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ENERGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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NASA SP-7043(07)

ENERGY

A Continuing Bibliography With Indexes

Issue 7

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced from July 1 through September 30, 1975 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(07)) lists 540 reports, journal articles, and other documents announced between July 1, 1975 and September 30, 1975 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 and succeeding issues are published quarterly.

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.

Each entry in the bibliography consists of a standard bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged in two major sections, *IAA Entries* and *STAR Entries* in that order. The citation, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR* including the original accession numbers from the respective announcement journals. This procedure, which saves time and money accounts for the slight variation in citation appearances.

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N75-17336* # Lockheed-California Co., Burbank.
STUDY OF ACTIVE COOLING FOR SUPERSONIC TRANSPORTS Final Report
G. D. Brewer and R. E. Morris Feb. 1975 152 p refs
(Contract NAS1-13226)
(NASA-CR-132573) Avail: NTIS HC $6.25 CSCL 01C

The potential benefits of using the fuel heat sink of hydrogen fueled supersonic transports for cooling large portions of the aircraft wing and fuselage are examined. The heat transfer would be accomplished by using an intermediate fluid such as an ethylene glycol-water solution. Some of the advantages of the system are: (1) reduced costs by using aluminum in place of titanium, (2) reduced cabin heat loads, and (3) more favorable environmental conditions for the aircraft systems. A liquid hydrogen fueled, Mach 2.7 supersonic transport aircraft design was used for the reference uncooled vehicle. The cooled aircraft designs were analyzed to determine their heat sink capability, the extent and location of feasible cooled surfaces, and the coolant passage size and spacing. Author

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A75-24957 * # **Effect of attitude constraints on solar-electric geocentric transfers.** L. L. Sackett and T. N. Edelbaum (Charles Stark Draper Laboratory, Inc., Cambridge, Mass.). *American Institute of Aeronautics and Astronautics, Electric Propulsion Conference, 11th, New Orleans, La., Mar. 19-21, 1975, Paper 75-350.* 12 p. 10 refs. Contract No. NAS3-18886.

The present work assesses the increase in flight time and fuel consumption due to introducing attitude constraints on both the thrust vector and the plane of the solar cell arrays on geocentrically orbiting spacecraft. A modified version of the SECKSPOT computer program calculates nearly time-optimal trajectories for the constrained case of zero pitch and roll. Unconstrained cases are generated with the SECKSPOT code. It is concluded that with a pitch constraint but without a roll constraint, power would not be a function of thrust direction, and so the time-optimal thruster direction would be along the projection of the primer vector in the plane normal to the radius vector. The roll constraint would cause power to become a function of thrust angle and sun angle. For certain sun angles the locus of the ratio of power to maximum power is concave and thus there may be jumps in the control angle. Comparisons are made for a SERT-C type mission between constrained and unconstrained cases in an inverse square gravity field. S.J.M.

A Listing of Energy Bibliographies Contained in This Publication:

IAA ENTRIES

A75-29471 **Solar ponds for space heating.** A. Rabl and C. E. Nielsen (Ohio State University, Columbus, Ohio). *Solar Energy,* vol. 17, Apr. 1975, p. 1-12. 19 refs.

The absorption of solar radiation by the artificially salinized water in solar heat-storage ponds is considered, and equations are derived for the resulting temperature range of the pond during year-round operation. It is concluded that solar ponds can supply adequate heating, even in regions near the arctic circle. In midlatitudes the pond should be roughly comparable in surface area and volume to the space desired to be heated. Cost estimates based on present technology and construction methods indicate competition with conventional heating. S.J.M.

A75-29472 **Design and construction of a residential solar heating and cooling system.** D. S. Ward and G. O. G. Lof (Colorado State University, Fort Collins, Colo.). *(International Solar Energy Society, U.S. Section Meeting, Colorado State University, Fort Collins, Colo., Aug. 21-23, 1974.) Solar Energy,* vol. 17, Apr. 1975, p. 13-20.

The first integrated system providing heating and cooling to a building by use of solar energy has been designed and installed in a residential-type building at Colorado State University. Solar heated liquid supplies heat to air circulating in the building and to a lithium bromide absorption air conditioner. Service hot water is also provided. Approximately two-thirds of the heating and cooling loads are expected to be met by solar energy, the balance by natural gas. The paper contains details of design and principles of operation. A breakdown of actual costs of the equipment and its installation is also provided. (Author)

A75-29473 **Modeling of the CSU heating/cooling system.** R. L. Oonk, W. A. Beckman, and J. A. Duffie (Wisconsin, University, Madison, Wis.). *(International Solar Energy Society, U.S. Section Meeting, Colorado State University, Fort Collins, Colo., Aug. 21-23, 1974.) Solar Energy,* vol. 17, Apr. 1975, p. 21-28. 5 refs. NSF Grant No. GI-40457.

This paper represents a thermal simulation of the Colorado State University solar house. A computer model of the solar energy system was developed and computer runs were made using one year of meteorological data to determine the important design features. The system consists of a flat plate solar collector, main storage tank, service hot water storage tank, auxiliary heater, absorption air conditioner with cooling tower and heat exchangers between the collector and storage, storage and service hot water tank and storage and residence. This system very closely models the CSU house in operating mode one. The results are in the form of monthly integrated values for the pertinent energy quantities. In addition, results are presented which show the effect on the system performance of the collector tilt, collector area and number of covers. (Author)

A75-29474 **A method of simulation of solar processes and its application.** S. A. Klein, T. L. Freeman, D. M. Beekman, W. A. Beckman, J. A. Duffie (Wisconsin, University, Madison, Wis.), and P. I. Cooper (Wisconsin, University, Madison, Wis.; Commonwealth Scientific and Industrial Research Organization, Div. of Mechanical Engineering, Melbourne, Australia). *(International Solar Energy Society, U.S. Section Meeting, Colorado State University, Fort Collins, Colo., Aug. 21-23, 1974.) Solar Energy,* vol. 17, Apr. 1975, p. 29-37. NSF Grant No. GI-34029.

A computer program designated TRNSYS (transient system simulation) has been developed to facilitate simulation of the interconnection and information transfer between solar energy system modules and to solve for the response of these coupled mathematical module models to time-dependent forcing functions (i.e. meteorological data). The design process thus becomes analogous to specifying an experimental system. The use of the program is illustrated by a comparison of methods of operating a solar heating system. S.J.M.

A75-29476 **Parametric performance and cost models for solar concentrators.** W. S. Duff, G. F. Lameiro, and G. O. G. Löf (Colorado State University, Fort Collins, Colo.). *Solar Energy,* vol. 17, Apr. 1975, p. 47-58. 9 refs. NSF Grant No. GI-37815.

A one-stage optimization scheme for sensitivity-analysis selection of one subsystem of a solar power plant is described. The method has general applicability to other solar concentrator heating systems. An extensive table of the performance of various parameters is included. It is noteworthy that cost optimization is accomplished within absorber shape categories. S.J.M.

A75-29477 * **Hydrogen production from solar energy.** M. M. Eisenstadt (New Mexico, University, Albuquerque, N. Mex.) and K. E. Cox. *Solar Energy,* vol. 17, Apr. 1975, p. 59-65. 31 refs. Grant No. NGT-44-005-114.

Three alternatives for hydrogen production from solar energy have been analyzed on both efficiency and economic grounds. The analysis shows that the alternative using solar energy followed by thermochemical decomposition of water to produce hydrogen is the optimum one. The other schemes considered were the direct conversion of solar energy to electricity by silicon cells and water electrolysis, and the use of solar energy to power a vapor cycle followed by electrical generation and electrolysis. The capital cost of hydrogen via the thermochemical alternative was estimated at $575/kW of hydrogen output or $3.15/million Btu. Although this cost appears high when compared with hydrogen from other primary energy sources or from fossil fuel, environmental and social costs which favor solar energy may prove this scheme feasible in the future. (Author)

A75-29478 **Performance of a solar battery using quasi-cylindrical array of plane mirrors as a concentrator.** S. Deb (Jadavpur University, Calcutta, India) and H. Saha (Jadavpur University, Calcutta; Kalyani, University, Nadia, India). *Solar Energy,* vol. 17, Apr. 1975, p. 67-73. 16 refs.

A75-29480 **Calculation of flat-plate collector loss coefficients.** S. A. Klein (Wisconsin, University, Madison, Wis.). *(International Solar Energy Society, U.S. Section Meeting, Colorado State University, Fort Collins, Colo., Aug. 21-23, 1974.) Solar Energy,* vol. 17, Apr. 1975, p. 79, 80. 7 refs. NSF Grant No. GI-34029.

A means of calculating U-L, the collector overall energy loss coefficient, is described which relates U-L to the sum of three energy loss rates: Q-R, the instantaneous rate of energy transferred to the transparent cover above the absorber plate by the processes of radiation and convection; Q-B, the instantaneous rate of energy conducted through the insulation below the plate; and Q-E, the instantaneous rate of energy lost from the plate due to edge effects. The first of these factors is the most important; equations for determining values of it are presented. S.J.M.

A75-29800 # **Interaction between the fuel-energy complex and the environment (Vzaimodeistvie toplivno-energeticheskogo kompleksa s okruzhaiushchei sredoi).** M. A. Styrikovich. *Akademiia Nauk SSSR, Vestnik,* Feb. 1975, p. 13-23. In Russian.

It is shown that atmospheric heating due to the steadily increasing energy consumption (which presently is a mere 0.02% of the radiation balance of the earth) will not produce any noticeable climatic changes, nor will it constitute any major hazard to the earth's population. In any case, it is negligible as compared to the problem of atmospheric pollution which has become of major concern to humanity. The principal sources of atmospheric pollution are examined, along with the factors responsible for the pollution of rivers, lakes, and oceans. Particular attention is given to measures that must be taken to prevent pollution due to off-shore drilling. V.P.

A75-30368 **A new concept for solar energy thermal conversion.** J. J. Cuomo, J. F. Ziegler, and J. M. Woodall (IBM Corp., Yorktown Heights, N.Y.). *Applied Physics Letters,* vol. 26, May 15, 1975, p. 557-559. 8 refs.

A material has been developed which allows a new approach to be taken to the conversion of solar energy to heat. It consists of a dense array of metal whiskers grown with spacings of a few wavelengths of visible light. The material selected has low emissivity and achieves significant optical absorption by trapping the light by a geometric maze effect. We have demonstrated that absorption of normal incidence light is greater than 98% from 0.5 to 40-micron wavelengths, and hemispherical emissivity at 550 C can be made less than 0.26. Since surfaces can be made of a single refractory element, such as W, high-temperature solar conversion (550 C) should be maintained with good surface stability. (Author)

A75-30375 # **Energy: A plan for action.** E. Teller (California, University, Berkeley, Calif.). New York, Commission on Critical Choices for Americans, 1975. 80 p. $2.00.

Action is outlined that will be necessary to achieve the implementation of a national conservation ethic, the introduction of avaliable energy-saving devices, the removal of barriers to increased energy production, and the establishment of better cooperation among energy-consuming nations. Targets for the year 1985, predictions of our position in the year 2000, and appendices on action recommendations, U.S. energy demand and supply, production, sources, R & D, and manpower are contained in the report. S.J.M.

A75-30487 # **Optimization of parameters of permeable thermoelectric generators (Optimizatsiia parametrov pronitsaemykh termoelektricheskikh generatorov).** G. K. Kotyrlo and Iu. N. Lobunets (Akademiia Nauk Ukrainskoi SSR, Institut Tekhnicheskoi Teplofiziki, Kiev, Ukrainian SSR). *Teplofizika i Teplotekhnika,* no. 28, 1974, p. 98-102. In Russian.

An analysis is made of the operating conditions of thermoelectric generators made of metallic materials. The dimensions of the thermoelements are optimized for maximum power or maximum efficiency. The heat-exchange conditions and the temperature variation of the thermal resistance of the material are taken into account. A.T.S.

A75-30750 **Power generation and efficiency in GaAs traveling-wave amplifiers.** F. Giannini and A. Salsano (Roma, Università, Rome, Italy). *IEEE Transactions on Microwave Theory and Techniques,* vol. MTT-23, May 1975, p. 449-452. 8 refs. Research supported by the Consiglio Nazionale delle Ricerche.

The effect of the dielectric loading in a bidimensional GaAs traveling-wave amplifier (TWA) is investigated, with respect to the EM power generated by the structure and the efficiency of the dc to RF conversion. The validity of some usual approximations and assumptions is studied and a parameter, i.e., the power gain x efficiency product, is proposed as a useful tool for comparing the possible performances of TWA's. (Author)

A75-30891 **Utilization of wind energy (Utilisation de l'énergie éolienne).** G. Massart (Centre National d'Exploitation des Océans, Brest, France). *L'Onde Electrique,* vol. 55, Apr. 1975, p. 225-230. 11 refs. In French.

Meteorological and technological factors involved in the efficient use of wind energy are reviewed, and a brief survey is made of past attempts to exploit this energy on a large scale. Calculation of wind energy, choice of energy utilization site, efficiency, and projects in progress are considered. It is stressed that wind energy can provide a source of power comparable to solar light energy if used effectively. S.J.M.

A75-30892 **Low-power turbines using organic vapor (Les turbines à vapeur organique de faible puissance).** L. Bronicki (ORMAT Turbines, Ltd., Yavne, Israel). *L'Onde Electrique,* vol. 55, Apr. 1975, p. 231-236. 5 refs. In French.

The present work describes experimental results obtained with a prototype organic vapor turbo generator. A discussion of the possible applications of this type of unit is also presented. Since 1965, efforts have been concentrated on applying the technology to telecommunications. Liquefied gases such as propane and butane are most often used in the devices. S.J.M.

A75-30949 **Fluctuations of electric power in MHD channels.** R. V. Ganefel'd and V. B. Red'kin (Akademiia Nauk Ukrainskoi SSR, Institut Elektrodinamiki, Kiev, Ukrainian SSR). *(Teplofizika Vysokikh Temperatur,* vol. 12, July-Aug. 1974, p. 908-910.) *High Temperature,* vol. 12, no. 4, Mar. 1975, p. 798-800. 6 refs. Translation.

A probabilistic method is described for determining the level of pulsations of specific electric power in MHD ducts as a function of pulsations of the thermodynamic parameters of the plasma flow. A plasma flow with given velocity and temperature is considered, where these parameters are regarded as steady ergodic Gaussian processes given by density distributions. The problem is studied in the framework of a zero-dimensional MHD-duct model, and only incompressible flow of the plasma is considered. An expression is derived for the pulsation level in a Faraday generator with partitioned electrodes. Some numerical results are shown. It is apparent that intense fluctuations of power occur even for rather weak temperature and velocity pulsations. P.T.H.

A75-31195 **Energy's hazy future.** G. D. Friedlander. *IEEE Spectrum,* vol. 12, May 1975, p. 32-40.

A summary of forecasts of U.S. electric generating capacity and electric energy use is presented. A consensus for 1985 is discussed along with an outlook for 2000. Attention is given to questions concerning power generation and storage for the period from 1975 to 2000, prospects regarding depletable and renewable energy sources, problems of power transmission, and the characteristics of future distribution systems. It is pointed out that steam, gas, and water turbines will continue their dominance in the field of power generation over the next 25 years. G.R.

A75-31267 **Solar energy for earth: An AIAA assessment.** Edited by H. J. Killian (Aerospace Corp., El Segundo, Calif.), G. L. Dugger (Johns Hopkins University, Silver Spring, Md.), and J. Grey (American Institute of Aeronautics and Astronautics, Inc., New

York, N.Y.). New York, American Institute of Aeronautics and Astronautics, Inc., 1975. 118 p. Members, $7.00; nonmembers, $9.50.

Direct and indirect solar energy and its potential for replacement of fossil fuels are investigated. Terrestrial insolation, solar heating and cooling, solar-thermal electric power, photovoltaic power, geosynchronous satellite solar power, wind power, ocean thermal energy conversion, and fuel production (biomass energy) are the principal topics covered.

S.J.M.

A75-31269 # **Solar heating and cooling.** J. R. Williams (Georgia Institute of Technology, Atlanta, Ga.) and C. S. Chen (U.S. Energy Research and Development Administration, Washington, D.C.). In: Solar energy for earth: An AIAA assessment. New York, American Institute of Aeronautics and Astronautics, Inc., 1975, p. 18-31.

Results of several studies on the technical, economic, social, environmental, and institutional factors implied by the application of solar energy to the heating and cooling of buildings are presented. Important conclusions include high estimates of fossil fuel price growth, good feasibility for proposed solar heating and cooling systems, and heating more cost-effective than cooling first. S.J.M.

A75-31270 # **Solar-thermal electric power.** R. L. Gervais (McDonnell Douglas Astronautics Co., Huntington Beach, Calif.) and P. B. Bos (Aerospace Corp., El Segundo, Calif.). In: Solar energy for earth: An AIAA assessment. New York, American Institute of Aeronautics and Astronautics, Inc., 1975, p. 32-45.

Technological designs and economic criteria accompanying them are reviewed for solar energy thermal collection and conversion to electrical energy (and secondarily to heating and cooling). Collection systems can be either centralized or distributed; the former of these could provide 100 MWe per sq km of collection area and working fluid in the 5000-F range, while the latter would furnish fluid at a relatively low temperature (500 K). The central-receiver concept is concluded to be the most economically feasible, with a busbar-level cost of $15/kWh. Paraboloid solar concentrators for distributed systems require only one-fifth the area that flat-plate concentrators demand, but they do not function on cloudy days and they are expensive to manufacture. Different heliostat designs (mirror pivoting methods) are discussed, with the ganged approach receiving emphasis. S.J.M.

A75-31271 # **Photovoltaic power.** M. Wolf (Pennsylvania, University, Philadelphia, Pa.). In: Solar energy for earth: An AIAA assessment. New York, American Institute of Aeronautics and Astronautics, Inc., 1975, p. 46-58. 25 refs.

Numerous photovoltaic system concepts and their status of development and application, requirements on such systems for widespread terrestrial application, problems remaining to be solved, and a general background survey of photovoltaic technology are presented. It is concluded that the cost area is the most difficult problem, but that commercial feasibility could be established in 10 years with adequate government support. S.J.M.

A75-31272 # **Geosynchronous satellite solar power.** J. R. Williams (Georgia Institute of Technology, Atlanta, Ga.). In: Solar energy for earth: An AIAA assessment. New York, American Institute of Aeronautics and Astronautics, Inc., 1975, p. 59-71. 49 refs.

