cell waste heat, in the form of hydrogen and carbon monoxide, to generate additional fuel in the coal gasifier, thereby eliminating the use of both an O2 plant and a stream bottoming cycle from the power plant. The concept has the potential for achieving coal-pile-to-busbar efficiencies of 50-59%, depending on the process configuration and degree of process configuration and degree of process development requirements. This is significantly higher than any previously reported gasifier-molten carbonate fuel cell system. Author

N83-35519# Electricite de France, Chatou Dept. Systemes Energetiques.
BIOMASS GASIFICATION [GAZEIFICATION DE LA BIOMASSE]
M BOILLOT Jun. 1982 36 p In FRENCH
(HP-52-D85-82-09) Avail: NTIS HC A03/MF A01

The chemical and physical properties of vegetable fuels are summarized and techniques used to convert biomatter into energy are described Fixed bed, fluidized bed, suspension, and charcoal based systems are described. The state of the art in France is reviewed. Organizations in other countries concerned with biomass energy research are listed Author (ESA)

N83-35522# Department of Science and Technology, New Delhi (India).
PROCEEDINGS OF THE US-INDIA BINATIONAL WORKSHOP IN HEAT TRANSFER ENGINEERING
R. K. SHAH (General Motors Corp., Lockport, N. Y.), J P HARTNETT (Illinois Univ., Chicago), and S. P SUKHATME (Indian Inst. of Tech., Bombay) Jul 1982 102 p Workshop held in India, 1981
(Contract NSF INT-81-13154)
(PB83-203539) Avail: NTIS HC A06/MF A01 CSCL 10A

A workshop supported by U.S. National Science Foundation and Indian Department of Science and Technology was held in India in December 1981 to identify research areas of mutual interest to the two countries, to foster a closer cooperation between heat transfer researchers in the two nations and to stimulate high quality collaborative research proposals. Seven U.S. delegates and ten Indian delegates agreed upon ten broad areas for research: coal conversion processes, heat recovery systems, alternative energy systems, conditioning of air, manufacturing processes, cryogenics, modeling of complex flows, multiphase systems, heat transfer augmentation, and combustion and high temperature systems. The research needs in these areas are summarized in the report Author (GRA)

N83-35557# Tetra Tech, Inc., Columbus, Ohio.
EVALUATION OF THE DEVONIAN SHALE PROSPECTS IN THE EASTERN UNITED STATES Final Report
R. A. STRUBLE 1982 405 p refs
(Contract DE-AC21-82MC-19143)
(DE83-008749, DOE/MC-19143/1305) Avail: NTIS HC A18/MF A01

The major objectives of the Eastern Gas Shales Project were: (1) to develop and demonstrate exploration rationales for the identification of areas within the Appalachian, Michigan and Illinois basins which offer the greatest potential for recovery of natural gas in commercial quantities, (2) to develop accurate estimates of gas-in-place and of the economically recoverable resource, and (3) to develop and demonstrate reliable and cost-effective extraction methods. The identification of potentially attractive target drilling areas and the accurate estimation of the in-place and economically-producible natural gas resource are reported. Maps, composites of geochemical parameters (total organic carbon, biofacies type, thermal alteration indexes) and stratigraphic data (thickness), combine source rock quality and thickness to identify areas in the basin with the potential for generating the greatest amounts of natural gas and oil. Author

N83-35583# Oregon State Univ., Corvallis Dept. of Atmospheric Sciences.
TIME SERIES MODELS FOR SIMULATING HOURLY WIND POWER
B G BROWN, R. W. KATZ, A H MURPHY, and B A PETERSON (Picotera Systems, Inc., Corvallis, Oreg.) Jun. 1982 54 p refs
(Contract DE-AC79-81BP-25593)
(DE83-010899; DOE/BP-154; BPA-82-10) Avail: NTIS HC A04/MF A01

A procedure for simulating hourly wind power values is discussed. The procedure is based on parametric time series models. Such an approach provides a framework within which both the non-Gaussian probability distribution of wind speeds and the correlation between consecutive hourly wind speed values can be taken into account in the simulation process. Simulated time series of wind power frequently are required in loading forecasting studies and in utility planning models The model development is described, including the statistical characteristics of wind speed, transformations of wind speed, autoregressive models of wind speed, and conversion of wind speed to wind power. The steps in the simulation procedure are dicussed in detail, including the simulation of wing speed and the conversion of simulated speed to simulated power, and presents an example of the simulation process for the Bonneville Power Administration (BPA) site at Goodnoe Hills. Some issues are examined briefly that may arise in applications of the simulation model. DOE

N83-35771# California State Univ., San Diego Dept. of Applied Mechanics and Engineering Sciences.
DEVELOPING TECHNOLOGIES FOR COAL UTILIZATION
S S PENNER *In* Brussels Univ. Liber Amicorum Andre L. Jaumotte p 535-548 1983 refs
Avail: NTIS HC A99/MF A01

The utilization of coal slurries in place of oil in utility and industrial boilers; the development of improved atmospheric and pressurized fluidized bed combustors; the designs of integrated combined cycle systems; and coal gasification and liquefaction to augment supplies of natural gas and liquid fuels, respectively are discussed. The worldwide coal resource base is so large that the necessity to manufacture liquid fuels from coals must be realized. An initiative proposed by the International Energy Agency defines several specific direct coal liquefaction designs and sites where direct coal liquefaction may be implemented. Author (ESA)

N83-35898# California Univ., Livermore Lawrence Livermore Lab.
EXPLICIT PARTICLE-DYNAMICS MODEL FOR GRANULAR MATERIALS
O R. WALTON 1982 9 p refs Presented at the 4th Intern. Conf on Numerical Methods in Geomech., Edmonton, Canada, 31 May - 4 Jun. 1982 Submitted for publication
(Contract W-7405-ENG-48)
(DE83-006411; UCRL-86266; CONF-8205151-1) Avail NTIS HC A02/MF A01

Discrete-particle simulation of granular-material motion is developing into a viable method for studying how various interparticulate forces affect the bulk behavior of granular solids. A two dimensional, polygonal-particle computer model, developed from the ideas of Cundall (1976), and incorporating other techniques from molecular dynamics, is being used in a study of the flow behavior of rubblized oil shale. Direct comparison with physical tests involving multiblock systems have verified the model's ability to predict the motion of real materials. Computer generated movies and high-speed motion pictures of physical tests involving gravity flow of 2-dimensional polygonal particles show formation of temporary arches followed by dynamic rupture and reformation of new arches. Direct shear tests on oil-shale rubble involving very large displacements indicate significant circulatory motion in the rubble. Computer simulation of the direct shear test show similar behavior. DOE

N83-35914# Joint Publications Research Service, Arlington, Va.
SOVIET SCIENCE COORDINATION COUNCIL HOLDS 39TH SESSION
R. PULLAT *In its* USSR Rept.: Sci and Technol Policy, No. 16 (JPRS-84352) p 6-10 19 Sep. 1983 Transl. into ENGLISH *from Izv. Akad. Nauk Est. SSR. Obshchestvennyye Nauki (Tallinn)*, v 3, no. 2, 1983 p 165-167
Avail: NTIS HC A05

Topics of discussion addressed were power engineering, liquid fuels, computer techniques, economic development, energy saving technologies, laser applications, and atmospheric physics. B.G.

N83-36106# Naval Weapons Center, China Lake, Calif. Public Works Dept.
MATERIALS AND ELECTRONIC EQUIPMENT CORROSION TESTS IN SOME U.S. NAVY GEOTHERMAL ENVIRONMENTS Progress Summary Report, Feb. 1978 - Dec. 1980
C RODGERS, S FINNEGAN, and K GRAHAM Mar 1983 44 p refs
(AD-A126355; NWC-TP-6393) Avail NTIS HC A03/MF A01 CSCL 11F

Samples of duriron cast iron, 316L stainless steel, unalloyed titanium, carbon steel coated with Teflon, and glass reinforced epoxy in tubular shapes were tested for approximately 17 months in two different types of low-pressure, medium-temperature steam environments. In addition, a variety of electronic equipment including aircraft instrumentation and battery-powered test circuits were exposed to a hydrogen-sulfide-rich environment at the Devils Kitchen area for approximately 2 years At Fallon, standard corrosion coupons of 11 different metals and alloys and some plastic cement samples were exposed to fluids in a deep brine well for three different time intervals up to 109 days (a planned-interval test series) Exposed samples were analyzed using a variety of methods including optical microscopy, X-ray diffraction techniques, and weight-loss measurements. Corrosion rates, modes, and various corrosion products and precipitates were established for the individual coupons and the tubular specimens, while the electronic instruments and test circuitry were given an operational and bench test before and after exposure and were also visually inspected. Test circuits (and one electronic instrument) were also periodically removed and tested Results are discussed. Author

N83-36120*# National Aeronautics and Space Administration. Pasadena Office, Calif.
FLUIDIZED BED COAL LIQUEFACTION Patent Application
S. A. QADER, inventor (to NASA) (JPL, California Inst. of Tech, Pasadena) 30 Jun. 1983 24 p
(Contract NAS7-100)
(NASA-CASE-NPO-15891-1; US-PATENT-APPL-SN-526740)
Avail: NTIS HC A02/MF A01 CSCL 07D

Coal is catalytically hydropyrolyzed at temperatures of 500 C to 700 C and pressures of 1000 psi to 4000 psi to form a liquefied product comprising gasoline and middle distillate fuel and diesel oils by forming a fluidized bed of coal in hot hydrogen or hydrogen steam gas fed into the bottom inlet of a reactor. Catalyst particles shower downwardly through the upper hydrorefining zone and lower liquefaction zone and are collected in an engager before recycle As the catalyst particles contact the coal particles within the liquefaction zone in the presence of hydrogen, the coal dissolves to form vapors which rise and are hydrocracked and refined to the upper zone before being swept out the outlet by the hot carrier gas. NASA

N83-36122*# National Aeronautics and Space Administration Pasadena Office, Calif.
FLUIDIZED BED DESULFURIZATION Patent Application
M. RAVINDRAM (JPL, California Inst. of Tech., Pasadena) and J J. KALVINSKAS, inventors (to NASA) (JPL, California Inst. of Tech, Pasadena) 30 Jun 1983 44 p
(Contract NAS7-100)
(NASA-CASE-NPO-15924-1; US-PATENT-APPL-SN-526768)
Avail: NTIS HC A03/MF A01 CSCL 07D

High sulfur content carbonaceous material, such as coal, is desulfurized by continuous fluidized suspension in a reactor with chlorine gas, inert dechlorinating gas, and hydrogen gas. A source of chlorine gas, a source of inert gas and a source of hydrogen *gas are connected to the bottom inlet through a manifold and a* heater. A flow controller operates servos in a manner to continuously and sequentially suspend coal in the three gases. The sulfur content is reduced at least 50% by the treatment. NASA

N83-36155# Language Services, Knoxville, Tenn
GAS PURIFICATION AT HIGH TEMPERATURES
W. VERPLANCKE 1982 10 p refs Transl. into ENGLISH from Chemie-Anlagen und Verfahren, no. 15, 1982 p 31-32 Sponsored by DOE
(DE83-010106; DOE-TR-3010106) Avail: NTIS HC A02/MF A01

Gas purification by filters in the past were subject to a temperature limitation of 250 C With steel fiber materials this limit can be raised to 500 C Bekinox steel fibers are produced from different alloys and metals such as stainless steel No 1.4404, Inconel 601 and Hastelloy X Bekinox fibers are used for the production of various types of porous media: (1) metal fiber woven fabric (Bekipor-FA); (2) three dimensional nonwoven fibers which are sintered to form a solid porous plate (Bekipor-ST), and (3) needlefelt which is produced when a Bekinox-fiber nonwoven in needle-punched on one or both sides with a Bekipor-FA woven. Industrial pilot tests of filter bags made with these materials show good performance as well as durability. 2 figures, 2 tables. DOE

N83-36160# Lewin and Associates, Inc., Washington, D. C.
CONCEPTUAL MODELS FOR GAS HYDRATES. PHASE 1: TECHNICAL DIRECTIVE 6 Final Report
V. KUUSKRAA, V. HAMMERSHAIMB, and W. SAWYER 10 Jun. 1983 59 p
(Contract DE-AC21-82MC-19239)
(DE83-015129; DOE/MC-19239/1422) Avail: NTIS HC A04/MF A01

Three conceptual models for the recovery of methane hydrates are discussed that address different recovery of methods for producing gas from hydrates. The three models are: (1) single well cyclic thermal injection; (2) multiwell continuous thermal injection; and (3) reservoir depressurization. In the first model, a reservoir is stimulated (either radially, horizontally or vertically),

steam is injected, and water/gas are produced cyclically. In the second model, 2 or more wells are interconnected by an induced fracture and the injection of steam and production of gas and water are continuous. In the third model, an induced fracture with a large surface area is propagated into the reservoir, the pressure in the fracture is maintained at a low value, and gas is produced through the gas-ice zone as the hydrate dissociates. The three conceptual hydrate recovery models represent original work as well as building on prior work by others. Five previously published models are reviewed for their strong and weak points and applicability to this modeling effort is summarized. DOE

N83-36161# State Univ. of New York, Buffalo. Combustion Lab.
CATALYTIC COMBUSTION OF SYNTHETIC FUELS Final Technical Report
L. A. KENNEDY 28 Mar. 1983 243 p
(Contract DE-FG22-80PC-30220)
(DE83-011116, DOE/PC-30220/T3, REPT-83-14) Avail: NTIS HC A11/MF A01

Experimental and numerical results are reported concerning the lean fuel oxidation of propane in a transition metal oxide based catalytic combustor. The catalyst used was comprised of binary transition metal oxides (Co304, Cr203) deposited either on alumina pellets or alumina washcoated ceramic, honeycomb monoliths. The effect of inlet temperature, inlet velocity and inlet equivalence ratio on combustor operation was studied under lean fuel conditions. The sensitivity of the combustor efficiency to small perturbations in inlet conditions was computed from experimental data The existence of multiple steady states in the combustor, and the range of inlet conditions under which they occur was investigated. Transitions between the different steady states were also studied. The heterogeneous kinetics for lean fuel oxidation of propane on this catalyst were represented using a three step, global mechanism. The rate parameters were computed from experimental data DOE

N83-36248# Ashland Petroleum Co., Ky
REFINING OF MILITARY JET FUELS FROM SHALE OIL, PART 2, VOLUME 2 (IN SITU SHALE OIL PROCESS DATA) Interim Technical Report, Jun. 1979 - Oct. 1980
H. R. MOORE, L M. HENTON, C. A. JOHNSON, and D. A. FABRY Wright-Patterson AFB, Ohio AFWAL Mar. 1982 287 p 3 Vol.
(Contract F33615-78-C-2080; AF PROJ. 2480)
(AD-A129031; AFWAL-TR-81-2056-VOL-2-PT-2) Avail: NTIS HC A13/MF A01 CSCL 21D

A complete EXTRACTACRACKING evaluation sequence has been performed for Occidental in situ shale oil Extensive tests for hydrotreating, catalytic cracking, extraction and product upgrading were successfully performed. Data from these tests are contained in this volume. These tests demonstrate that this oil is an acceptable feedstock for EXTRACTACRACKING Further, specification JP-4 and JP-8 turbine fuels were produced from these materials and provided to the Air Force. GRA

N83-36249# Ashland Petroleum Co., Ky.
REFINING OF MILITARY JET FUELS FROM SHALE OIL. PART 3: PILOT PLANT SAMPLE PREPARATION Interim Report, Nov. 1979 - Jun. 1981
F. H. TURRILL Wright-Patterson AFB, Ohio AFWAL Jul. 1982 101 p
(Contract F33615-78-C-2080; AF PROJ. 2480)
(AD-A128722, AFWAL-TR-81-2056-PT-3) Avail NTIS HC A06/MF A01 CSCL 21D

Phase 3 work performed was aimed at confirming final process design estimates proposed in Phase 1 and producing sample lots of turbine fuel for aircraft performance evaluations. Drum quantities of JP-4, JP-8 and Broadrange jet fuel were supplied to AFWAL, along with a gasoline blending component, diesel fuels, and residual fuels for these evaluations. Also, the scaled-up data from Phase 3 operating data were utilized in the Phase 4 Economic Evaluations. GRA

N83-36253# Southwest Research Inst., San Antonio, Tex. Energy System Research Div.
EFFECT OF LOW-PROOF ALCOHOL UTILIZATION TO SUPPLEMENT DIESEL FUEL ON ENGINES LIFE EXPECTANCY: CATERPILLAR 3306 PCI Final Report
W. E. LIKOS and C. A. MOSES Mar. 1983 31 p
(Contract DE-AC19-81BC-10467)
(DE83-006617; DOE/BC-10467/12) Avail: NTIS HC A03/MF A01

The effects of the used of proof ethanol to supplement diesel fuel in a 187-HP diesel engine was evaluated. Performance testing for power and emissions and pre and post inspections of critical components of the engine confirmed that no significant changes occurred to the engine due to the alcohol fueling It is concluded that alcohol fumigation does not result in serious wear or durability penalties. DOE

N83-36254# Southwest Research Inst., San Antonio, Tex Energy System Research Div.
EFFECTS OF LOW-PROOF ALCOHOL UTILIZATION TO SUPPLEMENT DIESEL FUEL ON ENGINE LIFE EXPECTANCY: JOHN DEERE 6466T Final Report
W E. LIKOS and C. A. MOSES Mar. 1983 30 p
(Contract DE-AC19-81BC-10467)
(DE83-006618; DOE/BC-10467/11) Avail: NTIS HC A03/MF A01

The effects of using 160 proof ethanol to supplement diesel fuel in a 157-HP diesel engine was evaluated Performance testing for power and emissions and pre and post inspections of critical components of the engine confirmed that no significant changes occurred to the engine due to the alcohol fueling. It is concluded that alcohol fumigation, under these conditions, does not result in serious wear of durability penalties. DOE

N83-36255# Naval Research Lab., Washington, D C. Chemistry Div
MECHANISMS OF SYNCRUDE/SYNFUEL DEGRADATION Annual Report, 15 Sep. 1981 - 30 Sep. 1982
R. N. HAZLETT, J. V. COONEY, and E. J. BEAL Jun. 1983 100 p
(Contract DE-AI19-81BC-10525)
(DE83-013819; DOE/BC-10525/4; AR-1) Avail NTIS HC A05/MF A01

Fuel stability tests were conducted at three temperatures - 43, 65 and 800C - with a wide variety of added nitrogen compounds. Most pyrroles develop copious amounts of total insolubles but pyridines, quinolines, tetrahydroquinolines, pyrazoles, pyrrolidines, piperidines and pyrazines form modest amounts of sediments. A time temperature concentration matrix for sediment formation was developed for 2,5-dimethylpyrrole (DMP). A very regular pattern is found with a first order dependence on DMP concentration and an apparent energy of 12 kcal/mole. It is found that basic extracts from two shale derived fuels, when added to the US Navy Shale-II diesel fuel, develop modest amounts of total insolubles. DOE

N83-36256# Sandia Labs., Albuquerque, N. Mex. Geo Energy Technology Dept.
SYNFUELS TECHNOLOGY PUBLICATIONS AND RELATED REPORTS: A BIBLIOGRAPHY, JANUARY 1978 - DECEMBER 1982
S. R. HUDSON, ed. May 1983 84 p
(Contract DE-AC04-76DP-00789)
(DE83-011770; SAND-83-0688) Avail NTIS HC A05/MF A01

Research on synfuels processes emphasizes the chemistry and physics of in situ processes for coal gasification and oil shale, and direct liquefaction processes for coal Research encompasses modeling, laboratory studies, field testing and diagnostics development. Publications, abstracts and sources documenting the research results for calendar years 1978 through 1982 are listed. DOE

N83-36260# Environmental Protection Agency, Ann Arbor, Mich. Emission Control Technology Div.
METHANOL: THE TRANSPORTATION FUEL OF THE FUTURE FOR THE 1983 MIDYEAR REFINING MEETING OF THE API (AMERICAN PETROLEUM INSTITUTE). A GOVERNMENTAL VIEW OF OXYGENATES FOR USE AS MOTOR FUELS AND MOTOR FUEL COMPONENTS
C. GRAY, JR. 11 May 1983 37 p refs
(PB83-215533) Avail: NTIS HC A03/MF A01 CSCL 21D

The analysis which led the conclusion that methanol is the most promising candidate transportation fuel is presented. Results of completed and ongoing engine/vehicle test programs and the concerns associated with the use of methanol as a transportation fuel are also included. GRA

N83-36261# Joyce (T. J.) Associates, Fairfax, Va.
IDENTIFICATION OF SAFETY RELATED RESEARCH AND DEVELOPMENT NEEDS FOR CNG (COMPRESSED NATURAL GAS) VEHICLE FUEL SYSTEMS Final Report, Dec. 1982 - Mar. 1983
T. J. JOYCE May 1983 71 p refs Sponsored by Gas Research Inst.
(PB83-217885; GRI-82/0061) Avail: NTIS HC A04/MF A01 CSCL 21D

The principal safety issues which concern compressed natural gas (CNG) suppliers, users and government officials were identified. A prioritized listing of safety related R&D projects which would alleviate the concerns was prepared The safety concerns were identified by means of a mail survey of equipment suppliers, gas utilities, consumers and government agencies Further information was obtained through follow-up interviews with respondents. The safety R&D conducted in the past or currently underway was reviewed. Existing and proposed safety regulations were analyzed to identify the R&D needed for the CNG industry to meet the requirements DOE

N83-36263# Puerto Rico Univ , Mayaguez.
BAMBOO AS A RENEWABLE ENERGY SOURCE
A. E MOLINI and J. G. IRIZARRY Aug 1982 21 p Presented at the 1st Pan Am. Congr. on Energy, and 2nd Natl. Conf. on Renewable Energy Technol., San Juan, Puerto Rico, 1-7 Aug. 1982
(PB83-211219) Avail NTIS HC A02/MF A01 CSCL 21D

Some of the approximately 1000 species of bamboo of some 50 genera, which range from plants the size of field grass to giants 120 ft. high and one ft. in diameter, and which grow from sea level in the tropics to 10,000 ft. mountain slopes, appear to be excellent alternate renewable energy sources. This paper presents the results obtained from a recently initiated research effort on the subject. Author (GRA)

N83-36264# Environmental Protection Agency, Ann Arbor, Mich. Test and Evaluation Branch.
EMISSIONS AND ENERGY EFFICIENCY CHARACTERISTICS OF METHANOL-FUELED ENGINES AND VEHICLES
J ALSON and T. M BAINES 14 Oct. 1982 36 p refs Presented at the Inst. of Gas Technol. Nonpetroleum Vehicular Fuels, III, Arlington, Va., 14 Oct 1982
(PB83-211607) Avail: NTIS HC A03/MF A01 CSCL 21D

The emissions and energy efficiency results from two recent Environmental Protection Agency (EPA) test programs involving engines designed to utilize methanol fuel are summarized. GRA

N83-36549*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYSIS OF POTENTIAL BENEFITS OF INTEGRATED-GASIFIER COMBINED CYCLES FOR A UTILITY SYSTEM
Y K CHOO Oct. 1983 21 p
(NASA-TP-2172; E-1465, NAS 1 60.2172) Avail NTIS HC A02/MF A01 CSCL 10B

Potential benefits of integrated gasifier combined cycle (IGCC) units were evaluated for a reference utility system by comparing long range expansion plans using IGCC units and gas turbine peakers with a plan using only state of the art steam turbine units and gas turbine peakers. Also evaluated was the importance of the benefits of individual IGCC unit characteristics, particularly unit efficiency, unit equivalent forced outage rate, and unit size. A range of IGCC units was analyzed, including cases achievable with state of the art gas turbines and cases assuming advanced gas turbine technology All utility system expansion plans that used IGCC units showed substantial savings compared with the base expansion plan using the steam turbine units. Author

N83-36584# California Univ., Livermore. Lawrence Livermore Lab. Earth Sciences Dept.
STUDIES OF EARTH STRESS AND HYDRAULIC FRACTURING WITH APPLICATIONS IN THE STIMULATION OF UNCONVENTIONAL-GAS RESERVOIRS
M. HANSON and D. TOWSE Sep 1982 9 p refs Presented at the Rock Mech. Workshop on Hydraulic Fracturing Stress Measurements, Monterey, Calif , 1 Jul 1983
(Contract W-7405-ENG-48)
(DE83-002248, UCRL-88166; CONF-830701-1) Avail: NTIS HC A02/MF A01

The mechanics of hydraulic fracturing for enhanced gas recovery were studied. A minifrac technique for stress measurements at coal mines in the Appalachian and Rocky Mountain regions, to be used to help design fracturing techniques to recover gas from gassy coal beds is discussed It is indicated that fracture propagation is strongly influenced by existing stresses and that the stress gradient in a nonuniform stress field may stop or turn the fracture. Field evidence shows that anisotropic rock properties due to rock fabric can be a major factor in fracture geometry and in calculated stress values DOE

N83-36609# Air Force Engineering and Services Center, Tyndall AFB, Fla. Engineering and Services Lab.
USAF (UNITED STATES AIR FORCE) ACADEMY WIND SITE SURVEY: METHODOLOGIES FOR USE BY THE AIR FORCE Final Report, May 1977 - Dec. 1980
T. E. KULLGREN, T. C FINLEY, and S. C. BOYCE Mar 1983 171 p refs
(Contract AF PROJ 2103)
(AD-A129581; AFESC/ESL-TR-81-02) Avail: NTIS HC A08/MF A01 CSCL 04B

This report describes a wind site survey to locate potential high energy sites at the USAF Academy for future wind machine installation. Surveying techniques developed during the project are described and illustrated Site-specific results, including wind characteristics and economic analyses, are presented Three wind site surveying methodologies are presented Author (GRA)

05

ENERGY CONVERSION

Includes thermomechanical, thermoelectric, geothermal, ocean thermal, and wind energy conversion. Also includes nuclear reacters, magnetohydrodynamic generators, and fuel cells.

A83-40767
DIFFICULTIES IN USING POWER LAWS FOR WIND ENERGY ASSESSMENT
D L. SISTERSON (Argonne National Laboratory, Argonne, IL), B. B. HICKS, R. L. COULTER, and M. L. WESELY Solar Energy (ISSN 0038-092X), vol. 31, no. 2, 1983, p. 201-204. Research supported by the U.S Department of Energy and U.S. Environmental Protection Agency. refs

Long-term data from several tall meteorological towers were used to evaluate the ability of the 1/7 power law to account for the presence of low-level nocturnal jets at heights relevant to large wind turbines. It was found that for homogeneous terrain

the 1/7 law was valid, but no single coefficient generated accurate velocity extrapolations during the night. It was determined that the flow frequently decouples at night at sites around the world, and a minimum power coefficient could be determined that signaled the onset of the decoupling, which was dependent on the Obhukov length for atmospheric stability. The transition to decoupling was at times associated with the occurrence of linear wind profiles. The long-term data indicated that the decoupling begins in the evening, reaches a maximum late at night, and a normal profile returns after sunrise. The magnitude of the power coefficient varies seasonally. It is concluded that a single power law is insufficient to adequately project the power available from the wind at a given site, and that consideration should be given to the added fatigue that a rotor and hub may experience due to the uneven shear forces induced by the jet. M.S.K.

A83-42134
A STUDY OF THE FORMATION OF NITROGEN OXIDES DURING THE COMBUSTION OF A LEAN HOMOGENEOUS MIXTURE IN THE HYBRID COMBUSTION CHAMBER OF AN AUTOMOTIVE GAS-TURBINE ENGINE [ISSLEDOVANIE OBRAZOVANIIA OKISLOV AZOTA PRI SZHIGANII BEDNOI GAMOGENNOI SMESI V GIBRIDNOI KAMERE SGORANIIA AVTOMOBIL'NOGO GAZOTURBINNOGO DVIGATELIA]
V. E. KOPYLOV Aviatsionnaia Tekhnika (ISSN 0579-2975), no. 1, 1983, p. 43-49. In Russian. refs

The combustion of lean phase-homogeneous fuel-air mixtures in homogeneous or hybrid combustion chambers is a promising method of reducing the amount of nitrogen oxides (NOx) in the exhaust gases of automotive gas-turbine engines. Here, the formation of nitrogen oxides in such engines is investigated theoretically and experimentally, and a simplified method for calculating the amount of NOx in the exhaust gas is proposed. The method allows for the effect of the nonuniformity of a homogeneous mixture. V.L.

A83-42627
ABSORPTION SPECTRA, ENERGY LEVELS AND CRYSTAL-FIELD ANALYSIS OF TRIVALENT NEODYMIUM IN THE GAMMA PHASE OF NEODYMIUM SESQUISULFIDE (GAMMA-ND2S3)
J. B. GRUBER (Portland State University, Portland, OR), R. P LEAVITT, and C. A. MORRISON (U S. Army, Harry Diamond Laboratories, Adelphi, MD) Journal of Chemical Physics (ISSN 0021-9606), vol. 79, Aug 15, 1983, p 1664-1668. refs

The energy levels of all manifolds from the ground state through 15,616/cm have been obtained from the absorption spectra of Nd(3+) in the gamma-phase of Nd2S3, together with crystal field parameters derived from a least squares fit of the experimental levels with a crystal field Hamiltonian of S(4) symmetry The rms deviation between calculated and experimental levels is 8.7/cm. A total of 50 levels was included in the fit, and the results are shown to be consistent with an effective point-charge model for the gamma-Nd2S3 lattice in which Nd(3+) vacancies are randomly distributed. The results obtained are applicable to thermoelectric and photovoltaic materials design. O C.

A83-42976#
ALUMINUM-AIR BATTERY DEVELOPMENT - TOWARD AN ELECTRIC CAR
J. F. COOPER Energy and Technology Review, June 1983, p. 20-33. refs

The developmental history of the Al-air battery for electric car applications is traced, noting the current efforts at transferring the technology to the private sector for moving to the commercialization stage. The technology development proceeded on defining the electrochemical and chemical basis of the battery, modeling the economics and energy balance of a transportation system based on aluminum, and configuring the cells to be rapidly refueled. An operable, nonrefuelable battery was produced by 1980. In the next three years, an Al-wedge battery was identified as a refuelable concept, multicell modules were manufactured, macrocyclic catalysts were introduced to replace noble metal elements, and the kinetics and chemical balances were characterized for hydrargillite. Aluminum plates were devised that can be inserted into the dry section of the cell, an operation that can be done at home. Further progress is needed on removing the hydrargillite, maintaining the battery efficiency, and improving cathode reliability, as well as developing a manufacturing process that can yield a 30 present decrease in costs, to an operative level of $0.05/km. M.S K.

A83-43348
NEW PROGRESS IN THE DEVELOPMENT OF A 94-GHZ PRETUNED MODULE SILICON IMPATT DIODE
M HEITZMANN and M. BOUDOT (Thomson-CSF, Montreuil-sous-Bois, Seine-Saint-Denis, France) IEEE Transactions on Electron Devices (ISSN 0018-9383), vol. ED-30, July 1983, p. 759-763. Research supported by the Direction des Recherches, Etudes et Techniques. refs

This paper presents 94-GHz pretuned modules with high efficiency. A description of device process and packaging technology is presented. CW output power levels of 345 mW with gold integrated heat sink and 800 mW with diamond heat sink have been achieved from double-drift IMPATT diodes at frequencies around 94 GHz, simultaneously with an efficiency around 10 percent and a junction temperature of 200-250 C. Author

A83-43367
ECONOMIC EVALUATION OF WIND ENERGY APPLICATIONS FOR REMOTE LOCATION POWER SUPPLY
P. C. BANDOPADHAYAY (Commonwealth Scientific and Industrial Research Organization, Div of Energy Technology, Highett, Victoria, Australia) Wind Engineering (ISSN 0309-524X), vol. 7, no. 2, 1983, p. 67-78.

An economic evaluation methodology based on the Present Value Analysis is proposed In this method, graphical representations of the system performance and the economic requirements are used to examine the economic implications of using Wind Energy Conversion Systems (WECS) to supply electrical power to an isolated user The method can also be used to determine the optimum sizes of the wind energy convertor and the electrical storage size of the simple WECS. The cost of electricity generation using a Total Energy Wind Conversion System is compared, using Present Value Analysis, with that of a WECS and a liquid fuel operated generating system. Author

A83-43368
WIND-LOAD CORRELATION AND ESTIMATES OF THE CAPACITY CREDIT OF WIND POWER - AN EMPIRICAL INVESTIGATION
B. MARTIN (Australian National University, Canberra, Australia) and J. CARLIN (Commonwealth Scientific and Industrial Research Organization, Div. of Mathematics and Statistics, Canberra, Australia) Wind Engineering (ISSN 0309-524X), vol. 7, no. 2, 1983, p. 79-84. Research supported by the National Energy Research, Development and Demonstration Council of Australia. refs

Capacity credit for wind-derived electricity is discussed in terms of a measure of the availability of wind power during peak load hours. Consideration is given to the reduction of the loss of load probability (LOLP) when wind-derived electricity is available in the grid. A formulation is developed which requires the input of wind and load data while aiding in estimates of the capacity credit. A sample problem is presented for hourly loads on an Australian grid where wind data had been recorded for 8 yr. Attention was given to unlimited wind power in the grid, as well as partial contributions to capacity. A constancy was observed in the relative wind resource and load over the years, although little correlation was found between wind speed occurrence and load. Suggestions for adjustments to previous indices used to establish capacity credits are presented M S.K.

A83-43369
THE WEIBULL DISTRIBUTION FUNCTION AND WIND POWER STATISTICS
G. J BOWDEN, P. R. BARKER, V. O. SHESTOPAL (New South Wales, University, Kensington, Australia), and J W. TWIDELL Wind Engineering (ISSN 0309-524X), vol. 7, no. 2, 1983, p. 85-98. Research supported by the Energy Authority of New South Wales and National Energy Research, Development and Demonstration Council of Australia refs

Relationships are defined between the wind moments (average speed and power) and the Weibull distribution parameters k and c. The parameter c is shown to be a constant multiple of the average wind velocity, provided that k lies between 1 6-3.0. Comparisons of predicted wind velocity moments generated from data on Lord Howe island are made for four mthods, the moments method, the lnln linear least squares, the maximum likelihood, and maximum likeness methods. The k and c parameters are calculated up to order 6 Good accuracy is found with the maximum likeness method and the moments method, while the other methods were unsuitable A simplified method for obtaining k is described, and the k and c values for the Lord Howe data are shown to display good agreement with measured values A generalized Weibull distribution is developed to yield annual and seasonal average velocity and average wind power distribution. M.S.K.

A83-43371
A STRATEGY FOR OPTIMIZATION OF WIND ENERGY SYSTEMS
S. WESTBERG (Linkoping, Universitet, Linkoping, Sweden) Wind Engineering (ISSN 0309-524X), vol. 7, no. 2, 1983, p. 104-114. refs

This paper presents a strategy to deal with wind energy systems as an optimization problem. An attempt is made to create a general procedure to describe a complete system The system is divided into three independent parts, the application, the wind turbine and the state of wind. In this way the problem becomes more tractable and each part can easily be changed while the others are unaffected. An illustrative example is described where a wind rotor is directly connected to the compressor of a heat pump. Author

A83-43372
PRINCIPLES OF ENERGY EXTRACTION FROM A FREE STREAM BY MEANS OF WIND TURBINES
G RIEGLER (Institute for Applied Systems Technology, Graz, Austria) Wind Engineering (ISSN 0309-524X), vol. 7, no. 2, 1983, p. 115-126. refs

The equations for the energy extraction from a free stream are developed with particular stress on the necessary basic assumptions. It follows that the only usable form of energy in a free stream is its kinetic energy. In order to get a high energy output per turbine area it is necessary to have a high velocity reduction as well as a high mass flow rate. In a free wind turbine there exists a direct relationship between velocity reduction and mass flow, whereas for diffuser augmented wind turbines a higher mass flow rate per turbine area can be obtained together with a higher velocity reduction. Author

A83-43421
A ONE-VOLT P-INP/N-CDSE REGENERATIVE PHOTOELECTROCHEMICAL CELL
P. G P. ANG and A. F. SAMMELLS (Eltron Research, Inc , Naperville, IL) Electrochemical Society, Journal (ISSN 0013-4651), vol. 130, Aug. 1983, p. 1784-1786. refs

Features and performance of a two-photoelectrode regenerative photoelectrochemical (PEC) cell that yielded a combined photovoltage of more than one volt are reported The photoanode was n-CdSe, the photocathode was p-InP, and the electrolyte was aqueous sulfide/polysulfide. Details of the fabrication process are provided, including formation of an ohmic contact by sputter deposited gold and then electroplating the photocathode with Zn, followed by a final sputtered gold layer. Tests under 100 mW/sq cm illumination of the unoptimized regenerative cell produced an open circuit voltage of 1.15 V, a short circuit current of 24 mA/sq cm, a fill factor of 0 40, and an overall efficiency of 5 5 percent. M.S.K.