Concepts and overview, photovoltaic arrays, solar thermal conversion, power transmission, space transportation, assembly and servicing in orbit, and safety and environmental effects are discussed as they relate to geosynchronous satellite solar power. This energy source poses advantages of increased available power density and time access (24 hr/day) over terrestrial sources; its environmental effects would be limited; a fully reusable earth-to-orbit space transportation system would have to be developed for it; and implementation of the program would probably not occur until the next century. S.J.M.

A75-31273 * # **Wind power.** J. M. Savino (NASA, Lewis Research Center, Cleveland, Ohio). In: Solar energy for earth: An AIAA assessment. New York, American Institute of Aeronautics and Astronautics, Inc., 1975, p. 72-81. 22 refs.

A historical background on windmill use, the nature of wind, wind conversion system technology and requirements, the economics of wind power and comparisons with alternative systems, data needs, technology development needs, and an implementation plan for wind energy are presented. Considerable progress took place during the 1950's. Most of the modern windmills feature a wind turbine electricity generator located directly at the top of their rotor towers.

S.J.M.

A75-31274 # **Ocean thermal energy conversion.** G. L. Dugger (Johns Hopkins University, Silver Spring, Md.). In: Solar energy for earth: An AIAA assessment. New York, American Institute of Aeronautics and Astronautics, Inc., 1975, p. 82-97. 32 refs.

The principal technology, economic parameters, environmental-social-political impact, interfacing and market capture potential, data and technology needs, and an implementation plan for ocean thermal energy conversion are considered. Some of the features of the conceptual designs formulated thus far are: (1) a floating platform that supports the plant, with an analogous configuration to stable platforms for deep-hole drilling; (2) submerged evaporators, condensers, and pumps; and (3) propane as a working fluid, due to its noncorrosive nature and high working pressure (these properties permit efficient, low-cost single stage turbines and generators). S.J.M.

A75-31275 # **Fuel production /biomass energy/.** A. L. Johnson, Jr. (Aerospace Corp., El Segundo, Calif.). In: Solar energy for earth: An AIAA assessment. New York, American Institute of Aeronautics and Astronautics, Inc., 1975, p. 98-110. 22 refs.

A thorough review of various aspects of biomass fuel production is presented. Fundamentals, integrated agricultural waste management, material recovery, biomass fuel plantations, technology development needs, an economic assessment and projections, environmental impact, a comparison with alternate approaches, interfacing with conventional systems, data needs, a technology assessment and projections, and a recommended implementation plan are discussed. Principal advantages of biomass energy technology are its simplicity and low cost. S.J.M.

A75-31448 **Energy, environment and building.** P. Steadman (Cambridge University, Cambridge, England). Cambridge, Cambridge University Press (Cambridge Urban and Architectural Studies. Volume 2), 1975. 296 p. 837 refs. $5.95.

Energy conservation measures in buildings are considered, taking into account questions of space heating and cooling, fuel efficiency and fuel cost, electric heating, insulation, the thermal mass, earth roofs, the reduction of glazed areas, window shutters, ventilation, heat exchangers, storage radiators, heat of fusion materials, and heat pumps. The use of solar energy is discussed along with aspects of solar space heating, the characteristics of wind power, the utilization of small scale water power, and approaches for obtaining and utilizing methane gas. A description is given of some autonomous, energy-conserving, and ecological buildings and projects. G.R.

A75-31512 # **Pilot solar air-conditioning plant and results of its use (Opytno-promyshlennaia solnechnaia konditsioniruiushchaia ustanovka i rezul'taty ee ispytaniia).** A. Kakabaev, A. Khandurdyeev, O. Klyshchaeva, and N. Kurbanov (Akademiia Nauk Turkmenskoi SSR, Fiziko-Tekhnicheskii Institut, Ashkhabad, Turkmen SSR). *Akademiia Nauk Turkmenskoi SSR, Izvestiia, Seriia Fiziko-Tekhnicheskikh, Khimicheskikh i Geologicheskikh Nauk,* no. 4, 1974, p. 40-46. In Russian.

A description is given of a solar air-conditioning system which has been tested on a three-story apartment house in Turkmen SSR. The system uses a 180-sq-m regenerator on the sloping roof. The experiments showed that on hot days with low humidity, a temperature of 23-25 C could be established in all the apartments. On days when the temperature was 28-33 C, the temperature varied in the range 19-22 C. A.T.S.

A75-31513 # Theoretical determination of the temperature in a solar water heater /steady state/ (Teoreticheskoe opredelenie temperatury v solnechnom vodonagrevatele /statsionarnyi rezhim/). R. Bairamov, K. Toiliev, and M. Khodzhiev (Akademiia Nauk Turkmenskoi SSR, Fiziko-Tekhnicheskii Institut, Ashkhabad, Turkmen SSR). *Akademiia Nauk Turkmenskoi SSR, Izvestiia, Seriia Fiziko-Tekhnicheskikh, Khimicheskikh i Geologicheskikh Nauk,* no. 4, 1974, p. 47-54. 7 refs. In Russian.

Analytic equations are obtained for determining the outlet temperature of water in a 'hot box'-type solar water heater as a function of the intensity of solar radiation, temperature of the surrounding medium, wind velocity, and discharge rate of the water. Factors taken into account include heat exchange with the surrounding medium and heat loss through the sides and bottom of the boiler. A more precise expression is obtained when changes in the temperature of the water flowing inside the boiler are taken into account. F.G.M.

A75-31515 # Theoretical research on the operation of a solar water heater and comparison with experimental data (Raschetnye issledovaniia raboty solnechnogo vodonagrevatel'ia i ikh sravnenie s eksperimental'nymi dannymi). R. Bairamov, K. Toiliev, and M. Khodzhiev (Akademiia Nauk Turkmenskoi SSR, Fiziko-Tekhnicheskii Institut; Turkmenskii Gosudarstvennyi Universitet, Ashkhabad, Turkmen SSR). *Akademiia Nauk Turkmenskoi SSR, Izvestiia, Seriia Fiziko-Tekhnicheskikh, Khimicheskikh i Geologicheskikh Nauk,* no. 4, 1974, p. 114-116. In Russian.

A75-31568 # Calculation of the electrical conductivity of the combustion products of the working medium in an open-cycle MHD generator (K raschetu elektroprovodnosti produktov sgoraniia rabochego tela MGDG otkrytogo tsikla). I. T. Iakubov (Akademiia Nauk SSSR, Nauchno-Issledovatel'skii Institut Vysokikh Temperatur, Moscow, USSR). *Teplofizika Vysokikh Temperatur,* vol. 12, Nov.-Dec. 1974, p. 1321, 1322. 6 refs. In Russian.

A75-31569 # Concerning the use of a nitrogen-potassium gaseous mixture for protection of MHD-generator electrodes by suction (K voprosu ob ispol'zovanii azotnokalievoi gazovoi smesi dlia zashchity vduvom elektrodov MGD-generatora). V. O. German, Iu. P. Kukota, and B. V. Par-Fenov (Akademiia Nauk Ukrainskoi SSR, Institut Tekhnicheskoi Teplofiziki, Kiev, Ukrainian SSR; Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). *Teplofizika Vysokikh Temperatur,* vol. 12, Nov.-Dec. 1974, p. 1323-1325. In Russian.

A75-31588 # Solar production of electrical energy (Production solaire de l'énergie électrique). M. Touchais. In: Meteorological and earth-resources satellites - Special technologies - International Collaboration; International Symposium on Space, 14th, Rome, Italy, March 18-20, 1974, Proceedings. Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1974, p. 255, 257-264. In French.

Present misconceptions and exaggerations concerning the use of solar energy, as well as possible means of capturing it and converting it to electrical form, are examined. It is emphasized that yield is not essential in energy captors, but rather in energy converters. The solar concentrator of the future will most likely be a large angular hemiparaboloid, and it will furnish electricity by thermal means. S.J.M.

A75-31698 Solar energy and architecture. J. K. Page. *Royal Institution of Great Britain, Proceedings,* vol. 47, 1974, p. 303-348. 12 refs.

Questions of solar energy availability are investigated, taking into account the influence of the atmosphere, the geometry of solar architecture, and approaches for predicting the energy falling on building surfaces. The radiative properties of building materials are discussed along with methods for combining the various thermal properties of buildings sensibly to make more effective use of solar energy. A description is given of four selected examples of solar architecture. G.R.

A75-32097 # Minimum cost solar thermal electric power systems - A dynamic programming based approach. W. S. Duff (Colorado State University, Fort Collins, Colo.). *Operations Research Society of America and Institute of Management Sciences, National Meeting, Chicago, Ill., Apr. 30-May 2, 1975, Paper.* 32 p. 9 refs. NSF Grant No. GI-37815.

A dynamic programming methodology is presented for deriving minimum-cost solar thermal electric power systems (STEPS). There are two basic STEPS concepts: (1) distributed systems and (2) tower-heliostat systems. Two types of distributed system are examined: those using steam as the medium of heat transport from a concentrator subsystem to an absorber-heat exchanger subsystem, and those using flat-plate collectors which function also as heat exchangers. The cost of the minimum-cost STEPS plant is found to be about 3.5 cents per kilowatt hour, including plant operation and maintenance. S.J.M.

A75-32212 # Approximate analysis of the steady temperature field of a parallelepiped with a local energy source (Priblizhennyi analiz statsionarnogo temperaturnogo polia parallelepipeda s lokal'nym istochnikom energii). G. N. Dul'nev and E. I. Ermolina (Leningradskii Institut Tochnoi Mekhaniki i Optiki, Leningrad, USSR). *Inzhenerno-Fizicheskii Zhurnal,* vol. 28, Apr. 1975, p. 685-693. 5 refs. In Russian.

A75-32324 'Time is energy' /Henson and Stringfellow Memorial Lecture/. J. T. Stamper (Hawker Siddeley Aviation, Ltd., Kingston-upon-Thames, Surrey, England). *Aeronautical Journal,* vol. 79, Apr. 1975, p. 169-178.

Various means of reducing total journey time, particularly by the use of VTOL aircraft and by the elimination of end-time delays, are considered. If end-time delays could be reduced, cruise speed could be lowered, with a concomitant decrease in energy consumption. From another point of view, it is stressed that time saved is energy spent: lower CTOL cruise speeds would result in a substantial increase in energy efficiency at only a small journey time penalty. S.J.M.

A75-32617 # Laser thermonuclear fusion (Lazernyi termoiadernyi sintez). Iu. V. Afanas'ev, E. G. Gamalii, O. N. Krokhin, and V. B. Rozanov. *Akademiia Nauk SSSR, Vestnik,* Dec. 1974, p. 20-27. In Russian.

The present work discusses some of the physical problems associated with the use of lasers to initiate thermonuclear fusion in a controlled way. The scheme whereby laser radiation strikes a spherical fuel target from all sides, compressing and heating it to the point where fusion takes place, is considered. Some characteristic parameters and diagnostic techniques concerning this scheme are discussed. P.T.H.

A75-32824 Dependence of the basic parameters of Al/x/Ga/1-x/As-GaAs solar converters on temperature and optical intensity. E. B. Vinogradova, M. B. Kagan, N. S. Koroleva, T. L. Liubashevskaia, and T. A. Nuller. *(Zhurnal Tekhnicheskoi Fiziki,* vol. 44, Oct. 1974, p. 2229-2234.) *Soviet Physics - Technical Physics,* vol. 19, Apr. 1975, p. 1378-1381. 7 refs. Translation.

We have investigated the basic parameters of p-Al/x/Ga/1-x/As-n-GaAs solar converters over wide ranges of temperatures and optical intensity. The low inverse saturation currents, the high constant collection coefficients over the entire spectrum, and the specific features of the electrical characteristics result in a high temperature stability of the power output and certain features over a wide range of temperatures and optical intensity. (Author)

A75-32851 # Design charts for hot liquid energy storage systems utilizing forced circulation. R. A. Pate and W. F. Phillips (Utah State University of Agriculture and Applied Science, Logan, Utah). *American Institute of Aeronautics and Astronautics, Thermophysics Conference, 10th, Denver, Colo., May 27-29, 1975, Paper 75-742.* 6 p.

Dimensionless design charts are developed which may be used for designing and predicting the performance of an energy storage system that could have application to solar energy utilization. The charts are obtained from a combined theoretical and experimental study of a hot liquid energy storage system, which utilizes forced circulation to transport the liquid between the heat exchanger and the storage tank. The results are presented in the form of dimensionless plots, which are sufficiently general to aid in the dimensional design of similar thermal energy storage systems. Close agreement was obtained between the theoretical model and the experimental results. Though the work was done with solar energy utilization in mind, the results are in no way limited to that. Sufficient generality is maintained to assure applicability of the results in designing similar systems for other uses as well. (Author)

A75-32852 # Storage of summertime waste heat from electric generating plants for use in wintertime. F. O. Smetana (North Carolina State University, Raleigh, N.C.). *American Institute of Aeronautics and Astronautics, Thermophysics Converence, 10th, Denver, Colo., May 27-29, 1975, Paper 75-743.* 7 p.

As an anternative to the construction of large cooling towers at plants generating electric power, it is suggested that one may wish to consider storing the waste heat produced during the summer until it can be used beneficially the following winter. Keeping tender crops from freezing is one of the most effective ways of using this heat because lower-temperature heat sources will suffice for this purpose than are necessary for space heating human habitations, for example. A 3600 MW plant rejects sufficient heat in 90 days to heat an agricultural area of 2.06 million square meters all winter if sufficient barriers are erected to inhibit horizontal air motion. This heat can be stored in 124 million cubic meters of water. Insulation, construction, and costs of such a tank are treated. (Author)

A75-32860 # Trapezoidal grooves as moderately concentrating solar energy collectors. J. R. Howell and R. B. Bannerot (Houston, University Houston, Tex.). *American Institute of Aeronautics and Astronautics, Thermophysics Conference, 10th, Denver, Colo., May 27-29, 1975, Paper 75-738.* 8 p. 5 refs. NSF Grant No. GI-41003.

The behavior of solar collector geometries designed to provide moderate concentration of solar flux is examined experimentally. The moderate concentration is achieved by using East-West oriented trapezoidal grooves with highly reflective sidewalls and a highly absorbant base plate. It is found, as predicted from previous analysis, that significant increases in collector efficiency are possible at the temperature required for supplying absorption air-conditioning systems. The experimental results verify the analysis. Concentration ratios from the measurements compare well with analytical predictions. Sidewall materials tested include back-surfaced glass and plexiglas mirrors and aluminum foil. Foil measurements are less consistent with predictions due to surface nonuniformities. (Author)

A75-32861 # Numerical modeling of flat plate solar collectors. P. R. Smith and M. H. Cobble (New Mexico State University, Las Cruces, N. Mex.). *American Institute of Aeronautics and Astronautics, Thermophysics Conference, 10th, Denver, Colo., May 27-29, 1975, Paper 75-739.* 8 p. Research supported by the Board of Educational Finance of New Mexico.

Three types of flat plate solar collectors were analyzed numerically and the results compared to experiment. The solar collectors studied were (1) a double glazed flat plate collector, (2) a thermal trap collector, and (3) a water-trickle collector. The analysis of all three collectors was on a time dependent basis and considered the thermal inertia of the water storage tank which the collectors supplied. The incident solar radiation, and the ambient atmospheric temperature were taken to be known functions of time. The numerically calculated performance proved to closely approximate the actual performance of the double glazed and the thermal trap collectors. The numerical model of the water-trickle collector predicted a much better performance than was actually obtained experimentally, apparently because condensate on the cover plate degrades transmission more than expected. (Author)

A75-32862 * # Outdoor flat-plate collector performance prediction from solar simulator test data. F. F. Simon and E. H. Buyco (NASA, Lewis Research Center, Cleveland, Ohio). *American Institute of Aeronautics and Astronautics, Thermophysics Conference, 10th, Denver, Colo., May 27-29, 1975, Paper 75-741.* 12 p. 12 refs.

This paper describes how collector performance obtained from test data with a simulator can be modified for real-life conditions. The approach taken is to correct the performance data obtained with the simulator for the variable conditions of ambient temperature, wind, incident angle, flow rate, etc., that are encountered in outdoor conditions. Modification of simulator data is accomplished by combining experiment with theory. The technique is demonstrated by application to a spectrally selective and a nonselective type of collector. This kind of modified simulator collector performance data should be valuable in solar systems analyses and for collector performance ranking based on all-day calculated conditions. (Author)

A75-32868 # Designing heat pipe heat sinks. C. C. Roberts, Jr. (Bell Telephone Laboratories, Inc., Naperville, Ill.). *American Institute of Aeronautics and Astronautics, Thermophysics Conference, 10th, Denver, Colo., May 27-29, 1975, Paper 75-724.* 12 p. 11 refs.

At high heat densities solid metal heat sinks using natural air convection cooling may not provide adequate protection against thermally induced damage to electronic components. Changing the coolant or the use of forced convection are among the many alternatives the thermal designer must choose to guarantee adequate thermal performance. Heat pipes can increase the efficiency of solid metal heat sink designs using natural air convection. Various heat pipe heat sink concepts are discussed along with performance data and manufacturing techniques. One heat pipe design reduced a transistor junction temperature by 22 C at 39 watts when compared to a solid metal heat sink of the same dimension. (Author)

A75-32870 * # The International Heat Pipe Experiment. R. McIntosh, S. Ollendorf (NASA, Goddard Space Flight Center, Greenbelt, Md.), and W. Harwell (Grumman Aerospace Corp., Bethpage, N.Y.). *American Institute of Aeronautics and Astronautics, Thermophysics Conference, 10th, Denver, Colo., May 27-29, 1975, Paper 75-726.* 12 p.

On October 4, 1974 the International Heat Pipe Experiment was launched aboard a Black Brant Sounding Rocket from White Sands, New Mexico. The flight provided six minutes of near zero gravity during which a total of ten separate heat pipe experiments were performed. The fifteen heat pipes which were tested represent some of the latest American and European technology. This flight provided the first reported zero gravity data on cryogenic and flat plate vapor chamber heat pipes. Additionally, valuable design and engineering data was obtained on several other heat pipe configurations. This paper will discuss the payload and four of the individual experiments. (Author)

A75-32872 * # Cryogenic heat pipe experiment - Flight performance onboard a sounding rocket. W. Harwell, J. Quadrini

(Grumman Aerospace Corp., Bethpage, N.Y.), A. Sherman, and R. McIntosh (NASA, Goddard Space Flight Center, Greenbelt, Md.). *American Institute of Aeronautics and Astronautics, Thermophysics Conference, 10th, Denver, Colo., May 27-29, 1975, Paper 75-729.* 12 p. 6 refs.

Flight data from a 15.8 mm OD, 760 mm long, axial-groove, methane cryogenic heat pipe verified successful priming and operation during six min of zero-g time. The nominal power applied to the evaporator was 60-w for the first 60 sec of zero-g time, 14 w for the next 270 sec, and 25 w for the last 20 sec of flight. The heat pipe condenser was mounted into an aluminum heat sink which was cooled to 103 K at launch and increased in temperature to 128 K by the end of the flight. Ground test data obtained for the flight heat pipe, together with theoretical predictions, indicate a zero-g heat transport capability of 3500 to 4000 w-cm in the 100-125 K temperature range. (Author)

A75-32913 # **Investigation of bubble formation in arteries of gas-controlled heat pipes.** A. Abhat, M. Groll, and M. Hage (Stuttgart, Universität, Stuttgart, West Germany). *American Institute of Aeronautics and Astronautics, Thermophysics Conference, 10th, Denver, Colo., May 27-29, 1975, Paper 75-655.* 12 p. 12 refs. European Space Research and Technology Centre Contract No. 2198/74AK.

Gas desorption and vapor-gas bubble nucleation are examined as the main causes for gas generation in arteries of operating variable conductance heat pipes. The conditions under which these phenomena may occur are stated. Criteria for bubble growth within the artery of an operating VCHP are presented and the effect of arterial bubbles on the maximum transport capability of the heat pipe is studied. In addition, experiments are carried out with ammonia-argon and acetone-argon heat pipes provided with an initially well-primed artery to study the temporal reduction in the maximum capability of the heat pipes following gas addition. The observed deterioration in performance is attributed to nucleation of vapor-gas bubbles within the artery during VCHP operation. (Author)

A75-32914 * # **Transverse header heat pipe.** F. Edelstein (Grumman Aerospace Corp., Bethpage, N.Y.). *American Institute of Aeronautics and Astronautics, Thermophysics Conference, 10th, Denver, Colo., May 27-29, 1975, Paper 75-656.* 8 p. 9 refs. Contract No. NAS8-27793.

A novel variable-conductance heat-pipe approach has been developed that delivers high-capacity loads, while eliminating the problem of artery gas blockage present in conventional designs. The unit, known as a transverse header, uses ammonia as the working fluid and nitrogen as the control gas. Its overall cylindrical shape is 5.1 cm in diameter by 0.61 m long. Under test with a fluid heat source, the maximum load achieved as a VCHP was 3,600W. As with conventional gas-loaded pipes, good temperature control was also obtained. An application of this device as a VCHP header for a heat-pipe radiator is described. (Author)

A75-32915 * # **Arterial gas occlusions in operating heat pipes.** E. W. Saaski (Sigma Research, Inc., Richland, Wash.). *American Institute of Aeronautics and Astronautics, Thermophysics Conference, 10th, Denver, Colo., May 27-29, 1975, Paper 75-657.* 7 p. 5 refs. Contract No. NAS2-7596.

The effect of noncondensable gases on high performance arterial heat pipes has been investigated both analytically and experimentally. Models have been generated which characterize the dissolution of gases in condensate and the diffusional loss of dissolved gases from condensate in arterial flow. These processes, and others, have been used to postulate stability criteria for arterial heat pipes. Experimental observations of gas occlusions were made using a stainless steel heat pipe equipped with viewing ports, and the working fluids methanol and ammonia with the gas additives helium, argon, and xenon. Observations were related to gas transport models. (Author)

A75-32916 # **A flexible cryogenic heat pipe.** E. W. Saaski (Sigma Research, Inc., Richland, Wash.) and J. P. Wright (Rockwell International Corp., Downey, Calif.). *American Institute of Aeronautics and Astronautics, Thermophysics Conference, 10th, Denver, Colo., May 27-29, 1975, Paper 75-658.* 5 p.

A 20-watt flexible heat pipe designed for operation at 100 K is described. Problem areas unique to cryogenic flexible heat pipes are defined and possible solutions to these design problems are discussed. Thermal test data is presented for operation with methane at 100 K and R-21 at 293 K. Bending force as a function of internal pressure is measured up to 1100 psig. (Author)

A75-32917 * # **Measurements of the performance of an electrohydrodynamic heat pipe.** R. I. Loehrke (Colorado State University, Fort Collins, Colo.) and R. J. Debs (NASA, Ames Research Center, Moffett Field, Calif.). *American Institute of Aeronautics and Astronautics, Thermophysics Conference, 10th, Denver, Colo., May 27-29, 1975, Paper 75-659.* 6 p.

The performance of an electrohydrodynamic heat pipe formed by enclosing three straight axial electrodes with a 1.27 cm O.D. internally threaded stainless steel tube was measured with Freon-11 as working fluid. The condenser and evaporator conductances at low power were comparable to those measured in a conventional capillary driven heat pipe using similar working fluids. The evaporator conductance improved at high power probably due to the onset of nucleate boiling. The maximum heat throughput for this pipe was substantially higher than that of a conventional pipe. (Author)

A75-32918 # **Compatibility and reliability of heat pipe materials.** A. Basiulis and R. C. Prager (Hughes Aircraft Co., Electron Dynamics Div., Torrance, Calif.). *American Institute of Aeronautics and Astronautics, Thermophysics Conference, 10th, Denver, Colo., May 27-29, 1975, Paper 75-660.* 9 p. 14 refs.

To predict the longlife capabilities of heat pipes, a life test program was begun eight years ago to evaluate potential heat pipe fluids. Fluids tested range from those suitable in cryogenic applications to those of use in high temperature heat pipes. Stainless steel proved to be acceptable for longterm use with all common low temperature fluids except water, which requires copper or monel. Failures were usually caused by material incompatibility or improper cleaning and processing, although breakdown of some high molecular weight organic fluids under heat pipe operating conditions was encountered. (Author)

A75-32919 * # **Capillary flow through heat-pipe wicks.** J. E. Eninger (TRW Systems Group, Redondo Beach, Calif.). *American Institute of Aeronautics and Astronautics, Thermophysics Conference, 10th, Denver, Colo., May 27-29, 1975, Paper 75-661.* 11). 6 refs. Contracts No. NAS2-8310; No. N00019-72-C-0340.

Theoretical expressions are obtained for the capillary-pressure limit and permeability of a fibrous wick in terms of the porosity and fiber diameter. Hysteresis in capillary pressure is included through the introduction of an empirical hysteresis constant. A partial-saturation model based on the statistical distribution of local porosity requires an additional empirical constant, the standard deviation. The theory is compared to results of a beta-ray absorption experiment that measured the liquid content of a partially saturated wick and to results of permeability measurements on partially and fully saturated wicks. A simple wick-weighing experiment is described that yields values for the empirical hysteresis constant and the standard deviation. Theoretical results are used to design an optimum wick. (Author)

A75-33118 **Energy sources for ocean technology (Energiequellen für die Meerestechnik).** W. Fischer (Brown, Boveri et Cie. AG, Heidelberg, West Germany). *VDI-Z*, vol. 117, no. 9, May 1975, p. 415-421. 56 refs. In German.

Means of evaluating the properties of an energy source for use in a specific sea application are discussed. In particular, the utilization of these evaluation methods in the design of unmanned ocean stations and manned underwater stations is examined. It is proposed that the costs and masses (quantities) associated with the energy content of an energy source can serve as yardsticks for its applicability to a particular field of use. The costs determined include maintenance as well as facility construction; low maintenance is emphasized in ocean implementation. S.J.M.

A75-33271 # **Heat pipe thermal control set point shift.** H. B. McKee (McDonnell Douglas Astronautics Co., St. Louis, Mo.). *Journal of Spacecraft and Rockets,* vol. 12, Mar. 1975, p. 191, 192. 6 refs.

An approximate technique is described for making rapid estimates of heat-pipe set-point drift behavior when the end-point conditions are known. Experimental data obtained for an ammonia-helium variable-conductance heat pipe are in good agreement with the calculations performed with the approximate methods. A.T.S.

A75-33758 # **Glass solar heat collector development.** R. B. Gillette, C. Deminet, and W. D. Beverly (Boeing Co., Engineering and Construction Div., Seattle, Wash.). *American Institute of Aeronautics and Astronautics, Thermophysics Conference, 10th, Denver, Colo., May 27-29, 1975, Paper 75-740.* 12 p. 9 refs. NSF-supported research.

Results are presented from a design study on a glass solar heat collector. In this design, sunlight passes through one or more glass cover plates and is absorbed in a blackened fluid which flows through a labyrinth of liquid passageways. Calculated thermal performance data are given for a prototype collector. Transmittance data on blackened fluids before and after ultra-violet radiation are also given. The primary reasons for pursuing development of a glass collector are that it promises low cost when mass produced and eliminates the need for large quantities of strategic materials such as aluminum and copper. (Author)

A75-33970 **Optimal solar energy collector system.** M. Kovarik (Commonwealth Scientific and Industrial Research Organization, Div. of Mechanical Engineering, Highett, Victoria, Australia). *Solar Energy,* vol. 17, May 1975, p. 91-95. 8 refs.

The problem of designing solar-energy collectors for the delivery of heat at minimum cost is analyzed in two different forms. In the first of these, a set of collectors is assumed to be available, each element having different properties uniformly distributed over its area; an optimal design is achieved by a suitable combination of a subset of such collectors. In the second form the collector is designed with a nonuniform, continuously varying insulation thickness. The principle of each solution is stated as a theorem. An example of the continuous solution for a flat plate collector is evaluated in an appendix. (Author)

A75-33971 **On the optimum tilt of a solar collector.** J. Kern and I. Harris (Witwatersrand, University, Johannesburg, Republic of South Africa). *Solar Energy,* vol. 17, May 1975, p. 97-102. 12 refs.

In the literature different values are found for the best tilt of a solar collector, but these are usually given as a function of latitude only. In this investigation the problem is formulated more rigidly and the optimum tilt is obtained as a function of latitude, weather data, and character of the energy demand. The resulting minimum collector area is only moderately sensitive to small deviations from the best angle. For inexpensive collector construction one can therefore replace the previous rules by one single recommendation, where the best angle is always equal to the latitude. However, large-scale installations or direct conversion of solar into electrical energy require a more accurate determination of the minimum collector area for a given objective function. A general method for doing this is devised and illustrated. (Author)

A75-33972 * **Solar stills for agricultural purposes.** M. K. Selcuk (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.) and V. V. Tran. *Solar Energy,* vol. 17, May 1975, p. 103-109. 17 refs. Research supported by the Turkish National Research Council; Grant No. NATO-508. TNRC Project MAG-247.

Basic concepts of using desalinated water for agricultural purposes are outlined. A mathematical model describing heat and mass transfer in a system combining a solar still with a greenhouse, its solution, and test results of a small-scale unit built at the Middle East Technical University, Ankara, Turkey, are discussed. The unit was employed to demonstrate the technical feasibility of the system. Further development and modifications are necessary for larger-scale operations. The basis of an optimization study which is underway at the Brace Research Institute of McGill University in Montreal, Canada, aimed at finding the best combination of design and operation parameters is also presented. (Author)

A75-33973 **Field performance and operation of a flat-glass solar heat collector.** P. G. Patil (PPG Industries Glass Research Center, Pittsburgh, Pa.). *(International Solar Energy Society, Meeting, Fort Collins, Colo., Aug. 1974.) Solar Energy,* vol. 17, May 1975, p. 111-117. 9 refs.

A75-33974 **Analysis of gas dissociation solar thermal power system.** T. A. Chubb (U.S. Navy, E. O. Hulburt Center for Space Research, Washington, D.C.). *(International Solar Energy Society, Meeting, Fort Collins, Colo., Aug. 1974.) Solar Energy,* vol. 17, May 1975, p. 129-136. 22 refs.

Energy collected at high temperatures in a set of scattered solar furnaces can be delivered to a central facility at intermediate temperature by using a polyatomic gas in a closed cycle circulation system. For example, gaseous SO_3 dissociates at 800 to 1000 C to form $SO_2 + O_2$ with absorption of heat; the products recombine in the presence of a catalyst at 500 to 600 C liberating the heat of recombination. A system using SO_3 for energy transfer and scaled for production of a continuous 100 MW of electrical power with 3 days of cloudy-weather storage is outlined. Alternate working fluids $CH_4 + H_2O$, $COCl_2$ and NF_3 are compared. Selected design options, potential problem areas, and possibilities of utilizing the collected heat for chemical processing are discussed. (Author)

A75-33975 **Underground storage of heat in solar heating systems.** J. Shelton (Williams College, Williamstown, Mass.). *Solar Energy,* vol. 17, May 1975, p. 137-143. 11 refs.

The thermal interaction between underground heat storage and the surrounding ground is studied. The storage medium may be water in a tank, rocks, the ground itself, etc. For the case of hemispherical geometry, analytic steady-state solutions and numerical solutions to select time-dependent situations are presented and discussed. The quasisteady-state average daily net heat loss into the surrounding ground from uninsulated underground heat-storage facilities is estimated to be only a few per cent of the heat-storage capacity for typical home-size units in low-conductivity ground in the absence of ground-water flow. The economics of added insulation under these circumstances appears to be critically site and system specific. The time required for the average heat-loss rate of a new system to approach the steady-state value is on the order of a year. The ground surrounding a typical heat-storage facility contributes very little to the system's storage capacity either on a daily or a seasonal time scale. (Author)

A75-34175 **Temperature effects in Schottky-barrier silicon solar cells.** S. M. Vernon and W. A. Anderson (Rutgers University, New Brunswick, N.J.). *Applied Physics Letters,* vol. 26, June 15, 1975, p. 707-709. 13 refs. Research supported by Exxon Enterprises and Rutgers University.

Experimental results are reported concerning temperature effects from 25 to 125 C on Schottky-barrier solar cells which were fabricated using a semitransparent Cu/Cr barrier metal layer on p-type silicon. The open-circuit voltage decreased by 2.3 mV/deg C and the fill factor by 0.11%/deg C, while the short-circuit current increased slightly with increased temperature. These results are consistent with previous work on p-n junction silicon solar cells. The diode quality factor n was shown to decrease with increased temperature, as predicted by field emission theory. The room-temperature photovoltaic output of cell 96 remained at 0.54 V, 25.4 mA/sq cm, and 8.5-10.6% efficiency using 80-100-mW/sq cm sunlight illumination after repeated temperature cycling. (Author)

A75-34314 # **Investigation of the electrical and temperature characteristics of a silicon photoelectric converter under natural conditions (Issledovanie elektricheskikh i temperaturnykh kharakteristik kremnievogo fotoelektricheskogo preobrazovatelia v naturnykh usloviiakh).** M. Ia. Bakirov and N. P. Aliev (Akademiia Nauk Azerbaidzhanskoi SSR, Institut Fiziki, Baku, Azerbaidzhan SSR). *Geliotekhnika,* no. 1, 1975, p. 9-11. In Russian.

A75-34315 # **Method of calibrating a solar power plant with a paraboloidal mirror (Sposob tarirovki gelioustanovki s paraboloidal'nym zerkalom).** V. V. Bystrov, V. I. Zhuk, and Iu. I. Machuev. *Geliotekhnika,* no. 1, 1975, p. 26-31. In Russian.

In the alternative method proposed, a molybdenum rod with a thermocouple mounted at the irradiated end is used as the calorimeter. The specific heat flux absorbed by the calorimeter is determined from the changes in the temperature of the irradiated external surface of the calorimeter. Knowing the absorption coefficient of the solar-spectrum rays and the solar radiation intensity (determined with an actinometer), it is then possible to calculate both the density of the heat flux concentrated on the calorimeter and the degree of concentration of the solar energy reflected by the mirror. V.P.

A75-34317 # **Determination of some thermophysical characteristics of a solar-type pebble accumulator (Opredelenie nekotorykh teplofizicheskikh kharakteristik galechnogo akkumuliatora solnechnogo tepla).** G. Ia. Umarov, R. R. Avezov, S. O. Khatamov, and M. Sharipova (Akademiia Nauk Uzbekskoi SSR, Fiziko-Tekhnicheskii Institut, Tashkent, Uzbek SSR). *Geliotekhnika,* no. 1, 1975, p. 38-41. 7 refs. In Russian.

A75-34320 # **Complex utilization of a solar power plant (Kompleksnoe ispol'zovanie solnechnoi ustanovki).** R. B. Salieva (Tashkentskii Institut Sviazi, Tashkent, Uzbek SSR). *Geliotekhnika,* no. 1, 1975, p. 65-71. In Russian.

The present work proposes a method for complex utilization of a solar power plant in pasture regions where underground springs are the only water source. The plant operates alternately in furnishing power to well pumps and in replenishing its storage cells. Algorithms for optimal control of the plant are given. P.T.H.

A75-34321 # **Solar heating and cooling of buildings using heat pumps /Brief survey/ (Teplonasosno-solnechnoe otoplenie i okhlazhdenie pomeshchenii /Kratkii obzor/).** O. L. Shvaleva, R. A. Zakhidov, and R. R. Avezov (Akademiia Nauk Uzbekskoi SSR, Fiziko-Tekhnicheskii Institut, Tashkent, Uzbek SSR). *Geliotekhnika,* no. 1, 1975, p. 72-79. 31 refs. In Russian.

The present work discusses the use of heat pumps of different types for alternate heating of rooms and water during winter and cooling during summer. The main characteristics of some commercial, industrial, and scientific heat pumps available are summarized. The use of heat pumps in conjunction with hot-box type solar power plants is discussed briefly. P.T.H.

A75-34531 **Evaluation of central solar tower power plant.** C. R. Easton, R. W. Hallet, Jr., S. Gronich, and R. L. Gervais (McDonnell Douglas Astronautics Co., Huntington Beach, Calif.). In: International Conference on Systems, Man, and Cybernetics, Dallas, Tex., October 2-4, 1974, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 77-82. NSF-supported research.