A83-43638
NOISE CHARACTERISTICS OF LARGE WIND TURBINE GENERATORS
H. H HUBBARD (College of William and Mary, Newport News, VA), F. W. GROSVELD, and K. P. SHEPHERD (Bionetics Corp., Hampton, VA) Noise Control Engineering Journal (ISSN 0736-2501), vol. 21, July-Aug. 1983, p. 21-29. refs

Data on wind turbine noise taken from the large wind turbines, the Mod-OA, Mod-1, and Mod-2, are examined for guides to developing a predictive model for wind turbine noise Data were taken on the pressure time histories, the narrowband spectra, the one-third octave band spectra, and the overall linear and A-weighted noise levels. A thumping noise recorded upstream from the Mod-1 was due to the encounter of the downwind turning blades with the tower wake. The upwind Mod-2 caused broadband noise with peaks at 800 Hz, caused by interactions of turbulent boundary layers with the blade trailing edges. Amplitude modulation of the overall pressure time history was associated with a periodic swishing noise. Some noises were machine specific; however, the low frequency loading was directed upwind and downwind from the rotors in all machines, while the broadband noise was nondirectional. The wind velocity gradient elongated the noise downwind and shortened it upwind Wake acoustic measurements of two of the Mod-2 machines indicated that the wake does not affect the acoustic output of one Mod-2 downwind from the other. Finally, evidence was found for random phase adding of broadband noise five rotors downstream. M S.K.

A83-43983* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md
THERMOELECTRIC ENERGY CONVERSION WITH SOLID ELECTROLYTES
T COLE (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA) Science (ISSN 0036-8075), vol. 221, Sept 2, 1983, p. 915-920. NASA-supported research. refs

The alkali metal thermoelectric converter (AMTEC) is a device for the direct conversion of heat to electrical energy. The sodium ion conductor beta-double prime-alumina is used to form a high-temperature regenerative concentration cell for elemental sodium An AMTEC of mature design should have an efficiency of 20 to 40 percent, a power density of 0 5 kilowatt per kilogram or more, no moving parts, low maintenance requirements, high durability, and efficiency independent of size. It should be usable with high-temperature combustion, nuclear, or solar heat sources. Experiments have demonstrated the feasibility of the AMTEC and confirmed the theoretical analysis of the device A wide range of applications from aerospace power to utility power plants appears possible. Author

A83-44028
OPTICAL DESIGN AND AEROELASTIC INVESTIGATION OF SEGMENTED WINDMILL ROTOR BLADES
C. C. CHAO and L. WANH (National Tsinghua University, Hsinchu, Republic of China) IN: Engineering science and mechanics; Proceedings of the International Symposium, Tainan, Republic of China, December 29-31, 1981. Part 2 . San Diego, American Astronautical Society, 1983, p. 814-831. refs

An aeroelastic model is developed for optimizing the aerodynamic design and aeroelastic structural analysis of segmented wind turbine rotor blades The treatment is limited to the aerodynamics of the segmented blade as a whole using the Box method, with attention given to rotor response with an appropriate aeroelastic feedback for optimizing the pitch response to aerodynamic moments which occur. Vibration and flutter are also accounted for, including the natural frequencies and the mode shapes. The rotor blades are segmented, each segment being a foam-filled core shell with two end bearings for rotating around the spar. Compensation springs restrict the rotation. An energy balance and the equations of motion are formulated in the aerodynamic analysis, and calculations are presented for a 60 ft

blade on a machine with an 8 m/sec design speed. A large diameter rotor is found to be preferable to many smaller machines for large power generation. A large rotor will not encounter structural resonance, and the segmented blade will be suitably damped in flapping, inplane lagging, and segment twist. M.S.K.

A83-44371#
SMALL GAS TURBINES AND THEIR APPLICATIONS IN THE FIELD OF HIGH-SPEED SURFACE CRAFT
R. W. CROSS (Ames Industrial, Ltd., Fareham, Hants., England) High-Speed Surface Craft (ISSN 0144-7823), vol. 22, Aug. 1983, p. 28-32.

The technical specifications of small gas-turbine engines for use on surface craft are presented. The applications considered are auxiliary power units and ship screening devices The components of the Gevaudan 9 power unit, which weights 55 kg in its recuperated form and is capable of providing 60 kW with continuous 24-h operation at -40 to 50 C in a salt-laden atmosphere, are listed The construction and operation of the subsystems (gas generator, oil system, fuel system, bleed-air circuit, electronic control box, heat exchanger, and advanced-design high-speed alternator) are described Improvements in the fuel efficiency are shown to make the unit competitive with diesel engines. The components of an 80-kg, 1080 x 510 x 480-mm gas-turbine device to produce smoke or dispense chaff and IR powders are listed. Small gas turbines are found to be just as complex as large turbines and hence expensive to procure, but also fuel efficient and highly reliable. T.K.

A83-44372#
HOVERCRAFT AUXILIARY POWER UNITS (APUS)
B. J. RUSSELL High-Speed Surface Craft (ISSN 0144-7823), vol. 22, Aug 1983, p. 34-37

Auxiliary power units (APU) manufactured by British firms for use in hovercraft are characterized. Both diesel and gas-turbine APUs are found to be well suited to the demands of this application The design features, dimensions, performance data, and installation requirements are discussed for the SS 90, SS 923, DA-1, BA-1, HM 5, and Gevaudan 9 APUs, as well as the TRS 18 gas-turbine smoke generator. The progress made in improving the fuel efficiency of gas turbines and reducing the weight of diesel engines is considered significant. T.K.

A83-45018
SPECIAL ELECTRICAL MACHINES: SOURCES AND CONVERTERS OF ENERGY [SPETSIAL'NYE ELEKTRICHESKIE MASHINY: ISTOCHNIKI I PREOBRAZOVATELI ENERGII]
A. I. BERTINOV, D. A BUT, S. R MIZIURIN, B. L. ALIEVSKII, and N. V SINEVA Moscow, Energoizdat, 1982, 552 p. In Russian. refs

The principles underlying the operation of electromechanical and dynamic energy converters are discussed, along with those for the direct conversion of solar, thermal, and chemical energy into electrical energy. The theory for electromechanical and dynamic converters is formulated using a generalized model for the electromechanical conversion of energy. Particular attention is given to electrical machinery designed for special purposes. Features of superconductor electrical machines are discussed. C.R.

A83-45919
A REVIEW OF LARGE WIND TURBINE SYSTEMS
H. SELZER (ERNO Raumfahrttechnik GmbH, Bremen, West Germany) and J I. LERNER IN: Advances in solar energy. Volume 1 . New York, American Solar Energy Society, Inc , 1983, p. 175-207. refs

Research areas in the design and operation of large wind turbines in the U S. and Europe are detailed, with attention given to current and completed programs. Theoretical work in the U.S. is focused on aerodynamics of blades, structural dynamics, control systems, and safety through safe life design, redundancy, and quality assurance. Work is continuing on wind characteristics over the rotor disk and design criteria with regard to cost/benefits and tradeoffs involving various configurations and materials for the rotor blades, placement, pitch control, blade articulation, the tower, the drive train, the gear box, a quill shaft, generator type, and reliability and maintenance. Costing models are being developed. Test experience has been gained through the manufacture and operation of the five Mod 0A, one Mod-1, four Mod-2, and one WTS-4 wind turbines. The European work on blade loading, wind turbine dimensioning, materials, wind structure, environmental impacts, and economics are reviewed, together with the operational experience with the Gedser, two Nibe, the Tvind, and Growian machines. Several countries are also testing smaller wind turbines manufactured indigenously or imported. M S.K.

A83-46462
ISENTROPIC MAGNETOGASDYNAMIC FLOW OF A PERFECT PLASMA
K. GERSTEN, D. GLUECK, and K OBERLAENDER (Bochum, Ruhr-Universitaet, Bochum, West Germany) IN: Recent contributions to fluid mechanics . Berlin, Springer-Verlag, 1982, p. 98-108.

An analytical model is developed for the isentropic one-dimensional magnetogasdynamic (MGD) channel flow, including the total enthalpy in an ideal MGD energy conversion system. The MGD device consists of a plasma in a channel, flowing perpendicularly to an electric field, a magnetic field, and the electric current density in a channel with sidewalls serving as electrodes The flow variables include the Mach number and specific enthalpy, with governing equations comprising conservation of mass and momentum, the isentropic relation, Maxwell's equation, and Ohm's law. A unique solution is obtained for each initial Mach number and electric field parameter in any channel geometry It is demonstrated that less than perfect efficiency is available in the conversion of mechanical to electrical energy, and results are given for a convergent-divergent geometry D.H.K

A83-46603
ANALYTICAL NOISE/PERFORMANCE MODELING OF DETECTOR CHARGE-COUPLED DEVICE (CCD) HYBRID DEVICES
W. T. MCDONALD, H. C. HOWARTH, and C T. KLEINER (Rockwell International Corp., Anaheim, CA) IN: Sensor design using computer tools; Proceedings of the Conference, Los Angeles, CA, January 28, 29, 1982 . Bellingham, WA, SPIE - The International Society for Optical Engineering, 1982, p. 154-162.

Hybrid focal plane devices with photovoltaic detectors mated to charge-coupled device (CCD) multiplexers are finding applications in an increasing variety of staring and scanning sensor systems. This paper presents analytical models for the modulation transfer function (MTF) and the noise in a sensor system which uses hybrid focal plane devices The MTF model treats principal sources of MTF degradation within the detector chip, the CCD, and signal processing. The noise model treats fifteen noise sources within the detector and CCD, and also accounts for noise generated in the signal processing chain. Both models are applicable for either staring or scanning sensor systems Limitations of the models are discussed. Author

A83-47203#
USE OF FLIGHT ENGINE TECHNOLOGY IN STATIONARY INDUSTRIAL GAS TURBINES AND DIESEL MOTORS [NUTZUNG VON FLUGTRIEBWERKS-TECHNOLOGIE BEI STATIONAEREN INDUSTRIEGASTURBINEN UND DIESELMOTOREN]
H. PRECHTER (Motoren- und Turbinen-Union Muenchen GmbH, Munich, West Germany) and B. BECKER (Kraftwerk Union AG, Muelheim, West Germany) Bundesministerium fuer Forschung und Technologie, Statusseminar ueber Luftfahrtforschung und Luftfahrttechnologie, 3rd, Hamburg, West Germany, May 2-4, 1983, Paper. 27 p. In German. refs

Significant cost savings can be attained by using flight engine technology in stationary gas turbines. Flight turbomotor component technology is being applied to advanced exhaust-driven superchargers Radial compressors with high-efficiency

backward-bending blades and large performance graph width permit increased loading pressure in modern diesel motors for ships and locomotives. Significant increases in efficiency for the same volume and small increases in production costs as well as improved fuel usage are attainable. The importance of efficient calculative methods as effective tools for solving complex problems is briefly discussed, as is the cooperation between the turbomachine industry and academic investigators. C D

A83-47945#
AUTOMOTIVE GAS TURBINE CERAMIC COMPONENT TESTING
W. D. CARRUTHERS and G. L. BOYD (Garrett Turbine Engine Co., Phoenix, AZ) American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 28th, Phoenix, AZ, Mar. 27-31, 1983 7 p.
(ASME PAPER 83-GT-112)

Ceramic component development for the NASA Advanced Gas Turbine Powertrain System Development Project is an iterative process, involving advanced nondestructive inspection techniques, visual/dimensional inspection, and thermal and mechanical screening tests. Analytically predicted peak thermal and/or mechanical component stresses have been defined for engine operation and have been closely simulated during rig testing. As developmental testing proceeds, steady state strain and transient thermal data is fed back to the analytical models in order to aid in the design/development process. Testing has so far accumulated 7.5 hours of 1144 K operation on an assembly of ceramic parts constituting a complete assembly of engine structural hardware O.C

A83-47990#
CERAMIC APPLICATIONS IN TURBINE ENGINES (CATE) DEVELOPMENT TESTING
H. E HELMS and S R. THRASHER (General Motors Corp., Diesel Allison Div , Indianapolis, IN) American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 28th, Phoenix, AZ, Mar. 27-31, 1983 7 p.
(ASME PAPER 83-GT-179)

The Ceramic Applications in Turbine Engines (CATE) project's concept for the developmental testing of vehicular gas turbine ceramic components is discussed in light of CATE's GT 404 engine development. In addition to assessing the development test experience accumulated with these ceramic components, attention is given to the prospective test method improvements which CATE project results have suggested. Ceramic component proof testing involves evaluation with a rig that induces stresses in a ceramic component which are comparable to those expected in actual use. Due to the design concepts employed, most of the stresses developed in such components are due to thermal gradients which arise in the element's engine environment. Stress-inducing rigs have been developed for thermal shock, engine regenerator elements, spin testing, bladder testing, regenerator seal leakage, and abradability. O.C

A83-48006#
CERAMIC COMPONENTS FOR HIGH-TEMPERATURE VEHICULAR GAS TURBINES - STATE OF THE ART OF THE GERMAN CERAMIC PROGRAM
K. HAGEMEISTER (Muenchen, Technische Universitaet, Munich, West Germany), E. TIEFENBACHER (Daimler-Benz AG, Stuttgart, West Germany), and P. WALZER (Volkswagenwerk AG, Wolfsburg, West Germany) American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 28th, Phoenix, AZ, Mar. 27-31, 1983. 11 p. Research sponsored by the Bundesministerium fuer Forschung und Technologie.
(ASME PAPER 83-GT-205)

In 1974, the West German Ministry of Research and Technology initiated a research program for the development of vehicular gas turbine ceramic component technology. Attention is given to the results obtained to date with such components as a combustion chamber, nozzles, and two types of turbine rotors, as well as to the relative merits of silicon carbide and silicon nitride as component materials subjected to severe, durability-taxing conditions. O C.

A83-48023*# Detroit Diesel Allison, Indianapolis, Ind
COMPONENT QUALIFICATION AND INITIAL BUILD OF THE AGT 100 ADVANCED AUTOMOTIVE GAS TURBINE
R. A JOHNSON (General Motors Corp., Detroit Diesel Allison Div., Indianapolis, IN) American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 28th, Phoenix, AZ, Mar. 27-31, 1983 9 p Research supported by the U.S. Department of Energy. refs
(Contract DEN3-168)
(ASME PAPER 83-GT-225)

In advance of initial dynamometer testing of the AGT 100 engine, all prime components and subsystems were bench/rig tested. Included were compressor, combustor, turbines, regenerator, ceramic components, and electronic control system. Results are briefly reviewed. Initial engine buildup was completed and rolled-out for test cell installation in July 1982. Shakedown testing included motoring and sequential firing of the combustor's three fuel nozzles. Author

A83-48030*#
PROGRESS IN NET SHAPE FABRICATION OF ALPHA SIC TURBINE COMPONENTS
R. S. STORM and R. G NAUM (Carborundum Resistant Materials Co., Niagara Falls, NY) American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 28th, Phoenix, AZ, Mar. 27-31, 1983 6 p. Research supported by the U S. Department of Energy.
(Contract DEN3-17, DEN3-168, DEN3-167)
(ASME PAPER 83-GT-238)

The development status of component technology in an automotive gas turbine Ceramic Applications in Turbine Engines program is discussed, with attention to such materials and processes having a low cost, net shape fabrication potential as sintered alpha-SiC that has been fashioned by means of injection molding, slip casting, and isostatic pressing The gas turbine elements produced include a gasifier turbine rotor, a turbine wheel, a connecting duct, a combustor baffle, and a transition duct. O C

A83-48173
AN HISTORICAL REVIEW OF PROPELLER DEVELOPMENTS
R. M. BASS (Dowty Rotol, Ltd., Gloucester, England) Aeronautical Journal (ISSN 0001-9240), vol. 87, Aug.-Sept. 1983, p. 255-267. refs

The stages in the historical development of air and water propellers are reviewed, with a focus on British variable-pitch aircraft propellers perfected after World War I. The earliest references to propeller-like devices are considered, and the beginnings of modern marine-propeller design in the 18th and 19th centuries are characterized. The technology of variable-pitch airplane propeller hubs is illustrated with detailed cross-section drawings, mainly from the 1940's and 1950's. The use of advanced materials such as fiber-reinforced composites and its effects on hub design in modern propellers is discussed. T.K.

A83-48308
US NATIONAL PROGRAMS IN CERAMICS FOR ENERGY CONVERSION
R. N KATZ (U.S Army, Army Materials and Mechanics Research Center, Watertown, MA) and R. B. SCHULZ (U.S Department of Energy, Washington, DC) IN: Progress in nitrogen ceramics; Proceedings of the Second Advanced Study Institute, Brighton, England, July 27-August 7, 1981 . Boston, MA and the Hague, Martinus Nijhoff Publishers, 1983, p. 727-735. refs

The present investigation is primarily concerned with the utilization of ceramics for advanced heat engine developments. The driving force behind efforts to use ceramics in energy conversion devices is related to the need to lessen the dependence on imported oil and imported strategic metals. The full implementation of ceramic configured gas turbines and industrial

heat exchangers could save $17.5 billion in oil imports. The U.S. ceramic configured gas turbine programs during the time from 1971 to 1980 are discussed along with the U.S. ceramic configured heat engine programs for the time starting in the spring of 1981 Attention is given to a number of recent advances related to gas turbines, Diesel engine technology, and turbochargers. G.R.

A83-48475
GYROMOTORS [GIDRODVIGATELI]
IU. V. ARBUZOV, B. A. DELEKTORSKII, V B. NIKANOROV, I. N ORLOV, and V. N. TARASOV Moscow, Izdatel'stvo Mashinostroenie, 1983, 177 p. In Russian. refs

Aspects of the theory and application of gyromotors are considered The characteristic features of their design are outlined, with attention given to the problem of using the engines in such a way as to form gyro instruments of high precision. The gyromotor is considered as a system, with consideration given to the relationships between the electrical, magnetic, thermal, and mechanical processes that have a direct bearing on the precision, readiness, and durability of gyroinstruments. Electrical analogy principles are used in constructing the mathematical models. The gyromotor is discussed as an electrical transformer, and methods are proposed for improving the stability of its parameters. C.R.

A83-48507
PHOTOVOLTAIC PROPERTIES OF METALLIFEROUS ZN-, NI-, SNIV (2CL-)-, VO-ETIOPORPHYRIN II [FOTOVOL'TAICHESKIE SVOISTVA METALLOPROIZVODNYKH ZN-, NI-, SNIV (2CL-)-, VO-ETIOPORFIRINA II]
V A. ILATOVSKII, V. M. RUDAKOV, I. B DMITRIEV, G. G. KOMISSAROV, A. F. MIRONOV, and R. P. EVSTIGNEEVA (Akademiia Nauk SSSR, Institut Khimicheskoi Fiziki, Moscow, USSR; Moskovskii Institut Tonkoi Khimicheskoi Tekhnologii, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 271, no. 2, 1983, p. 371-373. In Russian. refs

A83-48555
AURORAL PHYSICS
T. SATO (Hiroshima University, Hiroshima, Japan) IN: Magnetospheric plasma physics . Tokyo/Dordrecht, Center for Academic Publications Japan/D Reidel Publishing Co , 1982, p 197-243. refs

The physical principles governing the generation of auroral phenomena as a result of magnetospheric substorms are reviewed The primary sources of field-aligned currents and mechanical energy are characterized, and the double-layer acceleration mechanism is explored. The equations for magnetosphere-ionosphere coupling are derived, and the generation of auroral arcs via a feedback instability is described. Observational investigations of the auroral kilometric radiation are summarized. T K

A83-49000
OPERATION AND CONTROL OF A 2 GW WAVE-ENERGY SCHEME
H. W WHITTINGTON and J. R JORDAN (Edinburgh, University, Edinburgh, Scotland) IEE Proceedings, Part A - Physical Science, Measurement and Instrumentation, Management and Education, Reviews (ISSN 0143-702X), vol. 130, pt A, no. 6, Sept 1983, p. 340-349. refs

The British Isles have a potential to generate 100 GWh/year from wave energy conversion from devices in either attenuator or terminator configurations. The devices would be at least tens of kilometers long in order to produce up to 2 GW of electrical power. Operations of the system will be integrated with control and maintenance considerations monitored by shore-based computers. Each conversion unit or group will also have on-board computerized monitoring and control systems, as well as for power conversion and smoothing functions. Fault identification and logging will be required, and communications between units, groups, to shore, from shore, and to ships and aircraft will necessarily be through redundant links. The communications, control, and monitoring systems, together with the communications links, are projected to cost around $1,000,000 for four 1 MW units. M.S.K.

A83-49325
OPTIMUM LINEAR SYNCHRONOUS MOTOR DESIGN FOR HIGH SPEED GROUND TRANSPORTATION
T AZUKIZAWA (Toshiba Corp., Toshiba R & D Center, Kanagawa, Japan) IEEE Transactions on Power Apparatus and Systems (ISSN 0018-9510), vol. PAS-102, Oct 1983, p 3306-3314. refs

This paper decribes fundamental concepts pertinent to designing an optimum linear synchronous motor as the propulsion system for high speed ground transportation The complicated interactions between the key parameters are systematically arranged to show what is essential to determine these parameters. Some important guideposts to determine these parameters are obtained. Particularly, 0.7 tau sub s - 0.75 tau sub s long superconducting magnets are recommended (tau sub s: pole pitch). Also, a control method for economical linear synchronous motor operation is discussed Author

A83-49932
INTERNATIONAL MEETING ON LITHIUM BATTERIES, ROME, ITALY, APRIL 27-29, 1982
Meeting sponsored by the Electrochemical Society, Societa Chimica Italiana, U S. Navy, et al. Journal of Power Sources (ISSN 0378-7753), vol. 9, Apr.-May 1983, 201 p

Topics discussed include the mechanistic aspects of the reactivity of organic electrolytes with lithium, the electrochemistry of a nonaqueous lithium/sulfur cell, chromium oxides as cathodes for lithium cells, and the behavior of various cathode materials for nonaqueous lithium cells. Papers are presented on a reversible graphite-lithium negative electrode for electrochemical generators, on interfacial conduction in lithium iodide containing inert oxides, on the mechanism for ion conduction in alkali metal-polymer complexes, and on Li/SOCl2 cells for high temperature applications Attention is also given to Raman spectroscopic studies of the structure of electrolytes used in the Li/SOCl2 battery, to surface films on lithium in acetonitrile-sulfur dioxide solutions, and to polarization of the lithium electrode in sulfuryl chloride solutions. C.R.

A83-49954
HIGH-TEMPERATURE SOLID OXIDE FUEL CELL - TECHNICAL STATUS
W. FEDUSKA and A. O. ISENBERG (Westinghouse Electric Corp., Pittsburgh, PA) Journal of Power Sources (ISSN 0378-7753), vol. 10, June 1983, p. 89-102. refs
(Contract EY-76-C-03-1197; DE-AC03-79ET-11305; DE-AC02-80ET-17089)

The high-temperature solid oxide electrolyte fuel cell (SOFC) represents the basic building block for power generation in a variety of applications, ranging from total energy systems for residences, industrial cogeneration systems, and utility central station power production. This paper describes the operating principle of the SOFC and relates its component composition in the thin layer concept Performance and life test data to 5000 h are presented Sulfur tolerance prediction data and actual tolerance test data are also presented. In addition, test results include the effect of various fuels, e.g., CO and/or H2 (as derived from coal gas), on the performance of the SOFC cell. The status of the present technology is also described. Finally, the usefulness of the SOFC generator, studied as part of a cogeneration system is discussed. Author

A83-49957
DESIGN AND PERFORMANCE OF A SODIUM/SULPHUR MULTITUBE CELL
R. KNOEDLER and R. KRAPF (Brown, Boveri und Cie AG, Heidelberg, West Germany) Journal of Power Sources (ISSN 0378-7753), vol. 10, Aug. 1983, p. 263-270. Sponsorship: Bundesministerium fuer Forschung und Technologie.
(Contract BMFT-ET-4496-A)

Multiplate or multitube arrangements in battery designs generally result in higher specific energy and power values. Preliminary

investigations into the design and operation of a 4-tube Na/S cell with a theoretical capacity of 155 A h showed values of 100 W h/kg for the energy density at the 3 h rate and of 6 milliohms for the cell resistance, corresponding to a maximum power density of 100 W/Kg. With further improvements, values of 165 W h/kg and 180 W/kg can be expected to be realized. Another advantage of this design is reduced corrosion problems because the sulphur electrode can be put inside the beta-Al2O3 tubes. A more complex fabrication process and a higher probability of failures may be considered as drawbacks of this design Author

N83-30662*# Ford Motor Co., Dearborn, Mich Research Staff.
EVALUATION OF CERAMICS FOR STATOR APPLICATIONS: GAS TURBINE ENGINES INTERIM REPORT. STATOR FABRICATION AND EVALUATION Final Report
N. ARNON and W TRELA Mar. 1983 67 p refs
(Contract DEN3-0019)
(NASA-CR-168140; DOE/NASA/0019-83/1; NAS 1.26:168140)
Avail: NTIS HC A04/MF A01 CSCL 11B

The objective was to assess current ceramic materials, fabrication processes, reliability prediction, and stator durability when subjected to simulated automotive gas turbine engine operating conditions. Ceramic one-piece stators were fabricated of two materials, silicon nitride and silicon carbide, using two near-net-shape processes, slip casting and injection molding. Non-destructive evaluation tests were conducted on all stators identifying irregularities which could contribute to failures under durability testing. Development of the test rig and automatic control system for repeatably controlling air flow rate and temperature over a highly transient durability duty cycle is discussed. Durability results are presented for repeated thermal cycle testing of the ceramic one-piece stators. Two duty cycles were used, encompassing the temperature ranges of 704 to 1204 C (1300 to 2200 F) and 871 to 1371 C (1600 to 2500 F). Tests were conducted on 28 stators, accumulating 135,551 cycles in 2441 hours of hot testing Cyclic durability for the ceramic one-piece stator was demonstrated to be in excess of 500 hours, accumulating over 28,850 thermal cycles Ceramic interface forces were found to be the significant factor in limiting stator life rather than the scatter in material strength properties or the variation in component defects encountered. R.J F.

N83-30928# Midwest Research Inst., Golden, Colo Solar Energy Research Inst
ANALYSIS OF THE POTENTIAL OF THE ELECTROFLUID DYNAMIC WIND-DRIVEN GENERATOR
R. MITCHELL Jan. 1983 8 p refs Presented at the 6th Ann ASME Tech Conf., Orlando, Fla., 19-21 Apr. 1983
(Contract DE-AC02-77CH-00178, EG-77-C-01-4042)
(DE83-005712, SERI/TP-211-1851; CONF-830405-10) Avail. NTIS HC A02/MF A01

The basic principle behind the electrofluid dynamic wind-driven generator is the use of an aerosol particle as the active element in a drag type wind energy conversion system. These particles (liquid drops or bubbles) are charged and carried by the wind into an electrical field which exerts on them an electrical force which is opposite of the wind direction. The particles extract the kinetic energy from the wind through the drag force exerted on them. Because an electrical field coupling is used, a minimum of moving parts is required. The analysis of a preliminary conceptual design of a full-scale generator established a range for the value indicators and an understanding of its optimization potential and uncertainty. The value indicators for the electrofluid dynamic concept are compared with those of several concentrational wind energy conversion systems. DOE

N83-31107*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio.
DOE LARGE HORIZONTAL AXIS WIND TURBINE DEVELOPMENT AT NASA LEWIS RESEARCH CENTER
B. S LINSCOTT 1982 16 p refs Presented at the Wind/Solar Energy Conf., Kansas City, Mo., 25-26 Apr. 1983
(NASA-TM-83444, E-1744; DOE/NASA/20320-47; NAS 1.15:83444) Avail NTIS HC A02/MF A01 CSCL 10A

Large wind turbine activities managed by NASA Lewis are reviewed. These activities include results from the first and second generation field machines (Mod-OA, -1, and -2), the status of the Department of Interior WTS-4 machine for which NASA is responsible for technical management, and the design phase of the third generation wind turbines (Mod-5) Author

N83-31111# United Technologies Corp., South Windsor, Conn. Power Systems Div.
ON-SITE CELL FIELD TEST SUPPORT PROGRAM Annual Report, Jul. 1981 - Jun. 1982
J. W. STANIUNAS and G. P MERTEN Sep 1982 107 p refs Sponsored by Gas Research Inst.
(PB83-188672; FCR-4685; GRI-82/0046) Avail: NTIS HC A06/MF A01 CSCL 10B

Utility sites for data monitoring were reviewed and selected. Each of these sites will be instrumented and its energy requirements monitored and analyzed for one year prior to the selection of 40 Kilowatt fuel cell field test sites Analyses in support of the selection of sites for instrumentation shows that many building sectors offered considerable market potential. These sectors include nursing home, health club, restaurant, industrial, hotel/motel and apartment. GRA

N83-31455# Teledyne Energy Systems, Timonium, Md.
SPECIFICATION FOR STRONTIUM-90 500-WATT(E) RADIOISOTOPIC THERMOELECTRIC GENERATOR Final Report
T. HAMMEL, J. HIMES, A. LIEBERMAN, J. W MCGREW, D OWINGS, and F. SCHUMANN Apr. 1983 96 p refs
(Contract DE-AC04-83AL-22028)
(DE83-011200; DOE/AL-22028/T2, TES-3170) Avail: NTIS HC A05/MF A01

A conceptual design for a demonstration 500-watt(e) radioisotopic thermoelectric generator (RTG) was created. The design effort was divided into two tasks, viz., create a design specification for a capsule strenth member that utilizes a standard Strontium 90 fluoride filled WESF inner liner, and create a conceptual design for a 500-watt(e) RTG The strength member specification was designed to survive an external pressure of 24,500 psi and meet the requirements of special form radioisotope heat sources Therefore the capsule is if desired, licensed for domestic and international transport The design for the RTG features a radioisotopic heat source, an array of nine capsules in a tungsten biological shield, four current technology series connected thermoelectric conversion modules, low conductivity thermal insulation, and a passive finned housing radiator for waste heat dissipation The preliminary RTG specification formulated previous to contract award was met or exceeded. DOE

N83-31469# Junta de Energia Nuclear, Madrid (Spain). Div. de Investigacion Basica.
A SYNCHRONIZATION SYSTEM TO DIGITALIZE TJ-1 TOKAMAK DATA
L PACIOS, J GUASP, and A PEREZ-NAVARRO 1983 28 p refs In SPANISH; ENGLISH summary
(JEN-539; ISSN-0081-3397, ISBN-84-500-8670-1) Avail: NTIS HC A03/MF A01

At the TJ-1 Tokamak, signals are stored on a 60-channel magnetic memory. A system to address those channels and synchronize readout is presented The Digitalized signals are stored in structured files on PDP-11/34 magnetic disks. Author

N83-31478# Princeton Univ., N. J. Plasma Physics Lab.
RADIO-FREQUENCY ENERGY IN FUSION POWER GENERATION
J. Q. LAWSON, W. R. BECRAFT (General Electric Co., Schenectady, N.Y.), and D. J. HOFFMAN (ORNL) 1983 7 p refs Presented at the 5th Topical Meeting on Technol. of Fusion Energy, Knoxville, Tenn., 26 Apr. 1983
(Contract W-7405-ENG-26)
(DE83-012067; CONF-830406-34) Avail NTIS HC A02/MF A01

The history of radio-frequency (RF) energy in fusion experiments is reviewed, and the status of current efforts is described. Potential applications to tasks other than plasma heating are described, as are the research and development needs of RF energy technology. DOE

N83-31479# Oak Ridge National Lab., Tenn.
FIFTH TOPICAL MEETING ON THE TECHNOLOGY OF FUSION ENERGY
Apr. 1983 566 p refs Meeting held in Knoxville, Tenn., 26-28 Apr. 1983 Sponsored in part by the American Nuclear Society, Oak Ridge-Knoxville Section, Office of Fusion Energy of DOE, and EPRI
(Contract W-7405-ENG-26)
(DE83-004943; CONF-830406-ABSTS) Avail: NTIS HC A24/MF A01

Abstracts are presented of the approximately 250 papers that were presented at the conference. Some of the main topics included the following: (1) next generation devices, (2) tritium, (3) hybrids, (4) alternate fuels, (5) materials engineering, (6) blanket and first wall engineering, and (7) inertial confinement. DOE

N83-31481# California Univ., Livermore. Lawrence Livermore Lab.
SYMPOSIUM: NEW TRENDS IN UNCONVENTIONAL APPROACHES TO MAGNETIC FUSION
R. F. POST 5 Apr. 1983 24 p Symp. held in Stockholm, 16-18 Jun. 1982 Submitted for publication
(Contract W-7405-ENG-48)
(DE83-010064, CONF-830623-1, UCRL-89018) Avail: NTIS HC A02/MF A01

An extensive review of the meeting is given. The concepts discussed included reverse-field pinches, compact tori, advanced stellarators, multipoles, surface magnetic confinement systems, the bumpy torus, and a collection of mirror-based approaches. DOE

N83-31482# California Univ., Los Angeles. Dept. of Mechanics and Structures.
PLASMA-SURFACE INTERACTIONS IN MAGNETIC-FUSION SYSTEMS Annual Report
R. W. CONN 1982 45 p refs
(Contract DE-AT03-80ER-52062)
(DE83-010046; DOE/ER-52062/T1) Avail: NTIS HC A03/MF A01

The general scope of the work has been to develop the understanding of the plasma boundary and plasma-wall interactions through theory and computer modelling research on plasma edge physics, on the role of electric potentials at boundaries, on neutral-gas recycle including atmomic and surface-physics processes, on neutral-atom transport in plasmas. on neutral-atom flows in ducts connected to components such as pump limiters or divertors, and on techniques to modify plasma particle and heat flows in the edge in order to make the particle and heat fluxes to components more manageable. The possibility of simulating in a benchtop experiment some key physics and engineering issues was also investigated. DOE

N83-31483# Stanford Univ., Calif. High Temperature Gasdynamics Lab.
THE SUPPRESSION OF TURBULENCE IN COMBUSTION-DRIVEN MAGNETOHYDRODYNAMIC FLOWS
J. C. REIS Jan. 1983 192 p refs
(Contract DE-AC01-80ET-15611)
(DE83-007902; DOE/ET-15611/T8; HTGL-TR-2-83) Avail. NTIS HC A09/MF A01

The influence of a transverse magnetic field on velocity fluctuations in a combustion driven magnetohydrodynamic (MHD) flow has been experimentally and theoretically investigated and compared to that in liquid metal MHD flows. The measurements were made with a laser Doppler velocimeter in the Stanford M-2 MHD facility. A comparison of the measured mean velocity profiles, with and without magnetic field, indicated only a slight trend toward a more laminar shape, and substantially less change than in liquid metal flows. The turbulence intensity profiles indicated the same degree of suppression in the core, but substantially less suppression in the boundary layers in comparison to liquid metal flows. The difference is attributed to a reduced electrical conductivity in the boundary layer of the combustion driven flows A second difference between combustion driven and liquid metal MHD flows is that the combustion generated turbulence was dominated by long streamers. A theoretical model for turbulence suppression of the combustion streamers was developed. DOE

N83-31484# Columbia Univ., New York. Plasma Physics Lab.
SUPERFAST Z-PINCH-PRODUCED PLASMAS Ph.D. Thesis
W. W. HSING 1983 117 p refs
(Contract DE-AC02-80ER-10613)
(DE83-009278; DOE/ER-10613/2) Avail NTIS HC A06/MF A01

The superfast z-pinch was investigated as a possible means of producing an ultra-high (100 keV) temperature plasma. An ion Vlasov fluid electron code is shown to simulate the experimental behavior of a pinch. Dependence of the temperature on wall generated impurity, initial density profile, and generator parameters are indicated. Extrapolation of the code using state of the art pulse generators indicate feasibility of an ultra-high temperature plasma. DOE

N83-31485# California Univ., Livermore. Lawrence Livermore Lab.
PHYSICS OF LASER FUSION. VOLUME 4: THE FUTURE DEVELOPMENT OF HIGH-POWER SOLID-STATE LASER SYSTEMS
J. L. EMMETT, W. F. KRUPKE, and J. B. TRENHOLME 1982 76 p
(Contract W-7405-ENG-48)
(DE83-009211; UCRL-53344-VOL-4) Avail: NTIS HC A05/MF A01

Solid state lasers, particularly neodymium glass systems, have undergone intensive development during the last decade. Solid state laser technology is reviewed in the context of high peak power systems for inertial confinement fusion. Specifically addressed are five major factors: efficiency, wavelength flexibility, average power, system complexity, and cost; these factors today limit broader application of the technology. It is concluded that each of these factors can be greatly improved within current fundamental physical limits. It is further concluded that the systematic development of new solid state laser media, both vitreous and crystalline, should ultimately permit the development of wavelength flexible, very high average power systems with overall efficiencies in the range of 10 to 20%. DOE

N83-31487# Illinois Univ., Urbana-Champaign. Fusion Studies Lab.