A baseline design for heliostat, receiver, tower, and energy transport subsystems for a solar tower power plant has been defined down to the major component level. Preliminary manufacturing plans have been prepared for component fabrication, assembly, and installation. Capital costs have been estimated for the baseline design. The major cost element, other than the power plant, is the heliostat and its supportive equipment. The complete collector system is estimated to cost between $3 and $4/square foot ($30 to $40/square meter) installed. This corresponds to a levelized, fixed charge cost for generating energy of 15 to 20 mills/kwh electric exclusive of operation, maintenance, and plant parasitic load costs, which is competitive with current oil prices and may become competitive with coal at prices projected to the midpoint of operation of the solar power plant. (Author)

A75-34532 **A commentary on solar energy.** F. E. Rom (Solar Energy Products Co., Avon Lake, Ohio). In: International Conference on Systems, Man, and Cybernetics, Dallas, Tex., October 2-4, 1974, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 83-87. 9 refs.

A brief overview of solar energy is presented emphasizing the economic potential and opportunity for individual invention in this field. The optimistic review claims that a billion-dollar-per-year sales volume could be generated in the solar power industry within 5-10 years. It contends that teams of super-skilled personnel operating in large high-technology facilities backed by government funding would not be required. S.J.M.

A75-34533 **Economic and technical aspects of wind generation systems.** R. Ramakumar, W. L. Hughes, and H. J. Allison (Oklahoma State University, Stillwater, Okla.). In: International Conference on Systems, Man, and Cybernetics, Dallas, Tex., October 2-4, 1974, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 88-92. 15 refs. NSF Grant No. GI-39457.

Wind energy systems have the potential to provide a viable alternative to fossil fuels to satisfy the ever-increasing energy appetite of the world. A simplified economic analysis of wind energy systems of the type being developed at Oklahoma State University is presented and the calculated generation costs in mills per kWh are compared with those of conventional fuel-burning systems for different fuel costs, load factors and interest rates. The results show that certain aspects of wind energy conversion can, at present, generate energy at costs competitive with conventional systems and that more favorable conditions can be expected in the future as fossil fuels become scarce and fuel costs go up further as predicted. (Author)

A75-34607 # **Recuperator development trends for future high temperature gas turbines.** C. F. McDonald. *American Society of Mechanical Engineers, Gas Turbine Conference and Products Show, Houston, Tex., Mar. 2-6, 1975, Paper 75-GT-50.* 24 p. 21 refs. Members, $1.00; nonmembers, $3.00.

The current energy crisis and substantial increases in the costs of liquid and gaseous fuels, combined with reduced pollutant emission requirements, make the higher efficiency recuperative gas turbine cycle economically attractive for industrial and vehicular application. For future low cost, high temperature, small gas turbines, with improved cycle efficiencies, it is postulated that the complete hot section of the engine (combustor, ducts, turbine nozzle and rotor) will be all ceramic and may include a ceramic heat exchanger. Few of the answers are available today in the areas of ceramic recuperator performance, cost and structural integrity and concentrated development efforts are required to demonstrate the viability of a fixed boundary ceramic gas turbine heat exchanger. This paper briefly outlines possible design and development trends in the areas of exchanger configuration, surface geometry and materials, and it includes specific sizes and economic aspects of ceramic recuperators for future advanced low SFC gas turbines. (Author)

A75-34620 # **Component design considerations for gas turbine HTGR power plant.** C. F. McDonald, R. G. Adams, F. R. Bell, and P. Fortescue (General Atomic Co., San Diego, Calif.). *American Society of Mechanical Engineers, Gas Turbine Conference and Products Show, Houston, Tex., Mar. 2-6, 1975, Paper 75-GT-67.* 18

p. 7 refs. Members, $1.00; nonmembers, $3.00.

The gas turbine high-temperature gas-cooled reactor (HTGR) power plant combines the existing design HTGR core with a closed-cycle helium gas turbine power conversion system directly in the reactor primary circuit. The high density helium working fluid results in a very compact power conversion system. While the geometrics of the helium turbomachinery, heat exchangers, and internal gas flow paths differ from air breathing gas turbines because of the nature of the working fluid and the high degree of pressurization, many of the aerodynamic, heat transfer and dynamic analytical procedures used in the design are identical to conventional open-cycle industrial gas turbine practice. This paper outlines some of the preliminary design considerations for the rotating machinery, heat exchangers, and other major primary system components for an integrated type of plant embodying multiple gas turbine loops. The high potential for further improvement in plant efficiency and capacity, for both advanced dry-cooled and waste heat power cycle versions of the direct-cycle nuclear gas turbine, is also discussed. (Author)

A75-34850 **Fuels, minerals, and human survival.** C. B. Reed. Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., 1975. 206 p. 28 refs. $12.50.

The design and the operation of a nuclear power plant is discussed along with questions of waste disposal, aspects of safety and pollution, breeder reactors, and considerations regarding the growth of electric power consumption. Alternate energy systems are examined, taking into account power from fusion, sun-power systems, interim sources of power, and the significance of the coal resources. Problems of conservation and depletion are also considered. G.R.

A75-34928 **Wind energy utilization prospects.** R. Ramakumar, W. L. Hughes, and H. J. Allison (Oklahoma State University, Stillwater, Okla.). In: Institute of Environmental Sciences, Annual Technical Meeting, 21st, Anaheim, Calif., April 14-16, 1975, Proceedings. Volume 1. Mount Prospect, Ill., Institute of Environmental Sciences, 1975, p. 138-142. 14 refs. NSF Grant No. GI-39457.

The chief technical, economic, and environmental aspects of wind energy utilization are considered. One approach being studied is to allow the aeroturbine RPM to vary with wind velocity and employ variable-speed, constant-frequency generating systems to obtain constant-frequency power to be pumped into existing utility mains. Study of generation costs for wind energy systems indicates that wind energy has the potential to be competitive at present as a supplemental energy source. Wind energy systems appear to be environmentally benign, though more research is needed on the impact of large scale wind energy utilization. P.T.H.

A75-34931 **Solar air conditioning systems using Rankine power cycles - Design and test results of prototype three ton unit.** R. E. Barber (Barber-Nichols Engineering Co., Denver, Colo.). In: Institute of Environmental Sciences, Annual Technical Meeting, 21st, Anaheim, Calif., April 14-16, 1975, Proceedings. Volume 1. Mount Prospect, Ill., Institute of Environmental Sciences, 1975, p. 170-179. Research supported by Honeywell, Inc.

Design, operation, and performance of a solar Rankine cycle air conditioning system are reported. The system consists of a Rankine power cycle operating on Refrigerant 113 and a vapor compressor cooling system operating on Refrigerant 12. Test data showed a Rankine cycle efficiency of 9% and an air conditioning COP of 7.4, giving an overall COP of 0.5. It is predicted that the Rankine cycle system would greatly outperform an absorption system when coupled with a concentrating solar collector. P.T.H.

A75-34932 **Modeling of solar absorption air conditioning.** R. L. San Martin and W. A. Couch (New Mexico State University, Las Cruces, N. Mex.). In: Institute of Environmental Sciences, Annual Technical Meeting, 21st, Anaheim, Calif., April 14-16, 1975, Proceedings. Volume 1. Mount Prospect, Ill., Institute of Environmental Sciences, 1975, p. 186-189. 15 refs.

The object of this paper is to study the performance and optimization of absorption air conditioning systems utilizing low temperature heat sources presently obtainable using flat-plate solar collectors. Computer simulation is performed on both simple and modified absorption systems utilizing second law thermodynamic cycle analysis on three absorber-refrigerant pairs: lithium bromide-water, water-ammonia, sodium thiocyanate-ammonia. Sink temperatures were varied in accordance with temperatures which can be achieved using both air heat exchanges and cooling towers. The absorber-refrigerant pairs were compared using results of the thermodynamic cycle analysis and their own inherent properties. Parameters necessary to solar energy utilization were emphasized in comparison of the pairs. Absorption cycle efficiencies were studied using each of the refrigerant pairs with changes in sources and sink temperatures. (Author)

A75-34933 **Heating buildings with solar energy.** E. A. Farber, C. A. Morrison, H. A. Ingley, and F. J. Tarud (Florida, University, Gainesville, Fla.). In: Institute of Environmental Sciences, Annual Technical Meeting, 21st, Anaheim, Calif., April 14-16, 1975, Proceedings. Volume 1. Mount Prospect, Ill., Institute of Environmental Sciences, 1975, p. 190-193.

A general description of a solar heating system used for room heating, cooking, water heating, drying clothes, and electrical consumption for cooling and heating, is given. A degree day analysis for Gainesville, Florida, indicated that the solar heating system would consume 126 kWh of electricity during the winter months, giving a 92% reduction of energy consumption when compared to a heat pump, or a savings of 295 dollars annually. P.T.H.

A75-34934 **Solar characteristics of new absorptive coatings used on solar collectors.** E. A. Farber, C. A. Morrison, J. T. Pytlinski, H. A. Ingley (Florida, University, Gainesville, Fla.), and H. A. Clark (Dow Corning Corp., Midland, Mich.). In: Institute of Environmental Sciences, Annual Technical Meeting, 21st, Anaheim, Calif., April 14-16, 1975, Proceedings. Volume 1. Mount Prospect, Ill., Institute of Environmental Sciences, 1975, p. 194-197.

The characteristics of various absorptive coatings in the presence of clear sky radiation are discussed. The performance of the coatings is evaluated relative to their physical parameters such as: pigment binder ratio, coating, thickness, type of binder and type of pigment, as well as pigment size. Binders based on resin and alcohol/water and pigments of several particle's sizes were used. Commercially available black iron oxide having particle sizes from a few microns to about 149 microns were selected as the pigment to be evaluted. The absorptivity of the black iron oxide coatings is compared with the absorptivity of a coating which uses black carbon as pigment. (Author)

A75-34935 **Methodology of research of flat-plate solar collector absorptive coatings.** E. A. Farber, C. A. Morrison, J. T. Pytlinski, and H. A. Ingley (Florida, University, Gainesville, Fla.). In: Institute of Environmental Sciences, Annual Technical Meeting, 21st, Anaheim, Calif., April 14-16, 1975, Proceedings. Volume 1. Mount Prospect, Ill., Institute of Environmental Sciences, 1975, p. 198-201. 5 refs.

Several new types of coatings were developed and tested in the Solar Energy Laboratory of the University of Florida. The procedure for the preparation of the coatings using black iron oxide or carbon black as pigment and various Dow Corning resins as binders is presented in detail. Testing procedures under clear-sky solar radiation and using simulated radiation in laboratory conditions are described. The measurement methods, apparatus used to collect data and the Coating Performance Factor determination are also presented. The information furnished will provide a background information which should be helpful when organizing and integrating coating processing and testing facilities into a solar energy research activities. (Author)

A75-34936 **The University of Florida solar powered intermittent ammonia/water absorption air conditioner.** E. A. Farber, C. A. Morrison, H. A. Ingley, and E. Suarez (Florida, University, Gainesville, Fla.). In: Institute of Environmental Sciences, Annual Technical Meeting, 21st, Anaheim, Calif., April 14-16, 1975, Proceedings. Volume 1. Mount Prospect, Ill., Institute of Environmental Sciences, 1975, p. 202-205. 9 refs.

A75-34937 **An ecologic solar heated and cooled home.** B. Anderson and D. Coonley. In: Institute of Environmental Sciences, Annual Technical Meeting, 21st, Anaheim, Calif., April 14-16, 1975, Proceedings. Volume 1. Mount Prospect, Ill., Institute of Environmental Sciences, 1975, p. 206-210.

A solar heated and cooled house is described that incorporates principles of ecology and energy conservation. The house uses heat from flat plate, vertical wall solar collectors and wood heaters. Cooling is provided by natural ventilation from the shaded side of the house. The cool air flows through the spaces inside the house and out through the floor level air inlet of the solar collector, and is drawn out through a vent in the top of the solar collector using natural air convection. P.T.H.

A75-35096 **DFVLR activities in the area of energy research (DFVLR-Aktivitäten auf dem Gebiet der Energieforschung).** U. Sprengel (Deutsche Forschung- und Versuchsanstalt für Luft- und Raumfahrt, Abteilung Programmvorbereitung, Porz-Wahn, West Germany). *DFVLR-Nachrichten,* June 1975, p. 640-643. In German.

The activities considered are related to investigations concerning the long-term replacement of conventional fuels, the more efficient use of conventional fuels, the reduction of harmful effects of energy-transforming processes on the environment, and the enhancement of the economy and safety of mobile and stationary fluid kinetic machines. Attention is also given to the optimization of independent mobile and stationary power supply systems, the direct utilization of solar radiation, the utilization of wind energy, and the improvement of isolation and climatic technology in the case of buildings. G.R.

A75-35438 **Helium survey, a possible technique for locating geothermal reservoirs.** A. A. Roberts, I. Friedman, T. J. Donovan, and E. H. Denton (U.S. Geological Survey, Denver, Colo.). *Geophysical Research Letters,* vol. 2, June 1975, p. 209, 210.

Measurements were made of the helium concentration in the soil gases surrounding the Indian Hot Springs, Idaho Springs, Colorado. The helium concentration was shown to vary in a regular manner from the background level of 5.2 ppm to a high of more than 100 ppm near a warm (26 C) water seep, and more than 1000 ppm near a hot (40 C) water seep. Such an association of helium in the soil gas with these hot waters near the earth's surface suggests the possible utility of helium surveys in locating hidden geothermal reservoirs. (Author)

A75-35451 **Remote sensing applied to energy-related problems; Proceedings of the Symposium-Course, Miami, Fla., December 2-4, 1974.** Symposium sponsored by the University of Miami. Edited by T. N. Veziroglu (Miami, University, Coral Gables, Fla.). Coral Gables, Fla., University of Miami, 1974. 415 p. $35.

Papers are presented which report on progress in the development of remote sensing techniques as they relate to the search for and exploitation of energy resources. Some of the topics covered include spacecraft monitoring of the marine environment with microwave sensors, radar applications to weather analysis and forecasting and to precipitation climatology, laser measurement of sea salinity, temperature and turbidity in depth; remote sensing for western coal and oil shale development planning and environmental analysis; exploration for nuclear and fossil fuels by remote sensing techniques; satellite detection of air pollutants, and the satellite solar power station option. P.T.H.

A75-35458 # **Remote sensing for Western coal and oil shale development planning and environmental analysis.** H. D. Parker (Western Scientific Services, Inc., Fort Collins, Colo.). In: Remote sensing applied to energy-related problems; Proceedings of the Symposium-Course, Miami, Fla., December 2-4, 1974. Coral Gables, Fla., University of Miami, 1974, p. S4-3 to S4-25.

There are two broad categories of application for remote sensing technology in the development of fossil fuel resources in the Western U.S. The first includes pre-construction site evaluations, land use and usability mapping, and environmental baseline data acquisition. The second category involves long-term environmental monitoring. The geographic magnitude of these developments, particularly when multiple mines or processing plants are considered on a regional scale, precludes the use of conventional ground-based analysis techniques. The time frame in which these resources must be developed also limits the utility of conventional methods. This paper will discuss both categories of remote sensing applications and the overall role that remote sensing can play in furthering the national goal of major dependency on internal sources of energy. (Author)

A75-35461 # **Determining potential solar power sites in western hemisphere ocean and land areas based upon satellite observations of cloud cover.** H. W. Hiser and H. V. Senn (Miami, University, Coral Gables, Fla.). In: Remote sensing applied to energy-related problems; Proceedings of the Symposium-Course, Miami, Fla., December 2-4, 1974. Coral Gables, Fla., University of Miami, 1974, p. A-3 to A-16. 16 refs.

A75-35464 # **Multispectral data systems for energy related problems.** C. L. Wilson and R. H. Rogers (Bendix Corp., Ann Arbor, Mich.). In: Remote sensing applied to energy-related problems; Proceedings of the Symposium-Course, Miami, Fla., December 2-4, 1974. Coral Gables, Fla., University of Miami, 1974, p. A-35 to A-68. 7 refs.

A multispectral data system consists of data collection, data processing, data analysis and interpretation, and information dissemination (application) subsystems. The ERTS MSS and the data processing facility at Goddard Space Flight Center are examples of the first two subsystems respectively. The characteristics of airborne and satellite digital multispectral scanner data will be described, as will the digital data processing and analysis techniques which have been developed to automatically analyze and interpret the data. Techniques for output product generation and information dissemination will be illustrated using strip mine monitoring and environmental impact assessment for power plant siting and transmission line routing as examples. The problems associated with the development of semiautomated performance of the cited applications will be discussed, as will current status of the development programs. (Author)

A75-35465 # **The satellite solar power station option.** P. E. Glaser (Arthur D. Little, Inc., Cambridge, Mass.). In: Remote sensing applied to energy-related problems; Proceedings of the Symposium-Course, Miami, Fla., December 2-4, 1974. Coral Gables, Fla., University of Miami, 1974, p. A-69 to A-98. 19 refs.

The possibilities for using satellite solar power stations for large-scale power generation on earth, converting solar energy into microwave energy, transmitting it to the earth's surface, and transforming it into electricity have recently been explored. The current state of technology and the necessary developments for accomplishing the four functions - i.e., collection of solar energy, conversion to and transmission of microwaves and rectification to dc on the ground - are reviewed. The requirements for flight control, earth to orbit transportation and orbital assembly are discussed. Considerations are given to cost projections, resource use and economics. Environmental issues, including impact of waste heat release, water injection into the upper atmosphere by space vapor exhaust, and location of antenna sites are listed. Biological effects and radio frequency interference are explored. The time frame for accomplishing the operational system is outlined. (Author)

A75-35920 **Plasma heating methods (Les méthodes de chauffage d'un plasma).** T. Consoli. *Entropie,* vol. 11, no. 61, 1975, p. 41-54. 94 refs. In French.

The problem of heating a toroidally confined plasma to thermonuclear reactor ignition temperatures is stated, and several proposed solutions to it are described. The necessity for an extra heating source is demonstrated. Heating techniques reviewed comprise adiabatic magnetic compression, heating by rapid neutron beams, heating by electromagnetic waves, heating by magnetic pumping during transit time, and heating at the inferior hybrid frequency. Two experimental setups are described: PETULA, a classical Tokamak, and WEGA, a Stellarator (a toroidal device with helical coils). S.J.M.

A75-36013 # **Temperature dependence of the spectral characteristics of quick-response silicon photocells (Temperaturnaia zavisimost' spektral'noi kharakteristiki maloinertsionnykh kremnievykh fotoelementov).** L. K. Buzanova, A. Ia. Gliberman, N. M. Gracheva, T. M. Golovner, and A. P. Landsman (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Istochnikov Toka, Moscow, USSR). *Geliotekhnika,* no. 2, 1975, p. 8-13. 7 refs. In Russian.