STABILITY OF HIGH-BETA TOKAMAKS WITH RESPECT TO PELLET INJECTION Ph.D. Thesis

W C TETLEY 1983 34 p refs

(Contract DE-AC02-76ET-52040)

(DE83-002912; DOE/ET-52040/266; COO-2218-266) Avail: NTIS HC A03/MF A01

During the course of a long pulse or steady state operation, the fuel in a plasma becomes depleted. This necessitates the refueling of the reactor Several methods were proposed. The use of pellet injection in a high toroidal beta Tokamak is explored. Specifically the effect on stablity is studied. Limits on the beta are found with respect to the size of the pellet injected. The device studied is the proposed upgrade of the Doublet III. The principal conclusion is that the stable beta is dependent on the shape of the current profile, and that by flattening the profile the plasma stability is increased. DOE

N83-31488# Hanford Engineering Development Lab., Richland, Wash.

TRACK-MOUNTED REMOTE HANDLING SYSTEM FOR THE TOKAMAK FUSION ENGINEERING TEST

V. P. KELLY, J. D. BERGER, R. L. DAUBERT, and J. A. YOUNT 1982 8 p refs Presented at Am. Nucl. Soc. Winter Meeting, Washington, D.C., 14 Nov. 1982

(Contract DE-AC06-76FF-02170)

(DE83-003371, HEDL-SA-2715-FP; CONF-821103-30) Avail NTIS HC A02/MF A01

Concepts for remote handling machines (IVM) designed to transverse the interior of toroidal vessels with guidance and support from track systems have been developed for the proposed Tokamak Fusion Engineering Test (TFET). TFET was proposed as an upgrade for the Tokamak Fusion Test Reactor (TFTR), currently nearing completion. The track mounted IVMs were conceived to perform in vessel remote maintenance for TFET, including removal and replacement of pump limiter blades and protective tiles as well as other maintenance related tasks such as vessel wall inspection leak testing and interior cleanup The conceptual IVMs consist of three manipulator arms mounted on a common frame member a single power manipulator arm with high load carrying capacity and two lower capacity servomanipulator arms. Descriptions of the IVM concepts, in vessel track systems, and ex-vessel handling systems are presented DOE

N83-31489# California Univ., Livermore. Lawrence Livermore Lab

CONTINUOUS CRYOPUMP FOR STEADY-STATE MIRROR FUSION REACTORS

T H. BATZER and W. R. CALL 20 Sep. 1982 17 p refs Presented at 29th Natl. Symp. on Am. Vacuum Soc., Baltimore, 16 Nov. 1982

(Contract W-7405-ENG-48)

(DE83-001497; UCRL-87732; CONF-821111-10) Avail: NTIS HC A02/MF A01

The characteristics of Mirror Fusion Reactors, i.e., steady state operation, a low neutral gas density and a large gas through-put require unique vacuum pumping capabilities. One approach that appears to meet these requirements is a liquid helium cooled cryo-pump system in which a fixed portion is isolated and degassed while the remainder continues to pump. The time to degas a rotating, fixed portion of the pumping area and the ratio of that area to the total area fixed the gas inventory in the chamber The active pump area maintains the required neutral gas density and the time averaged degassing rate equals the gas throughput. A cryopump whereby the gas condensed (deuterium) on the liquid helium cooled panel is transferred to a collector pump and subsequently to an exterior mechanical pump and exhausted At panel loadings as high as .55 torr-litres/square cm the gas leakage during degassing is less than 8% and the degassing time is less than 10 minutes. DOE

N83-31897* National Aeronautics and Space Administration Pasadena Office, Calif.

CYCLING JOULE THOMSON REFRIGERATOR

E. TWARD, inventor (to NASA) (JPL, Calif. Inst. of Tech, Pasadena) 4 Jan. 1983 8 p Filed 28 Jan 1981 Supersedes N81-19344 (19 - 10, p 1338)

(NASA-CASE-NPO-15251-1; US-PATENT-4,366,680; US-PATENT-APPL-SN-229239; US-PATENT-CLASS-62-514R; US-PATENT-CLASS-62-48, US-PATENT-CLASS-337-14) Avail US Patent and Trademark Office CSCL 14B

A symmetrical adsorption pump/compressor system having a pair of mirror image legs and a Joule Thomson expander, or valve, interposed between the legs thereof for providing a, efficient refrigeration cycle is described. The system further includes a plurality of gas operational heat switches adapted selectively to transfer heat from a thermal load and to transfer or discharge heat through a heat projector, such as a radiator or the like. The heat switches comprise heat pressurizable chambers adapted for alternate pressurization in response to adsorption and desorption of a pressurizing gas confined therein.

Official Gazette of the U.S. Patent and Trademark Office

N83-31984# Cherrywood Farms, Williamsburg, Mich.

PROJECT DEMONSTRATION OF WIND TURBINE ELECTRICITY: INTERCONNECTING A NORTHERN MICHIGAN FRUIT FARM WITH A MAJOR UTILITY Final Report

D. M AMON 1982 259 p

(Contract DE-FG02-80R5-10226)

(DE83-001387, DOE/R5-10226/2) Avail: NTIS HC A12/MF A01

A project to interconnect a farm wind turbine with a utility is reported. Included are a summary of accomplishments and daily major events, correspondence relevant to the project (letters explaining the delay of installation, extending the period of performance, tax credits, net energy sellback legislation, etc.), publicity, legal aspects, maintenance and repair, analysis of test data, and accounting DOE

N83-32118# Lockheed Missiles and Space Co., Palo Alto, Calif

BUCKLING OF STEEL-CONTAINMENT SHELLS. TASK 1B: BUCKLING OF WASHINGTON PUBLIC POWER SUPPLY SYSTEMS' PLANT NO. 2 CONTAINMENT VESSEL Final Report, 25 Aug. 1980 - 30 Sep. 1982

E. MELLER and D. BUSHNELL Dec. 1982 124 p refs

(Contract NRC-FIN-B6568)

(DE83-901036; NUREG/CR-2836-VOL-1-PT-2; LMSC-D-812950-VOL-1-PT-2) Avail: NTIS HC A06/MF A01; also available HC SOD $6.00

Static buckling analyses of the steel containment vessel were conducted with use of several computer programs. The analyses were conducted as part of evaluation of two steel containment designs. Results are given from analyses of the containment as if it were axisymmetric and the second gives results from a STAGSC-1 model in which the largest penetration is included. Good agreement is obtained from analyses with BOSOR5 and STAGSC-1 for a case in which both of these computer programs were applied to the same configuration and loading Predictions of collapse from STAGSC-1 indicate that the largest penetration of the WPPSS-2 containment vessel is reinforced such that there is no decrease in load carrying capability below that indicated from models in which this penetration is neglected. DOE

N83-32175* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THERMIONIC ENERGY CONVERTERS Patent

J. F MORRIS, inventor (to NASA) 8 Dec. 1983 6 p Filed 19 Feb. 1981 Supersedes N81-19561 (19 - 10, p 1368)

(NASA-CASE-LEW-12443-1; US-PATENT-4,373,142, US-PATENT-APPL-SN-235797, US-PATENT-CLASS-310-306) Avail: US Patent and Trademark Office CSCL 10A

The efficiency of thermionic energy converters is improved by internal distribution of tiny sorted cesium diodes driven by the thermal gradient between the primary emitter and the collector.

The tiny, sorted diode distribution comprises protrusions of the emitter material from the main emitter face which contact the main collector face thermally but not electrically. The main collector ends of the protrusions are separated from the main collector by a thin layer of insulation, such as aluminum oxide. The shorted tiny diode distribution augments cesium ionization through internal thermal effects only within the main diode. No electrical inputs are required. This ionization enhancement by the distribution of the tiny shorted diodes not only reduces the plasma voltage drop but also increases the power output and efficiency of the overall thermionic energy converter

Official Gazette of the U.S. Patent and Trademark Office

N83-32176* National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio.

ADVANCED INORGANIC SEPARATORS FOR ALKALINE BATTERIES AND METHOD OF MAKING THE SAME Patent

D W. SHEIBLEY, inventor (to NASA) 1 Feb. 1983 5 p Filed 22 Dec. 1981

(NASA-CASE-LEW-13171-2; US-PATENT-4,371,596; US-PATENT-APPL-SN-333537; US-PATENT-CLASS-429-144; US-PATENT-CLASS-429-251; US-PATENT-CLASS-429-254, US-PATENT-CLASS-29-623.5) Avail US Patent and Trademark Office CSCL 10C

A flexible, porous battery separator includes a coating applied to a porous, flexible substrate. The coating comprises: (1) a thermoplastic rubber-based resin which is insoluble and unreactive in the alkaline electrolyte, (2) a polar organic plasticizer which is reactive with the alkaline electrolyte to produce a reaction product which contains a hydroxyl group and/or a carboxylic acid group, and (3) a mixture of polar particulate filler materials which are unreactive with the electrode. The mixture comprises at least one first filler material having a surface area of greater than 25 sq meters/gram, at last one second filler material having a surface area of 10 to 25 sq meters/gram. The volume of the mixture of filler materials is less than 45% of the total volume of the fillers and the binder. The filler surface area per gram of binder is about 20 to 60 sq meters/gram, and the amount of plasticizer is sufficient to coat each filler particle

Official Gazette of the U.S. Patent and Trademark Office

N83-32179 Miami Univ, Coral Gables, Fla. Clean Energy Research Inst

INDIRECT SOLAR WIND GEOTHERMAL: ALTERNATIVE ENERGY SOURCES 4, VOLUME 4

T. N. VEZIROGLU, ed. 1982 19 p refs

(LC-82-71533; ISBN-0-250-40557-1) Avail: Issuing Activity

The utilities are obliged to provide electricity in a reliable and cost effective manner. Some unique problems posed by large scale wind turbines as an electricity source have to be considered. A value model is presented which is based upon the fuel displacement capability and the capacity displacement capability of wind turbines. The amount of fossil fuels which is saved by wind turbines depends on the forecasted wind power output, the actual power output fluctuations of the wind turbines and on system operation. The highly controversial capacity credit of wind turbines is discussed under the aspect of system reliability. It is shown that calculations of the capacity credit should be based upon detailed investigations with regard to the time dependence of the hourly wind power output. Author

N83-32183# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. Coll. of Engineering.

DESIGN, CONSTRUCTION, TESTING AND EVALUATION OF A RESIDENTIAL ICE STORAGE AIR CONDITIONING SYSTEM M.S. Thesis Florida Univ.

J. J. SANTOS and T. A RITZ Dec. 1982 123 p refs

(AD-A128582; AFIT-CI-NR-82-83T) Avail: NTIS HC A06/MF A01 CSCL 13A

The experimental system was used to supply cooling to a single wide trailer and performance data were compared to a conventional air conditioning system of the some capacity. Utility rate information was collected from over one hundred major utility companies and used to evaluate economic comparison of the two systems. The ice storage system utilized reduced rate time periods to accommodate ice while providing continuous cooling to the trailer. The economic evaluation resulted in finding that the ice storage system required over 50% more energy than the conventional system. Although a few of the utility companies offered rate structures which would result in savings of up to $200 per year, this would not be enough to offset higher initial costs over the life of the storage system Recommendations include items that would have to be met in order for an ice storage system to be an economically viable alternative to the conventional system. GRA

N83-32185# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.

OCEAN ENERGY SYSTEM AT THE JOHNS HOPKINS UNIVERSITY APPLIED PHYSICS LABORATORY Quarterly Report, Jul. - Sep. 1982

D. RICHARDS, W. H. AVERY, D. RICHARDS, and E. J FRANCIS Oct. 1982 39 p refs Sponsored in part by DOE

(PB83-180034, JHU/APL/OQR-82-3) Avail: NTIS HC A03/MF A01 CSCL 10A

The Johns Hopkins University Applied Physics laboratory, is engaged in developing Ocean Thermal Energy Conversion (OTEC) systems that will provide synthetic fuels (e.g., methanol), energy intensive products such as ammonia (for fertilizers and chemicals), and aluminum The work also includes assessment and design concepts for hybrid plants, such as geothermal-OTEC (GEOTEC) plants. APL has been designated the Lead Laboratory in these areas by DOE/DOET. Another effort that began in the spring of 1982 is a technical advisory role to DOE with respect to their management of the conceptual design activity of the two industry teams that are designing offshore OTEC pilot plants that could deliver power to Oahu, Hawaii. Author (GRA)

N83-32597# Oak Ridge National Lab., Tenn. Fusion Energy Div.

CONSTRAINED RIPPLE OPTIMIZATION OF TOKAMAK BUNDLE DIVERTORS

L. M. HIVELY, J. A. ROME, V. E. LYNCH, J. F LYON, R H. FOWLER, Y. K. M. PENG, and R. A. DORY Feb. 1983 58 p refs

(Contract W-7405-ENG-26)

(DE83-006363; ORNL/TM-7898) Avail: NTIS HC A04/MF A01

Magnetic field ripple from a Tokamak bundle divertor is localized to a small toroidal sector and must be treated differently from the usual (distributed) toroidal field (TF) coil ripple. Generally, in a Tokamak with an unoptimized divertor design, all of the banana-trapped fast ions are quickly lost due to banana drift diffusion or to trapping between the 1/R variation in absolute value vector B Xl B and local field maxima due to the divertor. A computer code has been written to optimize automatically on-axis ripple subject to these constraints, while varying up to nine design parameters Optimum configurations have low on-axis ripple (less than 0.2%) so that, now, most banana-trapped fast ions are confined Only those ions with banana tips near the outside region (absolute value theta) or equal to 45 deg are lost. However, because finite-sized TF coils have not been used in this study, the flux bundle is not expanded. DOE

N83-32598# Georgia Inst. of Tech, Atlanta. School of Nuclear Engineering.

SATURATED TEARING MODES IN TOKAMAKS WITH DIVERTORS

G. BATEMAN Dec. 1982 8 p refs

(Contract DE-AS05-81ER-53117)

(DE83-005589; DOE/ER-53117/T1) Avail: NTIS HC A02/MF A01

A self-consistent theory of saturated tearing modes capable of predicting multiple magnetic island widths in Tokamaks with no assumptions on the cross-sectional shape, aspect ratio, or plasma pressure is developed. This algorithm is being implemented in the form of a computer code. It is proposed: (1) to complete, refine, document and publish this computer code; (2) to carry out a survey

in which the current profile, aspect ratio, cross-sectional shape, and pressure profile are varied in order to determine their effect on saturated tearing mode magnetic island widths, and (3) to determine the effort of some externally applied magnetic perturbation harmonics on these magnetic island widths. Particular attention is paid to the coupling between different helical harmonics, the effect of multiple magnetic islands on the profiles of temperature, pressure and current, and the potential of magnetic island overlap leading to a disruptive instability DOE

N83-32599# Department of Energy, Washington, D. C. Office of Fusion Energy
MAGNETIC FUSION ENERGY AND COMPUTERS. THE ROLE OF COMPUTING IN MAGNETIC FUSION ENERGY RESEARCH AND DEVELOPMENT
Jan 1983 156 p refs Revised
(DE83-006565, DOE/ER-0159) Avail NTIS HC A08/MF A01

This report documents the structure and uses of the MFE Network and presents a compilation of future computing requirements. Its primary emphasis is on the role of supercomputers in fusion research. One of its key findings is that with the introduction of each successive class of supercomputer, qualitatively improved understanding of fusion processes has been gained At the same time, even the current Class VI machines severely limit the attainable realism of computer models. Many important problems will require the introduction of Class VII or even larger machines before they can be successfully attacked. DOE

N83-32600# Princeton Univ., N. J. Plasma Physics Lab.
CONTINUOUS TOKAMAK OPERATION WITH AN INTERNAL TRANSFORMER
C. E. SINGER and D. R. MIKKELSEN Oct. 1982 35 p refs
(Contract DE-AC02-76CH-03073)
(DE83-002340; PPPL-1936) Avail NTIS HC A03/MF A01

A large improvement in efficiency of current drive in a Tokamak can be obtained using neutral beam injection to drive the current in a plasma which has low density and high resistivity The current established under such conditions acts as the primary of a transformer to drive current in an ignited high-density plasma. In the context of a model of plasma confinement and fusion reactor costs, it is shown that such transformer action has substantial advantages over strict steady-state current drive It is also shown that cycling plasma density and fusion power is essential for effective operations of an internal transformer cycle Fusion power loading must be periodically reduced for intervals whose duration is comparable to the maximum of the particle confinement and thermal inertia timescales for plasma fueling and heating. The design of neutron absorption blankets which can tolerate reduced power loading for such short intervals is indentified as a critical problem in the design of fusion power reactors. DOE

N83-32602# Idaho National Engineering Lab., Idaho Falls
CONCEPTUAL DESIGN REPORT FOR A FUSION ENGINEERING DEVICE
K. D. WATTS, L. S. MASSON, and R. S. MCPHERSON Oct 1982 68 p refs
(Contract DE-AC07-76ID-01570)
(DE83-002288, EGG-FT-6008) Avail: NTIS HC A04/MF A01

Design requirements, trade studies, design descriptions, conceptual designs, and cost estimates have been completed for the Fusion Engineering Device sector handling machine, movable manipulator system, subcomponent handling machine, and limiter blade handling machine. This information will be used by the Fusion Engineering Design Center to begin to determine the cost and magnitude of the effort required to perform remote maintenance on the Fusion Engineering Device. The designs presented are by no means optimum, and the costs estimates are rough order of magnitude. DOE

N83-32604# Los Alamos Scientific Lab., N Mex.
ADIABATIC COMPRESSION OF ELONGATED FIELD-REVERSED CONFIGURATIONS
R. L. SPENCER, M TUSZEWSKI, and R. K. LINFORD 1982 5 p refs Presented at the 5th Symp. on Phys. and Technol of Compact Toroids in the Magnetic Fusion Energy Program, Bellevue, Wash., 16-18 Nov. 1982
(Contract W-7405-ENG-36)
(DE83-003533; LA-UR-82-3380; CONF-821124-6) Avail: NTIS HC A02/MF A01

The simplest model of plasma dynamics is the adiabatic model. In this model the plasma is assumed to be in MHD equilibrium at each instant of time The equilibria are connected by the requirement that they all have the same entropy per unit flux, i.e., the equilibria form a sequence generated by adiabatic changes. The standard way of computing such a sequence of equilibria was developed by Grad, but its practical use requires a fairly complicated code. It would be helpful if approximately the same results could be gotten either with a much simpler code or by analytical techniques. In Sec. 2 a one dimensional equilibrium code is described and its results are checked against a two dimensional equilibrium code; in Sec. 3 an even simpler analytic calculation is presented. DOE

N83-32605# Princeton Univ., N. J. Lab for Plasma Physics.
DIAGNOSTICS FOR NEUTRAL-BEAM-HEATED TOKAMAKS
R J. GOLDSTON Dec. 1982 50 p refs
(Contract DE-AC02-76CH-03073)
(DE83-005049; PPPL-1951) Avail: NTIS HC A03/MF A01

Diagnostic techniques for neutral-beam-heated Tokamak plasmas fall into three categories: (1) magnetic diagnostics for measurements of gross stored energy, (2) profile diagnostics for measurements of stored thermal and beam energy, impurity content and plasma rotation, and (3) fast time resolution diagnostics to study MHD fluctuations and micro-turbulence DOE

N83-32607# Illinois Univ., Urbana. Lab for Fusion Studies
BURN DYNAMIC EXPERIMENT BASED ON THE FIELD-REVERSED THETA PINCH
G H. MILEY 1982 6 p refs Presented at the 5th Symp. on Phys and Technol of Compact Toroids in the Magnetic Fusion Energy Program, Bellevue, Wash , 16-18 Nov. 1982
(Contract DE-AC02-76ET-52040)
(DE83-005071; CONF-821124-13; COO-2218-262) Avail: NTIS HC A02/MF A01

A D-T burn dynamic experiment using a scaled-up field-reversed theta-pinch device is proposed as a first step towards demonstration of a D-3He burn The feasibility of such an experiment is based on a loss-cone-like confinement scaling plus the use of combined pellet and neutral-beam injection to heat the plasma, build-up its density, and damp the $m=2$ instability. DOE

N83-32608# Los Alamos Scientific Lab., N Mex
THE ANTARES FACILITY FOR INERTIAL-FUSION EXPERIMENTS: STATUS AND PLANS
P. D GOLDSTONE, G. R. ALLEN, H. JANSEN, A. SAXMAN, S. SINGER, and M. THUOT 1982 13 p refs Presented at the 6th Intern. Workshop on Laser Interaction and Related Plasma Phenomena, Monterey, Calif , 25-29 Oct. 1982
(Contract W-7405-ENG-36)
(DE83-003536; LA-UR-82-3328; CONF-821089-5) Avail: NTIS HC A02/MF A01

Antares is a large, 30 to 40 kJ CO2 laser system which will provide a base for experiments to determine the efficiency with which 10 micrometers of light can be used to drive target implosions while maintaining an acceptable level of preheat. Construction of the facility is in the final stages and diagnostics for initial experiments are being designed and constructed with operations scheduled to begin early in FY-84. After an initial shakedown period, a series of measurements will be performed to determine the energy scaling of hot electron temperature and target coupling efficiency in selected sets of targets including simple spheres. Experiments, now planned for Helios, will be continued to determine

whether CO2-produced ions are appropriate for driving inertial fusion targets with acceptable efficiency (Helios experiments have demonstrated that as much as 40% of the incident light can be converted to fast ions). DOE

N83-32609# California Univ., Livermore. Lawrence Livermore Lab.
FUSION-POWER DEMONSTRATION
C. D. HENNING, B. G. LOGAN, G. A CARLSON, W. S. NEEF, R W. MOIR, R. B. CAMPBELL (TRW), R. BOTWIN, I. R. CLARKSON, and T. J CARPENTER 29 Mar. 1983 9 p refs Presented at the 5th Topical Meeting on Technol. of Fusion Energy, Knoxville, Tenn., 26-28 Apr 1982 Prepared in cooperation with Grumman Aerospace, Bethpage, N.Y.
(Contract W-7405-ENG-48)
(DE83-010370, UCRL-88224; CONF-830406-23) Avail: NTIS HC A02/MF A01

As a satellite to the MARS (Mirror Advanced Reactor Study) a smaller, near-term device has been scoped, called the FPD (Fusion Power Demonstration). Envisioned as the next logical step toward a power reactor, it would advance the mirror fusion program beyond MFTF-B and provide an intermediate step toward commercial fusion power. Breakeven net electric power capability would be the goal such that no net utility power would be required to sustain the operation. A phased implementation is envisioned, with a deuterium checkout first to verify the plasma systems before significant neutron activation has occurred. Major tritium-related facilities would be installed with the second phase to produce sufficient fusion power to supply the recirculating power to maintain the neutral beams, ECRH, magnets and other auxiliary equipment. DOE

N83-32610# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
RECENT ADVANCES IN THOMSON SCATTERING: HIGH REPETITION RATE THOMSON SCATTERING DIAGNOSTICS ON LARGE PLASMA DEVICES
K. HIRSCH, H. ROEHR (Max-Planck Inst. fuer Plasmaphysik, Garching, West Germany), H SALZMANN (Max-Planck Inst. fuer Plasmaphysik, Garching, West Germany), and K. H STEUER Sep 1982 30 p refs Presented at 4th APS Topical Conf. on High Temp. Plasma Diagn., Boston, 25-27 Aug. 1982
(IPF-82-15) Avail NTIS HC A03/MF A01

Periodically pulsed Thomson scattering which covers the whole duration of a tokamak discharge is described Time resolution is 17 msec. Reliability is proved by operating for more than one year The YAG laser pulses exceed 1 million single shots. Extension to a spatial multipoint system yields the evolution in time of temperature and density profiles. It is suggested that using a periodically pulsed Nd:YAG laser and silicon avalanche photodiodes fulfills the requirements of fusion devices. Author (ESA)

N83-32611# Stuttgart Univ. (West Germany). Inst fuer Plasmaforschung.
PROPOSAL FOR A NEW THOMSON SCATTERING TECHNIQUE FOR LARGE FUSION DEVICES
H. SALZMANN and K. HIRSCH Nov. 1982 35 p refs
(IPF-82-16) Avail: NTIS HC A03/MF A01

The application of 180 deg scattering using ultrashort laser pulses is proposed. Spatial resolution along the laser beam is achieved by high speed detection, allowing time of flight measurements. This LIDAR technique uses a minimum number of window ports, and makes remote control unnecessary. Measurements along a spatial chord of 2.5 m length with 27 spatial points (spatial resolution = 9 cm) can be performed. A statistical error of 10 % can be achieved over the whole range of interesting plasma parameters. Only three optical components are placed in the torus hall. Only one wall penetration (of 80 sq cm) is needed. Laser repetition rates of at least 1 pulse/sec are possible.
Author (ESA)

N83-32612# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
PROPOSED 60 GHZ TRANSMISSION LINE SYSTEM FOR ELECTRON CYCLOTRON RADIATION HEATING (ECRH) ON W 7 ADVANCED STELLARATOR (AS)
G. JANAEN, P G. SCHUELLER, and M. THUMM Dec 1982 20 p refs
(IPF-82-17) Avail: NTIS HC A02/MF A01

The transmission line and launching systems for nonohmic plasma production and heating by ECR-waves with frequencies of 60 to 70 GHz for 200 kW, 100 msec and 800 kW, CW stellarators are described. The ECRH systems meet the requirements for neutral gas breakdown combined heating of a cold plasma and heating of a warm plasma. The TE02/TE01 gyrotron output mode mixture is converted into a pure TE01 mode which is used for long distance transmission in smooth overmoded waveguides Waveguide tapers with nonlinear contours, circumferentially corrugated normal mode bends with nonlinear curvature, and mode selective directional couplers are used. A TE01-TE11 mode converter produces an almost linearly polarized RF field for improved irradiation. The ECR waves are launched by focusing mirrors and corrugated polarization twist reflectors. An optional hybrid HE11 mode system launches an axisymmetric, narrow centered quasioptical beam with nearly no cross polarization.
Author (ESA)

N83-32687*# AiResearch Mfg. Co., Torrance, Calif
ADVANCED SINGLE PERMANENT MAGNET AXIPOLAR IRONLESS STATOR AC MOTOR FOR ELECTRIC PASSENGER VEHICLES Final Report
E. D. BEAUCHAMP, J. R. HADFIELD, and K. L. WUERTZ 8 Aug. 1983 226 p refs
(Contract DEN3-77; DE-AI01-77CS-51044)
(NASA-CR-167974; DOE/NASA/0077-81/1; NAS 1.26:167974; AIRESEARCH-82-19211) Avail: NTIS HC A11/MF A01 CSCL 13F

A program was conducted to design and develop an advanced-concept motor specifically created for propulsion of electric vehicles with increased range, reduced energy consumption, and reduced life-cycle costs in comparison with conventional systems. The motor developed is a brushless, dc, rare-earth cobalt, permanent magnet, axial air gap inductor machine that uses an ironless stator Air cooling is inherent provided by the centrifugal-fan action of the rotor poles An extensive design phase was conducted, which included analysis of the system performance versus the SAE J227a(D) driving cycle. A proof-of-principle model was developed and tested, and a functional model was developed and tested Full generator-level testing was conducted on the functional model, recording electromagnetic, thermal, aerodynamic, and acoustic noise data. The machine demonstrated 20.3 kW output at 1466 rad/s and 160 dc. The novel ironless stator demonstated the capability to continuously operate at peak current The projected system performance based on the use of a transistor inverter is 23.6 kW output power at 1466 rad/s and 83.3 percent efficiency. Design areas of concern regarding electric vehicle applications include the inherently high windage loss and rotor inertia. Author

N83-32805*# National Aeronautics and Space Administration, Washington, D. C.
COMPARATIVE EVALUATION OF GAS-TURBINE ENGINE COMBUSTION CHAMBER STARTING AND STALLING CHARACTERISTICS FOR MECHANICAL AND AIR-INJECTION
I. N. DYATLOV Feb 1983 12 p refs Transl. into ENGLISH from the book "Gorenie v Potoke" Kazan, USSR, 1970 p 160-169 Original language doc. announced as A71-28954 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc prep. by Kazanskiy Aviationny Inst., USSR
(NASA-TM-77024, NAS 1.15:77024) Avail: NTIS HC A02/MF A01 CSCL 21E

The effectiveness of propellant atomization with and without air injection in the combustion chamber nozzle of a gas turbine engine is studied. Test show that the startup and burning

performance of these combustion chambers can be improved by using an injection during the mechanical propellant atomization process It is shown that the operational range of combustion chambers can be extended to poorer propellant mixtures by combined air injection mechanical atomization of the propellant S.L

N83-32996# Technische Hogeschool, Delft (Netherlands). Ship Hydromechanics Lab.
WIND PROPULSION OF MERCHANT SHIPS
J. GERITSMA Oct. 1981 36 p refs Transl. into ENGLISH of "Windvoorsttuwing van Vrachtschepen" Rept-535, Oct. 1981 32 p Presented at Symp.: The Propulsion of the 1980's: Wind, Sun and Coal, Vissingen, the Netherlands, 15 Oct. 1981
(PB83-175489; REPT-535) Avail: NTIS HC A03/MF A01
CSCL 13J

The use of wind propulsion for merchant ships is discussed Various sail configurations are discussed. Problems of wind velocity and direction are noted. It is concluded that sailing ships in the future must use a combination of sails and motors, that the operation of the sails be automated, and that the rigging must not adversely affect loading and unloading operations. GRA

N83-33056# Tennessee Valley Authority, Knoxville.
TVA'S SPECIFICATION REQUIREMENTS AND PREOPERATIONAL CHECKS FOR ROTATING ELECTRICAL MACHINERY INSULATION
J. K. GREENE *In* Cameron (A. W. W) Workshop Proc.: Rotating Machinery Insulation 6 p Dec 1981
Avail: NTIS HC A10/MF A01

The Tennessee Valley Authority's specification requirements and operational checks for rotating electrical machinery insulation are discussed. Turbogenerators, hydromotor generators, and medium voltage motors are discussed Both preoperation and performance tests are described. Problems in analysis and retroactive qualification of selected motors for safety related service in nuclear power plants are discussed R.J.F.

N83-33057# Cameron (A. W. W.), Toronto (Ontario)
GENERATOR INSULATION SYSTEM TESTING
J. A. FORSTER (Forster (J A.) Engineering, Ltd.) *In* Cameron (A. W. W.) Workshop Proc : Rotating Machinery Insulation 6 p Dec. 1981
Avail: NTIS HC A10/MF A01

Tests of generator insulation systems are discussed. Slot discharge/corona, power factor tip-up, and accelerated life tests are considered. Voids in insulation systems, excessive tip-up, and damaging effects of temperature, vibration, and aging are discussed. R.J F.

N83-33059# American Electric Power Service Corp., New York.
ELECTRICAL SPECTRUM ANALYSIS OF OPERATING HYDRO ELECTRIC MACHINES
J. E. TIMPERLEY *In* Cameron (A. W. W) Workshop Proc.: Rotating Machinery Insulation 12 p Dec. 1981
Avail· NTIS HC A10/MF A01

The electrical spectrum analysis of the operation of five pumped storage machines is discussed. It was found that machines without electrical problems produced little radio noise, although all machines produced some noise. Severe problems produced severe radio noise If stator deterioration increases, the noise level increases Similar machines produce similar electrical spectrum signatures. The general source of discharges can be located A likelihood of failure can be calculated from spectrum analysis. R.J.F.

N83-33176# Jones (J. A.) Applied Research Co., Charlotte, N C.
REPEATABILITY OF TREES ROTOR BORE INSPECTION SYSTEM
F. V AMMIRATO Nov. 1982 73 p Sponsored by EPRI
(Contract EPRI PROJ. 1570-2)
(DE83-900739, EPRI-NP-2640) Avail: NTIS HC A04/MF A01

The repeatability of near bore flaw detection and sizing of the turbine rotor examination and evaluation system (TREES) developed was examined by making many repeat scans of sample blocks containing fatigue cracks and embedded spherical and disk shaped flaws of various sizes. Comparison data were collected manually using the bore ultrasonic characterization system (BUCS). It is shown that TREES consistently detects flaws in the near bore region. TREES determined the radial extent of flaws with associated standard deviations of 18% for fatigue cracks, 30% for embedded disk shaped reflectors Corresponding BUCS measurements show larger measurement spreads in each flaw classification DOE

N83-33343*# Boeing Engineering and Construction Co., Seattle, Wash.
MOD-2 WIND TURBINE SYSTEM DEVELOPMENT. VOLUME 2: DETAILED REPORT Final Report
Sep. 1982 194 p refs
(Contract DEN3-2; DE-AI01-82ET-20305)
(NASA-CR-168007, DOE/NASA/0002-2, NAS 1.26:168007)
Avail: NTIS HC A09/MF A01 CSCL 10A

Progress in the design, fabrication, and testing of a wind turbine system is reported. The development of the MOD-2 wind turbine through acceptance testing and initial operational evaluation is documented. The MOD-2 project intends to develop early commercialization of wind energy. The first wind turbine farm (three MOD-2 units) are now being operated at the Bonneville Power Administration site near Goldendale, Washington E.A K

N83-33351# Aerospace Systems, Inc., Burlington, Mass.
HORIZONTAL-AXIS WIND-SYSTEM ROTOR PERFORMANCE MODEL COMPARISON: A COMPENDIUM
Feb. 1983 513 p refs Prepared in cooperation with AeroVironment, Inc. and Oregon State Univ. and United Technologies Research Center
(Contract DE-AC04-76DP-03533)
(DE83-012265; RFP-3508) Avail: NTIS HC A22/MF A01

A compendium of four reports, the purpose of which is to evaluate performance prediction methods for horizontal-axis wind turbines is given A blade-element/momentum analysis and a lifting line/prescribed wake analysis were used. Contractors were to apply their prediction methods to two rotors, that of the Enertech 1500 and that of the 1/3-scale United Technologies Research Center (UTRC) 8 kW turbines. Results from the four prediction methods are compared with actual test data gathered via Controlled Velocity Testing (CVT). The conclusions are reviewed. For the Enertech 1500, rotor performance predictions closely agreed with CVT data Yet, because of the lack of high tip speed ratio data, verification of the Glauert momentum theory was not possible. Predictions regarding the UTRC 1/3 scale 8 kW rotor did not agree well with test results The reasons cited for the discrepancies center on inadequate airfoil section data and the varying blade pitch angles of the unique UTRC flexbeam rotor. DOE

N83-33354# Technische Univ., Munich (West Germany). Inst. fuer Thermische Kraftanlagen.
DIRECT CONDENSATION WITH HUMID AIR FOR HEAT EVACUATION FROM THERMAL POWER UNITS Final Report, Sep. 1981 [DIREKT-KONDENSATION MIT FEUCHTLUFT ZUR ABWAERMEABLEITUNG AUS THERMISCHEN KRAFTANLAGEN]
S SCHWAB and B. SCHIEBELSBERGER Bonn Bundesministerium fuer Forschung und Technologie Apr. 1983 78 p refs In GERMAN Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-054; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 16,50

The technical, economic, and ecological importance of direct condensation with humid air were investigated. Reference tests were conducted on existing units. A coding pipe bundle with two sections was fabricated and mounted. A demonstration model for mass transfer was built. Performance data experimentally obtained for a variation of essential system parameters are evaluated Theoretical, technical, and economic construction data for hybrid (direct condensation-dry cooling) systems are discussed.
Author (ESA)

N83-33359# Arizona Univ., Tucson. Engineering Experiment Station.
FEASIBILITY OF WIND TURBINE DIESEL HYBRID GENERATORS AT MCMURDO STATION, ANTARCTICA Final Report
L. B. SCOTT, JR., W. WRIGGLESWORTH, J L. BLAIR, and R. WATTERS Mar. 1983 354 p refs Sponsored in part by the NSF
(Contract NSF DPD-81-08420)
(PB83-189860) Avail: NTIS HC A16/MF A01 CSCL 10B

The results of a study to determine the feasibility of a wind-turbine/diesel hybrid system for the generation of electricity at McMurdo Station, Antarctica are given. A short description of past and present energy systems at McMurdo is given and some projected energy systems within which wind turbine generators would function are described. Feasibility is then discussed in terms of certain variables and performance parameters characterizing diesel-electric and wind turbine generator systems, and constraints defining the successful operation of these systems at McMurdo Station GRA

N83-33717# Brookhaven National Lab., Upton, N. Y. Accelerator Dept.
SUPERCONDUCTIVITY AND FUTURE ACCELERATORS
G. T DANBY and J. W. JACKSON 1983 4 p refs Presented at the Particle Accelerator Conf., Santa Fe, N. Mex. 21-23 Mar. 1983
(Contract DE-AC02-76CH-00016)
(DE83-010441; BNL-32806; CONF-830311-85) Avail: NTIS HC A02/MF A01

Particle accelerators employing accelerating cavities and deflecting magnets and new accelerator concepts and hardware yielding great improvements in performance and GeV per dollar are discussed The great idea for collective acceleration resulting from intense auxiliary charged-particle beams or laser light may or may not be just around the corner. In its absence, superconductivity (SC) applied both to RF cavities and to magnets opened up the potential for very large accelerators without excessive energy consumption and with other economies, even with the CW operation desirable for colliding beams High energy physics has aggressively pioneered this new technology: the Fermilab single ring 1 TeV accelerator - 2 TeV collider is near the testing stage. Brookhaven National Laboratory's high luminosity pp 2 ring 800 GeV CBA collider is well into construction. Other types of superconducting projects are in the planning stage with much background R and D accomplished. The next generation of hadron colliders under discussion involves perhaps a 20 TeV ring (or rings) with 40 TeV CM energy. This is a very large machine: even if the highest practical field B approx. 10T is used, the radius is 10x that of the Fermilab accelerator. DOE

N83-33718# California Univ., Livermore. Lawrence Livermore Lab.
ADVANCED TEST ACCELERATOR (ATA), A 50 MEV, 10 KA INDUCTION LINAC
L. L. REGINATO 1983 6 p refs Presented at the Particle Accelerator Conf., Santa Fe, N Mex., 21-23 Mar. 1983
(Contract W-7405-ENG-48)
(DE83-009314; UCRL-88877; CONF-830311-11) Avail: NTIS HC A02/MF A01

The ATA is an induction accelerator designed to produce 70 ns pulses of electrons at currents of 10 kA and energies in excess of 50 MeV. The accelerator is capable of operating at an average rate of 5 Hz or at 1 kHz for ten pulses. The parameters were chosen primarily to provide the experimental basis for advancing the understanding of electron beam propagation physics. The 85 m accelerator has been under construction for the past four years and has adopted mainly an improved version of the ETA technology to satisfy the required parameters. Initial operation of the facility and the energy conversion system from primary power to axial electric field will be described; recent advances in magnetic switching which have been incorporated in the innector will also be discussed. DOE

N83-33739# Los Alamos Scientific Lab., N. Mex.
A NEW GENERATION OF REACTORS FOR SPACE POWER
J. E. BOUDREAU and D. BUDEN 1982 52 p Presented at the Committee on Advanced Nuclear Systems Symp. on Advan. Reactor Systems, Washington, D.C., 15-17 Nov. 1982
(Contract W-7405-ENG-36)
(DE83-003574; LA-UR-82-3315; CONF-821148-2) Avail: NTIS HC A04/MF A01

Space nuclear reactor power is expected to power many new space missions that will require several times to several orders of magnitude anything flown in space to date. Power in the 100-kW range may be required in high Earth orbit spacecraft and planetary exploration. The baseline design for this particular nuclear subsystem technology is described, additionally, reactor technology is reviewed from previous space power programs, a preliminary assessment is made of technology candidates covering an extended power spectrum, and the status is given of other reactor technologies. DOE

N83-33745# Los Alamos Scientific Lab., N. Mex
SPACE REACTORS Progress Report, Oct. 1981 - Mar. 1982
W. A. RANKEN, comp. Jan. 1983 79 p refs
(Contract W-7405-ENG-36)
(DE83-008278; LA-9598-PR) Avail: NTIS HC A05/MF A01

Progress in design studies and technology for the SP-100 Project - successor to the Space Power Advanced Reactor (SPAR) Project - is reported for the period October 1, 1981 to March 31, 1982 The basis for selecting a high-temperature, UO2-fueled, heat-pipe-cooled reactor with a thermoelectric conversion system as the 100/kW-sub e/ reference design has been reviewed. Although no change has been made in the general concept, design studies have been done to investigate various reactor/conversion system coupling methods and core design modifications. Thermal and mechanical finite element modeling and three dimensional Monte Carlo analysis of a core with individual finned fuel elements are reported. Studies of unrestrained fuel irradiation data are discussed that are relevant both to the core modeling work and to the design and fabrication of the first in-pile irradiation test, which is also reported. Work on lithium-filled core heat pipe development is described, including the attainment of 15.6 kW/sub t/ operation at 1525 K for a 2-m-long heat pipe with a 15.7-mm outside diameter. The successful operation of a 5.5-m-long, lightweight potassium/titanium heat pipe at 760 K is described, and test results of a thermoelectric module with GaP-modified SiGe thermoelectric elements are presented DOE

N83-33746# Florida Inst. of Tech., Melbourne.
SPACE NUCLEAR POWER AND MAN'S EXTRATERRESTRIAL CIVILIZATION
J. J. ANGELO and D. BUDEN (Los Alamos Lab, N Mex.) 1983 24 p Presented at the 20th Space Congr., Cocoa Beach, Fla., 26-28 Apr. 1983
(Contract W-7405-ENG-36)
(DE83-007561; LA-UR-83-449; CONF-830421-1) Avail: NTIS HC A02/MF A01

This paper examines leading space nuclear power technology candidates. Particular emphasis is given the heat-pipe reactor technology currently under development at the Los Alamos National Laboratory. This program is aimed at developing a 10-100 kWe, 7-year lifetime space nuclear power plant. As the demand for space-based power reaches megawatt levels, other nuclear reactor designs including: solid core, fluidized bed, and gaseous core, are considered. DOE

N83-33748 Brigham Young Univ., Provo, Utah.
X-RAY EMISSION FROM LASER-PRODUCED PLASMAS Ph.D. Thesis
D. P. GAINES 1982 237 p
Avail: Univ. Microfilms Order No. DA8300388

Ten to forty Angstrom X-ray emission from laser produced plasmas was studied in order to determine pertinent plasma parameters, study plasma emission characteristics under varying laser/target conditions, and in order to generate characterization data on Layered Synthetic Microstructure (LSMs). Plasma temperatures were determined and compared with temperatures obtained by other workers The calculated temperatures were consistent, but precise temperature determination was not possible because density information was not calculable The emission characteristics showed surprisingly little dependence on target parameters, or laser intensity. The integrated reflectivity and line width of the LSMs, as determined from this research, matched values predicted from theoretical computations. In addition, the focusing ability of LSMs was demonstrated. Dissert Abstr

N83-33749# Argonne National Lab., Ill Engineering Div
INTERELECTRODE RESISTANCE AND PERFORMANCE OF SMALL AND LARGE SCALE MHD GENERATORS
E. D. DOSS and B. F. PICOLOGLOU Sep. 1983 19 p refs Backup document for publication in Journal of Energy in Jan./Feb. 1984
Avail NTIS HC A02/MF A01

The effect of reduced interelectrode resistance in MHD generators on the generator power output is investigated The analytical model used in the investigation allows for the solution for the electric field and current density distributions in the cross plane of the generator. The power output, expressed as a fraction of the power output of a perfectly insulated generator, is found to be a function of the wall temperature, the ratio of boundary layer thickness to channel transverse dimension, and the product of interelectrode resistance and channel cross-sectional area The interelectrode resistance is assumed to be inversely proportional to the channel transverse dimension and the variation of power output ratio with channel size is calculated. It is found that deterioration of performance of NHD generators, resulting from reduced interelectrode resistance, diminishes with generator size and is negligible for large-scale generators, provided that the interelectrode resistance remains larger than an order of one-tenth ohm Author

N83-33751# Nagoya Univ. (Japan). Inst. of Plasma Physics.
DISSIPATIVE TRAPPED ION INSTABILITY IN PLT AND INTOR
A. WAKAMATSU, K. SHIMIZU, and M. OGASAWARA (Keio Univ., Yokahama, Japan) Jun. 1983 21 p refs
(IPPJ-635) Avail NTIS HC A02/MF A01

The generation conditions of the dissipative trapped ion instability (DTII) are investigated for the parameters of the Princeton Large Torus (PLT) and the International Tokamak Reactor (INTOR) The finite banana width effect is taken into account in the dispersion relation. The conditions are greatly influenced by the impurities. Though the plasmas are well in the banana regime in both PLT and INTOR, DTII is not excited for Z (eff) = 3.5, and excited but it has negative growth rate for Z (eff) = 1.5, where Z (eff) is the effective charge number. Only for the pure case (Z (eff) = 1.0), the growth rate has small positive value in INTOR. M G.

N83-33752# Nagoya Univ. (Japan). Inst. of Plasma Physics.
HIGH-BETA BALLOONING-MADE STRUCTURES IN AXISYMMETRIC MIRRORS
R. HATAKEYAMA (Tohoku Univ., Sendai, Japan), N. SATO (Tsukuba Univ, Ibaraki, Japan), and M. INUTAKE Jun. 1983 22 p refs
(IPPJ-634) Avail: NTIS HC A02/MF A01

A low frequency magnetic mode is observed to grow in a line tied axisymmetric mirror with increasing plasma beta up to beta sub c predicted by ideal MHD ballooning mode theory The instability is excited like a standing wave in a region of unfavorable curvature and steep radial pressure gradient, traveling outward from the mirror well with a velocity less than the Alfven but higher than the sound velocity. It propagates azimuthally around the ion diamagnetic drift frequency with m=2 for beta approximately beta sub c, while appearing to propagate in the electron diamagnetic direction for beta beta sub c. Results are consistent with ballooning mode structures. M.G.

N83-33753# Nagoya Univ (Japan). Plasma Physics Lab.
EQUILIBRIA OF FIELD-REVERSED CONFIGURATION WITH SUBSIDIARY COILS
M. KAKO, T ISHIMURA, and T. AMANO Apr 1983 35 p refs
(IPPJ-633) Avail: NTIS HC A03/MF A01

Two-dimensional equilibria of a field-reversed configuration with subsidiary coils are computed by integrating the ideal magnetohydrodynamic equilibrium equation. The mirror coils assist to compress the plasma appreciably in the axial direction and also help sustain a literal 'compact torus', which is just smaller than the inner dimensions of the main coil. The cusp coils enlarge the plasma and consequently make the gradient of plasma density relaxed in the radial direction M.G.

N83-33754# Nagoya Univ. (Japan) Inst. of Plasma Physics
MOVING TOROIDAL LIMITER
K. IKUTA and A. MIYAHARA Jun. 1983 18 p refs
(IPPJ-636) Avail: NTIS HC A02/MF A01

The concept of the limiter-divertor by Mirnov is extended to a toroidal limiter-divertor (moving toroidal limiter) using the stream of ferromagnetic balls coated with a low Z material such as plastics, graphite and ceramics. An important advantage of the use of the ferromagnetic materials would be possible soft landing of the balls on a catcher, provided that the temperature of the balls is below Curie point. Moreover, the moving toroidal limiter would would act as a protector of the first wall not only against the vertical movement of plasma ring but also against the violent inward motion driven by a major disruption because the orbit of the ball in the case of a moving toroidal limiter distributes over the small major radius side of the toroidal plasma. M.G.

N83-33755# Illinois Univ., Urbana. Fusion Studies Lab.
CALCULATIONAL METHODS FOR FUSION-PLASMA ENGINEERING
G H. MILEY 1983 5 p refs Presented at the Topical Meeting on Advances in Reactor Computations, Salt Lake City, 28-31 Mar. 1983
(Contract DE-AC02-76ET-52040)
(DE83-002879, CONF-830304-4) Avail: NTIS HC A02/MF A01

Fusion plasma engineering involves the analysis of fusion plasma behavior under realistic conditions expected in future fusion reactors, i.e , it might be viewed as applied plasma physics. In a sense, then, the study of fusion plasma engineering for a fusion reactor is analogous to studies of core neutronics (reactor physics) for a fission reactor. These methods typically involve some techniques used in basic plasma physics studies, but the application to reactor conditions brings in new demands (e.g , complex

geometries and boundary conditions, nonuniform fields, impurities and neutral gas fluxes) that are frequently omitted in idealized plasma physics calculations. These demands in turn force the use of techniques such as multigroup treatments, Monte Carlo, etc., that are traditional in fission reactor physics but have not previously found much use in plasma studies. Several methods of this type are discussed as examples and similarities as well as differences compared to fission reactor methods are stressed. DOE

N83-33757# Argonne National Lab., Ill. Fusion Power Program.
PLASMA DISRUPTION FORCES: A PROGRAM FOR THE HP 9845 AND 9872 B PLOTTER
M. H. FOSS Nov. 1982 26 p
(Contract W-31-109-ENG-38)
(DE83-005415; ANL/FPP-TM-164) Avail: NTIS HC A03/MF A01

A computer program is described for the calculation of currents, forces, torques, and voltages in the conducting first wall and limiter of a Tokamak reactor experiencing a plasma quench Instructions are given for running the program in a HP 9845 B desk top computer with a 9872 B plotter The first wall and limiter are modelled by 44 coaxial loops. The inductance matrix among the loops is calculated, and the currents in them are calculated step by step over time; driven by the flux from the decaying plasma current and subject to the field from the plasma, from the poloidal field coils, and from all current loops. An insulating break in the limiter or first wall can be modelled by imposing a back voltage which causes all the currents in the limiter or first wall to sum to zero. This potential is related to the voltage between segments of a segmented limiter or first wall. DOE

N83-33758# Illinois Univ., Urbana. Fusion Studies Lab
COMPACT TORI FOR ALTERNATE-FUEL FUSION
G H MILEY 1982 30 p refs Presented at the Symp on New Trends in Unconventional Approaches to Magnetic Fusion, Stockholm, 16-18 Jun. 1982
(Contract DE-AC02-76ET-52040)
(DE83-005480, CONF-820644-5, COO-2218-257) Avail NTIS HC A03/MF A01

A D-T burn dynamic experiment using a scaled up field reversed theta pinch device is proposed as a first step towards demonstration of a D-3He burn The feasibility of such an experiment is based on a loss cone like confinement scaling described here plus the concept of using combined pellet and neutral beam injection to heat the plasma build up, its density, and damp the $m=2$ instability The potential extension to a D-3He reactor is also discussed. DOE

N83-33759# California Univ., Livermore. Lawrence Livermore Lab
TIME-RESOLVED X-RAY LINE DIAGNOSTICS OF LASER-PRODUCED PLASMAS
R. L. KAUFFMAN, D L. MATTHEWS, J. D. KILKENNY (Imperial College), and R. W. LEE (Imperial College) Nov 1982 16 p refs Presented at the 24th American Physical Society Ann Meeting, New Orleans, 1 Nov. 1982
(Contract W-7405-ENG-48)
(DE83-005575, UCRL-87522-REV-1; CONF-821128-3-REV-1) Avail: NTIS HC A02/MF A01

The underdense plasma conditions of laser irradiated disks were examined using K X-ray from highly ionized ions. A 900 ps laser pulse of 0.532 micron light is used to irradiate various Z disks which have been doped with low concentrations of tracer materials. The tracers, whose Z's range from 13 to 22, are chosen so that their K X-ray spectrum is senstive to typical underdense plasma temperatures and densities. Spectral are measured using a time-resolved crystal spectrograph recording the time history of the X-ray spectrum. A spatially-resolved, time-integrated crystal spectrograph also monitors the X-ray lines. Large differences in Al spectra are observed when the host plasma is changed from SiO2 to PbO or In. Spectra are presented along with preliminary analysis of the data. DOE

N83-33760# California Univ., Livermore. Lawrence Livermore Lab.
MAGNETS FOR THE MIRROR FUSION TEST FACILITY: TESTING OF THE FIRST YIN-YANG AND THE DESIGN AND DEVELOPMENT OF OTHER MAGNETS
T. A. KOZMAN, S. T WANG, Y. CHANG, E. N. C. DALDER, C. L. HANSON, R. E HINKLE, J. O. MYALL, C. R. MONTOYA, E. W. OWEN, and R. L. PALASEK 1982 9 p refs Presented at the Appl. Superconductivity Conf., Knoxville, Tenn., 30 Nov. - 3 Dec. 1982
(Contract W-7405-ENG-48)
(DE83-003438; UCRL-88111; CONF-821108-15) Avail: NTIS HC A02/MF A01

Completed in May 1981, the first Yin-Yang magnetic for the tandem Mirror Fusion Test Facility (MFTF-B) at Lawrence Livermore National Laboratory (LLNL) was successfully tested to its full design field (7.68 T) and current (5775 A). Since that time, the entire magnet array has been reconfigured - from the original A-cell to an axicell design. The MFTF-B magnet array now contains a total 26 large superconducting coils: 2 sets of yin-yang pairs, 2 sets of transition magnets (each containing two coils), 2 sets of axicell magnets (each containing three coils), and 12 central-cell solenoids Recent magnet history from the testing of the initial yin-yang set, through the design of the axicell configuration, to the planned development of the system is chronicled DOE

N83-33761# Los Alamos Scientific Lab, N Mex. Theoretical Div.
DYNAMICAL THRESHOLDS FOR COMPLETE FUSION
K T. R. DAVIES, A. J. SIERK, and J. R NIX 1983 20 p refs Presented at the 21 Intern. Winter Meeting on Nucl. Phys., Bormio, Italy, 24-29 Jan. 1983
(Contract W-7405-ENG-36)
(DE83-006061; LA-UR-83-57, CONF-830117-1) Avail NTIS HC A02/MF A01

It is our purpose here to study the effect of nuclear dissipation and shape parametrization on dynamical thresholds for compound-nucleus formation in symmetric heavy-ion reactions. This is done by solving numerically classical equations of motion for head-on collisions to determine whether the dynamical trajectory in a multidimensional deformation space passes inside the fission saddle point and forms a compound nucleus, or whether it passes outside the fission saddle point and reseparates in a fast-fission or deep-inelastic reaction Specifying the nuclear shape in terms of smoothly joined portions of three quadratic surfaces of revolution, we take into account three symmetric deformation coordinates. However, in some cases we reduce the number of coordinates to two by requiring the ends of the fusing system to be spherical in shape. The nuclear potential energy of deformation is determined in terms of a Coulomb energy and a double volume energy of a Yukawa-plus-exponential folding function. DOE

N83-33762# California Univ., Davis. Dept. of Mechanical Engineering.
RESEARCH ON THE HYLIFE LIQUID-FIRST-WALL CONCEPT FOR FUTURE LASER-FUSION REACTORS: LIQUID JET IMPACT EXPERIMENTS Final Report
M A HOFFMAN and A R RAFFRAY Aug. 1982 41 p refs
(Contract W-7405-ENG-48)
(DE83-004209; UCRL-15367-PT-3; FR-8) Avail: NTIS HC A03/MF A01

Transient and steady state drag of a single bar and of some selected arrays of bars were evaluated and the momentum removed from impacting liquid slugs determined. In order to achieve this aim, use was made of both the published literature and experimental data obtained from a small-scale experimental apparatus. The implications of two possible scaling laws for use in designing the small scale experiment are discussed. The use of near universal curves to evaluate the momentum removed during the initial transient period is described The small scale apparatus used to obtain steady state drag data is described. Finally, these results are applied to the HYLIFE fusion reactor. DOE

N83-33764# Oak Ridge National Lab., Tenn. Fusion Energy Div.
THE RF COUPLER TECHNOLOGY FOR FUSION APPLICATIONS
D. J HOFFMAN 1983 7 p refs Presented at the 5th Topical Meeting on Technol. of Fusion Energy, Knoxville, Tenn , 26 Apr. 1983
(Contract W-7405-ENG-26)
(DE83-012041; CONF-830406-29) Avail: NTIS HC A02/MF A01

Radio frequency (RF) oscillations at critical frequencies have successfully provided a means of conveying power to fusion plasmas due to the electrical-magnetic properties of the plasma. While large RF systems to couple power to the plasma were designed, built, and tested, the main link to the plasma, the coupler, is still in an evolutionary stage of development. Design and fabrication of optimal antennas for fusion applications are complicated by incomplete characterizations of the harsh plasma environment and of coupling mechanisms A brief description of RF coupler technology required for plasma conditions is presented along with an assessment of the status and goals of coupler development. DOE

N83-33768# Georgia Inst. of Tech , Atlanta. School of Nuclear Engineering and Health Physics.
RIPPLE REDUCTION COILS FOR TOKAMAK REACTORS
G. BATEMAN and J. R. FOX 28 Mar. 1983 7 p refs
(Contract DE-AS05-78ET-52025)
(DE83-011091; GTFR-41) Avail NTIS HC A02/MF A01

Ripple Reduction Poloidal Field (RRPF) coils together with blocks of ferro-magnetic iron shielding are used to design a commercial Tokamak reactor similar in size to STARFIRE with only eight rather than twelve toroidal field (TF) coils. The RRPF coils function like segmented poloidal field coils, placed between the TF coils and the neutron shielding, carrying an average of plus or minus 6 MA turns of current in the toroidal direction. Together with an additional pair of vertical field coils carrying 4.8 MAT, they produce the poloidal field needed for a beta approximately = 6% plasma equilibrium with elongation 1 66 and a pair of separatrices suitable for a poloidal divertor. The RRPF coils also reduce magnetic ripple near the top and bottom of the plasma while the laminated blocks of iron magnetic shielding placed under each TF coil reduce magnetic ripple near the midplane from a maximum of 5 48% to less than 1%. DOE

N83-33769# Massachusetts Inst of Tech., Cambridge. Plasma Fusion Center.
HESTER: A HOT-ELECTRON SUPERCONDUCTING TOKAMAK EXPERIMENTAL REACTOR AT M.I.T.
J. H. SCHULTZ and D. B. MONTGOMERY Apr. 1983 202 p refs
(Contract DE-AC02-78ET-51013)
(DE83-011628; DOE/ET-51013/53; PFC-RR-82-24) Avail: NTIS HC A10/MF A01

HESTER is an experimental Tokamak, designed to resolve many of the central questions in the Tokamak development program in the 1980's It combines several unique features with new perspectives on the other major Tokamak in rough order of their presently perceived importance, are the achievement of reactor like wall loadings and plasma parameters for long pulse periods, determination of a good, reactor relevant method of steady state or very long pulse Tokamak current drive, duplication of the planned very high temperature neutral injection experiments using only radio frequency heating, a demonstration of true steady state Tokamak operation, integration of a high performance superconducting magnet system into a Tokamak experiment, determination of the best methods of long term impurity control, and studies of transport and pressure limits in high field, high aspect ratio Tokamak plasmas. These objectives are described. DOE

N83-33770# Los Alamos Scientific Lab., N. Mex.
PLASMA FOCUS EXPERIMENTS POWERED BY EXPLOSIVE GENERATORS
B. L. FREEMAN, R. S. CAIRD, D. J. ERICKSON, C. M. FOWLER, W. B. GARN, H W. KRUSE, J. C. KING, D E. BARTRAM, and P. J. KRUSE 1983 28 p refs Presented at the 3rd Intern. Conf. on Megagauss Magnetic Field Generation and Related Topics, Novosibirsk, USSR, 13-17 Jun. 1983
(Contract W-7405-ENG-36)
(DE83-011166; LA-UR-83-1083; CONF-830606-5) Avail: NTIS HC A03/MF A01

The plasma focus project began as an effort to develop an intense, pulsed, expendable neutron radiographic source. Since previous efforts to power a plasma focus with explosive generators were successful, we proposed to couple plate generators to a coaxial-geometry plasma focus to achieve this goal. Utilizing a small capacitor bank and a selected set of diagnostics, the explosive experiments were successfully conducted with maximum currents of 1 5 MA to 2.4 MA A maximum neutron yield of approx. 3 x 10 (11) (DD) neutrons was achieved at the 2 4 MA level. Since the neutron yield did scale as a power of the maximum delivered current, and the neutron-producing source region was small, this approach is an attractive option to achieve a neutron radiographic source. The need for a reliable open-circuiting switch at several megamperes has resulted in postponement of the project. DOE

N83-33773# General Atomic Co , San Diego, Calif
THEORY OF LOWER-HYBRID-CURRENT DRIVE AT LOW DENSITIES
V. S CHAN, C. S. LIU, F. W. MCCLAIN, and M ROSENBERG Feb 1983 6 p refs Presented at the 5th Topical Conf. on Radio Frequency Plasma Heating, Madison, Wis., 21 Feb. 1983
(Contract DE-AT03-76ET-51011)
(DE83-006950; CONF-830210-1; GA-A-16984) Avail: NTIS HC A02/MF A01

Efficient toroidal current sustainment by LH waves was demonstrated experimentally on a number of Tokamaks at low densities. A theoretical model invoking the nonlinear excitation of magnetized plasma waves was proposed to explain many interesting features observed in these experiments which include enhanced SXR, cyclotron emissions and electrostatic fluctuations. Analysis of a set of moment equations deduced from this analytical mode predicts the existence of relaxation oscillations in perpendicular temperature and plasma wave energy which have subsequently been observed experimentally in certain situations. Due to the excessive stiffness of the moment equations, it is not possible to ascertain the conditions under which relaxation oscillations will occur. It is thus necessary to resort to a detailed kinetic analysis. A Fokker-Planck wave kinetic code was constructed which takes into account the nonlinear excitation of the plasma waves and follows the temporal evolution of these waves as well as the electron distribution during the RF current drive. Studies with the code show either relaxation oscillations or a steady state with significantly higher plasma wave energy depending on RF power level. The details of this and other dependences and comparison with experiments are reported. DOE

N83-33774# Fom-Instituut voor Plasmafysica, Jutphaas (Netherlands).
EXPERIMENTAL AND THEORETICAL ACTIVITIES IN PLASMA PHYSICS Annual Status Report, 31 Dec. 1982
Mar. 1983 92 p refs Sponsored by Nederlandse Organisatie voor Zuiver-WetenschappelizkOnderzoek (ZWO) and Euratom
Avail: NTIS HC A05/MF A01

Experimental research on plasma pinches; turbulent plasma heating; plasma diagnostics; gas blanket and Tokamaks; and electron cyclotron resonance heating is described. Theoretical investigations of magnetohydrodynamics, wave dynamics; and transport problems are summarized. Author (ESA)

N83-33800*# Garrett Turbine Engine Co , Phoenix, Ariz.
ADVANCED GAS TURBINE (AGT) POWERTRAIN SYSTEM DEVELOPMENT FOR AUTOMOTIVE APPLICATIONS Semiannual Progress Report, Jan. - Jun. 1981
Dec. 1981 87 p refs Prepared for DOE, Washington, D.C.
(Contract DEN3-167)
(NASA-CR-167901, DOE/NASA/0167-81/3; NAS 1.26:167901; GARRETT-31-3725(3); SAPR-3) Avail: NTIS HC A05/MF A01 CSCL 13F

Compressor development, turbine, combustion, regenerator system, gearbox/transmission, ceramic material and component development, foil gas bearings, bearings and seals, rotor dynamics development, and controls and accessories are discussed.
Author

N83-33858# Sandia Labs , Albuquerque, N. Mex.
WAKES OF ISOLATED DARRIEUS TURBINES
R. E. AKINS 1983 10 p refs Presented at 6th Biennial Wind Energy Conf., Minneapolis, 1 Jun. 1983
(Contract DE-AC04-76DP-00789)
(DE83-011501; SAND-82-25520; CONF-830631-1) Avail NTIS HC A02/MF A01

A knowledge of the flow structure in the wake of a wind turbine which is important in the design of arrays of units to be used in wind farm applications is discussed. An experimental program to measure the wake structure downwind of a 17m Darrieus vertical axis wind turbine was completed. Mean velocity deficits were measured as a function of tip speed ratio and incident wind direction for several downstream locations. Existing models are analyzed. The capability to predict performance of clusters of wind turbines is improved.
DOE

N83-33917# Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
SPACE ENERGETICS
A. YEFUSIJI 7 Apr. 1983 11 p Transl. into ENGLISH from Hangkong Zhishi (China), 1982 p 4-5
(AD-A128238, FTD-ID(RS)T-0206-83) Avail. NTIS HC A02/MF A01 CSCL 22B

Advantages and disadvantages of a space power plant, a new concept of space power engineering, and laser carrier rocket propulsion, are discussed.
N.W.

N83-34205# Argonne National Lab., Ill
ELECTRONIC CONDUCTIVITY OF LI2MNO3 DOPED WITH ALUMINUM, MAGNESIUM OR ZINC
G. H. KUCERA, J. W SIM, and J L. SMITH 1983 2 p refs Presented at the Electrochemical Society Meeting, San Francisco, 8 May 1983
(Contract W-31-109-ENG-38)
(DE83-009609, CONF-830508-12) Avail: NTIS HC A02/MF A01

Because Li2MnO3 is chemically stable in highly solvents, it warrants consideration as a starting material for electrode (cathode) development in such systems as the molten carbonate fuel cell and the magnetohydrodynamic (MHD) power generation system Stoichiometric Li2MnO3, a nonconductor, can be converted into an electronic semiconductor with the use of dopants. In this study, porous sintered samples of aluminum-, magnesium-, and zinc-doped Li2MnO3 were prepared, and the effects of dopant concentration and sintering temperature on electrical conductivity were examined. In addition, tests were performed to determine whether aluminum- and magnesium-doped Li2MnO3 are stable in 62 mol % Li2CO3-38 mol % K2CO3 eutectic at 925 K for a possible molten carbonate fuel cell application.
DOE

N83-34206# Department of Energy, Washington, D. C. Electric Power Div.
A GUIDE FOR THE ASSESSMENT OF TECHNOLOGIES FOR GENERATING ELECTRICITY
Jun 1982 632 p
(DE83-006468; DOE/EIA-0344) Avail. NTIS HC A99/MF A01

A general understanding of electric power generation, each technology is placed in perspective with regard to other technologies, supplementary and more detailed information, and a framework for future updating of data bases maintained by FIA are provided. Information on already commercialized technologies for generating electricity and technologies that have not moved beyond the prototype or demonstration state are included. It does not, however, include nuclear technologies or cogeneration, and does not discuss the fuel costs associated with producing electricity by each technology.
DOE

N83-34209# Oak Ridge National Lab., Tenn. Energy Div.
INTERCONNECTION PROBLEMS ASSOCIATED WITH SMALL DISPERSED ELECTRIC GENERATORS AND INVERTER DEVICES
W. T. JEWELL and D. T RIZY 1983 7 p refs Presented at the 14th Ann. Modeling and Simulation Conf., Pittsburgh, 21 Apr. 1983
(Contract W-7405-ENG-26)
(DE83-012065; CONF-830464-1) Avail NTIS HC A02/MF A01

This paper describes the simulations of electric-utility distribution systems with dispersed generation systems, such as solar photovoltaic and wind-generator systems, supplying power to the utility system. Problems caused by dispersed systems, such as potential damage to the utility system and lowering of power quality, were studied. The results provide guidance in the use of such dispersed systems.
DOE

N83-34214# Electricite de France, Clamart. Div. Machines Tournantes
SUPERCONDUCTING ALTERNATORS: ACTUAL STATUS AND OUTLOOK [ALTERNATEURS SUPRACONDUCTEURS ETAT ACTUEL ET PERSPECTIVES]
I. A. GLEBOV, L. I. CHUBRAEVA, J. S. EDMONDS, W. R. MCCOWN, G. RUELLE, and J. L. SABRIE Mar 1982 11 p refs In FRENCH Presented at Comite d'Etudes 2 CIGRE, 1982
(HM-16-978) Avail: NTIS HC A02/MF A01

The state of the art in cryoalternators is reviewed Cooling systems, inductor geometries, rotor designs, and system configurations are discussed. The first 300 MVA prototypes are under construction. Economic analysis suggests that significant savings in construction, installation and energy consumption are possible, compared with classic turboalternators.
Author (ESA)

N83-34331# California Univ , Livermore Lawrence Livermore Lab Dept. of Transportation Systems Research.
ANALYSIS AND COMPARISON OF AUTOMOTIVE-PROPULSION SYSTEMS
E. BEHRIN 1 Oct. 1982 24 p refs Presented at the Soc. of Automotive Engr. Congr., Detroit, 28 Feb. - 4 Mar. 1983
(Contract W-7405-ENG-48)
(DE83-004306; UCRL-88233; CONF-830201-2) Avail: NTIS HC A02/MF A01

Automotive propulsion systems are analyzed and their specific energy and specific peak power in terms of mechanical energy delivered from the propulsion systems' energy conversion device are compared. The calculations account for losses due to the energy conversion process and include the masses of both the fuel (or energy storage device) and the energy conversion components. Values used in the comparisons range from the state of the art, or most probable forecasts of characteristics, to highly optimistic projections of device characteristics. On the basis of this analysis, the range and acceleration for passenger vehicles utilizing the various propulsion systems is estimated. The power boosted hybrid systems are also examined.
DOE

N83-34332# California Univ, Livermore Lawrence Livermore Lab. Transportation Systems Research Office
ANALYSIS AND COMPARISON OF AUTOMOTIVE-PROPULSION SYSTEMS
E BEHRIN 1 Oct. 1982 11 p refs Presented at the Soc. of Automotive Engr. Congr, Detroit, 28 Feb - 4 Mar. 1983
(Contract W-7405-ENG-48)
(DE83-003878; UCRL-88233-REV-1; CONF-830201-2-REV-1)
Avail: NTIS HC A02/MF A01

A number of existing and proposed automotive-propulsion systems are analyzed and their specific energy and specific peak power in terms of mechanical energy delivered from the propulsion system's energy-conversion device are compared. The calculations account for losses due to the energy-conversion process and include the masses of both the fuel (or energy-storage device) and the energy-conversion components. Values used in the comparisons range from the current state of the art, or most-probable forecasts of characteristics, to highly optimistic projections of device characteristics On the basis of this analysis, the range and acceleration for passenger vehicles utilizing the various propulsion systems are estimated Power-boosted hybrid systems are also examined. DOE