The spectral characteristics of p-Si photocells with a resistivity of 200 Ohm-cm were studied at temperatures ranging from -100 to +80 C. The influence of deep-seated impurity centers in the space charge region and of the mode of photocell operation on the spectral characteristics and on the temperature coefficient of the photocurrent is demonstrated. V.P.

A75-36015 # **Investigation of photoelectric converter operation under conditions of strong illumination (Issledovanie raboty fotopreobrazovatelei v usloviiakh sil'nogo osveshcheniia).** A. M. Vasil'ev, V. M. Evdokimov, A. P. Landsman, and A. F. Milovanov (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Istochnikov Toka; Moskovskii Energeticheskii Institut, Moscow, USSR). *Geliotekhnika,* no. 2, 1975, p. 18-24. 6 refs. In Russian.

The parameters of illuminated photoelectric converters are studied experimentally. It is shown that the observed dependence of carrier lifetime on the illumination intensity leads to a more pronounced dependence of the photocurrent and the photo-emf. Illumination-induced changes of the p-n junction boundary conditions lead at superhigh intensities to saturation of the photo-emf. V.P.

A75-36017 # **Determination of the surface shapes of film-type solar energy concentrators with seams (Opredelenie formy poverkhnostei plenochnykh kontsentratorov solnechnoi energii so shvami).** Iu. A. Solodiannikov, V. I. Vorotnikov, and A. M. Gafurov (Akademiia Nauk Uzbekskoi SSR, Fiziko-Tekhnicheskii Institut, Tashkent, Uzbek SSR). *Geliotekhnika,* no. 2, 1975, p. 43-49. 9 refs. In Russian.

Large-area solar energy concentrators are prepared by joining a number of film surfaces. The mechanical and optical properties of the concentrators change with the increase in film thickness at the joints. This makes it necessary to study the surface configurations of concentrators with joints of various type and to determine their influence on the concentrator characteristics. Analytical solutions are obtained to the linear problems of determining the deformed shape of a circular specular reflecting membrane with a diametral seam, and the deflections of a tread under a running load that represents the reaction of the thread on a loaded membrane. V.P.

A75-36018 # **Study of the influence of container design and the thermal inertness of solar water heaters on their efficiency (Issledovanie vliianiia konstruktsii kotla i teplovoi inertsionnosti geliovodonagrevatelei na ikh effektivnost').** R. R. Avezov and F. Soatov (Akademiia Nauk Uzbekskoi SSR, Fiziko-Tekhnicheskii Institut, Tashkent, Uzbek SSR). *Geliotekhnika,* no. 2, 1975, p. 69-72. In Russian.

The analysis is carried out for metallic and sand-type solar water heaters and for two specific positions of the sun. The geometrical dimensions and the mechanical and heat-engineering indexes are tabulated. The analysis shows that, all other conditions being equal, the efficiency of metallic water heaters is greater by a factor of 2.2. V.P.

A75-36173 **Survey on power fluid for thermal power from low temperature and small temperature difference heat source.** S. Koyama and T. Nakahara. *Mitsubishi Juko Giho,* vol. 12, no. 2, 1975, p. 220-227. 10 refs. In Japanese, with abstract in English.

The characteristics of various working fluids for thermal energy turbines are analyzed and compared in order to select the most efficient fluid among them. Parameters surveyed include energy transfer capacity, heat transfer availability, size of heat exchanger, volume flow rate of fluid at turbine inlet, cycle efficiency, system pressure and leakage losses, and mean diameter, blade length and boss ratio of turbine. It is concluded that R114 and propane are the best working fluids under the conditions studied. S.J.M.

A75-36233 **Effect of inhomogeneity of conductivity on end effect in a sectional MHD generator.** V. N. Zatelepin and S. A. Medin (Akademiia Nauk SSSR, Nauchno-Issledovatel'skii Institut Vysokikh Temperatur, Moscow, USSR). *(Teplofizika Vysokikh Temperatur,* vol. 12, Sept.-Oct. 1974, p. 1071-1077.) *High Temperature,* vol. 12, no. 5, May 1975, p. 937-942. Translation.

The electrical characteristics of an MHD generator with semi-infinite sectional electrodes are analyzed, assuming that the magnetic field decays exponentially beyond the electrodes. The inhomogeneity of the conductivity across the MHD channel is taken into consideration. The potential distribution in the end region of the channel is determined analytically. V.P.

A75-36260 # **Investigation of the optimal MHD-generator characteristics for combinational open-cycle MHD power generators (Issledovanie optimal'nykh kharakteristik MGD-generatora dlia kombinirovannykh MGDES otkrytogo tsikla).** B. Ia. Shumiatskii, V. I. Kovbasiuk, G. M. Koriagina, and P. P. Ivanov (Akademiia Nauk SSSR, Nauchno-Issledovatel'skii Institut Vysokikh Temperatur, Moscow, USSR). *Teplofizika Vysokikh Temperatur,* vol. 13, Mar.-Apr. 1975, p. 407-412. 9 refs. In Russian.

A method for obtaining optimal MHD-channel flows is developed, using an improved quasi-one-dimensional flow model. The optimality criterion is formulated by analyzing a MHD power generator. V.P.

A75-36274 **Efficient CuInSe2/CdS solar cells.** J. L. Shay, S. Wagner (Bell Telephone Laboratories, Inc., Holmdel, N.J.), and H. M. Kasper (Bell Telephone Laboratories, Inc., Murray Hill, N.J.). *Applied Physics Letters,* vol. 27, July 15, 1975, p. 89, 90. 12 refs.

Fabrication of and results obtained with a newly optimized CuInSe2/CdS heterojunction solar cell are described. A power conversion efficiency of 12% was observed on a clear day in New Jersey (92 mW/sq cm). Solar efficiency in devices less than 1 sq cm in active area was limited by a low open-circuit voltage, correlated with microcracks in the CuInSe2 substrate. An antireflection coating was applied by evaporation of SiO that increased the quantum efficiency of this cell from 0.80 to 0.90 at 6328 A. The lattices of the two semiconductors match well. S.J.M.

A75-36275 * **A 15% efficient antireflection-coated metal-oxide-semiconductor solar cell.** R. J. Stirn and Y. C. M. Yeh (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). *Applied Physics Letters,* vol. 27, July 15, 1975, p. 95-98. 11 refs. Contract No. NAS7-100.

A new effect is being developed which significantly improves the conversion efficiency of antireflection-coated metal-oxide-semiconductor (AMOS) solar cells. The effect, a marked increase in the open-circuit voltage, is produced by the addition of an oxide layer to the semiconductor. Cells using gold on n-type gallium arsenide have been made with efficiencies up to 15% in terrestrial sunlight. All processing steps are amenable to the use of low-cost polycrystalline films of GaAs in place of the single crystals now used. (Author)

A75-36295 **Electronbeam heating for fusion.** J. Benford (Physics International Co., San Leandro, Calif.). *Laser Focus,* vol. 11, July 1975, p. 45-48. 8 refs.

It is pointed out that for the early demonstration of the feasibility of controlled nuclear fusion utilizing electron or laser beams a suitable approach might be based on the employment of a linear configuration which contains a magnetically confined plasma. Plasma-heating processes are considered along with energy-absorption mechanisms, approaches for reducing energy losses, the definition of reactor dimensions, and fusion-feasibility experiments. G.R.

A75-36305 **Power collection reduction by mirror surface nonflatness and tracking error for a central receiver solar power system.** R. H. McFee (McDonnell Douglas Astronautics Co., Huntington Beach, Calif.). *Applied Optics,* vol. 14, July 1975, p. 1493-1502.

The effects of random waviness, curvature, and tracking error of plane-mirror heliostats in a rectangular array around a central-receiver solar power system are determined by subdividing each mirror into 484 elements, assuming the slope of each element to be representative of the surface slope average at its location, and summing the contributions of all elements and then of all mirrors in the array. Total received power and flux density distribution are computed for a given sun location and set of array parameter values. Effects of shading and blocking by adjacent mirrors are included in the calculation. Alt-azimuth mounting of the heliostats is assumed. Representative curves for two receiver diameters and two sun locations indicate a power loss of 20% for random waviness, curvature, and tracking error of 0.1 deg rms, 0.002 per m, and 0.5 deg, 3 sigma, respectively, for an 18.2-m diam receiver and 0.3 deg rms, 0.005 per m, and greater than 1 deg, respectively, for a 30.4-m diam receiver. (Author)

A75-36306 **Solar energy - The physics of the greenhouse effect.** M. Young. *Applied Optics,* vol. 14, July 1975, p. 1503-1508. 25 refs.

For practical reasons, it is likely that low-temperature solar collectors have a more immediate future than high-temperature or photovoltaic generation of electricity. This paper discusses the physics of bare and covered flat-plate collectors. The greenhouse effect is the result of reducing convection to the point that radiation trapping becomes important. Nevertheless, at collector temperatures within 20-30 C of ambient, convection from the collector surface is so important that a special absorber with low IR emissivity may be no more efficient than a good, black absorber. At higher temperatures, selective absorbers are desirable. In the low temperature range, collection efficiency can be kept well over 80%, but falls rapidly with increasing collector temperature. This suggests that solar power may see early application in conjunction with heat pumps for heating and air conditioning. (Author)

A75-36307 **Stationary concentrating reflector cum tracking absorber solar energy collector - Optical design characteristics.** W. G. Steward and F. Kreith (Colorado, University, Boulder, Colo.). *Applied Optics,* vol. 14, July 1975, p. 1509-1512. 9 refs.

This article presents an analysis of the optical design characteristics of a stationary reflecting/tracking absorber solar energy collector. This type of collector consists of a segment of a spherical mirror placed in a stationary position facing the sun, but having a linear absorber that can track the image of the sun by a simple pivoting motion about the center of curvature of the reflector. The optical characteristics of this system and the axial variation of its concentration ratio are developed to provide information for the engineering design and sizing of this type of solar energy collector system. (Author)

A75-36357 **Investigations of the factors affecting the performance of a rotating heat pipe.** T. C. Daniels and F. K. Al-Jumaily (Swansea, University College, Swansea, Wales). *International Journal of Heat and Mass Transfer,* vol. 18, July-Aug. 1975, p. 961-973. 23 refs.

The rotating heat pipe is a device which utilizes a two-phase heat-transfer cycle. Rotation about the longitudinal axis generates a centrifugal force field and a component of this acting along the tapered wall pumps the condensate back to the evaporator. A theoretical Nusselt type analysis is proposed for the condensate film taking into account the drag effects of contra-flowing vapor. A performance prediction relates rates of heat transfer, rotational speeds, temperature differences across condensate films, fluid properties and heat pipe geometry. Experimental investigation tests the analysis with good agreement for the two Arcton 113 and 21 fluids but no agreement with water. An explanation for this is proposed. (Author)

A75-36362 **The conversion efficiency of ideal Shockley p-n junction photovoltaic converters in concentrated sunlight.** F. Sterzer (RCA Laboratories, Princeton, N.J.). *RCA Review,* vol. 36, June 1975, p. 316-323. 9 refs.

A75-36363 **Silicon solar cells for highly concentrated sunlight.** R. H. Dean, L. S. Napoli, and S. G. Liu (RCA Laboratories, Princeton, N.J.). *RCA Review,* vol. 36, June 1975, p. 324-335. 7 refs.

Silicon solar cells yield 8% overall conversion efficiency at 800-1600 X peak concentration. Electrical sheet resistance and thermal and high-injection-level effects are not serious problems with proper cell design. (Author)

A75-36415 # **Problems of direct conversion of thermal and nuclear energy to electric energy (Problemi na priakoto prevr'shchane na toplinnata i iadrenata energiia v elektricheska).** E. M. Shelkov. *B'lgarska Akademiia na Naukite, Spisanie,* vol. 20, no. 5, 1975, p. 28-38. In Bulgarian.

A75-36500 **Modeling and computer simulation of a microwave-to-dc energy conversion element.** J. J. Nahas (Notre Dame, University, Notre Dame, Ind.). In: Microwaves in service to man; International Microwave Symposium, Palo Alto, Calif., May 12-14, 1975, Digest of Technical Papers. New York, Institute of Electrical and Electronics Engineers, Inc., 1975, p. 194-196. 9 refs.

A distributed modeling technique that includes skin-effect losses in transmission lines has been used to model a microwave-to-dc energy conversion element consisting of a dipole antenna, a low-pass filter, a Schottky barrier diode, and a dc filter. Computer simulation has demonstrated 70% conversion efficiency for the element and has shown that there is a resonance effect in the Schottky barrier diode that tends to generate strong higher harmonics. Most of the energy loss comes in the diode rectifier, as expected. S.J.M.

A75-36539 # **French activity in electric propulsion.** J. Mutin (Centre National d'Etudes Spatiales, Paris, France). In: European Electric Propulsion Conference, 3rd, Hinterzarten, West Germany, October 14-18, 1974, Proceedings. Cologne, Deutsche Gesellschaft für Luft- und Raumfahrt, 1974, p. 18-21.

French activities in the development of cesium bombardment and contact technologies are described. The present survey shows that attitude control is more critical in electric propulsion than in chemical propulsion. In addition, a three-axis stabilized body with sun-oriented solar arrays is considered as an example of a com-

munications satellite. It is concluded that thrust vectoring is necessary to achieving sufficient mass savings; that thruster characteristics must remain constant from one thrust to the next; and that thruster selection must be made on the system stabilization level.
S.J.M.

A75-36719 **Alternative fuels for aviation.** E. M. Goodger (Cranfield Institute of Technology, Cranfield, Beds., England). *Aeronautical Journal*, vol. 79, May 1975, p. 212-224. 17 refs.

Overall characteristics of alternative fuels, proposed to meet the desired technological improvements are discussed, together with the feasibility of using these possible replacements for petroleum products in the aviation industry. Low and high density fuels, hydride fuels, carbon containing fuels, vaporising and/or endothermically reacting fuels, hydrocarbon fuels, aromatic mixtures, liquid methane, liquid hydrogen, nitrogen hydrides, alcohols, nuclear fuels, and various mixtures are analyzed for their performance, levels of volumetric and combined gravimetric energy densities, handling safety, pollution, thermal stability and capacity, and availability.
M.G.

A75-36720 **Evaluation of the overall fuel mass penalty of an aircraft system.** R. Le Claire (Hawker Siddeley Aivation, Ltd., Kingston-on-Thames, Surrey, England). *Aeronautical Journal*, vol. 79, May 1975, p. 225-228.

A method for evaluating the fuel mass penalty incurred in flight after fitment of a system to an aircraft is discussed. The relative importance of the parameters involved in the method are shown, in particular, the relationship between fuel penalty due to system basic mass and that due to system drag. It is concluded that fuel penalty associated with drag is significantly more critical than that due to weight, therefore any drag reduction (without an increase in basic system mass) would result in substantial fuel savings and possibly increased payload.
M.G.

A75-36809 **Remote sensing applied to mine subsidence - Experience in Pennsylvania and the Midwest.** T. V. Leshendok, R. V. Amato, and O. R. Russell (Earth Satellite Corp., Washington, D.C.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 298-307.

Results of investigations are presented concerning the analysis of small- and large-scale color, color infrared, and black-and-white aerial photographs, as well as ERTS-1, side looking airborne radar, and multispectral imagery in order to detect mine subsidence and to correlate geological features with subsidence occurrence. Three types of surface expressions of mine subsidence are recognized: regional or areal subsidence; small, discrete subsidences called photoholes; and linear subsidence. It is shown that analysis of aerial remote sensing data makes it possible to identify surface subsidence features in hardly detectable areas, to determine linear geological features related to past or future subsidence occurrence, to establish relationships between subsidence and underground mine patterns, and to identify subsidence-prone areas for regional and local planning.
S.D.

A75-36811 **Net radiation and other energy-related maps from remotely sensed imagery.** R. W. Pease and D. A. Nichols (California, University, Riverside, Calif.). In: American Society of Photogrammetry, Annual Meeting, 41st, Washington, D.C., March 9-14, 1975, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1975, p. 322-333. 5 refs.

Synoptic maps showing the spatial distributions of energy-related phenomena over the terrestrial surface have not been feasible with previous traditional instruments and observation techniques. The advent of calibrated multispectral optical scanners, however, has made possible the rapid measurement of surface energy emittance and reflectance. Data acquired in a few minutes with scanners in airborne platforms can be translated into maps showing such things as urban heat islands, surface albedos, energy absorbed by the surface, and net radiation. An experiment using the ERIM M-7 scanner and Baltimore as a test-site city has yielded successfully isarithmic maps of these phenomena as they existed during an imaging overflight. Methods for acquiring calibrated data from a scanner and the creation of maps from image transparencies are described and evaluated.
(Author)

A75-37005 # **A non-polluting powerplant for large airships.** F. Morse (Boston University, Boston, Mass.). *American Institute of Aeronautics and Astronautics, Lighter Than Air Technology Conference, Snowmass, Colo., July 15-17, 1975, Paper 75-927.* 7 p. 7 refs.

A report is presented describing the features of an aircraft propulsion system which is characterized principally by (1) use of a Rankine cycle to transform chemical energy into shaft work and (2) use of liquid hydrogen as the energy source. Such a system would produce a nearly pollution-free exhaust and would have additional benefits of low sound level and marked improvement in specific fuel consumption over existing types. However, owing to relatively high specific weights, extensive condenser surfaces and the low volumetric heating value of hydrogen, the system as described would be exclusively applicable to large, lighter-than-air craft.
(Author)

A75-37008 # **The Shell natural gas airship, and other L.T.A. activities by Aerospace Developments.** J. E. R. Wood (Aerospace Developments, London, England). *American Institute of Aeronautics and Astronautics, Lighter Than Air Technology Conference, Snowmass, Colo., July 15-17, 1975, Paper 75-932.* 5 p.

Feasibility of transporting natural gas by means of lighter than air craft and the design of a large monocoque airship are studied. Neither the nonrigid, semirigid nor the Zeppelin type rigid craft are suitable for this application. Traditional methods of construction of airships are also not suitable, but tests have shown the adhesive bonding assembly techniques to be structurally advantageous, especially the honeycomb sandwich technique. The basic pre-assembly requirements for the 'unitary panel' which forms the basis of the hull structure of the airship are presented. The gas separator and the transverse membranes are discussed, in addition to the main propulsion system, control systems, and the mode of operation. An 8 million cu.ft. ship is predicted to fly by 1979 and the 'fleet size' craft of 100 million cu.ft. by 1984.
M.G.