N83-34451*# Power Technologies, Inc., Schenectady, N Y.
CONTROL OF LARGE WIND TURBINE GENERATORS CONNECTED TO UTILITY NETWORKS Final Report
E. N. HINRICHSEN May 1983 91 p refs
(Contract DEN3-252; DE-AI01-76ET-20320)
(NASA-CR-168200, DOE/NASA/0252-1; NAS 1.26 168200; R19-83) Avail. NTIS HC A05/MF A01 CSCL 10B

This is an investigation of the control requirements for variable pitch wind turbine generators connected to electric power systems. The requirements include operation in very small as well as very large power systems. Control systems are developed for wind turbines with synchronous, induction, and doubly fed generators Simulation results are presented It is shown how wind turbines and power system controls can be integrated. A clear distinction is made between fast control of turbine torque, which is a peculiarity of wind turbines, and slow control of electric power, which is a traditional power system requirement. Author

N83-34452*# Aerospace Corp, El Segundo, Calif Government Support Operations.
PHOSPHORIC ACID FUEL CELL PLATINUM USE STUDY Final Report
H. L. LUNDBLAD May 1983 119 p refs
(Contract DE-AI21-80ET-17088)
(NASA-CR-168130, DOE/NASA/2701-2; NAS 1.26 168130, ATR-83(3813-08)-1ND) Avail NTIS HC A06/MF A01 CSCL 10A

The U.S. Department of Energy is promoting the private development of phosphoric acid fuel cell (PAFC) power plants for terrestrial applications. Current PAFC technology utilizes platinum as catalysts in the power electrodes. The possible repercussions that the platinum demand of PAFC power plant commercialization will have on the worldwide supply and price of platinum from the outset of commercialization to the year 2000 are investigated. The platinum demand of PAFC commercialization is estimated by developing forecasts of platinum use per unit of generating capacity and penetration of PAFC power plants into the electric generation market. The ability of the platinum supply market to meet future demands is gauged by assessing the size of platinum reserves and the capability of platinum producers to extract, refine and market sufficient quantities of these reserves. The size and timing of platinum price shifts induced by the added demand of PAFC commercialization are investigated by several analytical methods. Estimates of these price shifts are then used to calculate the subsequent effects on PAFC power plant capital costs. Author

N83-34456*# Fairchild Weston Systems, Inc., Sarasota, Fla.
DOE/NASA WIND TURBINE DATA ACQUISITION SYSTEM. PART 4: OPERATIONS AND MAINTENANCE MANUAL (PLUMBROOK STATION)
S. PRENGER and T. TATMAN Feb. 1983 96 p
(Contract C-19179-D)
(NASA-CR-168084; NAS 1.26 168084; FWS-7680-PT-4) Avail: NTIS HC A05/MF A01 CSCL 10A

Preventive maintenance, calibration procedures, system verification, system operating procedures, systems software fundamentals, data base (program files), and patchboard layout are discussed. Author

N83-34458# Aluminum Co. of America, Alcoa Center, Pa.
DESIGN AND FABRICATION OF A LOW COST DARRIEUS VERTICAL AXIS WIND TURBINE SYSTEM: PHASE 2, VOLUME 1: EXECUTIVE SUMMARY
Mar. 1983 51 p
(Contract DE-AC04-76DP-00789)
(DE83-010218; SAND-82-7113/1) Avail: NTIS HC A04/MF A01

Described is the successful fabrication, installation, and checkout of 100 kW 17 meter Vertical Axis Wind Turbines (VAWTs). The turbines are Darrieus-type VAWTs with rotors 17 meters (55 feet) in diameter and 25.15 meters (83 feet) in height They can produce 100 kW of electric power at a cost of energy as low as 3 cents per kWh, in an 18 mph wind regime using 12% annualized costs Four turbines were produced; three are installed and are operable at: (1) Wind Systems Test Center, Rocky Flats, Colorado; (2) the US Department of Agriculture Conservation and Production Research Center at Bushland, Texas; and (3) Tisbury Water Authority, Vineyard Haven, Massachusetts, on the island of Martha's Vineyard. The fourth turbine is stored at Bushland, Texas awaiting selection of an erection site. DOE

N83-34460# Pacific Northwest Lab, Richland, Wash. Advanced Concepts Evaluation Sect.
TECHNICAL AND ECONOMIC ASSESSMENT OF THE USE OF AMMONIA EXPANDERS FOR ENERGY RECOVERY IN AIR-COOLED POWER PLANTS
S. G. HAUSER, G. J. HANE, and B. M. JOHNSON Jul 1982 46 p refs
(Contract DE-AC06-76RL-01830)
(DE82-018857; PNL-3279) Avail: NTIS HC A03/MF A01

Binary cycle power plants have been the subject of much discussion among engineers and scientists for nearly 100 years Current economic and environmental concerns have stimulated new interest and research. Ammonia has been recommended by other studies as the leading contender for use as simply the heat rejection medium in an air-cooled power plant This study investigates the technical feasibility and economic potential of including an expander in the heat rejection system of an air-cooled power plant The expander would be used during certain parts of the year to increase the total output of the power plant. Five different plant locations (Miami, San Francisco, Bakersfield, Chicago, Anchorage) were investigated to show the effect which climate has on the economic potential of this ammonia bottoming cycle. The study shows that the expected energy costs for the bottoming cycle only will be less than 50 mills/kWh for any of the five plant locations. This cost assumes that an ammonia phase-change heat rejection system is already a part of the existing plant DOE

N83-34757# Technical Research Centre of Finland, Espoo. Electrical Engineering Lab.
ASSESSMENT OF CONTROL ROOMS OF NUCLEAR POWER PLANTS
L. NORROS, J. RANTA, and B. WAHLSTROEM May 1983 30 p refs Sponsored by Finnish Ministry of Trade and Industry
(VTT-184, ISBN-951-38-1763-6; ISSN-0358-5077) Avail. NTIS HC A03/MF A01; Technical Research Centre of Finland, Espoo FIM 25

The NUREG 0700 recommendations were assessed for implementation in the control rooms of Finnish nuclear power

plants Direct conclusions drawn from the American situation are misleading, because of differences in, for example, procurement of instruments or personnel training. If the review is limited to control room details, the NRC program (checklist) is successful. It can also be used during planning to observe small discrepancies.
Author (ESA)

N83-34771 California Univ., Berkeley.
AXIAL FLOW OF A COLLISIONAL PLASMA THROUGH MULTIPLE MAGNETIC MIRRORS Ph.D. Thesis
R. V. BRAVENEC 1982 178 p
Avail Univ. Microfilms Order No. DA8300441

The flow of a collisional plasma along a magnetic field is studied, with emphasis on flow through multiple magnetic mirrors. A steady state analysis of viscous flow through a multiple mirror device is performed to understand the transition from sonic flow to diffusion with increasing values of lambda/m(lambda is the ion-ion mean free path and /m is the mirror scale length). Numerical and experimental studies of transient plasma injection into a multiple mirror device are presented in order to understand the process by which a collisional plasma is trapped. Steady state solutions for an isothermal plasma are first given for a uniform field and a single mirror. These results are then used to study flow through a multiple mirror device, for which it is shown that the isothermal assumption is valid because of ion viscous heating. Numerically determined density profiles and confinement times are compared to approximate analytical solutions, an empirical expression for the confinement line is obtained which exhibits additively the contribution of viscosity to the ideal fluid confinement time.
Dissert. Abstr.

N83-34773# Nagoya Univ. (Japan). Inst. of Plasma Physics.
BIBLIOGRAPHY ON IONIZATION AND CHARGE TRANSFER PROCESSES IN ION-ION COLISION
H. TAWARA Jun 1983 32 p
(IPPJ-AM-25) Avail: NTIS HC A03/MF A01

The collision process between ions plays a key role in realization of the inertial confinement fusion reactors as well as magnetic confinement reactors. A bibliographic compilation is given on the experimental and theoretical investigations on the charge transfer and ionization processes in ion-ion cllisions. L.F.M.

N83-34781# KMS Fusion, Inc., Ann Arbor, Mich
ATOMIC PHYSICS IN INERTIAL FUSION
J. T. LARSON and D. J. TANNER 1982 19 p refs Presented at 6th Intern. Workshop on Laser Interaction and Related Phenomena, Monterey, Calif.
(Contract DE-AC08-82DP-40152)
(DE83-002544; KMSF-U-1270; CONF-821089-2) Avail: NTIS HC A02/MF A01

Some characterization of dense plasmas such as those encountered in IF experiments are described. The usual treatments of atomic structure and their impact on physical processes are shown to be incorrect for densities comparable to solid or higher. Thermodynamic information, thermal electron conduction, and radiative processes are all greatly affected on the short time scales involved in these plasmas. Simple analytical calculations are no longer possible. DOE

N83-34782# Department of Energy, Washington, D. C. Development and Technology Div.
SPECIAL-PURPOSE MATERIALS FOR MAGNETICALLY CONFINED FUSION REACTORS Annual Progress Report
Aug. 1982 118 p refs
(DE83-003922, DOE/ER-0113/1, APR-4) Avail: NTIS HC A06/MF A01

Fusion reactor materials problems other than the first-wall and blanket structural materials are discussed. Components that are considered as special purpose materials include breeding materials, coolants, neutron multipliers, barriers for tritium control, materials for compression and OH coils and waveguides, graphite and SiC, heat-sink materials, ceramics, and materials for high-field (10-T) superconducting magnets. Crucial and generic materials problems that must be resolved if magnetic-fusion devices are to succeed are addressed. DOE

N83-34783# Princeton Univ., N. J Plasma Physics Lab.
DISSIPATIVE EFFECTS ON FINITE-LARMOR-RADIUS MODIFIED MAGNTOHYDRODYNAMIC BALLOONING MODES
J. W. CONNOR, L. CHEN, and M S CHANCE Nov. 1982 16 p refs
(Contract DE-AC02-76CH-03073)
(DE83-003905; PPPL-1957) Avail: NTIS HC A02/MF A01

Finite-ion-Larmor-radius (FLR) effects provide a band of additional stability for values beta (exactly equal to plasma pressure/magnetic pressure) exceeding the limit predicted for ideal magnetohydrodynamic (MHD) ballooning modes. The effect of particle collisions on the stable modes of the FLR modified ideal theory that exist in this range of beta values are examined. DOE

N83-34784# Princeton Univ., N. J. Plasma Physics Lab
DIAGNOSTICS FOR HOT PLASMAS USING HYDROGEN NEUTRAL BEAMS
R. J. GOLDSTON Dec 1982 47 p refs
(Contract DE-AC02-76CH-03073)
(DE83-003904; PPPL-1952) Avail NTIS HC A03/MF A01

Neutral hydrogen beams can be used to determine plasma line density, based on simple attenuation measurements. This technique was applied to the study of beam-injected mirror plasmas Neutral beams are also used in a number of Tokamaks to supply a local increase of the neutral atom target density for charge exchange. By directing a time-modulated neutral beam across the sight-line of a charge-exchange analyzer, and measuring the modulated neutral particle efflux from the plasma, local measurements of the ion energy distribution function can be made If a modulated diagnostic neutral beam is directed across the sight-line of an ultra-violet spectrometer, the local densities and possibly velocity distributions of fully stripped impurities can be measured. The fast hydrogen neutrals charge exchange with fully stripped impurities in the plasma, leaving the impurities in excited hydrogen-like states In their prompt radiative decay the impurity ions emit characteristics UV lines, which can be detected easily
DOE

N83-34785# Princeton Univ., N. J.
RADIO-FREQUENCY WAVE TRAJECTORIES FOR CURRENT DRIVE IN TOKAMAK REACTORS
K. L. WONG Dec 1982 30 p refs
(Contract DE-AC02-76CH-03073)
(DE83-005051; PPPL-1961) Avail NTIS HC A03/MF A01

Detailed ray tracing calculations were carried out for three modes of waveguide-launched radio-frequency waves for Tokamak reactor parameters to evaluate their applicability for steady state current drive. The merits and demerits of each mode are discussed DOE

N83-34786# California Univ., Livermore. Lawrence Livermore Lab.
ATOMIC PROCESSES IN HIGH-DENSITY PLASMAS
R. M. MORE 1982 43 p refs Presented at the NATO Workshop Conf on Atomic and Mol Processes in Controlled Fusion, Palermo, Sicily, 19-30 Jul. 1982 Submitted for publication
(Contract W-7405-ENG-48)
(DE83-007360; UCRL-88511; CONF-820731-3) Avail: NTIS HC A03/MF A01

Dense atomic plasmas such as that produced in inertial confinement fusion are reviewed. The target implosion physics along with the associated atomic physics, i.e., free electron collision phenomena, electron states I, electron states II, and nonequilibrum plasma states are described. DOE

N83-34787# California Univ., Livermore Lawrence Livermore Lab.
SCALING OF LASER-PLASMA INTERACTIONS WITH LASER WAVELENGTH AND PLASMA SIZE
C E MAX, E. M CAMPBELL, W. C MEAD, W L. KRUER, D W. PHILLION, R. E TURNER, B F. LASINSKI, and K. G. ESTABROOK 25 Jan 1983 21 p refs Presented at the 6th Intern. Workshop on Laser Interaction and Related Plasma Phenomena, Monterey, Calif., 25 Oct. 1982
(Contract W-7405-ENG-48)
(DE83-010103; UCRL-88056; CONF-821089-9) Avail NTIS HC A02/MF A01

Plasma size is an important parameter in wavelength scaling experiments because it determines both the threshold and potential gain for a variety of laser plasma instabilities. Most experiments to date have of necessity produced relatively small plasmas, due to laser energy and pulse length limitations. Three experiments which had large enough plasmas that some instability thresholds were exceeded or approached are discussed. Evidence for Raman scatter, filamentation, and the two plasmon decay instability needs to be confirmed in experiments which measure several instability signatures simultaneously, and which produce more quantitative information about the local density and temperature profiles.
DOE

N83-34789# Oak Ridge National Lab., Tenn. Fusion Engineering Design Center.
FED-R: A FUSION ENGINEERING DEVICE UTILIZING RESISTIVE MAGNETS
D. L. JASSBY, ed. and S. S. KALSI, ed. Apr. 1983 296 p refs
(Contract W-7405-ENG-26)
(DE83-009765, ORNL/FEDC-82/1) Avail: NTIS HC A13/MF A01

The principal purpose of the FED-R Tokamak facility is to provide a substantial quasi-steady flux of fusion neutrons irradiating a large test area in order to carry out thermal, neutronic, and radiation effects testing of experimental blanket assemblies having a variety of configurations, compositions, and purposes. The design of the FED-R device also suggests potential for a upgrade that could be employed as a full scale demonstration reactor for some specific fusion neutron application when required. DOE

N83-34790# California Univ., Livermore. Lawrence Livermore Lab.
INERTIAL CONFINEMENT FUSION WITH DIRECT ELECTRIC GENERATION BY MAGNETIC FLUX COMPRESSION
G P LASCHE 1983 7 p refs Presented at the 5th Topical Meeting on Technol of Fusion Energy, Knoxville, Tenn., 26-28 Apr 1983
(Contract W-7405-ENG-48)
(DE83-009814; UCRL-88210; CONF-830406-8) Avail: NTIS HC A02/MF A01

A high power density laser fusion reactor concept in investigated in wich directed kinetic energy imparted to a large mass of liquid lithium in which the fusion target is centrally located is maximized. In turn, this kinetic energy is converted diectly to electricity with, potentially, very high efficiency by work done against a pulsed magnetic field applied exterior to the lithium Because the concept maximizes the blanket thickness per unit volume of lithium, neutron induced radoactivities in the reaction chamber wall are many orders of magnitude less than is typical of D-T fusion reactor S concepts. DOE

N83-34792# Illinois Univ., Urbana-Champaign Nuclear Engineering Program.
COMPUTATIONAL STUDIES OF OHMIC HEATING IN THE SPHEROMAK Ph.D. Thesis
R. E. OLSON 1983 184 p refs
(Contract DE-AC02-76ET-52040)
(DE83-013015; DOE/ET-52040/T10, COO-2218-267) Avail: NTIS HC A09/MF A01

Time dependent computational simulations using both single fluid O-D and two fluid 1 1/2-D models are developed for and utilized in an investigation of the ohmic heating of a spheroman plasma. The plasma density and composition, the applied magnetic field strength, the plasma size, and the plasma current density profile are considered for their effects on the spheromak heating rate and maximum achievable temperature. The feasibility of ohmic ignition of a reactor size spheromak plasma is also considered
DOE

N83-34793# California Univ., Livermore. Lawrence Livermore Lab.
DESIGN CONSIDERATIONS FOR DIRECT-ILLUMINATION-DRIVEN INERTIAL-FUSION REACTORS
J HOVINGH 1983 15 p refs Presented at the 5th Topical Meeting on Technol. of Fusion Energy, Knoxville, Tenn., 26-28 Apr. 1983
(Contract W-7405-ENG-48)
(DE83-010928; UCRL-88215; CONF-830406-52) Avail: NTIS HC A02/MF A01

This study parametrically examines the implications on inertial-fusion-reactor design of the use of direct-drive pellets as an alternative to the radiation-driven targets. We have examined the impacts of direct illumination on mirror damage constraints, reactor neutronic performance, and system energetics and cost. The capital costs for low f/number, direct-illumination-driven inertial-fusion power plants are required to be significantly less than those for the radiation-driven or high f/number direct-illumination-driven power plants to produce electricity at the same cost. DOE

N83-34942*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STUDY OF LH2-FUELED TOPPING CYCLE ENGINE FOR AIRCRAFT PROPULSION
G. E. TURNEY and L. H FISHBACH 1983 21 p refs Presented at the Aircraft Design Systems and Operations Meeting, Fort Worth, Tex., 17-19 Oct 1983, sponsored by AIAA and AHS
(NASA-TM-83466; E-1735, NAS 1.15:83466) Avail: NTIS HC A02/MF A01 CSCL 21E

An analytical investigation was made of a topping cycle aircraft engine system which uses a cryogenic fuel. This system consists of a main turboshaft engine which is mechanically coupled (by cross-shafting) to a topping loop which augments the shaft power output of the system. The thermodynamic performance of the topping cycle engine was analyzed and compared with that of a reference (conventional-type) turboshaft engine. For the cycle operating conditions selected, the performance of the topping cycle engine in terms of brake specific fuel consumption (bsfc) was determined to be about 12 percent better than that of the reference turboshaft engine. Engine weights were estimated for both the topping cycle engine and the reference turboshaft engine. These estimates were based on a common shaft power output for each engine. Results indicate that the weight of the topping cycle engine is comparable to that of the reference turboshaft engine. Author

N83-35287# Akron Univ , Ohio. Dept. of Chemical Engineering.
TRANSITION-METAL-OXIDE COATED TITANIUM ELECTRODES FOR REDOX BATTERIES Final Report
R F SAVINELL Dec. 1982 56 p refs
(Contract DE-AC03-76SF-00098)
(DE83-011035; LBL-15716) Avail: NTIS HC A04/MF A01

The production of porous electrodes with reproducible surface activity for experiments to corroborate predictions of porous

electrode theory to ascertain if simple one step outer sphere electron transfer mechanism applies to the ferric-ferrous redox reaction at high reactant/product concentrations in a strong acid chloride medium was investigated. Kinetic rate expressions of this couple under these conditions at the metal oxide surfaces were sought. Coatings of the conductive and active rutile structure form of selected transition metal oxides were desired. Both IrO2 and RuO2 coatings having the rutile structure were prepared by thermal decomposition of their respective hydrated chloride salts. Low over potential exchange current densities of the ferric-ferrous couple were measured in concentrated solution at Pt, RuO2 and IrO2 RDF's. Significant corrections were necessary for ohmic effects, mass transfer effects, and nonuniform current distribution. It is shown that the electrocatalytic activity of RuO2 is comparable to that of Pt while the activity of IrO2 is approximately an order of magnitude less than Pt. The measured free energy of activation was similar for all three substrates and a nonbinding interaction between the couple and the surfaces is suggested. The variation in exchange currents among the different substrates can be attributed to some extent on double layer effects but primarily to crystal structure differences. DOE

N83-35441# Joint Publications Research Service, Arlington, Va.
BREKHOVSKIKH AND MONIN ON CURRENT CONCERNS OF OCEANOLOGISTS
L. BREKHOVSKIKH and A. MONIN *In its* USSR Rept.: Earth Sci., No. 28 (JPRS-84367) p 31-34 20 Sep. 1983 Transl. into ENGLISH from Pravda (USSR), 1 Jun 1983 p 3
Avail: NTIS HC A05

The growing importance of the world oceans to human life is discussed. The ocean can provide intercontinental shipping, energy and minerals for industry, protein for food, medicines, water for the deserts, and recreational areas. The development of the resources of the world ocean were studied. E A.K.

N83-35506# Gould, Inc., Rolling Meadows, Ill. Materials Lab.
INVESTIGATION OF LITHIUM-THIONYL CHLORIDE BATTERY SAFETY HAZARDS Final Report, 28 Sep. 1981 - 31 Dec. 1982
A. I. ATTIA, K. A. GABRIEL, and R. P. BURNS Jan. 1983 208 p refs Prepared in cooperation with Chicago Univ., Ill
(Contract N60921-81-C-0363)
(AD-A128382; REPT-838-012) Avail: NTIS HC A10/MF A01
CSCL 10C

In the ten years since the feasibility of a lithium-thionyl chloride cell was first recognized (1) remarkable progress has been made in hardware development. Cells as large as 16,000 Ah (2) and batteries of 10 8 MWh (3) have been demonstrated. In a low rate configuration, energy densities of 500 to 600 Wh/kg are easily achieved. Even in the absence of reported explosions, safety would be a concern for such a dense energetic package; the energy density of a lithium-thionyl chloride cell is approaching that of dynamite (924 Wh/kg). In fact explosions have occurred. In general the hazards associated with lithium-thionyl chloride batteries may be divided into four categories: Explosions as a result of an error in battery design. Very large cells were in prototype development prior to a full appreciation of the hazards of the system. It is possible that some of the remaining safety issues are related to cell design; Explosions as a result of external physical abuse such as cell incineration and puncture; Explosions due to short circuiting which could lead to thermal runaway reactions. These problems appear to have been solved by changes in the battery design (4); and Expolsions due to abnormal electrical operation (i.e., charging (5) and overdischarging (6) and in partially or fully discharged cells on storage (7 and 8). Author (GRA)

N83-35509# Aluminum Co. of America, Alcoa Center, Pa.
DESIGN AND FABRICATION OF A LOW-COST DARRIEUS VERTICAL-AXIS WIND-TURBINE SYSTEM, PHASE 2. VOLUME 3: DESIGN, FABRICATION, AND SITE DRAWING
Mar. 1983 121 p 3 Vol.
(Contract DE-AC04-76DP-00789; DE-AC04-78AL-04272)
(DE83-010900; SAND-82-7113/3) Avail: NTIS HC A06/MF A01

The design, fabrication, and site drawings associated with fabrication, installation, and check out of 100 kW 17 meter Vertical Axis Wind Turbines (VAWTs) were reported. The turbines are Darrieus type VAWTs with rotors 17 meters in diameter and 25.15 meters in height. They can produce 100 kW of electric power at a cost of energy as low as 3 cents per kWh, in an 18 mph wind regime using 12% annualized costs. Four turbines are produced three are installed and are operable. DOE

N83-35512# Aluminum Co. of America, Alcoa Center, Pa.
DESIGN AND FABRICATION OF A LOW-COST DARRIEUS VERTICAL-AXIS WIND-TURBINE SYSTEM, VOLUME 2 Final Technical Report
Mar 1983 235 p
(Contract DE-AC04-76DP-00789)
(DE83-012360; SAND-82-7113/2) Avail: NTIS HC A11/MF A01

The fabrication, installation, and checkout of 100-kW 17 meter vertical axis wind turbines is described Turbines are Darrieus-type VAWIs with rotors 17 meters and 25.15 meters in height. They can produce 100 kW of electric power at a cost of energy as low as 3 cents per kWh, in an 18-mph wind regime using 12% annualized costs. Four turbines were produced; three are installed and are operable. Contract results are documented. DOE

N83-35513# *Rockwell International Corp., Golden, Colo. Wind* Energy Research Center.
WIND-SYSTEMS MECHANICAL HEATING WITH PUMPS AND AGITATORS
M P SCHROEDER Aug. 1982 48 p refs
(Contract DE-AC04-76DP-03533)
(DE83-012269; RFP-3435) Avail: NTIS HC A03/MF A01

Technical guidelines for the potential development of wind energy/mechanical heating systems are sought. Their importance as an alternative energy system is assessed. Two mechanical devices, the centrifugal pump agitator, are identified as having the greatest apparent potential for high performance and low cost mechanical heating systems. Problems associated with the use of these devices are presented, together with their advantages. A passive rotor control system, independent of utility interconnection, which utilizes the inherent operating characteristics of the centrifugal pump to reduce complexity and cost, is also presented. Additionally, a more detailed analysis is presented defining the extent of system efficiency degradation due to heat loss encountered when transporting heated fluid via pipelines. Results of the analysis indicate that this loss can be effectively controlled by utilizing proper design guidelines, but that efficiency loss may be unacceptable for long or complicated line systems. DOE

N83-35515# Sandia Labs., Albuquerque, N. Mex
IMPROVED DOUBLE-MULTIPLE STREAMTUBE MODEL FOR THE DARRIEUS-TYPE VERTICAL AXIS WIND TURBINE
D. E. BERG 1983 8 p refs Presented at the Am Solar Energy Soc. Meeting, Minneapolis, 1 Jun. 1983
(Contract DE-AC04-76DP-00789)
(DE83-012500; SAND-82-2479C; CONF-830622-8) Avail: NTIS HC A02/MF A01

Double streamtube codes model the curved blade (Darrieus-type) vertical axis wind turbine (VAWT) as a double actuator fish arrangement (one half) and use conservation of momentum principles to determine the forces acting on the turbine blades and the turbine performance. Sandia National Laboratories developed a double multiple streamtube model for the VAWT which incorporates the effects of the incident wind boundary layer, nonuniform velocity between the upwind and downwind sections of the rotor, dynamic stall effects and local blade Reynolds number variations. The theory underlying this VAWT model is described,

as well as the code capabilities Code results are compared with experimental data from two VAWT's and with the results from another double multiple streamtube and a vortex filament code. The effects of neglecting dynamic stall and horizontal wind velocity distribution are also illustrated. DOE

N83-35516# North Wind Power Co., Inc., Warren, Vt
NORTH WIND 4-KILOWATT WIND-SYSTEM DEVELOPMENT. PHASE 1: DESIGN AND ANALYSIS, VOLUME 2, TECHNICAL REPORT
C. COLEMAN and D. J. MAYER May 1982 158 p refs Prepared in cooperation with Rockwell International Corp., Golden, Colo.
(Contract DE-AC04-76DP-03533)
(DE83-012271, RFP-3424/2) Avail: NTIS HC A08/MF A01

This report presents the results of Phase 1 of a program to design and fabricate a cost-effective SWFCS in the 3-6kW class During Phase 1, extensive design work was complimented by scale-model testing of critical components and concepts, aimed at developing analytical tools, design guidelines, and experience for implementation on the full-scale prototype scheduled for fabrication and testing in Phase 2 of this contract. The advanced concepts employed in the soft-rotor/control system and the electrical-power-generation scheme were designed, tested, and verified. Design emphasis has been placed on reliability, safety, cost effectiveness, and user acceptance. A summary of the analysis, testing, and design conducted throughout Phase 1 is included in this report. DOE

N83-35580# SRI International Corp., Menlo Park, Calif.
IMPROVED DIAGNOSTIC MODEL FOR ESTIMATING WIND ENERGY
R. M. ENDLICH and J. D. LEE Mar 1983 86 p refs
(Contract DE-AC06-76RL-01830)
(DE83-011878; PNL-4526) Avail: NTIS HC A05/MF A01

A quantitative method to estimate the wind resource at specific sites where wind energy generation may be economically feasible was investigated. A computer model that makes such estimates is described. The model uses standard weather reports and terrain heights in deriving wind estimates; the method of computation was changed from what has been used previously The performance of the current model is compared with that of the earlier version at three sites; estimates of wind energy at four new sites are also presented. DOE

N83-35587# Pacific Northwest Lab , Richland, Wash.
WIND-BEHAVIOR RESEARCH IN THE WIND-ENERGY-TECHNOLOGY PROGRAM
L. L. WENDELL May 1983 8 p refs Presented at the 6th Biennial Wind Energy Conf., Minneapolis, 1-3 Jun. 1983
(Contract DE-AC06-76RL-01830)
(DE83-013823; PNL-SA-11172; CONF-830631-9) Avail: NTIS HC A02/MF A01

The wind energy technology shift in emphasis is discussed. Priorities were shifted to research focusing on the direct interaction of the turbine and the winds. Because of the activity in the design and testing of large wind turbines over the past 2 years, a high priority is given to experiments and studies of microscale turbulence affecting wind turbine stresses. Wind variability is it relates to turbine operating strategy and energy capture is emphasized. The spacing between turbines in a cluster is an important factor in the effectiveness of the cluster in extracting maximum energy from the wind without significantly affecting the turbine design life. The major tasks are the development and testing of reliable models to simulate the effects of rotational sampling from single towers or remote sensing devices. It is recommented that more wind turbines and turbine clusters are placed in service, further research should be conducted on space and time variability of the wind. E.A.K.

N83-35743# Brussels Univ. (Belgium). Inst. de Mecanique Appliquee.
LIBER AMICORUM ANDRE L. JAUMOTTE
1983 683 p refs Partly in ENGLISH and FRENCH
(REPT-NT-50) Avail. NTIS HC A99/MF A01

Combined cycle power generation, flow theory, heat transfer, thermodynamics, turbocompressors, kinetics, energy technology, and lubrication are discussed.

N83-35759# Ecole Nationale Superieure de Mechanique et d'Aerotechnique, Poitiers (France).
OPTIMIZATION OF WIND TURBINE PROPELLERS [OPTIMISATION DES HELICES EOLIENNES]
R. GOETHALS *In* Brussels Univ. Liber Amicorum Andre L. Jaumotte p 343-357 Mar. 1983 refs In FRENCH
Avail: NTIS HC A99/MF A01

Methods for the optimization of two and three blade wind turbine propellers are summarized. Methods based on the determination of the maximum power coefficient, and on direct calculation of usable power from the performance characteristics of different blade geometries are considered The performances of standard wind turbines are illustrated. Author (ESA)

N83-35764# Open Univ., Milton (England).
COMBINED HEAT AND POWER SUPPLY USING CARNOT ENGINES
J. H HORLOCK *In* Brussels Univ. Liber Amicorum Andre L. Jaumotte p 429-441 1983 refs
Avail: NTIS HC A99/MF A01

The Marshall Report on the thermodynamic and economic feasibility of introducing large scale combined heat and electrical power generation (CHP) into the United Kingdom is summarized Combinations of reversible power plant (Carnot engines) to meet a given demand of power and heat production are analyzed The Marshall Report states that fairly large scale CHP plants are an attractive energy saving option for areas of high heat load densities Analysis shows that for given requirements, the total heat supply and utilization factor are functions of heat output, reservoir supply temperature, temperature of heat rejected to the reservoir, and an intermediate temperature for district heating Author (ESA)

N83-35774# Ghent Univ. (Belgium). Lab. for Machines and Machine Construction.
CONCENTRATOR CONCEPTS FOR WIND ENERGY SYSTEMS
H SOMERLING and E. DICK *In* Brussels Univ Liber Amicorum Andre L. Jaumotte p 591-607 1983 refs
Avail NTIS HC A99/MF A01

The fluid mechanic principles on which wind energy concentrators are based are outlined and concentrator systems are discussed. It is shown that, within the system, the energy concentration is due to concentration of the mass flow through the turbine and to augmentation of the energy drop over the turbine. The power coefficient of a system can be written as the product of a mass concentration coefficient, an energy augmentation coefficient and an extraction coefficient. Author (ESA)

N83-35815# Rockwell International Corp , Canoga Park, Calif Energy Systems Group.
SPACE REACTOR ELECTRIC SYSTEMS: SYSTEM INTEGRATION STUDIES, PHASE 1
R. V. ANDERSON, D. BOST, W R. DETERMAN, R. B HARTY, B. KATZ, V KESHISHIAN, A. F LILLIE, and W. B. THOMSON 29 Mar. 1983 27 p refs
(Contract DE-AT03-82SF-11687)
(DE83-010531; ESG-DOE-13399) Avail: NTIS HC A03/MF A01

The results of preliminary space reactor electric system integration studies performed were presented. The preliminary studies investigated a broad range of reactor electric system concepts for powers of 25 and 100 KWe Timely system information of suitable accuracy to support ongoing mission planning activities was studied. The preliminary system studies were performed by assembling the five different subsystems that are used in a system: the reactor, the shielding, the primary heat transport, the power

conversion processing, and the heat rejection subsystems. The subsystem data were largely based on Rockwell's recently prepared Subsystem Technology Assessment Report. Nine generic types of reactor subsystems were used in these system studies. Several levels of technology were used for each type of reactor subsystem. Seven generic types of power conversion-processing subsystems were used, and several levels of technology were again used for each type. DOE

N83-35820# Electricite de France, Paris. Div. Fiabilite et Fonctionnement.
ANALYSIS OF THE OPERATION OF AMERICAN WESTINGHOUSE PWR NUCLEAR REACTORS DURING 1980. MONTHLY PRODUCTION DIAGRAMS [ANALYSE DU FONCTIONNEMENT DES TRANCHES NUCLEAIRES AMERICAINES, PWR, WESTINGHOUSE AU COURS DE L'ANNEE 1980. DIAGRAMMES DE PRODUCTION MENSUELS]
H. BOCQUAIRE Dec. 1981 97 p refs In FRENCH
(HP-219/81/75) Avail: NTIS HC A05/MF A01

Availability and production are indicated for American nuclear reactors according to power rating. The number of incidents and length of stoppage is given for each type of system and each installation. Production rose six points overall compared with 1979. The range 1000 MW progressed 13 points (65% production capacity reached). The 700 to 1000 MW range improved by 5 points, despite many repairs to steam generators and almost total stoppage of one plant (48% production). The 400 to 600 MW range lost 12 points due to stops for recharging and many repairs to steam generators. Author (ESA)

N83-35822# Electricite de France, Paris. Div. Fiabilite et Fonctionnement.
SAINT LAURENT B1 NUCLEAR POWER PLANT: THERMAL AND MECHANICAL BEHAVIOR OF THE 01 RES SUPERHEATER CONDENSATES COOLER [CENTRALE DE SAINT-LAURENT B1: COMPORTEMENT THERMIQUE ET MECANIQUE D'UN REFROIDISSEUR DES CONDENSATS DU SURCHAUFFEUR (01 RCS)]
M. MATHIOT and A. FROMAL Apr. 1982 38 p refs In FRENCH
(HP-219/82/13) Avail: NTIS HC A03/MF A01

The thermal and mechanical performance of long thin tubes used to recover condensates from a PWR superheater and to raise the temperature of water fed into the steam generator was assessed, to see if temperature gradients liable to damage the tubes occur during load variations. Results show that maximum stress occurs during stable operation at nominal load Stress decreases in transient regimes. Stress is decreased by modifying the procedure for opening the steam inlet valve. Author (ESA)

N83-35823# Electricite de France, Paris Div. Fiabilite et Fonctionnement
THERMAL AND MECHANICAL BEHAVIOR OF SUPERHEATER DRYER BUNDLES OF SAINT LAURENT B1 AND B2 REACTORS [CENTRALE DE SAINT-LAURENT B: COMPORTEMENT THERMIQUE ET MECANIQUE DES FAISCEAUX DES SECHEURS SURCHAUFFEURS DE SAINT-LAURENT B1 ET B2]
A. LECOGUIEC and M. MATHIOT May 1982 183 p refs In FRENCH
(HP-219/82/14) Avail: NTIS HC A09/MF A01

The mechanical performance of superheater dryers was analyzed during pressurized water reactor startup tests System design is described, and tube dilation incidents are discussed. Modifications to the system, and instruments installed during testing are detailed. Results for tests at half power, full power, and during the transition from half to full power are presented.
Author (ESA)

N83-35824# Electricite de France, Paris. Div. Fiabilite et Fonctionnement.
SAINT LAURENT B REACTOR: SYNTHESIS OF THERMAL AND MECHANICAL TESTS ON THE TUBES OF SUPERHEATER DRYERS IN SECTIONS 1 AND 2 [CENTRALE DE SAINT-LAURENT B: SYNTHESE DES ESSAIS DE COMPORTEMENT THERMIQUE ET MECANIQUE DES FAISCEAUX DES SECHEURS SURCHAUFFEURS DES TRANCHES 1 ET 2]
A LECOGUIEC and M. MATHIOT Jul 1982 26 p refs In FRENCH
(HP-219/82/29) Avail NTIS HC A03/MF A01

Thermal and mechanical test results for PWR reactor superheater tubes are summarized and incidents which occurred during testing are described. Modifications to equipment and operating procedures are proposed. Author (ESA)

N83-35836# Nagoya Univ. (Japan). Inst. of Plasma Physics.
PROCEEDINGS OF THE US-JAPAN WORKSHOP ON 3-D MHD SIMULATION
Apr. 1983 152 p refs Workshop held in Nagoya, Japan, 7-11 Mar. 1983
(IPPJ-632) Avail: NTIS HC A08/MF A01

Recent experimental progress in plasma heating has pushed the Magnetohydrodynamic (MHD) analysts toward a higher beta confinement, thus requiring a more elaborate code than that based on the reduced set of equations. Three dimensional MHD code simulation work was done on spheromaks, Helotrone, Heliac, and Tokamak devices.

N83-35837# Japan Atomic Energy Research Inst., Ibaraki
MHD COMPUTATIONS AT JAERI, NUMERICAL STUDY OF RESISTIVE INTERNAL KINK MODE, FINITE-BETA EFFECT ON TEARING MODE
T. TAKEDA, M. AZUMI, T. TSUNEMATSU, M. KUMAGAI (Toshiba Co.), G. I. KURITA, K. I. NARAOKA (Fujitsu Ltd.), T. TAKIZUKA, Y. TANAKA (Fujitsu Ltd.), and S. TOKUDA *In* Nagoya Univ. Proc. of the US-Japan Workshop on 3-D MHD Simulation p 1-17 Apr 1983 refs
Avail: NTIS HC A08/MF A01

With the steady progress of the Tokamak experiments and theoretical studies detailed comparison becomes possible between the experimental data and computational results. It is rather difficult to numerically analyze the Tokamak plasma with generality in the three dimensional space. The full set of the ideal/resistive MHD equations incorporated with various non-MHD effects cannot be solved owing to lack of computer power. Simplified models are used to simulate each realistic physics phenomenon. Accordingly, it is necessary to draw up the overall program of the analyses of the MHD phenomena for the comprehensive understandng of the Tokamak plasma. Combinations of linear/nonlinear and ideal/resistive models are, for example, required to understand even a single MHD phenomenon. In order to cope with the comprehensive theoretical understanding of the Tokamak plasma project TRITON which consists of development of a numerical code system TRITON and the analyses of the Tokamak plasma by using the code was executed. Author

N83-35838# Oak Ridge National Lab., Tenn
THE 3-D RESISTIVE MHD CALCULATIONS FOR TOKAMAK PLASMAS: BEYOND THE SIMPLE REDUCED SET OF EQUATIONS
B. A. CARRERAS, L. GARCIA, T. C. HENDER, H R. HICKS, J. A. HOLMES, V. E. LYNCH, and B. F. MASDEN *In* Nagoya Univ. Proc. of the US-Japan Workshop on 3-D MHD Simulation p 18-29 Apr. 1983 refs Prepared in cooperation with Union Carbide Nuclear Co., Oak Ridge, Tenn.
(Contract W-7405-ENG-26)
Avail: NTIS HC A08/MF A01

Numerical studies of the resistive stability of Tokamak plasmas in cylindrical geomtry were performed using the full set of resistive Magnetohydrodynamic (MHD) equations and an extended version of the reduced set of resistive MHD equations including diamagnetic

and electron temperature effects In particular, the nonlinear interaction of tearing modes of many helicities was investigated. The numerical results confirm many of the features uncovered previously using the simple reduced equations. Author

N83-35839# Princeton Univ., N J Lab. for Plasma Physics.
REDUCED EQUATIONS FOR INTERNAL KINKS IN TOKAMAKS
R. IZZO, D. A. MONTECELLO, H R. STRAUSS, W. PARK, J. MANICKAM, and J. DELUCIA *In* Nagoya Univ Proc. of the US-Japan Workshop on 3-D MHD Simulation p 30-42 Apr. 1983 refs
(Contract DE-AC02-76CH-03073)
Avail: NTIS HC A08/MF A01

A reduced set of ideal magnetohydrodynamic (MHD) equations are derived for large aspect ratio, low beta Tokamaks that adequately describe the linear and nonlinear evolution of ideal internal kink modes in Tokamaks. Author

N83-35840# Nagoya Univ. (Japan). Inst. of Plasma Physics.
THREE DIMENSIONAL MHD SIMULATION ON THE STABILITY OF A HIGH-BETA TOKAMAK
T. OGINO, H. SANUKI, and T. KAMIMURA *In its* Proc. of the US-Japan Workshop on 3-D MHD Simulation p 43-50 Apr. 1983
Avail: NTIS HC A08/MF A01

The equilibrium configuration of a high beta Tokamak to give the maximum toroidal beta, beta(sub t) was studied from a two dimensional MHD simulation under the condition of a constant total toroidal current when the magnitude of the vertical magnetic field was controlled in the equilibrium, which was made by adjusting the diamagnetic effect and the toroidal current profile Next, a critical stability condition for the low-n ballooning mode was obtained by a three dimensional MHD simulation starting from the equilibrium given by two dimensional MHD simulation. In the present simulation, the MHD equations are solved by the two step Lax-Wendroff scheme as an initial value problem under the fixed boundary condition. Author

N83-35841# Hiroshima Univ. (Japan). Inst. for Fusion Theory
SPHEROMAK TILTING AND ITS STABILITY CONTROL
T. HAYASHI and T. SATO *In* Nagoya Univ. Proc. of the US-Japan Workshop on 3-D MHD Simulation p 51-64 Apr. 1983 refs
Avail: NTIS HC A08/MF A01

Spheromak configuration is globally unstable, particularly tilt unstable. Stability analysis states that a conducting wall close to a spheromak plasma could stabilize the instablity. Experimentally, it is also confirmed that a figure eight or a saddle coil acts to stabilize it, though eventually it suffers a tilting instability. A numerical technique to create a rather arbitrarily shaped spheromak like the one with a flux hole, and the dynamics governing the tilting instability, namely the influence of the magnetic index, the toroidal current (q-profile) and the resistivity upon the tilting growth rate, and the roles of magnetic reconnection upon the nonlinear development were studied. Clarification of the stabilizing effects of the distance of the horizontal and vertical walls and the radius of the center poles; and the influence of the wall condition, namely, whether or not the wall acted as a flux conserver in the spheromak creation stage were investigated Author

N83-35842# *Hiroshima Univ. (Japan). Inst. for Fusion Theory.*
THREE-DIMENSIONAL SPHEROMAK MERGING
Y. ODA and T SATO *In* Nagoya Univ. Proc. of the US-Japan Workshop on 3-D MHD Simulation p 65-75 Apr. 1983 refs
Avail: NTIS HC A08/MF A01

Spheromak is an attractive object both technically and physically to nuclear fusion plasma research. Because of the compactness and versatility coming from its intrinsic nature that the confinement magnetic fields are topologically separated from the external circuit, there are several technical advantages in designing a fusion reactor. Spheromak provides several physically interesting subjects, particularly as an object for revealing global plasma dynamics. For example, it is interesting to know how such a self-confined plasma is created starting from a realistic condition. It is interesting also to know whether such a self-confined plasma is configurationally stable or unstable and, if unstable, by what dynamics the evolution is governed. Three-dimensional simulations have disclosed that the plasma suffers a tilting disruption through reconnection and recent more extensive 3-D simulations have examined in detail the global dynamics of tilting instability and the remedies of the instability. Author

N83-35843# New York Univ., New York
SEARCH FOR A HIGHER BETA STELLARATOR
O BETANCOURT *In* Nagoya Univ. Proc. of the US-Japan Workshop on 3-D MHD Simulation p 76-79 Apr. 1983 refs
(Contract DE-AC02-76ER-03077)
Avail: NTIS HC A08/MF A01

One of the main parameters of interest in a stellarator configuration is that of critical beta. Each case must be examined from the point of view of equilibrium limits, stability limits (global as well as local modes) and transport. An extended version of our 3D computational method was used to explore these questions in detail for configurations of interest like Heliotron E, Heliac and ATF. Author

N83-35844# Kyoto Univ. (Japan). Lab. for Plasma Physics
MHD PROBLEMS IN HELIOTRON PLASMAS
M WAKATANI *In* Nagoya Univ. Proc of the US-Japan Workshop on 3-D MHD Simulation p 80-83 Apr. 1983 refs
Avail: NTIS HC A08/MF A01

(MHD) Magnetohydrodynamic equilibrium and stablity of heliotron plasmas was investigated by solving the reduced MHD eqs. derived by using the stellarator expansion numerically. Since the short length of the helical period is averaged over, the lowest equilibrium has axisymmetry and it allows each long wave length mode to be charactrized by a single toroidal mode number, n, thereby the stability analysis is reduced to a two dimensional problem. The three dimensional flux surfaces of heliotron plasmas is obtained by including the first order correction in the equilibrium calculations. This approach may sacrifice some physics compared to the three dimensional calculation, but the improved resolution and computational speed offer a better understanding to explore the large parameter space. Author

N83-35845# Oak Ridge National Lab , Tenn.
EQUILIBRIUM AND STABILITY STUDIES FOR HIGH BETA PLASMA IN TORSATRON/HELIOTRON DEVICES
B. A CARRERAS, L A. CHARLTON, W. A. COOPER, L. GARCIA, J. H. HARRIS, T. C. HENDER, H. R. HICKS, J. A. HOLMES, V. E. LYNCH, and B. F. MASDEN *In* Nagoya Univ. Proc. of the US-Japan Workshop on 3-D MHD Simulation p 84-96 Apr. 1983 refs Prepared in cooperation with Union Carbide Nuclear Co , Oak Ridge, Tenn
(Contract W-7405-ENG-26)
Avail: NTIS HC A08/MF A01

The equilibrium and stability properties of high beta plasmas in *torsatron/heliotron devices were investigated Three numerical* approaches were used to study plasma equilibria for a range of coil configurations. The method of averaging permits fast equilibrium and stability calculations. Two fully 3-D codes, namely the Chodura-Schluter code, and the NEAR code recently developed, are used to explore selected regions of parameter space. The resulting equilibria calculated with different methods are in good agreement. This validates the average method approach and enhances its usefulness. Results are presented for configurations with different aspect ratios and number of field periods. The role of the vertical field was also studied in detail. The main conclusion is that for moderate aspect ratios, the self stabilizing effect of the magnetic axis shift is large enough to open a direct path to the second stability regime. Author

N83-35846# California Univ., Livermore. Lawrence Livermore Lab. Magnetic Fusion Energy Computer Center.
NONLINEAR THREE-DIMENSIONAL MHD CALCULATIONS OF RESISTIVE INSTABILITIES IN A REVERSED FIELD PINCH
A. A. MIRIN and J. KILLEEN *In* Nagoya Univ. Proc. of the US-Japan Workshop on 3-D MHD Simulation p 97-115 Apr. 1983 refs
(Contract W-7405-ENG-48)
Avail: NTIS HC A08/MF A01

A three dimensional finite beta compressible nonlinear resistive MHD code, TEMCO, is used to study resistive instabilities in a reversed field pinch (RFP). The code uses cylindrical coordinates (r, phi, z) and hence is applicable to both cylindrical and toroidal geometries. The present study assumes an infinite aspect ratio (cylindrical) RFP, with r being distance along the minor radius, phi the poloidal angle, and z distance along the torus or cylinder. A description of the physics and numerical techniques used in TEMCO along with illustrative simulations of the evolution and interaction of a modes in an RFP are presented. Author

N83-35848# Nagoya Univ. (Japan). Inst. of Plasma Physics.
TEARING MODE OF REVERSED FIELD PINCHES
H. ASHIDA (Electrotechnical Lab.), T. AMANO, and A. NAGATA *In its* Proc. of the US-Japan Workshop on 3-D MHD Simulation p 122-127 Apr. 1983 refs
Avail: NTIS HC A08/MF A01

Nonlinear evolution of the resistive modes was investigated especially on the Tokamak plasmas and is known to have the significant effects on the quasi-steady equilibrium of the confined plasmas. These reconnecting processes of the internal disruptions were analyzed numerically by the Tokamak expansion but the diffuse pinches must be calculated without this approximation. The reconnection due to the tearing modes in the reversed field pinches (RFP) is the fundamental phenomenon for the formation of the force free configuration which is the lowest energy state under the constraint of the flux conservation. The finite beta effect on the resistive instabilities is also important for the RFP plasmas which are ideally stable up to high beta. The effect of the nonlinear tearing modes on the confined plasma in the quasi-steady equilibrium by using the cylindrical model was considered.
Author

N83-35849# Hiroshima Univ. (Japan). Inst. for Fusion Theory.
SELF-REVERSAL MECHANISM IN THE REVERSED FIELD PINCH
T. SATO and K. KUSANO *In* Nagoya Univ. Proc. of the US-Japan Workshop on 3-D MHD Simulation p 128-135 Apr 1983 refs
Avail: NTIS HC A08/MF A01

Self reversal of the magnetic field in the toroidal pinch appears to include a key to the dynamics governing the magnetic field topology change. A preliminary result of 3-D simulations attempting to reveal the mechanism is presented. A theoretical model of a developed self reversal mechanism was reviewed and then a simulation model and preliminary results were presented. Author

N83-35850# California Univ., Livermore. Lawrence Livermore Lab.
THE 3-D EQUILIBRIUM CODES FOR MIRROR MACHINES
T. B. KAISER *In* Nagoya Univ. Proc. of the US-Japan Workshop on 3-D MHD Simulation p 136-144 Apr. 1983 refs
(Contract W-7405-ENG-48)
Avail: NTIS HC A08/MF A01

Several codes were developed during the past few years for computing 3D guiding center equilibria for quadrupole tandem mirrors. These codes are complementary to one another, each having its own advantages and weaknesses. The important features of each of the codes are listed. All three are based on the long-thin or paraxial expansion of the tensor-pressure MHD equations, in which the inverse aspect ratio is taken to be small. Another feature common to all three codes is the assumption that the gyroradius is negligible compared to the perpendicular scale length, so that finite-orbit effects can be ignored. Author

N83-35857# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
BEHAVIOR OF AN ARC IN A PLASMA CONTACT OF A HOMOPOLAR GENERATOR
I. S. ROGACHEV and L. I. YANTOVSKIY 25 Apr. 1983 11 p refs Transl. into ENGLISH from Vestnik Kharkovskogo Politekhnicheskogo Inst. (USSR), no. 29(77), 1968 p 83-87
(AD-A128290; FTD-ID(RS)T-0404-83) Avail: NTIS HC A02/MF A01 CSCL 20I

Forced displacement of the cathode and anode spots occur in a plasma contact of a homopolar generator as a result of the rotation of the rotor and the effect of the leakage field of the excitation coil. To reduce erosion of the electrodes, one should avoid the conditions when S (sub a) and S (sub k) can become equal to zero or very small, i.e., do not permit the worsening of vacuum, shortlength of the discharge gap, weak transverse field, and the rotor speed at which v (sub a) - v (sub x) = v (sub n).
GRA

N83-35859# Wisconsin Univ., Madison.
HEAT-TRANSFER CHARACTERISTICS OF FLOWING AND STATIONARY PARTICLE-BED-TYPE FUSION-REACTOR BLANKETS Ph.D. Thesis
R E. NIETERT Feb. 1983 365 p 2 Vol.
(Contract W-7405-ENG-48)
(DE83-009324; UCRL-15521-VOL-1) Avail: NTIS HC A16/MF A01

Heat transfer characteristics of flowing and stationary particle bed type fusion reactor blankets are discussed. The following five appendices are included: (1) physical properties of materials; (2) thermal entrance length Nusselt number variations; (3) stationary particle bed temperature variations; (4) falling bed experimental data and calculations; and (5) stationary bed experimental data and calculations L.F M.

N83-35860# Wisconsin Univ., Madison.
HEAT-TRANSFER CHARACTERISTICS OF FLOWING AND STATIONARY PARTICLE-BED-TYPE FUSION-REACTOR BLANKETS Ph.D. Thesis
R. E. NIETERT Feb. 1983 283 p refs 2 Vol.
(Contract W-7405-ENG-48)
(DE83-009322; UCRL-15521-VOL-2) Avail: NTIS HC A13/MF A01

The heat transfer characteristics of flowing and stationary packed particle beds have recently become of interest in connection with conceptual designs of fusion reactor blankets. A detailed literature survey has shown that the processes taking place in such beds are not fully understood despite widespread use in the chemical industry and other engineering disciplines for more than five decades. In this study, two experimental investigations were pursued. In the first, a heat transfer loop was constructed through which glass microspheres were allowed to flow by gravity at controlled rates through an electrically heated stainless steel tubular test section. In the second, an annular packed bed was constructed in which heat was applied through the outer wall by electric heating of a stainless steel tube. Cooling occurred at the inner wall of the annular bed by flowing air through the central tube. A second air stream was allowed to flow through the voids of the packed bed. An error minimization technique was utilized in order to obtain the two dimensional one parameter effective conductivity for the bed by comparing the experimental and theoretically predicted temperature profiles. Experiments were conducted for various modified Reynolds numbers less than ten.
DOE

N83-35863# California Univ., Livermore. Lawrence Livermore Lab.
INERTIAL-CONFINEMENT-FUSION TARGETS
C D. HENDRICKS 10 Aug. 1982 24 p Presented at the Top Meeting on Inertial Confinement Fusion, San Diego, Calif., 26-28 Feb. 1980
(Contract W-7405-ENG-48)
(DE83-010614; UCRL-84006; CONF-800208-28) Avail. NTIS HC A02/MF A01

Much of the research in laser fusion has been done using simple ball on stalk targets filled with a deuterium tritium mixture. The targets operated in the exploding pusher mode in which the laser energy was delivered in a very short time (approx. 100 ps or less) and was absorbed by the glass wall of the target. The high energy density in the glass literally exploded the shell with the inward moving glass compressing the DT fuel to high temperatures and moderate densities. Temperatures achieved were high enough to produce DT reactions and accompanying thermonuclear neutrons and alpha particles. The primary criteria imposed on the target builders were (1) wall thickness, (2) sphere diameter, and (3) fuel in the sphere. DOE

N83-35866# Columbia Univ., New York. School of Engineering and Applied Sciences.
CREATION OF HIGH-TEMPERATURE PLASMA THROUGH THE USE OF A SUPERFAST Z-PINCH Ph.D. Thesis
A H. AUSLENDER 1983 155 p refs
(Contract DE-AC02-80ER-10613)
(DE83-011021; DOE/ER-10603/3) Avail: NTIS HC A08/MF A01

A theoretical and computational study of plasma temperature generated during a superfact Z-pinch hydrogen plasma implosion-driven by a modern multi-terrawatt pulsed power source is presented The solution of the time dependent, one dimensional, initial value problem used to study and describe the pinch process includes the effects of kinetic instabilities, anomalous collisionality, plasma heating, and all relevant energy loss mechanisms. Two dimensional effects are estimated by using a modified form of the one dimensional model. DOE

N83-35870# Columbia Univ., New York. Lab for Plasma Physics.
MEASUREMENT OF HIGH-BETA TOKAMAK PRESSURE PROFILES WITH MULTIPOINT THOMSON SCATTERING Ph.D. Thesis
F. M LEVINTON 1983 120 p refs Sponsored in part by the Natural Sciences and Engineering Research Council of Canada
(Contract DE-AC02-76ET-53016)
(DE83-012452, DOE/ET-53016/81; COO-2456-81) Avail NTIS HC A06/MF A01

A multipoint Thomson-scattering system was developed to obtain pressure profiles along the major radius of Torus h,2 a high-beta Tokamak. The profiles obtained during the 20 to 25 micro sec lifetime of the discharge indicates that the plasma has a peak temperature of 80 eV and density of 1.0 x 10 to the 15th power/cu cm. The profiles remain fairly constant during this time until the equilibrium is lost, after which the temperature and density decays to 10 eV and 10 to the 14th power/cu cm very quickly approximately/micro sec. Experimental results show Torus h2 has a high-beta equilibrium, with a strong shift of the peak of the pressure profile towards the outside. Numerical results from a 2-D free boundary MHD equilibrium code have obtained equilibria which closely approximate the experimentally measured profiles. DOE

N83-35871# Oak Ridge National Lab, Tenn. Fusion Energy Div.
NEW ALGORITHM FOR COMPUTING THE ABLATION OF HYDROGENIC PELLETS IN HOT PLASMAS
S. L MILORA Apr 1983 28 p refs
(Contract W-7405-ENG-26)
(DE83-010447; ORNL/TM-8616) Avail NTIS HC A03/MF A01

A method is presented for calculating the evaporation rate of hydrogenic pellets immersed in an unmagnetized plasma with a suprathermal particle component of arbitrary distribution function. The computational procedure is based on hydrodynamic solutions for the expansion of the gaseous cloud, obtained in a previous treatment that considered the effects of thermal particles only The appropriate heat source terms, derived from the stopping power of the gaseous shield, are worked out for energetic ions produced by neutral beam injection heating. The model predicts 27-cm penetration in a Poloidal Divertor Experiment (PDX) plasma, compared with experimentally measured values in the range of 29 to 32 cm. An application to the Tokamak Fusion Test Reactor (TFTR) gives an estimated 21-cm penetration for a 2.5-mm-diam tritium pellet injection at 2000 m/s into a 55-cm-bore plasma heated to a central electron temperature of 4 keV by 34 MW of neutral injection. DOE

N83-35872# Oak Ridge National Lab., Tenn. Fusion Energy Div.
SIMULATION OF INERTIAL AND BEAM-DRIVEN EFFECTS ON IMPURITIES IN TOKAMAK PLASMAS
E. C. CRUME, JR Jul. 1983 34 p refs
(Contract W-7405-ENG-26)
(DE83-014892; ORNL/TM-8699) Avail: NTIS HC A03/MF A01

Experiments on beam heated Tokamak plasmas in the Impurity Study Experiment (TSX-B) indicate that counterinjection leads to enhanced accumulation of impurities and coinjection leads to reduced accumulation of impurities relative to ohmically heated plasmas. According to neoclassical theory, both inertial and beam driven effects can modify impurity distributions in beam heated plasmas We have implemented treatments of these effects in our basic impurity transport simulation code, IMPTAR, in order to investigate whether these effects could account for the observations in TSX-B. We briefly review the neoclassical theory of these effects and infer various consequences. We then present simulation results for model coinjected and counterinjected ISX-B plasma with inertial and beam driven effects treated both separately and together. DOE

N83-35873# California Univ., Berkeley Lawrence Berkeley Lab
ONSET OF INCOMPLETE MOMENTUM TRANSFER IN FUSION-LIKE PROCESSES
R G. STOKSTAD, Y. CHAN, M. MURPHY, I. TSERRUYA, S WALD, and A. BUDZANOWSKI (Inst. of Nuclear Physics, Krakow) Mar 1983 34 p refs Presented at the Symp on Nucl Phys., Oaxtepec, Mexico, 4 Jan. 1983
(Contract DE-AC03-76SF-00098)
(DE83-012476; LBL-15874; CONF-830138-2) Avail NTIS HC A03/MF A01

Velocity spectra of evaporation risidues from the reactions O16 + Al, Ca, and Ni were measured at bombarding energies of 8 8, 13.6, and 19.6 MeV/u. Comparison with statistical model predictions shows clear evidence for the onset of incomplete momentum transfer at about 5 MeV/u above the interaction barrier. To first order, the results are similar for all targets, suggesting that the missing momentum is mainly associated with the projectile. The fraction of transferred linear momentum appears to decrease linearly with increasing relative velocity of the colliding nuclei at the barrier DOE

N83-35874# Oak Ridge National Lab., Tenn. Fusion Energy Div.
MHD ACTIVITY IN THE ISX-B TOKAMAK: EXPERIMENTAL RESULTS AND THEORETICAL INTERPRETATION
B. A. CARRERAS, J. L. DUNLAP, W. A. COOPER, R. A. DORY, T. C HENDER, M MURAKAMI, V K. PARE, A. J WOOTTON, J. D. BELL, L. A CHARLTON et al. Jun. 1983 62 p refs Prepared in cooperation with Texas Univ., Austin
(Contract W-7405-ENG-26; DE-FG05-80ET-53088)
(DE83-012340; ORNL/TM-8648) Avail. NTIS HC A04/MF A01

The observed spectrum of magnetohydrodynaic (MHD) fluctuations in the Impurity Study Experiment (ISX-B) Tokamak is clearly dominated by the n = 1 mode when the q = 1 surface is the plasma. This fact agrees well with theoretical predictions based

on three-dimensonal (3-D) resistive MHD calculations. They show that the (M = 1; n = 1) mode is the dominant instability. It drives other n = 1 modes through toroidal coupling and n 1 modes through nonlinear couplings. These theoretically pedicted mode structures have been compared in detail with the experimentally measured wave forms (using arrays of soft X-ray detectors). The agreement is excellent. More detailed comparison between theory and experiment have required careful reconstructions of ISX-B equilibria. The equilibria so constructed have permitted a precise evaluation of the ideal MHD stability properties of ISX-B. The present results indicate that the high-beta ISX-B equilibria are marginally stable to finite-n ideal MHD modes. DOE

N83-35875# Argonne National Lab., Ill. Fusion Power Program Office.
OVERVIEW OF FIRST WALL/BLANKET/SHIELD TECHNOLOGY
R. E NYGREN Apr. 1983 18 p refs Presented at the 5th Topical Meeting on Technol. on Fusion Energy, Knoxville, Tenn , 26-28 Apr. 1983
(Contract W-31-109-ENG-38)
(DE83-011725; CONF-830406-42) Avail. NTIS HC A02/MF A01

This brief overview of first wall, blanket, and shield technology focuses first on changes and trends in important dsign issues from the 1970's to the 1980's, then on current perceptions of critical issues in first wall, blanket, and shield design and related technology. The emphasis is on base technology than either systems engineering or materials development, on the two primary confinement systems, Tokamaks and mirrors, and on production of electricity as the primary goal for development. DOE

N83-35876# Los Alamos Scientific Lab., N. Mex
MODELING AND ANALYSIS OF INERTIAL-CONFINEMENT-FUSION FACILITIES
I O. BOHACHEVSKY and A. T. PEASLEE, JR 1983 22 p refs Presented at the 3rd Intern. Conf. on Emerging Nucl. Energy Systems, Helsinki, 6-9 Jun. 1983
(Contract W-7405-ENG-36)
(DE83-011147; LA-UR-83-1175; CONF-830632-1) Avail NTIS HC A02/MF A01

Approximate analytic models are used to explore relations among technical and economic characteristics of Inertial Confinement Fusion (ICF) facilities. Presented are attainable pulse rates for different reactor cavities and dependencies of the unit production cost of electricity on ICF driver pulse energy and repetition rate and on the facility size and the performance of the driver-pellet combination. The results indicate that economic electricity production with ICF reactors may require repetition rates of approximately 15 Hz or 20 Hz but that it may be achieved with values of the driver efficiency-pellet gain product as low as approximately 3 or 4. DOE

N83-35879# Argonne National Lab , Ill.
DEMONSTRATION TOKAMAK POWER PLANT
M ABDOU, C. BAKER, J BROOKS, D. EHST, R. MATTAS, D. L. SMITH, D. DEFREECE, G. D. MORGAN, and C. TRACHSEL 1983 15 p refs Presented at 5th Topical Meeting on Technol of Fusion Energy, Knoxville, Tenn , 26-28 Apr. 1983 Prepared in cooperation with McDonnell Douglas Astronautics Co., St. Louis
(Contract W-31-109-ENG-38)
Avail: NTIS HC A02/MF A01

A conceptual design for a Tokamak demonstration power plant (DEMO) was developed. A large part of the study focused on examining the key issues and identifying the R and D needs for: (1) current drive for steady-state operation, (2) impurity control and exhaust, (3) tritium breeding blanket, and (4) reactor configuration and maintenance. Impurity control and exhaust will not be covered in this paper but is discussed in another paper in these proceedings, entitled Key Issues of FFD/INTOR Impurity Control System. DOE

N83-35880# Sandia Labs., Albuquerque, N. Mex. Pulsed Power Applications Dept.
REPETITIVE PULSED POWER TECHNOLOGY FOR INERTIAL-CONFINEMENT FUSION
K. R. PRESTWICH and M. T. BUTTRAM 27 Jun. 1983 10 p refs Presented at the 5th Topical Meeting on Technol. of Fusion Energy, Knoxville, Tenn., 26 Apr. 1983
(Contract DE-AC04-76DP-00789)
(DE83-012507, SAND-82-2388C; CONF-830406-55) Avail NTIS HC A02/MF A01

The pulsed power requirements for inertial confinement fusion reactors are defined for ion beam and laser drivers. Several megajoule beams with 100's of terrawatt peak powers must be delivered to the reactor chamber 1 to 10 times per second. Ion beam drivers are relatively efficient requiring less energy storage in the pulsed power system but more time compression in the power flow chain than gas lasers. These high peak powers imply very large numbers of components for conventional pulse power systems. A new design that significantly reduces the number of components is presented. DOE

N83-35881# Wisconsin Univ., Madison. Inst for Plasma Physics.
STABILITY ANALYSIS OF EXPERIMENTAL HIGH-BETA TOROIDAL PLASMAS
A G. KELLMAN, M. W. PHILLIPS, S. C PRAGER, and M. C ZARNSTORFF Jun 1983 48 p refs
(Contract DE-AC02-76ET-53051)
(DE83-013543; DOE/ET-53051/54) Avail: NTIS HC A03/MF A01

The plasma beta measured in the bad curvature region ranges from (ALPHA) approximately 8% to 44% (n/sub e/ approximately 2-5x10(13) cm(+3), B/sub pol/ approximately 200 to 860 G) in macroscopically stable plasmas with decay times in excess of 1000 Alfven times. Theoretical work performed on non-MHD effects to explain the significant enhancement of plasma stability above the ideal MHD ballooning instability limit of 4$ is described. The effects are included in finite-n MHD theory and a detailed kinetic treatment including finite Larmor radius and heat flow along field lines. The FLR effects are sufficient to explain the stability of the (ALPHA) = 8% plasma through coupling of the ballooning mode to a stable oscillatory ion drift wave. This cannot explain the stability of the more collisional, larger gyroradius (ALPHA) = 44% plasma. Equilibrium diamagnetism is strongly affected by ion gyroviscosity in this plasma, and the role of this effect on the equilibrium and stability is discussed. DOE

N83-35882# Los Alamos Scientific Lab., N. Mex.
MODELING STUDY OF ENERGY BALANCE IN THE ZT-40M REVERSED-FIELD PINCH: LOW-CURRENT PASSIVE CROWBAR OPERATION
J. P. CHRISTIANSEN (UKAEA, Abingdon, England) and R A. GERWIN Apr. 1983 24 p refs
(Contract W-7405-ENG-36)
(DE83-013226; LA-9668-MS) Avail: NTIS HC A02/MF A01

The energy confinement time corresponding to a Reversed-Field Pinch in low current passive crowbar operation is considered. Assuming classical ohmic heating, we derive a formula from an analytic power balance study, and this is compared with the values calculated from a ID atomic physics transport code that incorporates various Tokamak scaling laws for energy confinement. By constraining the code to reproduce the experimental results from the ZT-40M device, we find that the values of the energy confinement time calculated by the code generally agree with those predicted by the formula and indicate a confinement time approximately 0.1 ms for the considered set of experiments. The power balance study also compares the RFP and the Tokamak The energy confinement time for the RFP is found to be substantially smaller than that for the tokamak when values of minor radius, current, and density are similar, by virtue of the smaller value of poloidal beta in the RFP. The numerical results do not suggest that any particular one of the Tokamak scaling laws is best suited to describing the RFP behavior. DOE

N83-36489# Lincoln Lab., Mass Inst. of Tech., Lexington. Group 68

A HIGH PRESSURE MERCURY TURBINE CYCLE FOR USE IN SPACECRAFT AND TERRESTRIAL POWER PLANTS

R. M. LERNER 22 Mar. 1983 257 p refs

(Contract F19628-80-C-0002; AF PROJ. 2029; AF PROJ 6430)

(AD-A129016; ESD-TR-82-176; TR-577) Avail: NTIS HC A12/MF A01 CSCL 13B

A high pressure thermomechanical cycle using mercury as the working fluid can be made practical at close to theoretical thermodynamic efficiency between a hot shoe temperature of about 1200 K (3000 psia boiler pressure) and 600 K condenser. Means are proposed for utilizing a simple Rankine cycle without superheat, in which liquid droplets are vaporized by radiative heat transfer after being sprayed into the boiler chamber as a mist, and in which vapor wetness is controlled (by addition of further hot mist if need be) prior to expansion in a nozzle; and in which, after expansion, the kinetic energy of both droplet and vapor phases is utilized in a turbine GRA

N83-36499# Argonne National Lab., Ill. Energy and Environmental Systems Div.

A STRUCTURAL-CERAMIC RESEARCH PROGRAM: A PRELIMINARY ECONOMIC ANALYSIS

L. R. JOHNSON, A. P. S. TEOTIA, and L. G. HILL Mar. 1983 81 p refs

(Contract W-31-109-ENG-38)

(DE83-014263; ANL/CNSV-38) Avail: NTIS HC A05/MF A01

The macroeconomic impacts (effects on gross national product, employment, fuel imports, and balance of trade) were modeled for two scenarios, one in which the US dominates the commercialization of ceramics in heat engines throughout the 1990s and the other in which Japan dominates. The positive effects of US dominance were forecast to be substantially greater than the negative effects of foreign dominance due to two assumptions: (1) Japanese ceramic commercialization does not include the truck and stationary engine markets because of a lack of historical presence in these areas and (2) imports of Japanese cars with ceramic engines are legislatively limited to 30% of new car sales. It is found that improved ceramics can also be substituted for superalloys containing strategic materials and thus reduce US dependence on foreign suppliers DOE

N83-36547*# Engelhard Corp., Menlo Park, Calif. Research and Development Dept

PHOSPHORIC ACID FUEL CELL STACK AND SYSTEM DEVELOPMENT Final Technical Report

A. KAUFMAN Oct. 1981 206 p

(Contract DE-AC01-78ET-15366)

(NASA-CR-172861; NAS 1.26:172861) Avail: NTIS HC A10/MF A01 CSCL 10B

The development of phosphoric acid fuel cell stack components, fuel selection and processing, integrated system design and development, and large stack design and development were examined. Author

N83-36550# Naval Civil Engineering Lab., Port Hueneme, Calif.