A75-37154 **Controlling the response of thermoelements that generate electricity.** V. P. Babin and E. K. Iordanishvili. *(Geliotekhnika, no. 5, 1974, p. 3-8.) Applied Solar Energy*, vol. 10, no. 5-6, 1974, p. 1-5. Translation.

Conditions permitting the reduction of time lag without decreasing geometrical dimensions in solar collectors are formulated and substantiated. For the two thermoelement models considered (plate model and half-space model), it is shown that virtually identical thermal flux densities are required for accelerated attainment of regime. The half-space model does not necessitate the creation of thermoelements of minimum height; moreover, there is no need to remove waste heat from the cold side over the time interval that this model and its associated mathematical expressions remain valid.
S.J.M.

A75-37155 **Optimization of the operating conditions of a combined generator-cooler thermoelement.** V. P. Babin and E. K. Iodanishvili. *(Geliotekhnika, no. 5, 1974, p. 9-12.) Applied Solar Energy*, vol. 10, no. 5-6, 1974, p. 6-9. 6 refs. Translation.

The problem of combining Seebeck-effect thermal electric generator and Peltier-effect thermal cooling elements into one unit that directly converts heat into 'cold' is treated. A single-value condition is considered such that this combined thermoelement operates at maximum efficiency, and a simple analytical expression for this condition is given, along with a formula that directly yields the necessary ratio of generator and cooler resistances. S.J.M.

A75-37157 **Energy distribution in the concentration field of a two-mirror device with a paraboloidal back reflector.** D. A. Kirgizbaev and R. A. Zakhidov (Akademiia Nauk Uzbekskoi SSR, Fiziko-Tekhnicheskii Institut, Tashkent, Uzbek SSR). *(Geliotekhnika,* no. 5, 1974, p. 20-24.) *Applied Solar Energy,* vol. 10, no. 5-6, 1974, p. 16-19. Translation.

The effective disposition of the heating plane in the region of convergence of twice-reflected rays (Z-max - Z-min) in a two-mirror device with a paraboloidal back reflector is ascertained, and the energy distribution over the heating spot is determined. It is found that the use of the paraboloidal back reflector degrades the characteristics of a two-mirror system by a factor of several times as compared to a hyperboloidal back reflector. The maximum energy density with the paraboloidal reflector, however, remains high enough for high-temperature processes and experiments to be conducted. S.J.M.

A75-37159 **Generation of electric power at high reliability levels using a group of solar power plants in an energy system.** B. V. Tarnizhevskii and A. N. Smirnova (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Istochnikov Toka, Moscow, USSR). *(Geliotekhnika,* no. 5, 1974, p. 36-43.) *Applied Solar Energy,* vol. 10, no. 5-6, 1974, p. 29-34. Translation.

The possibility of equilibrating and stabilizing generated capacity and power through parallel operation of a group of solar power plants in an energy system is estimated. Such a system is shown to be much more reliable than individual power plants, which are subject to greater total variations in incident light. I.e., the radiation intensity that can be realized at a high reliability level (99%) is 4-5 times higher with an integrated system than with individual installations. Mathematical analyses are presented to support this claim. S.J.M.

A75-37160 **Principles of a composite study involving combined use of solar and wind energy.** R. B. Salieva (Tashkentskii Elektrotekhnicheskii Institut Sviazi, Tashkent, Uzbek SSR). *(Geliotekhnika,* no. 5, 1974, p. 48-52.) *Applied Solar Energy,* vol. 10, no. 5-6, 1974, p. 35-38. Translation.

A theoretical comparison of the productivity of wind and solar power installations, as determined from variations in wind speed and solar radiation intensity, is given. The productivities are represented as regular stochastic processes. The complementary nature of the annual chronological variation patterns of wind and solar energy fluxes suggests combined use of these sources. S.J.M.

A75-37161 **Generalizations of composite studies involving combined use of wind and solar energy.** R. B. Salieva (Tashkentskii Elektrotekhnicheskii Institut Sviazi, Tashkent, Uzbek SSR). *(Geliotekhnika,* no. 5, 1974, p. 53-58.) *Applied Solar Energy,* vol. 10, no. 5-6, 1974, p. 39-42. Translation.

Sample calculations were made using the composite method for the situation of water supply to pastures and electrical power supply to radio relay stations; results of these calculations are presented. Wind and solar installations were assumed to operate simultaneously and to have a common electrical accumulator; this accumulator supplies power when neither of the installations is functioning. The advantages of combined utilization of wind and solar energy are demonstrated, particularly in the case of relatively small-scale consumers spread out over an extensive, transportationally rigorous terrain. S.J.M.

A75-37162 **Full-scale tests of 'photovolt' high-voltage photocells at high light flux levels.** U. A. Arifov, M. Gaibnazarov, B. N. Dzhalilov, A. I. Kulagin, A. P. Landsman, and D. S. Strebkov (Akademiia Nauk Uzbekskoi SSR, Institut Elektroniki, Tashkent Uzbek SSR; Vsesoiuznyi Nauchno-Issledovatel'skii Institut Istochnikov Toka, Moscow, USSR). *(Geliotekhnika,* no. 6, 1974, p. 3-9.) *Applied Solar Energy,* vol. 10, no. 5-6, 1974, p. 49-54. 7 refs. Translation.

High-voltage silicon photoelectric converters of the 'fotovol't' type are applicable for large-scale power generation. Experiments were performed to determine the power characteristics of such photoelements using focusing devices to concentrate the solar radiation fluxes on them. The optimal operating regimes of the photocells was studied in order to develop proposals for the construction of an electric power plant. Two types of focusing devices were used to concentrate the light on the photoelement: a faceted device consisting of 40 plane reflectors, which increased the light flux by a factor of 40, and a parabolic reflector, which increased the flux by a factor of 200. The experiments allowed a determination of the realistic feasibility of using reflectors to increase the specific power of solar batteries. A.T.S.

A75-37163 **Photoelectric energy converter temperature sensor.** L. L. Silin and A. Kh. Cherkasski (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Istochnikov Toka, Moscow, USSR). *(Geliotekhnika,* no. 6, 1974, p. 13-15.) *Applied Solar Energy,* vol. 10, no. 5-6, 1974, p. 58-60. 5 refs. Translation.

The resistive temperature sensors usually used on photoelectric cells are not transparent to visible light and, therefore, cannot be used on the illuminated side of the cells. A description is given of a thermoresistive sensor developed to minimize the masking effect. Such sensors have performed reliably for two years of continuous use. A.T.S.

A75-37164 **Dynamic calculation of semiconductor photoconverter series resistance.** A. S. Lisin (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Istochnikov Toka, Moscow, USSR). *(Geliotekhnika,* no. 6, 1974, p. 16-23.) *Applied Solar Energy,* vol. 10, no. 5-6, 1974, p. 61-67. Translation.

A dynamic method is proposed for calculating the series resistance of a semiconductor photoelectric cell. The method allows one to express the series resistance in terms of the dynamic resistance of the p-n junction and the rear contact. The analysis is made for the most widespread type of photocell, with a continuous rear contact and a front contact in the form of a band around the perimeter of the doped layer. The dependences of the series resistance on the dynamic resistance are graphed for various values of the spreading resistance of the doped layer; the dynamic resistance of the rear region, including the base and the rear contact; and the dimensions of the photocell. It is shown that the series resistance can increase by more than a factor of 3 in going from no-load to short-circuit conditions. A.T.S.

A75-37165 **Photoelectric generator testing in the Azerbaidzhan SSR mountains.** N. V. Pul'manov, M. Ia. Bakirov, N. P. Aliev, and V. N. Potapov (Akademiia Nauk Azerbaidzhanskoi SSR, Fizicheskii Institut, Baku, Azerbaidzhan SSR). *(Geliotekhnika,* no. 6, 1974, p. 27-30.) *Applied Solar Energy,* vol. 10, no. 5-6, 1974, p. 70-72. 5 refs. Translation.

Results are presented from a one-year test of photoelectric generator under natural conditions in a mountainous region of the Azerbaidzhan SSR. The experiment was conducted to determine the feasibility of using such generators as autonomous power sources for cathodic protection of support towers for high-voltage electric-transmission lines in remote areas. The current-voltage load characteristics and the daily and seasonal variation in the power output of the device are discussed. A.T.S.

A75-37166 **Fabricating paraboloidal high-temperature solar concentrators from mollified sectors.** G. Ia. Umarov, A. K. Alimov, A. Abduazizov, and M. Usmanov (Akademiia Nauk Uzbekskoi SSR, Fiziko-Tekhnicheskii Institut, Tashkent, Uzbek SSR). *(Geliotekhnika,* no. 6, 1974, p. 31-36.) *Applied Solar Energy,* vol. 10, no. 5-6, 1974, p. 73-77. 12 refs. Translation.

Solar-energy concentrators in the form of paraboloidal mirrors 1.5 and 2.0 m in diameter were produced by assembling glass sectors which had been formed from flat plates by heat and vacuum treatment. The costs of the reflecting element and the framework were calculated. It was found that the cost increases with the number of sectors: a 1.5-m concentrator having 12 sectors would cost about 34 rubles, while one with 8 sectors would cost 27 rubles. A.T.S.

A75-37240 * # **Summary of NASA-Lewis Research Center solar heating and cooling and wind energy programs.** R. W. Vernon (NASA, Lewis Research Center, Cleveland, Ohio). *University of Alabama, Southeastern Conference on Application of Solar Energy, Huntsville, Ala., Mar. 24-26, 1975, Paper.* 23 p. 12 refs.

NASA is planning to construct and operate a solar heating and cooling system in conjunction with a new office building being constructed at Langley Research Center. The technology support for this project will be provided by a solar energy program underway at NASA's Lewis Research Center. The solar program at Lewis includes: testing of solar collectors with a solar simulator, outdoor testing of collectors, property measurements of selective and nonselective coatings for solar collectors, and a solar model-systems test loop. NASA-Lewis has been assisting the National Science Foundation and now the Energy Research and Development Administration in planning and executing a national wind energy program. The areas of the wind energy program that are being conducted by Lewis include: design and operation of a 100 kW experimental wind generator, industry-designed and user-operated wind generators in the range of 50 to 3000 kW, and supporting research and technology for large wind energy systems. An overview of these activities is provided. (Author)

A75-37243 * # **Porous matrix structures for alkaline electrolyte fuel cells.** R. W. Vine and S. T. Narsavage (United Technologies Corp., South Windsor, Conn.). *Electrochemical Society, Meeting, 147th, Toronto, Canada, May 11-16, 1975, Paper.* 9 p. Contract No. NAS3-15339.

A number of advancements have been realized by a continuing research program to develop higher chemically stable porous matrix structures with high bubble pressure (crossover resistance) for use as separators in potassium hydroxide electrolyte fuel cells. More uniform, higher-bubble-pressure asbestos matrices were produced by reconstituting Johns-Manville asbestos paper; Fybex potassium titanate which was found compatible with 42% KOH at 250 F for up to 3000 hr; good agreement was found between bubble pressures predicted by an analytical study and those measured with filtered structures; Teflon-bonded Fybex matrices with bubble pressures greater than 30 psi were obtained by filtering a water slurry of the mixture directly onto fuel cell electrodes; and PBI fibers have satisfactory compatibility with 42% KOH at 250 F. S.J.M.

A75-37331 **Optical interfaces in solar energy utilization.** A. B. Meinel (Arizona, University; Helio Associates, Inc., Tucson, Ariz.). In: Effective systems integration and optical design; Proceedings of the Seminar, San Diego, Calif., August 21-23, 1974. Palos Verdes Estates, Calif., Society of Photo-Optical Instrumentation Engineers, 1975, p. 12-16. NSF Grant No. GI-41895.

Potential approaches for utilizing solar energy are examined. It is concluded that it would be difficult to obtain consumer acceptance for systems providing solar heating and cooling for homes. However, solar electrical power via community or central power stations meets the requirement of minimum perturbation of the current socio-economic system. It is thought that economically feasible solar power systems could be developed within a decade of intensive work. The chief problems are related to the optical interface between the incoming sunlight and the using system. G.R.

A75-37396 * # **The effect of sunshine testing on terrestrial solar cell system components.** A. F. Forestieri and E. Anagnostou (NASA, Lewis Research Center, Cleveland, Ohio). *Institute of Electrical and Electronics Engineers, Photovoltaic Specialists Conference, 11th, Phoenix, Ariz., May 6-8, 1975, Paper.* 7 p.

Samples of FEP-encapsulated silicon solar cells and various potential encapsulation or cover materials were subjected to both accelerated and real-time testing. The durability of the samples was determined by measuring changes in solar cell output or optical transmission as a function of exposure. The tests revealed some problem areas in the structural integrity of the materials, e.g., delamination and cracking in FEP. These problems were probably related to defects in fabrication. FEP and Aclar had the least transmission loss after accelerated exposure equivalents of 5 and 3 years, respectively. S.J.M.

A75-37397 * # **V-grooved silicon solar cells.** C. R. Baraona and H. W. Brandhorst (NASA, Lewis Research Center, Cleveland, Ohio). *Institute of Electrical and Electronics Engineers, Photovoltaic Specialists Conference, 11th, Phoenix, Ariz., May 6-8, 1975, Paper.* 9 p.

Silicon solar cells with macroscopic V-shaped grooves and microscopically texturized surfaces have been made by preferential etching techniques. Various conditions for potassium hydroxide and hydrazine hydrate etching were investigated. Optical reflection losses from these surface were reduced. The reduced reflection occurred at all wavelengths and resulted in improved short circuit current and spectral response. Improved collection efficiency is also expected from this structure due to generation of carriers closer to the cell junction. Microscopic point measurements of collected current using a scanning electron microscope showed that current collected at the peaks of the texturized surface were only 80% of those collected in the valleys. (Author)

A75-37400 * # **The high intensity solar cell - Key to low cost photovoltaic power.** B. L. Sater (NASA, Lewis Research Center, Cleveland, Ohio) and C. Goradia (Cleveland State University, Cleveland, Ohio). *Institute of Electrical and Electronics Engineers, Photovoltaic Specialists Conference, 11th, Phoenix, Ariz., May 6-8, 1975, Paper.* 11 p. 15 refs.

This paper discusses the problems associated with conventional solar cells at high intensities and presents the design considerations and performance characteristics of the 'high intensity' (HI) solar cell which appears to eliminate the major problems. Test data obtained at greater than 250 AM1 suns gave a peak output power density of 2 W per sq cm at an efficiency exceeding 6% with an unoptimized cell operating at over 100 C. It appears that operation at 1000 AM1 suns at efficiencies greater than 10% is possible. At 1000 AM1 suns and 10% efficiency, the HI cell manufacturing cost is estimated to be $0.25/watt, with multi-megawatt annual production capability already existing within the industrial sector. A high intensity solar system was also analyzed to determine its cost effectiveness and to assess the benefits of further improving HI cell efficiency. (Author)

A75-37402 * # **Advances in the theory and application of BSF cells.** J. Mandelkorn and J. H. Lamneck (NASA, Lewis Research Center, Cleveland, Ohio). *Institute of Electrical and Electronics Engineers, Photovoltaic Specialists Conference, 11th, Phoenix, Ariz., May 6-8, 1975, Paper.* 5 p. 8 refs.

A study to determine the influence of fabrication processes and bulk material properties on the behavior of back surface field (BSF) cells is reported. It is concluded that a photovoltage is generated at the p(+), p back junction of the cell. The concept of majority carrier collection is proposed as a possible mechanism for this generation. Advantages accruing to the advent of BSF cells are outlined. S.J.M.

A75-37403 * # **Effects of high doping levels on silicon solar cell performance.** M. P. Godlewski, H. W. Brandhorst, Jr., and C. R. Baraona (NASA, Lewis Research Center, Cleveland, Ohio). *Institute of Electrical and Electronics Engineers, Photovoltaic Specialists Conference, 11th, Phoenix, Ariz., May 6-8, 1975, Paper.* 7 p. 19 refs.

Open-circuit voltages measured in silicon solar cells made from 0.01 ohm-cm material are 150 mV lower than voltages calculated from simple diffusion theory and cannot be explained by poor diffusion lengths or surface leakage currents. An analytical study was made to determine whether high doping effects, which increase the intrinsic carrier concentration, could account for the low observed voltages and to determine the limits on voltage and efficiency imposed by high doping effects. The results indicate that the observed variation of voltage with base resistivity is predicted by these effects. A maximum efficiency of 19% (AMO) and a voltage of 0.7 volts were calculated for 0.1 ohm-cm cells assuming an optimum diffused layer impurity profile. (Author)

A75-37404 * # **Effect of impurity doping concentration on solar cell output.** P. A. Iles and S. I. Soclof (Optical Coating Laboratory, Inc., Santa Rosa, Calif.). *Institute of Electrical and Electronics Engineers, Photovoltaic Specialists Conference, 11th, Phoenix, Ariz., May 6-8, 1975, Paper.* 15 p. 18 refs. Contract No. NAS3-17360.

Experimental measurements were made of solar cell and related photovoltaic parameters for silicon with high concentrations of dopant impurities. The cell output peaked for doping levels around 10 to the 17th power per cu cm. Independent measurements of diffusion length and open circuit voltage at high doping levels showed severe reductions at concentrations above 10 to the 18th power per cu cm. Theoretical reasons are given to explain these reductions. Indication is given of the problems requiring solution before increased cell output can be achieved at high doping levels. (Author)

A75-37656 **Multimegawatt fuel cell power system.** L. M. Handley (United Aircraft Corp., Power Utility Div., South Windsor, Conn.) and D. R. Warnock (USAF, Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio). In: NAECON '75; Proceedings of the National Aerospace and Electronics Conference, Dayton, Ohio, June 10-12, 1975. New York, Institute of Electrical and Electronics Engineers, Inc., 1975, p. 289-294. Contract No. F33615-72-C-1371.