A 20-KW WIND ENERGY CONVERSION SYSTEM (WECS) AT THE MARINE CORPS AIR STATION, KANEOHE, HAWAII Progress Report, Sep. 1978 - Dec. 1981

D. PAL Jan. 1983 69 p refs

(AD-A128761, NCEL-TN-1655) Avail: NTIS HC A04/MF A01 CSCL 10B

The wind turbine generator chosen for the evaluation was a horizontal-axis-propeller-downwind rotor driving a three-phase, self-excited alternator through a step-up gear box. The alternator is fed into the base power distribution system through a three-phase, line-communtated-synchronous inverter using SCRs. The site has moderate wind conditions with an annual average windspeed of 12 to 14 mph, and the WECS turbine has a relatively high (29 mph) rated windspeed. The 20-kW WECS systems was primarily designed to obtain operating experience with, and maintenance information on, a 20-kW-sized WECS. This report describes in detail the experience gained and lessons learned during the field evaluation GRA

N83-36551# Ballistic Research Labs., Aberdeen Proving Ground, Md

COPPERHEAD BATTERY TESTER

W. J. CRUICKSHANK Jun. 1983 49 p

(Contract DA PROJ. 1L1-62618-AH-80)

(AD-A129503, AD-F300261; ARBRL-MR-03275) Avail. NTIS HC A03/MF A01 CSCL 10C

The development of a tester for the control section battery of the M712 Cannon-Launched Guided Projectile has fulfilled a requirement for the automatic testing of a series of batteries. The tester is a self-contained instrument that is used with a shock test system to rapidly perform complete tests after an initial setup. GRA

N83-36552# Gould, Inc., Rolling Meadows, Ill. Materials Lab.

STUDIES LEADING TO THE DEVELOPMENT OF HIGH-RATE LITHIUM-SULFURYL CHLORIDE BATTERY TECHNOLOGY Final Report, 1 Sep. 1981 - 31 Aug. 1982

J. C. HALL, M. KOCK, and F. MARIKAR Dec. 1982 163 p refs

(Contract DAAK20-81-C-0420, DA PROJ. 1L1-62705-AH-94)

(AD-A129564, DELET-TR-81-0420-2, REPT-827-055) Avail: NTIS HC A08/MF A01 CSCL 10C

Batteries built with an inorganic catholyte (e.g., thionyl chloride and sulfuryl chloride) are of interest for military applications on the basis of their high demonstrated energy density and high discharge rate capability when compared with organic electrolyte lithium cells. By far the greatest attention has been given to the lithium-thionyl chloride (Li/SOCl2) system, cells and batteries have been demonstrated with energy densities in excess of 600Wh/kg (1). Less attention has been given to the development of lithium-sulfuryl chloride batteries possibly because of a somewhat lower theoretical energy density (1700 and 1500 Wh/kg for Li/SOCl2 and Li/SO2Cl2 respectively). Author (GRA)

N83-36553# United Technologies Corp., South Windsor, Conn. Power Systems Div.

MEGAWATT FUEL CELL SYSTEMS ANALYSIS Final Report, Sep. 1981 - Jul. 1982

J. C. TROCCIOLA Wright-Patterson AFB, Ohio AFWAL Feb. 1983 66 p refs

(Contract F33600-81-C-0582; AF PROJ. 3145)

(AD-A129398; AFWAL-TR-83-2013; PSD/UTC-FCR-4513) Avail: NTIS HC A04/MF A01 CSCL 10B

This analysis effort evaluated the operational and economical benefits of utilizing a megawatt fuel cell to provide prime electrical power and thermal energy to an Air Force Logistics Center. Issues motivating this analysis include concerns with the Air Logistics Center's vulnerability to electrical grid and fuel supply disruption, and energy conservation/self sufficiency goals established by the Air Force Logistics Command. This effort determined that megawatt fuel cells can provide an economical alternative for survivable power systems when compared to electrical grid/diesel boiler systems currently used. Author (GRA)

N83-36554# United Technologies Corp., South Windsor, Conn. Power Systems Div.

ON-SITE FUEL CELL APPLICATION ANALYSIS Final Report, Sep. 1981 - Dec. 1982

J. W. STANIUNAS Wright-Patterson AFB, Ohio AFWAL Feb. 1983 79 p refs

(Contract F33615-81-C-0582, AF PROJ. 3145)

(AD-A129388; AFWAL-TR-83-2014; PSD/UTC-FCR-4513-1)

Avail: NTIS HC A05/MF A01 CSCL 12A

This program evaluated the energy conservation and economic potential of on-site fuel cell service for Air Force Logistic Command Facilities. Numerous facilities were examined at Wright-Patterson AFB, Hill AFB, and Robins AFB. One facility was selected at each base for detailed benefit and integration analyses. Results of the analyses are presented. Author (GRA)

N83-36555# Bechtel Corp , San Francisco, Calif.
INTEGRATED STRUCTURE DESIGNS FOR PHOTOVOLTAIC ARRAYS
H. A. FRANKLIN Apr 1983 254 p refs
(Contract DE-AC04-76DP-00789)
(DE83-013143; SAND-81-7191) Avail: NTIS HC A12/MF A01

The third phase of a multiyear program to investigate the design of low cost support structures for solar photovoltaic arrays used for central power production is described. Two low cost candidate support concepts were investigated Detailed design integration was investigated. Design integration involved detailing various foundation and superstructure systems to reduce structural redundancy and improve system efficiency for fabrication and installation. Wind tunnel tests of the fixed, flat panel arrays were made The structural responses and aerodynamic stability of candidate designs were checked by wind dynamic analyses The fabrication and installation of a nonoperative demonstration array in Albuquerque, NM, which shows the simplicity and effectiveness of the selected design for future large scale applications is outlined. DOE

N83-36893# Rockwell International Corp , Canoga Park, Calif. Energy Systems Group.
HELIUM GENERATION IN FUSION REACTOR MATERIALS Progress Report, Jan. - Mar. 1982
D. W. KNEFF and H FARRAR 1982 17 p refs
(Contract DE-AT03-76ET-52015)
(DE82-015579; DOE/ET-52015/T19) Avail: NTIS HC A02/MF A01

Helium accumulation neutron dosimetry for the Omega West Reactor was studied Neutron energy spectrum unfolding using combined helium accumulation and radiometric measurements was demonstrated for the neutron environment of the Omega West Reactor. The RTNS-II fluence mapping and helium generation cross sections were investigated. Neutron fluence contours were calculated for the high flux region of the RTNS-II sample irradiation volume, and the cross section of elemental lead was determined for 14.8 MeV neutrons. Combined helium accumulation and radiometric dosimetry for Be(d,n) neutron spectra was also studied. Neutron energy spectrum unfolding using combined helium accumulation and radiometric measurements was demonstrated for the Be(d,n) neutron environment DOE

N83-36938# California Univ., Livermore. Lawrence Livermore Lab.
NATIONAL MIRROR PROGRAM PLAN
C. A GERICH Aug. 1982 124 p refs
(Contract W-7405-ENG-48)
(DE83-002653, UCAR-10042-82) Avail: NTIS HC A06/MF A01

This Plan is current as of August 1982. The major milestones listed herein represent an aggressive, success oriented program paced primarily by technical results. Consistent with applicable government policies and the overall program planning of the Department's Office of Fusion Energy, this Plan assumes approval of the Mirror Program's next major step beyond MFTF-B, a deuterium-tritium (D-T) burning engineering reactor called the Fusion Power Demonstration facility (formerly the Tandem Mirror Next Step). The near term goal of the tandem mirror program is to lay the scientific and technical groundwork for an economically attractive, D-T fusion reactor design before the end of the 1980s. Construction of the FPD facility based on the tandem mirror could be initiated around 1988. A second phase, complete with a nuclear power blanket demonstration, could be initiated in the mid-1990s, based on nuclear engineering data from a facility such as the Technology Demonstration Facility described below. The outline of an acceptable tandem mirror reactor design was first published in 1981, and will be further developed and described in the Mirror Advanced Reactor Study during FY 1982-1983. DOE

N83-37028*# General Motors Corp , Indianapolis, Ind.
CERAMIC APPLICATIONS IN TURBINE ENGINES Progress Report, 1 Jul. - 31 Dec. 1980
J. A. BYRD, M. A. JANOVICZ, and S. R. THRASHER Sep. 1981 165 p
(Contract DEN3-17)
(NASA-CR-165494; DOE/NASA/0017-3; NAS 1.26:165494; DDA-EDR-10672) Avail: NTIS HC A08/MF A01 CSCL 21E

Development testing activities on the 1900 F-configuration ceramic parts were completed, 2070 F-configuration ceramic component rig and engine testing was initiated, and the conceptual design for the 2265 F-configuration engine was identified. Fabrication of the 2070 F-configuration ceramic parts continued, along with burner rig development testing of the 2070 F-configuration metal combustor in preparation for 1132 C (2070 F) qualification test conditions. Shakedown testing of the hot engine simulator (HES) rig was also completed in preparation for testing of a spin rig-qualified ceramic-bladed rotor assembly at 1132 C (2070 F) test conditions. Concurrently, ceramics from new sources and alternate materials continued to be evaluated, and fabrication of 2070 F-configuration ceramic component from these new sources continued. Cold spin testing of the critical 2070 F-configuration blade continued in the spin test rig to qualify a set of ceramic blades at 117% engine speed for the gasifier turbine rotor. Rig testing of the ceramic-bladed gasifier turbine rotor assembly at 108% engine speed was also performed, which resulted in the failure of one blade The new three-piece hot seal with the nickel oxide/calcium fluoride wearface composition was qualified in the regenerator rig and introduced to engine operation wiwth marginal success. N.W.

06

ENERGY TRANSPORT, TRANSMISSION, AND DISTRIBUTION

Includes transport of fuels by pipelines, tubes, etc., microwave power transmission, and superconducting power transmission.

A83-41524
HEAT TRANSFER IN ENERGY PROBLEMS
T. MIZUSHINA, ED. (Kyoto University, Kyoto, Japan) and W J. YANG (Michigan, University, Ann Arbor, MI) Washington, DC, Hemisphere Publishing Corp, 1983, 249 p

Results of recent research are presented concerning heat transfer in energy problems, including high-temperature heat transfer, high-flux heat transfer, high-performance heat transfer, heat transfer in nonconventional energy (power and propulsion) systems, and novel heat transfer techniques Topics discussed include studies of full-coverage film cooling, radiative properties of metals and alloys at high temperature, critical heat flux conditions in high-quality boiling systems, heat transfer characteristics of the evaporation of a liquid droplet on heated surfaces, high-performance surfaces for non-boiling heat transfer, and high performance heat transfer surfaces for boiling and condensation. Also examined are high flux heat transfer in gaseous solid suspension flow, nuclear process heat applications of high temperature heat exchange, heat transfer considerations in the use of new energy resources, and high performance mist-cooled condensers for geothermal binary cycle plants. No individual items are abstracted in this volume N.B.

A83-41991
INVESTIGATION OF THE UNSTEADY MODES OF OPERATION OF GAS-REGULATED HEAT PIPES WITH GAS DISSOLVING IN THE HEAT CARRIER [ISSLEDOVANIE NESTATSIONARNYKH REZHIMOV RABOTY GAZOREGULIRUEMYKH TEPLOVYKH TRUB S RASTVORIAIUSHCHIMSIA V TEPLONOSITELE GAZOM]
M. G. SEMENA, R. A PETRENKO, V. M. BATURKIN (Kievskii Politekhnicheskii Institut, Kiev, Ukrainian SSR), and R. MUELLER Energetika (ISSN 0579-2983), May 1983, p. 70-75. In Russian. refs

A83-42350
AN EXPERIMENTAL INVESTIGATION OF A LOW HEAT FLUX, WICKLESS HEAT PIPE
B. S. LARKIN (National Research Council, Ottawa, Canada) Canadian Society for Mechanical Engineering, Transactions (ISSN 0315-8977), vol. 7, no. 2, 1983, p 96-99. refs

This paper reports tests on a wickless heat pipe to be used for transporting heat from the ground to protect an electronic package from low ambient temperatures Evaporating heat transfer coefficients were measured for low heat fluxes where the behavior of the evaporating film is unpredictable The effects of type of working fluid, heat flux, charge quantity and tube inclination were investigated. Author

A83-42659
ENHANCEMENT OF HEAT TRANSFER
W. NAKAYAMA (Hitachi, Ltd., Mechanical Engineering Research Laboratory, Tsuchiura, Ibaraki, Japan) IN: Heat transfer 1982, Proceedings of the Seventh International Conference, Munich, West Germany, September 6-10, 1982 Volume 1 . Washington, DC, Hemisphere Publishing Corp , 1982, p 223-240 refs

Recent publications on enhancement of heat transfer are reviewed, emphasizing the effects of roughness elements, fins, and porous surfaces. Enhancement of forced convective heat transfer on roughened surfaces, performance evaluation of enhanced surfaces, viscous flows in cooled tubes and tubes with swirlers, and active methods of enhancement are addressed Aspects of pool boiling heat transfer are considered, including nucleate boiling heat transfer on rough surfaces and porous surfaces, and maximum and minimum heat fluxes. Evaporative heat transfer is discussed for thin-film evaporation on structured surfaces and liquid spray cooling of a heated surface Condensation heat transfer on external surfaces is covered, including filmwise condensation on vertical finned and fluted surfaces and on horizontal tubes. In-tube boiling and condensation are treated, discussing their enhancement by fins and inserts, as well as critical heat flux in coiled, rifled, and corrugated tubes. C.D.

A83-42755
NUMERICAL STUDY OF HEAT TRANSFER SYSTEM WITH STAGGERED ARRAY OF VERTICAL FLAT PLATES USED AT LOW REYNOLDS NUMBER
K. SUZUKI, E. HIRAI, T SATO (Kyoto University, Kyoto, Japan), and S. KIEDA (Hitachi, Ltd , Mechanical Engineering Research Laboratory, Tsuchiura, Ibaraki, Japan) IN: Heat transfer 1982; Proceedings of the Seventh International Conference, Munich, West Germany, September 6-10, 1982. Volume 3 . Washington, DC, Hemisphere Publishing Corp., 1982, p. 483-488. Sponsorship: Ministry of Education, Science and Culture of Japan. refs
(Contract MOESC-56045070)

A83-42765
HEAT TRANSFER CHARACTERISTICS OF THE TWO-PHASE CLOSED THERMOSYPHON (WICKLESS HEAT PIPE)
F. E. ANDROS (IBM Corp., Endicott, NY) and L. W. FLORSCHUETZ (Arizona State University, Tempe, AZ) IN Heat transfer 1982, Proceedings of the Seventh International Conference, Munich, West Germany, September 6-10, 1982. Volume 4 . Washington, DC, Hemisphere Publishing Corp., 1982, p. 187-192. refs
(Contract NSF ENG-75-09072)

Steady-state heat transfer characteristics and heat transfer limits (dry-out) for a vertical stainless steel tubular two-phase closed thermosyphon with Freon-113 working fluid are reported as a function of certain geometric parameters and liquid fill quantity. Condenser section heat transfer characteristics agreed reasonably well with existing laminar film condensation correlations and were found to be independent of the evaporator section, except for larger liquid fills. Evaporator characteristics were quite complex and appeared, under some conditions, to be coupled to condenser characteristics through effects of system pressure and/or surface wave as present on the descending condensate film. A laminar thin film evaporation model was found to give reasonable agreement with local evaporator temperature measurements in those regions of the evaporator where a continuous film apparently persisted. The measured heat transfer characteristics are interpreted relative to an earlier investigation by the authors in which flow characteristics in a similar device were visually and photographically observed. Author

A83-42766
HEAT PIPES - THERMAL DIODES
B. F APTEKAR, J. M. BAUM, M. N. IVANOVSKII, F. F. KOLGOTIN, and V. I SERBIN (Gosudarstvennyi Komitet po Ispol'zovaniiu Atomnoi Energii, Fiziko-Energeticheskii Institut, Obninsk, USSR) IN: Heat transfer 1982; Proceedings of the Seventh International Conference, Munich, West Germany, September 6-10, 1982 Volume 4 . Washington, DC, Hemisphere Publishing Corp., 1982, p. 213-217. refs

The performance concept and peculiarities of the new type of thermal diode with the trap and with the wick breakage are dealt with in the report The experimental data were obtained and analysed for the working fluid mass and the volume of the liquid in the wick on the forward-mode limiting heat transfer. The flow rate pulsation of the working fluid in the wick was observed visually on the setup with the transparent wall The quantitative difference on the data on the investigated thermal diode and on the identical heat pipes without the wick breakage is found experimentally concerning the forward-mode limiting heat transfer. Author

A83-42767
EXPERIMENTAL STUDIES OF HEAT AND MASS EXCHANGE PHENOMENA IN THE TWO-COMPONENT HEAT PIPE
J. M. BAUM, M N. IVANOVSKII, V. I. SERBIN, and S. S. IUROV (Gosudarstvennyi Komietet po Ispol'zovaniiu Atomnoi Energii, Fiziko-Energetischeskii Institut, Obninsk, USSR) IN: Heat transfer 1982; Proceedings of the Seventh International Conference, Munich, West Germany, September 6-10, 1982. Volume 4 . Washington, DC, Hemisphere Publishing Corp., 1982, p. 219-223. refs

The results of the experimental studies of the two-component heat pipe performance are presented in this paper. The water/ethanol mixture was used as the working fluid. The qualitative mechanism of mass exchange in different sections of the heat pipe is suggested as a model. The value of the power transferred by the heat pipe, as well as the correlation of the evaporator, the condenser, and the transport section lengths practically do not influence the extent of separation of the components in the heat pipe. Author

A83-43023
VAPOR FLOW REVERSAL IN THE CONDENSATION ZONE OF A SIMULATED FLAT-PLATE HEAT PIPE
H. VAN OOIJEN, C. J. VAN DER STAR, and C J. HOOGENDOORN (Delft, Technische Hogeschool, Delft, Netherlands) IN: Heat transfer 1982, Proceedings of the Seventh International Conference, Munich, West Germany, September 6-10, 1982. Volume 6 . Washington, DC, Hemisphere Publishing Corp., 1982, p. 331-335. refs

Recent vapor flow computations have indicated the possibility of flow reversal in the condensation zone of heat pipes. A vapor flow model consisting of a parallel plate channel with porous walls has been constructed The evaporation and condensation processes were simulated by means of air injection and suction through the porous walls. Pressure profiles along the vapor channel have been measured. In the condenser the predicted pressure buildup for values of the radial Reynolds number greater than 5 was found Velocity profiles in the condenser were measured with Laser Doppler Velocimetry using photon correlation techniques. For asymmetrical flow, with injection and suction through the bottom plate only, flow reversal along the top plate was measured in the far end of the condenser for radial Reynolds number not less than 15 as expected from the computer calculations. In the case that a noncondensable gas is present in the condenser, as is the case for variable conductance heat pipes, the existence of a zone of recirculating flow will strongly influence the condensation process. Author

A83-47379#
AN APPROACH FOR THE APPLICATION OF GENERIC TECHNOLOGIES TO SOLAR POWER SATELLITES
P. E. GLASER (Arthur D. Little, Inc., Cambridge, MA) International Astronautical Federation, International Astronautical Congress, 34th, Budapest, Hungary, Oct 10-15, 1983. 6 p. refs
(IAF PAPER 83-428)

The evolution of the solar power satellite (SPS) concept is summarized and the generic technologies to meet the SPS requirements are discussed. The synergy with space technology development is considered and a 'terracing' approach to SPS development presented to mitigate impediments associated with implementation of large-scale projects related to technical uncertainties, project control, and investments. The activities associated with this approach and the near-term decisions with reference to the SPS are discussed The factors which will influence the development of the SPS including coordination requirements are considered. Author

N83-30926# Brookhaven National Lab., Upton, N. Y.
A THEORY OF LOSSES AND LOSS MEASUREMENTS OF SUPERCONDUCTING POWER CABLES CONSISTING OF HELICALLY WOUND CONDUCTOR TAPES
F. SCHAUER 13 Dec. 1982 98 p refs
(Contract DE-AC03-76CH-00016)
(DE83-009874; BNL-51644; TIC-4500) Avail: NTIS HC A05/MF A01

The ac losses of short prototypes (up to 100 m) of superconducting cables are usually measured electrically by multiplying the cable currents with the corresponding voltage drops and time averaging the products in an electronic wattmeter. With this method the losses of different parts of a cable can be measured by using appropriate voltage pickup probes to measure (1) the overall cable voltage; (2) the axial voltage drops of the inner and outer conductors respectively; (3) the voltage drop of the surface of a conductor tape, and (4) the losses of the shorted end. The axial and spiral probes, and their functions are discussed. A theory of losses and loss measurements of superconducting power cables consisting of helically wound conductor tapes is given for the single helix cable, double helix cable, and double helix cables with metallic core and stabilizer layers Theoretical results using this theory are compared with experimental data from testing a 1 m cable and a 100 m cable. DOE

N83-30964# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
PERFORMANCE OF A VARIABLE CONDUCTANCE HEAT PIPE HEAT EXCHANGER Final Scientific Report, 15 May 1982 - 14 Feb. 1983
P D. CHANCELOR Feb 1983 61 p refs
(Contract AF-AFOSR-0205-82; AF PROJ. 2301)
(AD-A126861; EOARD-TR-83-8) Avail NTIS HC A04/MF A01 CSCL 13A

The performance of an air to air heat exchanger in which heat is transferred to a finned evaporator and from a finned condenser via a heat pipe was evaluated. The variable conductance heat pipe is to the condenser fins a heat source and to the evaporator fins a heat sink. The principal advantage of the variable conductance heat pipe heat exchanger is the ability to modulate power transfer independent of stream inlet conditions. This type of heat exchanger is of particular interest to the commercial aircraft industry because of its control system. The results from this research will help to provide the engineer with experimental data necessary to design a full scale prototype heat exchanger to be tested in situ Author (GRA)

N83-32180*# Raytheon Co., Waltham, Mass. Microwave Power Tube Div.
DESIGN STUDY FOR A GOUND MICROWAVE POWER TRANSMISSION SYSTEM FOR USE WITH A HIGH-ALTITUDE POWERED PLATFORM Final Report
W. C. BROWN Jun 1983 136 p refs
(Contract NAS6-3200)
(NASA-CR-168344; NAS 1.26 168344; PT-6052) Avail. NTIS HC A07/MF A01 CSCL 10B

The conceptual design of a ground-based microwave power transmission system is described This system is intended to supply electrical power via an air link to a high-altitude (21 km) powered platform. The platform must be equipped with the required instrumentation (RECTENNA) to convert the RF energy to dc power Author

N83-32998# Thermo Electron Corp., Waltham, Mass.
HIGH-EFFICIENCY, GAS-FIRED, HEAT-PIPE, WARM-AIR HEATING SYSTEM Annual Report, Jan. - Dec. 1982
F. E. BECKER, A I. ZAKAK, and E F. SEARIGHT Jan. 1983 64 p
(PB83-194936; TE-4296-11-83, GRI-83/0005) Avail. NTIS HC A04/MF A01 CSCL 13A

Four residential heat pipe furnaces were installed at selected test sites early in 1982. Each furnace unit operated at 100,000 Btu/hr heat input with a steady state efficiency of 86 percent. Two of the units were life cycle tested in laboratories; no major difficulties were encountered during their operation Two additional furnaces were tested in homes. Field test performance confirmed that a steady state efficiency of 86 percent and a seasonal efficiency of 82-83 percent were obtained. A major furnace manufacturer has been licensed to manufacture and sell the heat pipe furnace developed by Thermo Electron under GRI sponsorship A manufacturing prototype furnace was designed and fabricated taking into consideration the production capabilities of the manufacturer. The furnace is rated at 105,000 Btu/hr heat input and has a steady state efficiency of 85 percent. A field test was begun to continue through the 1982-83 heating season. GRA

N83-33064# Los Alamos Scientific Lab., N. Mex.
DEVELOPMENT AND TESTING OF A 50-KA, PULSED SUPERCONDUCTING CABLE
J. J. WOLLAN, W. C. HAMILTON, J. DECLERC, and B. A. ZEITLIN 1982 6 p refs Presented at the Appl. Superconductivity Conf., Knoxville, Tenn., 30 Nov. 1982 Prepared in cooperation with Intermagnetics General Corp., Guilderland, N.Y.
(Contract W-7405-ENG-36)
(DE83-003556, LA-UR-82-3424; CONF-821108-7) Avail: NTIS HC A02/MF A01

Prototype cables for 7.5-T, pulsed field application in Tokamak poloidal coils were designed, fabricated, and evaluated. Successful

fabrication of a 10 m superconducting sample represents the largest superconducting cable ever made. Details of the fabrication, the problems expected and encountered, and the solutions to those problems are discussed. Results of stability measurements on the superconducting prototype also are presented. DOE

N83-33082 ESDU International Ltd., London (England)
HEAT PIPES: GENERAL INFORMATION ON THEIR USE, OPERATION AND DESIGN
Aug. 1980 40 p refs Sponsored by Institution of Chemical Engineers and Institution of Mechanical Engineers
(ESDU-80013; ISBN-0-85679-296-9; ISSN-0141-402X) Avail: ESDU

This Data Item is an addition to the Heat Transfer Subseries. A review of the various devices that are commonly called heat pipes, their applications and how they operate is provided. Information of a general nature concerned with the use and design (but not manufacture) of heat pipes is provided Other data give methods for calculating the performance of two-phase closed thermosyphons, data on wick properties, and data on the physical properties of working fluids ESDU

N83-33083 ESDU International Ltd., London (England).
THERMOPHYSICAL PROPERTIES OF HEAT PIPE WORKING FLUIDS: OPERATING RANGE BETWEEN -60 DEG C AND 300 DEG C
Aug. 1980 24 p refs
(ESDU-80017; ISBN-0-85679-300-0, ISSN-0141-402X) Avail ESDU

This Data Item is an addition to the Heat Transfer Subseries. Tabulated values and equations of the saturation-line thermophysical properties of a number of fluids suited to capillary heat pipe and thermosyphon use such as described in ESDU 79012 and 81038 are presented. The fluids considered are acetone, ammonia, diphenyl ether/diphenyl (e g. Dowtherm A), o-dichlorobenzene (e.g. Dowtherm E), methanol, toluene and water which are all suitable fluids operating close to normal temperatures. The properties considered are vapor pressure, density of the saturated liquid and vapor, specific latent heat of vaporization, specific heat capacity of the saturated liquid, dynamic viscosity of the saturated liquid and vapor, thermal conductivity of the saturated liquid and surface tension Figures of merit (parameters based on working fluid properties indicating the relative suitability of the fluids for various operating temperatures) are given for both capillary-driven heat pipes and thermosyphons ESDU

N83-33090 ESDU International Ltd., London (England).
HEAT PIPES-PERFORMANCE OF 2-PHASE CLOSED THERMOSIPHONS
Jul. 1982 28 p refs
(ESDU-81038-AMEND-B) Avail ESDU

This Data Item is an addition to the Heat Transfer Subseries Processes involved in a thermosiphon, whereby high rates of heat transfer can be obtained between surfaces that have only a small temperature difference between them, are described. Heat is transferred by means of evaporation and condensation, and gravity is used to return the liquid film to the evaporator as compared with capillary-driven designs which use a wick. The thermosiphons discussed have: (1) circular tubes of uniform cross section; (2) a single component working fluid and no noncondensable gas; (3) either no wick or a simple wick or insert in the evaporator wall, and (4) angles of inclination to the horizontal 5 to 90 degrees The maximum overall rate of heat transfer depends on the overall temperature difference and the sum of the thermal resistances of the various solid, liquid, and vaporous media and interfaces involved Methods are given for calculating each thermal resistance Advice and expressions are also given for the limits of vapor pressure, sonic velocity in the vapor, dry-out, boiling limit, and the counter-current flow limit ESDU

N83-33102*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Mechanical and Aerospace Engineering.
USER'S MANUAL FOR THERMAL ANALYSIS PROGRAM OF AXIALLY GROOVED HEAT PIPE (HTGAP)
Y. KAMOTANI Sep. 1978 64 p refs
(Contract NAS5-24144)
(NASA-CR-170563; NAS 1.26:170563) Avail: NTIS HC A04/MF A01 CSCL 20D

A computer program that numerically predicts the steady state temperature distribution inside an axially grooved heat pipe wall for a given groove geometry and working fluid under various heat input and output modes is described. The program computes both evaporator and condenser film coefficients. The program is able to handle both axisymmetric and nonaxisymmetric heat transfer cases Non-axisymmetric heat transfer results either from non-uniform input at the evaporator or non-uniform heat removal from the condenser, or from both. The presence of a liquid pool in the condenser region under one-g condition also causes non-axisymmetric heat transfer, and its effect on the pipe wall temperature distribution is included in the present program. The hydrodynamic aspect of an axially grooved heat pipe is studied in the Groove Analysis Program (GAP). The present thermal analysis program assumes that the GAP program (or other similar programs) is run first so that the heat transport limit and optimum fluid charge of the heat pipe are known a priori. Author

N83-33940*# TRW Defense and Space Systems Group, Redondo Beach, Calif.
SPACE POWER DISTRIBUTION SYSTEM TECHNOLOGY. VOLUME 2: AUTONOMOUS POWER MANAGEMENT Final Report
D. K. DECKER, M. D CANNADY, J. E CASSINELLI, B F. FARBER, C. LURIE, G. W. FLECK, J. W LEPISTO, A MESSNER, and P. F. RITTERMAN Mar. 1983 199 p refs 2 Vol.
(Contract NAS8-33198)
(NASA-CR-170853; NAS 1.26:170853; TRW-34579-6001-UT-00-VOL-2) Avail NTIS HC A09/MF A01 CSCL 22B

Electrical power subsystem requirements, power management system functional requirements, algorithms, power management subsystem, hardware development, and trade studies and analyses are discussed. Author

N83-34226*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RADIANT HEATING TESTS OF SEVERAL LIQUID METAL HEAT-PIPE SANDWICH PANELS
C J. CAMARDA and A. BASIULIS (Hughes Aircraft Co , Torrance, Calif.) Aug. 1983 9 p refs Presented at the AIAA 21st Aerospace Sci. Meeting, Reno, Nev., 10-13 Jan. 1983
(NASA-TM-85669; NAS 1.15:85669; AIAA-83-0319) Avail: NTIS HC A02/MF A01 CSCL 20D

Integral heat pipe sandwich panels, which synergistically combine the thermal efficiency of heat pipes and the structural efficiency of honeycomb sandwich construction, were conceived as a means of alleviating thermal stress problems in the Langley Scramjet Engine Test panels which utilized two different wickable honeycomb cores, facesheets with screen mesh sintered to the internal surfaces, and a liquid metal working fluid (either sodium or potassium) were tested by radiant heating at various heat load levels. The heat pipe panels reduced maximum temperature differences by 31 percent with sodium working fluid and 45 percent with potassium working fluid. Results indicate that a heat pipe sandwich panel is a potential, simple solution to the engine thermal stress problem Other interesting applications of the concept include: cold plates for electronic component and circuit card cooling, radiators for large space platforms, low distortion large area structures (e.g., space antennas) and laser mirrors Author

N83-35307* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HEAT PIPE THERMAL SWITCH Patent
D. A. WOLF, inventor (to NASA) (Dynatherm Corp., Cockeysville, Md.) 6 Sep. 1983 6 p Filed 16 Oct 1982 Supersedes N83-12525 (21 - 03, p 0390)
(NASA-CASE-12812-1; US-PATENT-4,402,358; US-PATENT-APPL-SN-434674; US-PATENT-CLASS-165-32; US-PATENT-CLASS-165-104.26) Avail: US Patent and Trademark Office CSCL 20D

A thermal switch for controlling the dissipation of heat between a body is described. The thermal switch is comprised of a flexible bellows defining an expansible vapor chamber for a working fluid located between an evaporation and condensation chamber. Inside the bellows is located a coiled retaining spring and four axial metal mesh wicks, two of which have their central portions located inside of the spring while the other two have their central portions located between the spring and the side wall of the bellows The wicks are terminated and are attached to the inner surfaces of the outer end walls of evaporation and condensation chambers respectively located adjacent to the heat source and heat sink. The inner surfaces of the end walls furthermore include grooves to provide flow channels of the working fluid to and from the wick ends The evaporation and condensation chambers are connected by turnbuckles and tension springs to provide a set point adjustment for setting the gap between an interface plate on the condensation chamber and the heat sink.
Official Gazette of the U.S. Patent and Trademark Office

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ENERGY STORAGE

Includes flywheels, heat storage, underground air storage, compressed air, storage batteries, and electric hybrid vehicles.

A83-43418
ZINC ELECTRODE MORPHOLOGY IN ALKALINE SOLUTIONS. II - STUDY OF ALTERNATING CHARGING CURRENT MODULATION ON PASTED ZINC BATTERY ELECTRODES
J. MCBREEN, E GANNON (Brookhaven National Laboratory, Upton, NY), D.-T. CHIN, and R. SETHI (Clarkson College of Technology, Potsdam, NY) (Electrochemical Society, Meeting, Minneapolis, MN, May 10-15, 1981) Electrochemical Society, Journal (ISSN 0013-4651), vol. 130, Aug. 1983, p. 1641-1645. refs
(Contract NSF ENG-25153; DE-AC02-76CH-00016)

A83-43950
RECUPERATOR ALLOYS FOR HIGH-TEMPERATURE WASTE HEAT RECOVERY
G Y LAI, M F ROTHMAN, S. BARANOW, and R. B. HERCHENROEDER (Cabot Corp., Kokomo, IN) Journal of Metals (ISSN 0148-6608), vol 35, July 1983, p. 24-29. refs

The performance characteristics of commercial alloys are evaluated for their use as heat recuperators in high-temperature industrial processing facilities to recover the waste heat from flue gas streams and use it to preheat incoming combustion air. Four flue gas environments used in high-temperature industrial processing systems are examined· oxidizing, sulfidizing, carburizing, and chlorine-contaminated environments. The relative performance of several alloys in these hostile environments is evaluated in order to provide information useful for selecting the most appropriate alloys for the construction of recuperators Also examined are other materials properties that are of importance in the materials selection, such as the short-time tensile properties, creep rupture properties, and thermal stability N B.

A83-45075#
THE ENERGETIC OPTIMIZATION OF PROPULSION SYSTEMS FOR ELECTRIC VEHICLES [ENERGETISCHE OPTIMALISERING VAN AANDRIJFSYSTEMEN VOOR ELEKTRISCHE VOERTUIGEN]
L A. M VAN DONGEN Eindhoven, Technische Hogeschool, Doctor in de Technische Wetenschappen Thesis, 1983, 189 p. In Dutch refs

Computer simulation and empirical testing of engines and drive trains for an electric passenger car are reported The design concept uses a standard 1600-kg automobile body, a separately-excited dc motor, and lead-acid batteries The motor-speed and load dependence of the drive-train efficiency is taken into account in the modular simulation program, which considers motor regulation, battery characteristics, and transmission separately. Expressions relating the battery charge state to the motor power loss are derived. The greater efficiency of multiple versus single-fixed gear ratios and of manual versus automatic (torque converter) gearboxes for this application is established, and the need to match the power train to the peak power requirement is pointed out. The model is shown to give estimates of component performance which are in good agreement with laboratory and prototype test results. T.K.

A83-46299
LOW COST ENERGY STORAGE FLYWHEELS FROM STRUCTURAL SHEET MOLDING COMPOUND
J. F. KAY (Owens-Corning Fiberglas Corp., Research and Development Div., Granville, OH) IN: The role of the polymeric matrix in the processing and structural properties of composite materials; Proceedings of the Joint U.S.-Italy Symposium on Composite Materials, Capri, Italy, June 15-19, 1981 New York, Plenum Press, 1983, p. 437-452.