A high power density H2/O2 fuel cell system is described. The system is modular and consists of two major subsystems: a power plant subsystem where energy conversion takes place and a supply subsystem for reactants and cooling water. Each power plant occupies 4.0 cu ft, weighs 295 lbs, and produces 575 kW. The cooling water supply is low-pressure (30 psia), and the reactant supply (at 3000 psia) provides a pressure source to force cooling water from the water tank into the power plant cooling system. Power required will determine the size and weight of the power plant subsystem, while operating time will determine the size and weight of the supply subsystem. The system is designed for short (30 sec to 2- or 3- min), high-power aerospace applications. A useful life of hundreds of missions is predicted for the equipment. S.J.M.

A75-37657 **MHD energy conversion for high power electrical needs.** E. C. Thoms, P. D. Lindquist, D. W. Swallom, and J. F. Holt (USAF, Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio). In: NAECON '75; Proceedings of the National Aerospace and Electronics Conference, Dayton, Ohio, June 10-12, 1975. New York, Institute of Electrical and Electronics Engineers, Inc., 1975, p. 295-300. 23 refs. DARPA-supported research.

A lightweight, liquid-fuel MHD generator is under development. This prototype machine will produce 10 megawatts electrical output. Tests on a 2-MW model yielded a specific power-to-mass flow rate of 0.62 MW per kg per sec. Because the volume/surface ratio of the generator is roughly proportional to the power output level, the 10-MW unit should considerably exceed that figure. In-house development substantiates this expectation. An in-house power converter is used to increase the MHD output level to the order of tens of kilovolts. Lightweight magnet development, lightweight MHD channel development, and demonstration of MHD converter circuitry capable of lightweight packaging prove the engineering feasibility of airborne MHD power sources. A portable MHD unit has been developed in the USSR for electrically probing the earth's crust. (Author)

A75-37686 **Development of the KIVA-I MHD open cycle generator.** J. K. Lytle and R. V. Shanklin (Systems Research Laboratories, Inc., Dayton, Ohio). In: NAECON '75; Proceedings of the National Aerospace and Electronics Conference, Dayton, Ohio, June 10-12, 1975. New York, Institute of Electrical and Electronics Engineers, Inc., 1975, p. 499-506. 8 refs. USAF-supported research.

The results of the development of the KIVA-I MHD open cycle power generator system is described. The work involved the construction of a water-cooled diagonal-conducting wall generator which permits system operation in excess of 1 minute at a maximum power level of 200 kW. A high-voltage dc-to-dc converter was successfully driven by the generator for short test durations resulting in a 38 kV converter output. In addition, computer modeling of the combustor and channel performance resulted in modifications to these components which reduced generator losses and improved the overall performance of the system. To further improve the operation of the KIVA-I MHD generators, high-energy colloidal fuels are being developed. Increases in power output of 50 percent are anticipated when powdered metals, such as aluminum and magnesium, are suspended in a JP-4 or toluene fuel emulsion. The projected increase is a result of a higher flame temperature and non-equilibrium interaction between the gas and liquid-oxide phases of the products of combustion. (Author)

A75-37836 **Optimization of fusion power density in the two-energy-component tokamak reactor.** D. L. Jassby (Princeton University, Princeton, N.J.). *Nuclear Fusion,* vol. 15, June 1975, p. 453-464. 21 refs. Contract No. AT(11-1)-3073.

Optimal plasma conditions are determined for maximizing fusion power density in the two-energy-component (TCT) tokamak, in order to optimize the total neutron flux for a device of given size. The minimum value of fusion power multiplication (Q) required for economic operation as a fissile breeder is discussed. The ideal maximum fusion power density increases monotonically with decreasing electron temperature, but if a beam power multiplication of about 1 is desired, the preferred range of operation for electron temperature is 5 to 8 keV. Here, the optimal value for electron density times confinement time is 8 times 10 to the 12th sec per cu cm, while the corresponding beam pressure is 0.8 to 0.9 times the bulk-plasma pressure. Attaining the largest Q values demands the retention of all D-T alphas, while maximizing fusion power density entails ejection of alphas from the plasma. P.T.H.

A75-37846 **Energy and Resources - A plan is outlined according to which solar and wind energy would supply Denmark's needs by the year 2050.** B. Sorensen (Copenhagen, University, Copenhagen, Denmark). *Science,* vol. 189, July 25, 1975, p.255-260. 17 refs.

A wind-solar energy plan is proposed for Denmark. The suggested annual average energy consumption of 19 gigawatts by the year 2050 corresponds to solar energy collecting panels (in use only 50% of the time) with an area of about 180 sq km and a windmill-swept area of about 150 sq km. These regions constitute less than 1% of the total land area. Such a plan is concluded to be more desirable than the initially lower-cost alternative of intensive extraction of low-grade fossil fuel deposits. S.J.M.

A75-37849 **Ocean thermal gradient hydraulic power plant.** E. J. Beck (U.S. Navy, Naval Construction Battalion Center, Port Hueneme, Calif.). *Science,* vol. 189, July 25, 1975, p. 293, 294.

Solar energy stored in the oceans may be used to generate power by exploiting thermal gradients. A proposed open-cycle system uses low-pressure steam to elevate water, which is then run through a hydraulic turbine to generate power. The device is analogous to an air lift pump. (Author)

A75-37850 **Foam solar sea power plant.** C. Zener and J. Fetkovich (Carnegie-Mellon University, Pittsburgh, Pa.). *Science,* vol. 189, July 25, 1975, p. 294, 295. NSF Grants No. GI-39114; No. AER-73-07863A02.

In the accompanying report Beck suggests a new type of open-cycle system for obtaining power from the ocean's thermal gradient. A modification of this open-cycle plant which will ensure a high efficiency, and also a low capital cost per unit power output, is described here. (Author)

A75-38474 * # **Laser energy conversion.** K. W. Billman (NASA, Ames Research Center, Physical Gasdynamics and Lasers Branch, Moffett Field, Calif.). *Astronautics and Aeronautics,* vol. 13, July-Aug. 1975, p. 56-65. 25 refs.

Laser radiation could possibly provide a feasible approach for the transmission of energy between stations and vehicles in space and on earth. The transmitted energy could be used for the operational requirements of the receiving space station, lunar base, or spacecraft. In addition, laser energy could also be employed to provide power for the propulsion of vehicles in space. The present status of development regarding the various technological areas involved in an implementation of these objectives is examined, taking into account the possibility of further advances needed to satisfy the technical requirements. Attention is given to laser-induced chemistry for converting the radiation energy into chemical energy. Other subjects considered are related to photovoltaics, optical diodes, thermo-electronics, laser rockets, and photon engines. G.R.

A75-38568 **Theoretical study of the energy output of two magnetohydrodynamic generators (Etude théorique des rendements énergétiques de deux générateurs magnétohydrodynamiques).** J. Vergnes (Domaine Universitaire du Chaudron, Saint-Denis, Réunion, France). *Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques,* vol. 280, no. 23, June 16, 1975, p. 707-709. In French.

The current work presents a comparative study of the yield of two alternating current generators consisting of rectangular conduits which contain an electroconductive viscous fluid and are subjected to a uniform magnetic induction field. The study assumes that the conduits are closed by a fixed resistance R. The fluid is caused to move by either one oscillating surface of the conduit (dissymmetric system), or by two surfaces (symmetric case). S.J.M.

A75-38644 **Satellites for energy transmission to earth - Technical and socioeconomic studies (Satelliten zur irdischen Energie-Übertragung - Technische und sozio-ökonomische Untersuchungen).** K. A. Ehricke. *(Hermann-Oberth-Gesellschaft, Raumfahrtkongress, 23rd, Salzburg, Austria, June 25-29, 1974.) Astronautik,* vol. 12, no. 2, 1975, p. 19-25. In German.

An overview of three new technologies that will improve the present energy situation is presented: (1) the production of electricity with nonfossil energy sources, chiefly nuclear, solar and geothermal ones; (2) the transmission of energy via microwaves; and (3) space technology, particularly economic space transportation means. A comparison of the electrical energy available per year from different sources is given with the expected conversion efficiencies for each source, and the subject of solar power conversion and transmission by means of satellites is discussed. Several characteristic quantities for a typical satellite energy relay station are tabulated, a cost analysis of this energy source is carried out, and a plan for the global distribution of satellite stations is put forward. S.J.M.

A75-38648 # **Laboratory semiautomatic infrared device for determining the composition of petroleum products in sewage (Laboratornyi poluavtomaticheskii infrakrasnyi pribor dlia opredeleniia soderzhaniia nefteproduktov v stochnoi vode).** V. M. Osipov, V. V. Luchinskii, and A. S. Egorov (Spetsial'noe Konstruktorskoe Biuro po Avtomatizatsii Neftepererabotki i Neftekhimii, Leningrad, USSR). *Khimiia i Tekhnologiia Topliv i Masel,* no. 6, 1975, p. 59, 60. 7 refs. In Russian.

The design of a laboratory infrared analyzer that will determine the total content of petroleum products in sewage of technological installations and refineries is described. The principle of the operation is an extractive-photometric process. The contaminants being analyzed are extracted from the sewage sample with the aid of carbon tetrachloride. The resultant extract is photometrized using infrared light at a wavelength of 3417 micron that corresponds to the absorption of CH2-groups. The electron-optical measurement system and the main technical characteristics of the device are examined. M.G.

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STAR ENTRIES

N75-21391# Los Alamos Scientific Lab., N.Mex.
FUNDAMENTAL ASPECTS OF SYSTEMS FOR THE THERMOCHEMICAL PRODUCTION OF HYDROGEN FROM WATER
M. G. Bowman Oct. 1974 11 p refs Presented at 1st Natl. Topical Meeting on Nucl. Process Heat Appl., Los Alamos, New Mexico, 1 Oct. 1974
(Contract W-7405-eng-36)
(LA-UR-74-1459; Conf-741032-2) Avail: NTIS HC $3.25

The thermochemical production of hydrogen by direct use of primary heat is a strong motivation for research to develop optimized processes. Maximum efficiency will be realized only if the thermochemical cycle is optimized for the temperature of the heat source. This implies that each heat source will require a different process. In order to conduct a systematic program of selecting useful processes from the very large number potentially available, it will be advantageous to delineate the thermodynamic, kinetic, engineering and economic criteria required for an optimum process and then conduct a vigorous theoretical and experimental program to identify cycles that approximate these criteria. This paper demonstrates one method of applying thermodynamic criteria in the synthesis of thermochemical processes for water splitting. Author (NSA)

N75-21480# California Univ., Livermore. Lawrence Livermore Lab.
LIQUID PLUGGING IN IN SITU COAL GASIFICATION PROCESSES
D. W. Gregg 25 Oct. 1974 7 p refs
(Contract W-7405-eng-48)
(UCRL-51686) Avail: NTIS HC $3.25

The presence of liquids can severely alter the spacial propagation characteristics of the flame front in an in situ coal gasification process. In a cocurrent burn, the liquids, water, and coal tars will be baked or pyrolyzed out of the coal in the hot zone near the flame front and will condense on cooler coal further downstream from the flame front. In the region where condensation is taking place, the liquids can plug the formation and thus alter or stop the gas flow pattern necessary for maintaining a spacially controlled flame front. Liquid plugging effects and their relationship to the permeability and the absolute crack sizes in the formation are discussed in a semiquantitative manner. The calculations presented are a rough guide to the requirements for preparing the coal seam with hydraulic or explosive fracturing, when such fracturing is needed. Author (NSA)

N75-21716 Texas A&M Univ., College Station.
PRODUCTION OF OIL FROM FRACTURED RESERVOIRS BY WATER DISPLACEMENT Ph.D. Thesis
Jon Kleppe 1974 70 p
Avail: Univ. Microfilms Order No. 75-2869

The flow behavior of fractured oil reservoirs produced by water displacement was studied. A two-dimensional numerical model capable of simulating flow of water and oil in the matrix blocks as well as in the fractures was developed. The validity of the model was checked against data from a laboratory experiment involving a matrix-fracture system. Good agreement was observed between the laboratory and simulation results. By means of numerical simulation the effects of production rate and fracture flow capacity on the production history and ultimate oil recovery of a fractured system were evaluated. It is demonstrated that for a given fracture flow capacity, the producing water-oil ratio is a unique function of oil remaining in place and present producing rate. A reservoir can be produced at a high rate until the water-oil ratio becomes too high to handle. Reducing the rate causes the water-oil ratio to decrease to the value it would have had if all the oil had been produced at this lower rate. Dissert. Abstr.

N75-21781# California Univ., Livermore. Lawrence Livermore Lab.
THREE-DIMENSIONAL SUBSURFACE DELINEATION VIA A NOVEL METHOD FOR DETERMINING THE SUBSURFACE ELECTRICAL PROFILE
R. J. Lytle, R. M. Bevensee, and D. L. Lager 18 Oct. 1974 17 p refs
(Contract W-7405-eng-48)
(UCRL-51685) Avail: NTIS HC $3.25

The combination of a standard experimental procedure (four-probe electrical resistivity), a novel analytical technique (probabilistic potential theory), and a powerful inversion algorithm (optimization/generalized linear inverse) is proposed as a method for determining the subsurface electrical profile. It is proposed that the feasibility of the procedure be tested by analysis of field experiments in conjunction with scale-model laboratory experiments to validate the algorithms for general structure. The procedure should have great practical value in a wide variety of applications: hydrology, location and definition of the shape and extent of underground resources (e.g., geothermal reservoirs, ore bodies, or deposits of coal, sand, or gravel), faultline definition, and monitoring of changes in subsurface conditions (e.g., as in earthquake studies, in situ coal gasification, and burn-front studies of oil-shale gasification). Author (NSA)

N75-21786# Stanford Research Inst., Menlo Park, Calif.
THE POTENTIAL FOR DEVELOPING ALASKAN COALS FOR CLEAN EXPORT FUELS, PHASE 1 Interim Report, Jan. - Jul. 1974
Dec. 1974 25 p
(Contract DI-14-32-0001-1516)
(PB-238539/1; OCR-108-INT-1) Avail: NTIS HC $3.25 CSCL 08I

Economic feasibility of a coal conversion facility using the large Beluga coal reserves of Alaska is discussed. Although this study is site-related and one of a kind research, the data generated should have general application to coal resource development in other western coal mining areas. Even though the Alaskan reserves are somewhat remote from markets for coal and coal-derived fuels, the proximity of the recoverable coal reserves to deep water ports--unique to Alaska and Washington--promises some interesting and potentially low cost transportation options for development. GRA

N75-21788# Geological Survey, Reston, Va. Conservation Div.
RELATIONSHIPS BETWEEN BIDDING AND HYDROCARBON PRODUCTION OF THE FEDERAL OUTER CONTINENTAL SHELF (THROUGH 1970) Final Report
John Lohrenz and Hillary A. Oden Aug. 1974 36 p refs
(PB-238188/7; USGS-CD-74-001) Avail: NTIS HC$3.75 CSCL 08I

Bonuses are compared with royalty collected as a result of 26 Federal competitive lease sales for acreage on the outer continental shelf in which 1,588 leases were issued. The leases issued as a result of each sale are grouped according to bonus paid per acre. The data are analyzed and conclusions made as to the oil and gas industry's bidding behavior. GRA

N75-21790 Pittsburgh Univ., Pa.
DEVELOPMENT OF A SOLUBLE REACTANTS AND

PRODUCTS SECONDARY BATTERY Ph.D. Thesis
Edward Jean Lahoda 1974 122 p
Avail: Univ. Microfilms Order No. 75-4100

A theoretical and experimental study on the development of a secondary battery using soluble reactants and products was performed. A method for evaluating the theoretical performance of this type of secondary battery according to the specifications of energy and power to mass, volume, and cost ratios was developed and applied to ten prospective redox reactions. The four best combinations in the specifications studied were the Fe-Cr, Fe-Sn, Sn-Cr, and Fe-Ti systems. The properties of the half-cell separator (an anion membrane) are considered important. An experimental method for evaluating commercially available anion membranes according to the diffusion rate of multivalent cations through them was developed. Six different membranes were tested. The one with the lowest diffusion rate of the cations was the AMV anion membrane. It was found that a high anion transference number of high perm-selectivity was also a good indicator as to the suitability of the membrane for this type of secondary battery. Dissert. Abstr.

N75-21791 Pennsylvania Univ., Philadelphia.
ECONOMIC-ENVIRONMENTAL POWER DISPATCH Ph.D. Thesis
Jacob Zahavi 1974 380 p
Avail: Univ. Microfilms Order No. 75-2795

A dispatch procedure for power generation systems which meet the demand for power while taking into account both cost and emission considerations is developed. The control problem is formulated as a bicriterion optimization problem with two conflicting objective functions: operating costs and the combined pollution. A tradeoff curve, representing all alternative dispatch policies, is obtained for any demand level. The tradeoff curve is defined as the set of all efficient points between cost and pollution, and is computed in a parametric form by minimizing a penalty function. The economic interpretations of the tradeoff curve are discussed. An air pollution diffusion model is applied to points on the tradeoff curve to evaluate the alternative dispatch policies. Several measures, based on exposure to pollution, which serve as a first approximation to air pollution damage, are evaluated. The utility function is described by a quasi-concave function whose maximum point is found among points on the tradeoff curve. An interactive search method is devised, in order to find the dispatch policy that maximizes the utility function. The models are applied to a realistic power system. The computations are carried out for various demand levels and various weather conditions, and the comparative analysis of the results is discussed. Dissert. Abstr.