Compression molded structural sheet molding compound (SMC) composed of S-2 Glass and polyester resin has been used to fabricate energy storage flywheel rotors. This technique has the potential of low cost, high throughput production of rotors for the automobile industry. An isophthalic polyester resin and chopped S-2 Glass were used to mold flat, constant cross section discs 53 3 cm (21 inches) in diameter, 2 54 cm (1.0 inches) thick, and 49.5 kg (22 5 pounds) in weight. Materials characterizations have shown a tensile strength of 337 MPa (49 ksi) for the S-2 Glass reinforced rotors, which would allow the rotor to store 28.6 watt-hours per kilogram (13 watt-hours per pound) at 330 hertz when a filament wound carbon fiber/epoxy ring is fitted around the SMC core A dynamic test of an SMC flywheel has shown an energy storage density of 27.7 watt-hours per kilogram (12.6 watt-hours per pound) at 330 hertz Author

A83-46780
SUPERCONDUCTING MAGNETIC ENERGY STORAGE
W. V HASSENZAHL (California, University, Berkeley, CA) IEEE, Proceedings (ISSN 0018-9219), vol. 71, Sept. 1983, p. 1089-1098. refs
(Contract DE-AC03-76SF-00098)

Design features of two superconducting magnetic energy storage (SMES) systems for utility load levelling applications are described and compared. Costing analyses indicated that units storing at least 1 GWh would be economical, and these would need a warm structure such as rock as supports for the hardware, encased in fiberglass reinforced epoxy. The superconducting coil, made of, e.g., NbTi, would be cooled by liquid He to 4.4 K, which would also cool the power leads. A transformer would change the high voltage, low current incoming power to the low voltage, high current the coil would store. The NbTi filaments would be embedded in a copper matrix, although aluminum may be used as a stabilizer. Details of the tunnel and excavation, the cryogenic system, and the electrical systems are provided, together with design factors for a low aspect ratio cell. M.S K.

A83-49622
BATTERY STORAGE IN RESIDENTIAL APPLICATIONS OF ENERGY FROM PHOTOVOLTAIC SOURCES
A. R. LANDGREBE and S W. DONLEY (U.S. Department of Energy, Washington, DC) Applied Energy (ISSN 0306-2619), vol. 15, no. 2, 1983, p. 127-137 refs

The state-of-the-art for grid-interfaced residential solar cell-battery storage systems is assessed, together with the potential markets. Photovoltaic (PV) systems are limited to daytime operation and storage is required to optimize the utility interface in terms of peak loads and displacement of fossil fuel consumption Residential Pb-acid batteries are expected to be commercially viable at $100-150/kWh by 1985, and residential PV systems could generate 10-100 GW total by the year 2000, provided the batteries have a 20 yr lifetime. Other battery systems under development which could meet the cost and lifetime goals by 1983 include Ni-Zn and Ni-Fe, and Zn-Br and Fe-Cr systems may be ready by 1990 at significantly lower cost. Additional research is proceeding on Li-metal sulfide, Na-S, Zn-Cl,and Fe-Fe systems. D H.K.

A83-49674
CHOICE OF PARAMETERS FOR A FLYWHEEL ENERGY STORAGE SYSTEM [O VYBORE PARAMETROV ENERGOAKKUMULIKUIUSHCHEI SISTEMY NA OSNOVE MAKHOVIKOV]
N. F. SVIRIDENKO Kosmicheskie Issledovaniia na Ukraine (ISSN 0321-4508), no 16, 1982, p 94-98. In Russian refs

Consideration is given to the problem of choosing the structural scheme and basic parameters of a flywheel energy storage unit which is part of a spacecraft auxiliary power supply system A mathematical model describing the working process of the energy storage unit is proposed along with a simplified method for determining and optimizing the parameters of the principal elements of this system. B.J.

N83-30557# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div
COMPUTER CONTROL OF ELECTROCHEMICAL EXPERIMENTS WITH APPLICATION TO ZINC/NICKEL OXIDE CELLS M.S. Thesis
M. H KATZ, F. R. MCLARNON, and E J CAIRNS Dec. 1982 453 p refs
(Contract DE-AC03-76SF-00098)
(DE83-009132; LBL-15546) Avail: NTIS HC A20/MF A01

A computer-controlled test system was designed and constructed to allow the simultaneous and continuous cycling of 16 or more electrochemical cells. The system offers resolution and stability within 0.025% of full scale, and response times are typically 1 ms A wide variety of charge and discharge regimes, including pulsed charge and power discharge profiles, are implemented through various computer algorithms. The software configuration allows two programs to execute concurrently in the computer memory and to communicate with each other through a set of codified messages. This arrangement permits flexible interaction with all experiments and provides on-line data reduction and display. The test system has been employed to investigate the effects of constant current and various pulsed current charging modes on the cycle life and capacity retention of Zn/NiOOH cells cycled at 100% depth of discharge. Test results included cell voltages, potentials of the NiOOH and Zn electrodes versus Hg/HgO reference electrodes, coulombs, watt-hours average voltages, and associated efficiencies. Postmortem tests included Zn electrode X-ray studies Author

N83-30857# Royal Military Coll. of Science, Shrivenham (England). Dept. of Physics.
PLASTICS IN BATTERIES
P. J FYDELOR and K. V. LOVELL 1982 22 p refs Presented at Inst. of Elec. Engr Intern. Conf on Plastics in Telecommun., 15-17 Sep. 1982
(TN-PD/30/82) Avail NTIS HC A02/MF A01

The use of plastics in rechargeable cells is reviewed. Cell cases, electrodes, electrode spacers, separators and absorbers and electrolytes are discussed. Related aspects of polymer technology are summarized, and trends are outlined. Although the use of plastics improves electrochemical efficiency and service life, traditional batteries remain first choice for many users for stationary batteries. Author (ESA)

N83-31112# Science Research Council, Chilton (England)
ENERGY STORAGE FOR WIND-GENERATOR APPLICATION Report, Dec. 1981
F. M. RUSSEL 1982 10 p
(PB83-165936; RL-81-081) Avail: NTIS HC A02/MF A01
CSCL 10C

A low-cost method was developed for storing energy and stiffening power supplied by wind generators It involved inflatable, fabric-reinforced elastic liners buried underground and containing a fluid, probably water, at an intermediate pressure. The ground would be subject to elastic deformation and the method could be applicable to unstable ground such as deep sand, heterogeneous sedimentary or other unconsolidated deposits in remote locations or hostile environments. While the density of energy storage was considered low, compared with pumped-hydro systems, the technology could be attractive for developing countries. GRA

N83-31548# California Univ., Livermore Lawrence Livermore Lab. Transportation Systems Research Dept.
CAN FIBER-COMPOSITE FLYWHEELS INCREASE AUTOMOBILE FUEL ECONOMY
L G OCONNELL Dec 1982 16 p refs Presented at the 28th Natl Soc. for the Advancement of Mater. Process Engr Symp., Anaheim, Calif., 12-14 Apr. 1983
(Contract W-7405-ENG-48)
(DE83-005336; UCRL-88107, CONF-830408-2) Avail: NTIS HC A02/MF A01

Overall petroleum consumption in the US has decreased, but not in the transportation sector. In 1981, transportation's use of petroleum increased. If we are to stop this trend without curtailing the vehicle miles traveled (VMT), automobiles must get smaller or the fuel economy of the current sizes must increase. Flywheels have long been considered as a means of improving fuel economy Flywheels utilized with the internal combustion engine (ICE) allow the engine to be load-leveled. Thus the engine can operate in the region of minimum brake specific fuel consumption or maximum fuel economy. In addition, the flywheel can be used to recover the vehicle's kinetic energy during deceleration and braking operations for later use during acceleration. This adds further to the vehicle's fuel economy. There are two general approaches to the use of the flywheel. In one case, the flywheel power boosts the ICE-supplies power transients, and in the other case, the flywheel drives the wheels and is recharged by the ICE periodically at a constant rate DOE

N83-33310 Societe Nationale Industrielle Aerospatiale, Les Mureaux (France)
THE ENERGY WHEEL IN OPERATION
J. P BARTHELEMY 1982 5 p refs Presented at INTELEC 82, Washington
(SNIAS-831-422-103) Avail: NTIS HC A02

An energy wheel was implemented as an uninterruptible power supply unit for a rural telephone exchange. A high speed rotor, magnetically suspended, inside a vacuum container, is activated by a brushless motor Being reversible, this motor acts as an electrical energy generator in case of failure or microcuts from the mains. No failure, no maintenance, no detrimental effect of cold winter environment, and satisfactory level of available back up energy are reported Improvements such as mass reduction, easy implementation, vacuum tightness, and ac supply are identified. Author (ESA)

N83-33334*# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Res. and Development Center.
NONDESTRUCTIVE EVALUATION TECHNIQUES FOR NICKEL-CADMIUM AEROSPACE BATTERY CELLS Final Technical Report
R. HAAK and D. TENCH Oct. 1982 53 p refs
(Contract NAS7-918; JPL-955708)
(NASA-CR-172964; NAS 1.26:172964) Avail: NTIS HC A04/MF A01 CSCL 10C

The ac impedance characteristics of Ni-Cd cells as an in-situ, nondestructive means of determining cell lifetime, particularly with respect to the probability of premature failure were evaluated. Emphasis was on evaluating Ni-Cd cell impedance over a wide frequency range (10,000 to 0.0004 Hz) as the cells were subjected to charge/discharge cycle testing. The results indicate that cell degradation is reflected in the low frequency (Warburg) impedance characteristics associated with diffusion processes. The Warburg slope (W) was found to steadily increase as a function of cell aging for completely discharged cells. In addition, based on data for two cells, a high or rapidly increasing value for W signals imminent cell failure by one mechanism. Degradation by another mechanism is apparently reflected in a fall-off (roll-over) of W at lower frequencies. As a secondary result, the frequency dependence of the absolute cell impedance at low frequencies (5 - 500 mHz) was found to be a good indication of the cell state-of-charge. S.L.

N83-33355# MITEC G m.b.H., Ottobrunn (West Germany).
LARGE-SCALE THERMAL STORAGE SYSTEMS. POSSIBILITIES OF OPERATION AND STATE OF THE ART Final Report, Dec. 1981
R. JANK Bonn Bundesministerium fuer Forschung und Technologie May 1983 53 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-074; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 11

The state of the art of large scale thermal energy storage concepts is reviewed. With earth pit storage, the materials question has to be concentrated on. The use of container storage in conventional long distance thermal nets has to be stimulated. Aquifer storage should be tested in a pilot plant to obtain experience in natural aquifer use Author (ESA)

N83-33802# Purdue Univ., Lafayette, Ind Electric and Hybrid Vehicle Systems Development Lab.
ENGINEERING FIELD TEST OF ELECTRIC VEHICLES Final Report
L. L. OGBORN and A. T. MCDONALD Dec. 1982 135 p refs
(Contract DE-AC02-80CS-50110)
(DE83-009539, DOE/CS-50110/1) Avail. NTIS HC A07/MF A01

The development of a digital data acquisition system (DAS) for use in electric vehicle (EV) research, development, and engineering field test programs is reported. The system is designed for use in mission activities, as well as for accumulating baseline vehicle performance data. The system architecture, hardware components, and modular software design are described. Sensor choices, system installation, calibration, and operation are also treated. Methods of handling and processing of EV data are discussed. Discussion of problems encountered and precautions required for satisfactory operation should be useful in future programs. Complete hardware and software documentation is included. DOE

N83-33941*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ASSESSMENT OF FLYWHEEL ENERGY STORAGE FOR SPACECRAFT POWER SYSTEMS
G. E. RODRIGUEZ, P A. STUDER, and D. A. BAER May 1983 53 p refs
(NASA-TM-85061; NAS 1.15:85061; G-83F0229) Avail: NTIS HC A04/MF A01 CSCL 22B

The feasibility of inertial energy storage in a spacecraft power system is evaluated on the basis of a conceptual integrated design that encompasses a composite rotor, magnetic suspension, and a permanent magnet (PM) motor/generator for a 3-kW orbital average payload at a bus distribution voltage of 250 volts dc. The conceptual design, which evolved at the Goddard Space Flight Center (GSFC), is referred to as a Mechanical Capacitor. The baseline power system configuration selected is a series system employing peak-power-tracking for a Low Earth-Orbiting application. Power processing, required in the motor/generator, provides a potential alternative configurations that can only be achieved in systems with electrochemical energy storage by the addition of power processing components. One such alternative configuration provides for peak-power-tracking of the solar array and still maintains a regulated bus, without the expense of additional power processing components. Precise speed control of the two counterrotating wheels is required to reduce interaction with the attitude control system (ACS) or alternatively, used to perform attitude control functions Critical technologies identified are those pertaining to the energy storage element and are prioritized as composite wheel development, magnetic suspension, motor/generator, containment, and momentum control. Comparison with a 3-kW, 250-Vdc power system using either NiCd or NiH2 for energy storage results in a system in which inertial energy storage offers potential advantages in lifetime, operating temperature, voltage regulation, energy density, charge control, and overall system weight reduction B W

N83-34462# Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service
RESEARCH ACTIVITIES ON FLYWHEEL ENERGY STORAGE IN THE FRAME OF THE FIRST FINALIZED ENERGY PROGRAM OF THE NATIONAL RESEARCH COUNCIL
P. ALIA 1983 26 p Presented at 2nd European Symp. on Flywheel Energy Storage, Turin, 9-13 May 1983; sponsored by Politechnico di Milano, and CNR
(CISE-2028) Avail NTIS HC A03/MF A01

Kinetic energy storage by flywheels, and design and construction of a prototype flywheel storage station in order to achieve the leveling of the diagram of the electric power required by industrial users are discussed. Results show that the exploitation of flywheels is viable Author (ESA)

N83-35059# California Univ., Livermore. Lawrence Livermore Lab
COMPOSITE FLYWHEELS: STATUS AND PERFORMANCE ASSESSMENT AND PROJECTIONS
A. P. COPPA and S. V. KULKARNI 1983 21 p refs Presented at 2nd European Symp. on Flywheel Energy Storage, Turin, 9 May 1983 Submitted for publication
(Contract W-7405-ENG-48)
(DE83-012048; UCRL-89085; CONF-830503-2) Avail: NTIS HC A02/MF A01

Prototype composite energy-storage flywheels that evolved from the US Department of Energy/Lawrence Livermore National Laboratory flywheel-development program demonstrated high energy-storage performance and durability in ultimate-speed and cyclic-spin tests. Ultimate energy densities as high as 72.8 wh/kg (702 Wh) and 114 KWh cu m resulted with a design potential up to 100 Wh/kg ultimate. Low-cost rotor designs are discussed and ultimate-speed spin-test results reported. Progress in understanding the failure modes and containment behavior of these rotors and plans to test burst containment within prototype flywheel housings are noted. DOE

N83-35060# California Univ., Livermore. Lawrence Livermore Lab. Transportation Systems Research Office.
COMPOSITE-FLYWHEEL DURABILITY AND LIFE. PART 1: TEST PROGRAM
S. V. KULKARNI and K. I. REIFSNIDER (Virginia Polytechnic Inst. and State Univ.) Sep. 1982 40 p refs
(Contract W-7405-ENG-48)
(DE83-011279, UCRL-15523-PT-1) Avail: NTIS HC A03/MF A01

An experimental program designed to establish the durability and life of the composite flywheel designs available at this time is presented. The objective of the test program are (1) to establish the durability and lifetime of flywheel rotors under conditions which include all of the essential details of the spectrum loading that rotors are likely to sustain as an energy storage device for various applications; (2) to identify critical performance and durability characteristics which potentially limit the long term use of the rotor designs currently under development; and (3) to develop test techniques and philosophies which can be used for fatigue testing of flywheels and to relate specimen data to rotor performance The test plan methodology is considered. DOE

N83-35286# Argonne National Lab., Ill. Chemical Engineering Div.
STATUS OF IMPROVED LEAD-ACID, NICKEL/IRON, AND NICKEL/ZINC BATTERIES BEING DEVELOPED UNDER DOE'S ELECTRIC VEHICLE BATTERY PROGRAM
J. F. MILLER, J B. RAJAN, F HORNSTRA, C. C. CHRISTIANSON, and N P. YAO 1982 3 p refs Presented at the Electrochem Soc. Fall Meeting, Detroit, 17 Oct. 1982
(Contract W-31-109-ENG-38)
(DE83-008691; CONF-821015-9) Avail: NTIS HC A02/MF A01

Progress in each of the three battery systems since the initiation of this battery development program is described. The 1983 demonstrated accomplishments are verified test results obtained on multicell modules (typically three to six cells each). Significant technical progress was made in extending battery life. Additional progress in cell development and battery subsystem design (chargers, watering systems, electrolyte management systems) has allowed the construction of full size battery packs. Lead acid, nickel/iron, and nickel/iron full size batteries were produced for in vehicle testing and evaluation. DOE

N83-35288# Argonne National Lab , Ill.
DESIGN CONSIDERATIONS FOR A LI-AL/FES BATTERY FOR AN ELECTRIC VAN
A A. CHILENSKAS, H. SHIMOTAKE, D. L BARNEY, T. SASAKI (Higashi-Fuji Technology Center), Y. KIMURA, K GOTO, and T TODA 1983 5 p refs Presented at the Soc. of Automotive Engr Congr., Detroit, 28 Feb. 1983 Prepared in cooperation with Toyota Motor Co., Ltd., Aichi (Japan)
(Contract W-31-109-ENG-38)
(DE83-009504; CONF-830201-3) Avail. NTIS HC A02/MF A01

Battery vehicle design interactions were studied A van converted to electric drive was used to model the performance of the vehicle Power train requirements were calculated on the basis of achieving performance equivalent to that of gasoline engine or diesel powered vehicles. Vehicle energy requirements were obtained by integrating the power required to complete a SAE J227a/D cycle A weight analysis for the conversion was completed as well as a preliminary design to locate the batteries within the vehicle without encroaching upon passenger space The power/energy ratio of the battery was determined as a function of the vehicle range. Specifications for the vehicle and battery for several cases of interest (e.g., gasoline or diesel type acceleration) are given. DOE

N83-35290# Public Service Electric and Gas Co., Newark, N. J
MODELING AND COMPUTERIZED CHARACTERIZATION OF LEAD-ACID BATTERY DISCHARGES. BATTERY ENERGY STORAGE TEST (BEST) FACILITY
E. A. HYMAN Jan. 1983 92 p refs Sponsored in part by EPRI
(Contract DE-AC02-76ET-29368; EPRI PROJ. 255-2)
(DE83-008368; DOE/ET-29368/T13, RD-83-1) Avail: NTIS HC A05/MF A01

Characterization of the discharge performance of large scale, lead acid battery subunits was implemented via computer adjusted parameter values of a new empirical performance model fitted to time series data for each subunit The model, which includes relaxation effects, accurately fits electrical behavior during various time varying current discharges Cell data fitted was obtained from cells of four different sizes, two of which are antimony grid and two of which are calcium grid Sample applications illustrating the usefulness of the model, and a discussion of characterization methodology results are presented. DOE

N83-35291# Lockheed Missiles and Space Co., Palo Alto, Calif. Chemistry Lab.
RECHARGEABLE ALKALINE ZINC/FERRICYANIDE BATTERY, PHASE 2 Final Report, 26 Oct. 1981 - 18 Sep. 1982
G B. ADAMS, R P. HOLLANDSWORTH, and B. D. WEBBER Feb. 1983 171 p refs
(DE83-010615; SAND-83-7001) Avail: NTIS HC A08/MF A01

The technical advancement of the alkaline zinc/ferricyanide battery to meet goals of scale up and the solid reactant storage with 1000-cm(2) full scale cells was demonstrated. A conceptual engineering design for a 50-kW solar photovoltaic storage system was developed, solar acceptance random cycling was demonstrated and cycle life of cells operating at 70- and 200-mA.h/cm(2) capacity was demonstrated A crystallizer/reservoir with a capacity of 300 mA h/cm(2) that delivers solids free electrolyte to the cell was tested. A conceptual engineering design of a 50-kW solar storage battery system was formulated with mass and thermal balances computed. Mean voltaic and coulombic efficiencies are 83.3 +- 1 8% and 92 0 +- 1.8%, respectively. Single cell cycle life tests run under similar conditions at 249 +- 45 mA h/cm(2) have logged over 220 cycles with mean energy efficiency of 75.3 +- 5 1%. Mean voltaic and coulombic efficiencies are 84 7 +- 2 0 and 89.0+- 6 0, respectively. DOE

N83-35296# Argonne National Lab , Ill.
SUMMARY OF AQUEOUS MOBILE BATTERY DEVELOPMENT
C. C CHRISTIANSON, N. P YAO, J. B. RAJAN, J F. MILLER, J. LEE, and K. CHOI 1982 8 p Presented a the 5th DOE Battery and Electrochem. Contractors' Conf., Crystal City, Va., 7 Dec. 1982
(Contract W-31-109-ENG-38)
(DE83-010716; CONF-821211-11) Avail· NTIS HC A02/MF A01

Progress at ANL in developing improved aqueous battery technology for use in electric vehicles is described Research directed at improving the lead acid, nickel iron, and nickel zinc technologies is emphasized. DOE

N83-35298# California Univ., Berkeley. Lawrence Berkeley Lab Energy and Environment Div.
HIGH-SPECIFIC-ENERGY SECONDARY BATTERIES AND THEIR APPLICATIONS
E J. CAIRNS Jan. 1983 17 p refs Presented at the Electro Electronic Show and Conv., New York, 19-21 Apr. 1983
(Contract DE-AC03-76SF-00098)
(DE83-012877, LBL-15517; CONF-830486-1) Avail NTIS HC A02/MF A01

The state of development, problems, and possible applications are discussed for a number of rechargeable cells, which include: lead/lead dioxide, cadmium/nickel oxide, hydrogen/nickel oxide, iron/nickel oxide, zinc/nickel oxide, zinc/silver oxide, zinc/halogen, lithium/titanium disulfide, lithium/iron sulfide, and sodium/sulfur cells DOE

N83-35496*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STEADY-STATE AND DYNAMIC EVALUATION OF THE ELECTRIC PROPULSION SYSTEM TEST BED VEHICLE ON A ROAD LOAD SIMULATOR Final Report
M. O DUSTIN Aug. 1983 22 p refs
(Contract DE-AI01-77CS-51044)
(NASA-TM-83445; DOE/NASA/51044-32; E-1745; NAS 1.15:83445) Avail: NTIS HC A02/MF A01 CSCL 13F

The propulsion system of the Lewis Research Center's electric propulsion system test bed vehicle was tested on the road load simulator under the DOE Electric and Hybrid Vehicle Program. This propulsion system, consisting of a series-wound dc motor controlled by an infinitely variable SCR chopper and an 84-V battery pack, is typical of those used in electric vehicles made in 1976. Steady-state tests were conducted over a wide range of differential output torques and vehicle speeds. Efficiencies of all of the components were determined. Effects of temperature and voltage variations on the motor and the effect of voltage changes on the controller were examined. Energy consumption and energy efficiency for the system were determined over the B and C driving schedules of the SAE J227a test procedure. Author

N83-35498*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NICKEL-HYDROGEN COMPONENT DEVELOPMENT
J. A. CHARLESTON 1983 12 p refs Presented at Natl. Tech. Assoc Conv., Kissimee, Fla., 25-30 Jul. 1983
(NASA-TM-83487; E-1811; NAS 1.15 83487) Avail: NTIS HC A02/MF A01 CSCL 10A

Light weight energy storage systems for future space missions are investigated. One of the systems being studied is the nickel hydrogen battery. This battery is designed to achieve longer life, improve performance, and higher energy densities for space applications. The nickel hydrogen component development is discussed. Test data from polarization measurements of the hydrogen electrode component is presented. S L.

N83-35508# Energy Management Associates, Inc., Santa Clara, Calif.
EVALUATION OF SUPERCONDUCTING MAGNETIC ENERGY STORAGE SYSTEMS Final Report
S T. LEE, R. S. ALBERT, and D T. IMAMURA Feb. 1983 85 p refs Sponsored by EPRI
(Contract EPRI PROJ. 1832-2)
(DE83-901465, EPRI-EM-2861) Avail NTIS HC A05/MF A01

The breakeven capital cost of Superconducting Magnetic Energy Storage (SMES) and its highest possible value were studied. The results are compared by EPRI to the capital cost of SMES being estimated by Bechtel in a related study. The best and most reasonable estimate of the SMES breakeven capital cost is 1080 $/kW in 1981 dollars. The highest possible value for an ideal SMES with perfect availability, zero refrigeration load and 100% incremental cycle efficiency is 1510 $/kW when installed in a utility approximately one third of the US in size. Two methods of analysis are used. A single year analysis that assigns an energy credit and a capacity credit to SMES provides the method for parametric and sensitivity analyses. A thirty year life cycle analysis comparing SMES to a coal fired generation alternative recognizes fuel cost escalation effects. The value of SMES to each of the six EPRI Regional Systems is computed. In comparison with pumped storage, SMES is worth 14% more to a utility. DOE

N83-35517# Varta Batterie A.G., Kelkheim (West Germany). Forschungs- und Entwicklungszentrum.
HIGH TEMPERATURE - HIGH ENERGY CELL WITH A SOLID ELECTROLYTE Final Report, Dec. 1981
U. VONALPEN, M. F BELL (Max-Planck Inst. fuer Festkoerperforschung), H. H. HOEFER (Max-Planck Inst. fuer Festkoerperforschung), and S SCHINDLER (Rosenthal Technik AG) Bonn Bundesministerium fuer Forschung und Technologie May 1983 39 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-095; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 9,30

High temperature energy cells for peak load equalizing stations and electric driven vehicles are studied. In the phase diagram with the end compounds Na2O, ZrO2, SiO2, P2O5, a compound Na2.94Zr1.49Si2 2P0 8O10.53 was found. This material has many advantages when used as a ceramic separator in Na/S cells. It can be easily synthesized from the starting materials; it has a low sintering temperature; it is insensitive to moisture, has a low resistance (7,50hm cm) at the working temperature of the Na/S cell, and it is stable in contact with molten sodium up to 400 C. Another composition Na3.1ZR1 55Si2.3P0.7O11 was found, which may be well suited for room temperature applications. The low sintering temperature of these compounds enables the application of ceramic plastification procedures for the fabrication of ceramic parts of any shape. Author (ESA)

N83-35804# Argonne National Lab., Ill.
ARGONNE TANDEM-LINAC ACCELERATOR SYSTEM
L M. BOLLINGER 1983 6 p refs Presented at the Particle Accelerator Conf., Santa Fe, N. Mex., 21-23 Mar. 1983
(Contract W-31-109-ENG-38)
(DE83-011718, CONF-830311-131) Avail: NTIS HC A02/MF A01

Design considerations and operational experience for the existing heavy-ion accelerator consisting of a tandem injecting into a superconducting linac are summarized, with emphasis on the general features of the system. This introduction provides the basis for a discussion of the objectives and design of ATLAS, a larger tandem-linac system being formed by expanding the existing superconducting linac. DOE

N83-36385# Sandia Labs , Albuquerque, N. Mex.
ZINC-BROMINE BATTERIES FOR BULK ENERGY STORAGE
R. J. BELLOWS, C. ELSPASS, H. EINSTEIN, P. GRIMES, E. KANTNER, P MALACHESKY, and K. NEWBY 1983 17 p refs Presented at the 18th Intersoc. Energy Conversion Eng. Conf., Orlando, Fla., 21 Aug 1983
(Contract DE-AC04-76DP-00789)
(DE83-010822; SAND-83-7083; CONF-830812-3-DRAFT) Avail: NTIS HC A02/MF A01

The design, testing, operation, and state of development of zinc-bromine batteries are discussed. DOE

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GENERAL

A83-45317
THE EFFECT OF THE PARAMETERS OF CYCLIC LOADING ON THE KINETICS OF DEFORMATION AND FRACTURE OF EI826 ALLOY [O VLIIANII PARAMETROV TSIKLICHESKOGO NAGRUZHENIIA NA KINETIKU DEFORMIROVANIIA I RAZRUSHENIIA SPLAVA EI826]
V. D MANKO (Akademiia Nauk Ukrainskoi SSR, Institut Problem Prochnosti, Kiev, Ukrainian SSR) Problemy Prochnosti (ISSN 0056-171X), Aug 1983, p. 15-17. In Russian. refs

The cyclic creep behavior and the fatigue life of EI826, a Cr-Ni alloy used in power engineering, were studied experimentally as a function of the conditions of mechanical loading at constant temperature (800 C). Experimental results were processed using methods of mathematical statistics. It is shown that the kinetics of cyclic deformation and the fatigue life of the specimens are largely determined by the loading frequency and the time during which the specimen remains unloaded. V L.

A83-49497
HIGH TEMPERATURE CORROSION OF PURE NICKEL AND NICKEL-20 PERCENT CHROMIUM ALLOY IN THE PRESENCE OF CALCIUM SULFATE AND GRAPHITE
K. MORIMOTO and M OBAYASHI (Tokyo Central Research and Development Laboratories, Inc., Aichi, Japan) (Japan Institute of Metals, International Symposium on High Temperature Corrosion of Metals and Alloys, 3rd, Mount Fuji, Japan, Nov 17-20, 1982) Japan Institute of Metals, Transactions, Supplement (ISSN 0021-4434), vol. 24, 1983, p. 311-318 refs

N83-32932# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
EROSION OF HARD-METAL COATINGS
A. LEVY, T. BAKKER, E. SHOLZ, and M. AZADABEH Oct 1982 42 p refs Presented at the TMS/AIME Meeting, Atlanta, Ga., 6-10 Mar. 1983
(Contract DE-AC03-76SF-00098)
(DE83-006747; LBL-15293; CONF-830317-1) Avail: NTIS HC A03/MF A01

The use of protective coatings on components in fossil fuel energy processes to provide thermal insulation, corrosion resistance and/or wear resistance is becoming more prevalent In those applications where small, erosive particles occur in the environment, such as in the use of pulverized coal, erosion behavior of the coating becomes an important design consideration. The erosion of several protective, hard metal type coatings and monolithic inserts by particles entrained in an air blast has been investigated. SiC, Si3N4, tungsten carbide, and a series of nickel chromium boron alloys were tested at room temperature. The materials were fabricated by chemical vapor deposition, flame spraying, plasma arc spraying, detonation gun spraying, melting and brazing, and hot pressing. The effects of composition, morphology, method of fabrication, thickness, and surface texture on erosion behavior are discussed. The mechanisms of erosion for the different materials are defined and compared. It was determined that the materials had a wide range of erosion resistance with the fine grain size and minimum porosity materials having the lowest erosion rates. DOE

N83-34696# Oak Ridge National Lab., Tenn. Mathematics and Statistics Research Dept.
EXPERT OPINION AND RANKING METHODS
V. R R. UPPULURI Mar 1983 23 p refs
(Contract W-7405-ENG-26)
(DE83-007160, NUREG/CR-3115; ORNL/CSD/TM-201) Avail: NTIS HC A02/MF A01

Suppose we have k objects and wish to rank them according to a characteristics. A judge compares these objects two at a time and indicates whether one object is better or worse or equal to another objects This data is analyzed by log least squares procedure and the lambda sub max procedure suggested by Saaty. It is shown by examples, how one can incorporate the data from several judges to obtain a ranking of the objects. Finally, the case when a judge compares the objects two at a time and indicates the probability that one object is better than another object is considered, and it is shown how one can get a ranking of the objects DOE

N83-35077# Argonne National Lab , Ill. Chemical Engineering Div.
ELECTROLYSIS OF ALUMINUM SULFIDE IN MOLTEN CHLORIDES
N. Q MINH, R. O. LOUTFY, and N. P. YAO 1982 11 p refs Presented at the 111th AIME Ann. Meeting, Dallas, 14 Feb 1982
(Contract W-31-109-ENG-38)
(DE83-010632, CONF-820205-7) Avail. NTIS HC A02/MF A01

A laboratory scale investigation of the production of aluminum by the electrolysis of aluminum sulfide in molten salt electrolytes was carried out at Argonne National Laboratory. The solubility, electrochemical behavior, and electrolysis of Al2S3 were studied in MgCl2-NaCl-KCl eutectic and in the eutectic containing AlCl3 at 1023K. DOE

N83-35525 California Univ., Irvine.
ATMOSPHERIC METHANE: CONCENTRATION, SWAMP FLUX AND LATITUDINAL SOURCE DISTRIBUTION Ph.D. Thesis
E W. MAYER 1982 204 p
Avail: Univ. Microfilms Order No. DA8303537

The concentration of methane in the atmosphere was measured from 1977 through 1980 to establish the worldwide background mixing ratios. Sampling sites were located from Alaska to southern Chile. In all sampling periods a North/South hemispheric concentration gradient was observed with a North/South ratio of approximately 1.05. Methane production from a swamp in New York state was measured from October 1980 through July 1981 The methane production exhibited a strong temperature dependence Equations relating the methane production to the average air temperature in the sampling area were developed. Major methane sources were evaluated as functions of latitude and temperature The results predict that approximately 75% of the atmospheric methane input occurs in the Northern Hemisphere The total methane source strength shows a seasonal variation, with a maximum input occurring from June through August, and a minimum from December through February. Dissert. Abstr.

N83-36952# Brown Univ., Providence, R. I. Materials Research Lab.
(?) MATERIALS SCIENCE RESEARCH IN PLASTICITY OF SOLIDS, FRACTURE OF SOLIDS, INORGANIC GLASSES AND SOLID SURFACES Annual Technical Report, 1 Jul. 1981 - 30 Jun. 1982
30 Jun. 1982 98 p
(Contract NSF DMR-79-235701)
(AD-A125259) Avail: NTIS HC A05/MF A01 CSCL 20L

This Annual Technical Report of the Materials Research Laboratory presents accomplishments achieved from 1 July 1981 through 30 June 1982. Subjects discussed are: plasticity of solids, fracture of solids, inorganic glasses, solid surfaces, lower dimensionality materials and structurres, properties of materials at low temperatures, and materials for solar energy conversion.
L.F.M.

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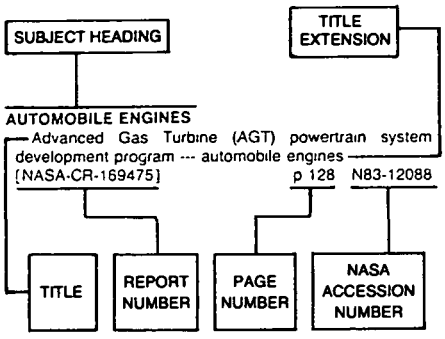

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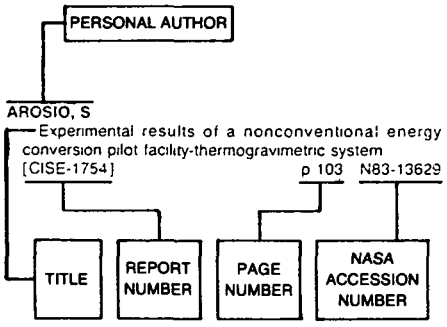

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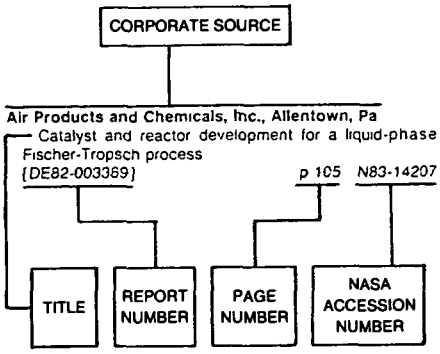

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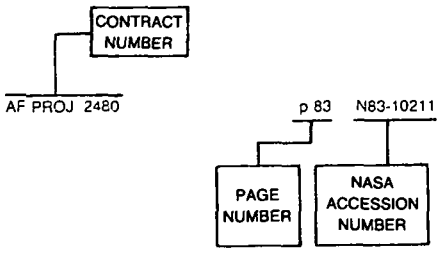

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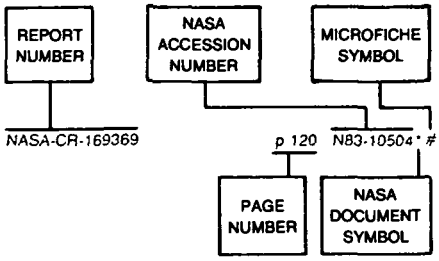

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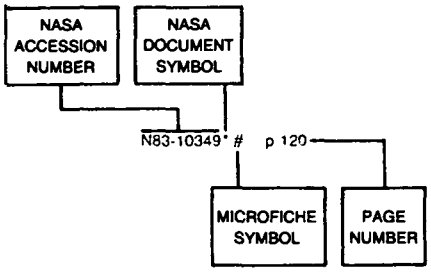

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