N75-21792*# Tyco Labs., Inc., Waltham, Mass.
NICKEL-CADMIUM CELLS Final Report, 30 Mar. 1972 - 30 May 1973
Edward J. Rubin and Michael J. Turchan Aug. 1974 116 p refs
(Contract NAS5-23102)
(NASA-CR-143715; C-227) Avail: NTIS HC $5.25 CSCL 10C

A high energy density nickel cadmium cell of aerospace quality was designed. The approach used was to utilize manufacturing techniques which produce highly uniform and controlled starting materials in addition to improvements in the overall design. Parameters controlling the production of plaque and both positive and negative plate were studied. Quantities of these materials were produced and prototype cells were assembled to test the proposed design. Author

N75-21793# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
PROBLEMS IN ELECTRIC POWER PRODUCTION
G. Campos, G. Venuti, S. Donelli, S. Frullani, L. Maiani, and E. Tabet 23 Dec. 1973 72 p refs In ITALIAN
(ISS-T-73/16) Avail: NTIS HC $4.25

Some aspects of the energy problem are discussed which were the subject of a hearing. In particular the report deals with the health aspects of the main pollutants produced by different power stations (thermoelectrical, fueled both by oil and natural gas, nuclear) and with the current laws in several countries. Author

N75-21794*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SOLAR COLLECTOR PERFORMANCE EVALUATED OUTDOORS AT NASA-LEWIS RESEARCH CENTER
R. W. Vernon 1974 7 p refs Presented at Workshop on Solar Collectors for Heating and Cooling of Buildings, New York, 21-23 Nov. 1974; sponsored by NSF
(NASA-TM-X-71689) Avail: NTIS HC $3.25 CSCL 10A

An outdoor facility constructed to evaluate solar collector performance for conditions that would be encountered by collectors if they were incorporated in a solar heating/cooling system is described. Preliminary performance data is presented. Author

N75-21795*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PLANS AND STATUS OF THE NASA-LEWIS RESEARCH CENTER WIND ENERGY PROJECT
R. Thomas, R. Puthoff, J. Savino, and W. Johnson 1975 31 p refs Proposed for presentation at Joint Power Conf., Portland, Oreg., 28 Sep. - 1 Oct. 1975; cosponsored by IEEE and ASME
(NASA-TM-X-71701; E-8309) Avail: NTIS HC $3.75 CSCL 10A

Wind energy is investigated as a source of energy. The wind energy program that is managed by the NASA-Lewis Research Center is described. The Lewis Research Center's Wind Power Office, its organization, plans, and status are discussed. Major elements of the wind power project included are: an experimental 100 kW wind-turbine generator; first generation industry-built and user-operated wind turbine generators; and supporting research and technology tasks. Author

N75-21796*# Kanner (Leo) Associates, Redwood City, Calif.
WIND POWER INSTALLATIONS. PRESENT CONDITION AND POSSIBLE LINES OF DEVELOPMENT
Ye. M. Fateyev Washington NASA Mar. 1975 80 p refs Transl. into ENGLISH from Vetrosilovyye Ustanovki Sosttoyaniye i puti razvitiya (Moscow), 1959 80 p
(Contract NASw-2481)
(NASA-TT-F-16204) Avail: NTIS HC $4.75 CSCL 10A

Wind power is discussed as a source of energy, past, present and future. A brief summary of the history and development of windmills is presented. Tables of average wind velocity are included for different zones in the U.S.S.R. compiled from meteorological stations over a period of years. It is shown that the development of highly efficient wind power theory and engineering has led to the development of highly efficient wind-driven motors which use up to 42% of wind energy. The agricultural uses of wind-driven motors are also discussed. The matching of piston and centrifugal use of millstones with wind-driven motors are included. The use of free and unlimited wind energy is concluded to be efficient, particularly in agricultural and rural areas. Author

N75-21797# California Univ., Livermore. Lawrence Livermore Lab.
METHYL ALCOHOL PRODUCTION BY IN SITU COAL GASIFICATION
A. Pasternak 27 Aug. 1974 23 p refs
(Contract W-7405-eng-48)
(UCID-51600) Avail: NTIS HC $3.25

The need to use the large coal deposits of the U.S. as the raw material source for crude oil is discussed. Methyl alcohol can be produced from coal and used as a transportation fuel in internal combustion engines. The production route involves gasification of coal to carbon monoxide and hydrogen (synthesis gas) and high pressure catalytic conversion of these gases to methyl alcohol. In situ gasification of coal may be a less expensive way to produce synthesis gas than mining coal and gasifying it in surface plants. In situ gasification may also have less environmental impact and may be capable of using deep coal seams that cannot be mined economically. A process for in situ gasification leading to methyl alcohol production is described, and the thermodynamics and costs of the process are outlined. Capital requirements are estimated to be $354 million for annual production of methyl alcohol with a fuel value of 81 trillion Btu's. The selling price is estimated to be $1.04 per million Btu's (5.9 cents per gallon). Author (NSA)

N75-21799# Brookhaven National Lab., Upton, N.Y.
COAL COMBUSTION AND DESULFURIZATION IN A ROTATING FLUIDIZED BED REACTOR
S. Chalchal, T. V. Sheehan, and M. Steinberg Oct. 1974 24 p refs Sponsored by ERDA
(BNL-19308) Avail: NTIS HC $3.25

The use of coal as a fuel for electrical power generation is limited by its sulfur content, resulting in high sulfur pollution of the flue gas from its use in conventional combustion. Sulfur removal is achieved by burning the coal with limestone and dolomite in a fluidized bed. An evaluation of the fluidized bed combustion process is made and the principles of rotating fluidized bed combustion are presented. A preliminary design of pressurized fluidized bed combustor is given. NSA

N75-21800# California Univ., Livermore. Lawrence Livermore Lab.
DIRECT CONVERSION OF PLASMA ENERGY TO ELECTRICITY FOR MIRROR FUSION REACTORS
R. W. Moir, W. L. Barr, and G. A. Carlson 24 Sep. 1974 17 p refs Presented at the 5th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Tokyo, 11 Nov. 1974 Sponsored by ERDA
(UCRL-76051) Avail: NTIS HC $3.25

Direct conversion of plasma and ion beam energy to electricity for mirror fusion reactors is described. Selective leakage, magnetic expansion, electron separation, deceleration, and collection of ions are discussed. An experiment testing all processes except selective leakage gave an overall efficiency of 86.5 + or - 1.5% for a 22-stage collector. Computer calculations of these same processes gave an efficiency of 88.6 + or - 1.5%, agree. Experiments on a two-stage collector gave 65% efficiency compared to 69% calculated efficiency. One- two-, and 22-stage converters were studied under reactor-like conditions with a large computer simulation code that accounts for space charge, secondary electrons, and finite, realistic electrode shapes. Laboratory tests of mono-energetic beam direct conversion gave 96% efficiency for a 2-keV low power dc beam and 70% for a dc 20 keV, 1-kW beam. Author (NSA)

N75-21801# Australian Inst. of Nuclear Science and Engineering, Lucas Heights.
AINSE ENGINEERING CONFERENCE
Aug. 1974 76 p refs Conf. held at Lucas Heights, Australia, 19-21 Aug. 1974
(Conf-740814-Absts) Avail: ERDA Depository Libraries HC $7.00

Abstracts of sixty papers are presented. Topics include: Energy and nuclear power, fuel cycle, control systems, fuel elements, and mechanical aspects, energy conversion, heat and mass transfer, turbulence, fluid flow, fluctuation and noise analysis. NSA

N75-21802# Sandia Labs., Albuquerque, N.Mex.
FLYWHEEL ENERGY SYSTEMS
F. Biggs Nov. 1974 46 p refs
(Contract AT(29-1)-789)
(SAND-74-0113) Avail: NTIS HC $3.75

Concepts are developed for advanced flywheels made of high-strength filamentary composite materials. The various flywheel systems described are important to the clean and efficient use of energy. Recent related work is summarized and several relevant research areas are identified. Author (NSA)

N75-21803# Parsons (Ralph M.) Co., Pasadena, Calif.
TECHNICAL EVALUATION SERVICES, CLEAN LIQUID AND/OR SOLID FUELS FROM COAL Technical Progress Report, Oct. 1972 - Aug. 1974
Nov. 1974 13 p
(Contract DI-14-32-0001-1234)
(PB-237216/7; POCR-82-INT-4) Avail: NTIS HC $3.25 CSCL 07A

A preliminary design and capital cost estimate report was prepared describing a coal conversion demonstration plant capable of producing 25,000 bbl/day of clean boiler fuels. Also completed was a preliminary process design and economic evaluation for a Fischer-Tropsch process plant to process 3,500 TPD of coal. Work is in the later stage of completion for a preliminary design and economic analysis of a conceptual nominal 25,000-TPD commercial COED-based pyrolysis plant with char gasification and electrical power generation. Reviews of process design, mechanical design, and construction progress are nearly completed for the SRC pilot plant located at Tacoma, Washington. GRA

N75-21804# Mallory Battery Co., Tarrytown, N.Y.
NON-HAZARDOUS PRIMARY LITHIUM-ORGANIC ELECTROLYTE BATTERY BA-5590 ( )/U Final Report, Jul. 1973 - Sep. 1974
Thomas Watson Oct. 1974 32 p
(Contract DAAB07-73-C-0282)
(AD-A003312; ECOM-0282-73-F) Avail: NTIS CSCL 10/3

The subject concerns the development and fabrication of Battery No. BA-5590( )/U in accordance with the performance/safety requirements as defined in the Technical Guidelines for Non-Hazardous Primary Lithium-Organic Electrolyte Batteries dated 29 March 1973. The primary concern has been the fabrication of the subject batteries in conference with these guidelines and most important, the development of effective safety mechanisms to insure non-hazardous operation under all conditions of storage, use and operation. Basic considerations for such safety mechanisms were system reliability, effectiveness, economics and adaptability to eventual automated production. The electrolyte consists of 70% sulfur dioxide by weight. The remaining 30% contains lithium bromide and the organic solvents. GRA

N75-21806# Army Electronics Command, Fort Monmouth, N.J.
CYLINDRICAL ERBIUM OXIDE RADIATOR STRUCTURES FOR THERMOPHOTOVOLTAIC GENERATORS Research and Development Technical Report
Guido E. Guazzoni and Emil Kittl Aug. 1974 33 p refs
(DA Proj. 1S7-62704-AH-94)
(AD-A001525; ECOM-4249) Avail: NTIS CSCL 10/2

Results of an experimental investigation are reported which cover the fabrication and evaluation of slip-casted and hot pressed erbium oxide cylinders and silicon carbide structures coated with erbium oxide. Suitable erbium oxide cylindrical structures will be used as radiating mantles in thermophotovoltaic converter systems. The pure erbium oxide cylindrical mantles were found to be deficient in thermal shock resistance which resulted in cracking of the mantles and extremely low thermal cycle life. The erbium oxide coated silicon carbide structures provided satisfactory thermal cycling capability up to 1500C but their spectral emission showed a large content of background radiation which manifested itself in an increased amount of undesirable interband emission. Higher optical density of the erbium oxide coating, to provide reduction of unwanted background radiation, is necessary to make these structures of practical use. GRA

N75-21810# Arizona State Fuel and Energy Office, Phoenix.
PUTTING THE SUN TO WORK: A HISTORY AND DIRECTORY OF CURRENTLY AVAILABLE SOLAR ENERGY APPLICATIONS
Ken Bacher 1974 31 p refs
(PB-238189/5) Avail: NTIS HC $3.75 CSCL 10B

A short history in non-technical terms of solar energy development is presented. Methods of collection are discussed for residential, commercial, and industrial applications. A listing of solar energy equipment manufacturers for hot water heaters, collectors, swimming pool heaters, total home systems, glazing systems for solar control, wind power, and solar cells is included. GRA

N75-21811# Battelle Columbus Labs., Ohio.
ENERGY R/D DATA WORKSHOP
Nov. 1974 37 p Workshop held at Gaithersburg, Md., 6-7 May 1974 Prepared in cooperation with NBS, Washington, D. C. and AEC, Washington, D. C.
(Grant NSF GN-42243)
(PB-237493/2) Avail: NTIS HC $3.75 CSCL 05B

The problems of energy data priorities and energy data tagging were discussed in two separate working sessions. Background for these sessions came from a panel discussion relating forthcoming energy R and D programs to data dissemination programs and from a series of prepared talks concerning various aspects of energy data. GRA

N75-21812# Pennsylvania State Univ., University Park. Coal Research Section.
DEPENDENCE OF COAL LIQUEFACTION BEHAVIOR ON COAL CHARACTERISTICS Interim Report, Jan. 1973 - Jun. 1974
Jan. 1975 45 p refs
(Contract DI-14-01-0001-390)
(PB-238522/7; OCR-61-INT-9) Avail: NTIS HC $3.75 CSCL 10A

Liquefaction behavior of coal samples was studied. The samples had widely differing sulfur contents (up to 6%) but the oils produced had sulfur contents less than 0.5% in almost all cases. In addition, the results strongly indicated that in a number of cases the mineral constituents of coals, usually considered as unwanted impurities, may actually have a beneficial effect as additional catalysts for the liquefaction process. GRA

N75-21815# Western Forest Products Lab., Vancouver (British Columbia).
ENERGY PLANTATIONS: SHOULD WE GROW TREES FOR POWER PLANT FUEL
R. S. Evans Jul. 1974 23 p refs
(PB-238417/0; VP-X-129) Avail: NTIS HC $3.25 CSCL 10B

The proposal that trees, a renewable resource, might be cut as fuel for electric-power plants is examined. The Pacific northwest is suggested as a likely location for an energy plantation. Wood and bark production in dense red alder stands is shown to be exceptionally high and land area requirements are not excessive. GRA

N75-21816# United Aircraft Corp., East Hartford, Conn.
FEASIBILITY DEMONSTRATION OF A SOLAR POWERED TURBOCOMPRESSOR AIR CONDITIONING AND HEATING SYSTEM Quarterly Progress Report, 15 Jun. - 15 Sep. 1974
F. R. Biancardi 15 Sep. 1974 48 p refs
(Contract NSF C903)
(PB-238570/6; UARL-N951923-1; NSF/RA/N-74-105; QPR-1) Avail: NTIS HC $3.75 CSCL 10B

The feasibility of operating a Rankine cycle turbocompressor air conditioning and heating system was demonstrated for temperature levels consistent with flat plate solar collectors. Primary emphasis was placed on defining the operating conditions of components and selecting the working fluid for the demonstration turbocompressor system. Emphasis was also placed on the disassembly and check of the existing turbocompressor components, and the modification or procurement of new components required for the laboratory demonstrator. GRA

N75-21817# Transportation Systems Center, Cambridge, Mass.
ENERGY STATISTICS. A SUPPLEMENT TO THE SUMMARY OF NATIONAL TRANSPORTATION STATISTICS Final Report, 1961 - 1973
William F. Gay Aug. 1974 140 p
(PB-236767/8; DOT-TSC-OST-74-12) Avail: NTIS HC $5.75 CSCL 21D

A compendium is presented of selected time-series data describing the transportation, production, processing, and consumption of energy. The report is divided into three main sections. The first, entitled Energy Transport, contains such items as the revenues and expenses of oil pipeline companies, number and capacities of U.S. tank ships, and the total crude oil transported in the U.S. by method of transportation. The second section, entitled Reserves, Production, and Refining, reveals the growth over time of the U.S. oil and natural gas reserves, refinery capacity, and yields. Trends in the demand for fuel and power are displayed in the third section, entitled Energy Consumption. Throughout this part, the transportation sector is emphasized. Included are the gasoline and oil costs of automobiles of different sizes, the consumption of petroleum by type of product, the electrical energy consumed by the local transit industry, and other important statistics describing the supply and demand for energy. GRA

N75-21818# Sobotka and Co., Inc., New York.
INDUSTRIAL ENERGY STUDY OF THE PETROLEUM REFINING INDUSTRY Final Report
May 1974 98 p refs
(Contract DI-14-01-0001-1656)
(PB-238671/2; FEA/EI-1656) Avail: NTIS HC $4.75 CSCL 10A

Information is provided on the structure of the petroleum refining industry as well as on energy consumption patterns and the potential for energy substitution and conservation. GRA

N75-21819# North Carolina State Dept. of Administration, Raleigh. State Planning Div.
A STATE ENERGY MANAGEMENT PLAN FOR NORTH CAROLINA, PHASE 1: A QUANTITIVE DESCRIPTION OF THE CURRENT SITUATION AND ANALYSIS OF THE DETERMINANTS AND CONSEQUENCES OF FUTURE ENERGY USE Final Report
Jun. 1974 224 p refs Prepared in cooperation with Res. Triangle Inst., Durham, N. C.
(PB-238197/8) Avail: NTIS HC $7.25 CSCL 10A

A basic requirements scenario related to projected socio-economic growth in North Carolina is developed, assuming current trends in energy use patterns, in order to set objectives, develop policies, devise plans, establish budgets, and implement programs for future energy consumption. GRA

N75-21821# Massachusetts Univ., Amherst. Dept. of Mechanical Engineering.
FEASIBILITY STUDY OF A 100 MEGAWATT OPEN CYCLE OCEAN THERMAL DIFFERENCE POWER PLANT
J. L. Boot and J. G. McGowan Aug. 1974 100 p refs
(Grant NSF GI-34979)
(PB-238571/4; TR-74-3; NSF/RANN/SE/GI-34979/TR-74-3; NSF/RA/N-74-109) Avail: NTIS HC $4.75 CSCL 10B

A technical feasibility study is reported on a 100 Mw gross output open Rankine cycle powerplant driven by the ocean thermal difference. Key components of the power system were: A radial inflow turbine designed for optimum efficiency with a blade diameter of 235 feet; a falling film evaporator 250 feet in diameter and 16 feet high; a falling film deaerator system 45 feet in diameter and 32 feet high; a shed-in-tube condenser (137,000 1 inch O.D. tubes 39 ft. long) producing 25 million gallons per day of fresh water; and a single cold water pump designed specifically for this system. The net electrical power output was approximately 59.1 Mw. GRA

N75-21822# Houston Univ., Tex. Dept. of Mechanical Engineering.
THE EVALUATION OF SURFACE GEOMETRY MODIFICATION TO IMPROVE THE DIRECTIONAL SELECTIVITY OF SOLAR ENERGY COLLECTORS Quarterly Report, 1 Jul. - 30 Sep. 1974
John R. Howell and Richard B. Bannerot 31 Oct. 1974 16 p refs
(Grant NSF GI-41003)
(PB-238509/4; UHME/Sol/3; NSF/RANN/SE/GI-41003/PR-74-3; NSF/RA/N-74-143; QR-3) Avail: NTIS HC $3.25 CSCL 10B

The performance of the flat plate collector can be greatly enhanced with the use of spectrally (wavelength) and/or directionally selective surfaces. This document reports on progress in examining two model geometries to determine the optimum parameters that will maximize the directional selectivity. GRA

N75-21823# Battelle Columbus Labs., Ohio.
A REVIEW OF THE PROJECT INDEPENDENCE REPORT SUBMITTED TO OFFICE OF ENERGY RESEARCH AND DEVELOPMENT, NATIONAL SCIENCE FOUNDATION, 10 JANUARY 1975 Final Report
Samuel Globe and Richard A. Craig 10 Jan. 1975 183 p refs
(Contract NSF C-914)
(PB-238791/8) Avail: NTIS HC $7.00 CSCL 10A

The Project Independence Report (PIR) issued in November 1974 by the Federal Energy Administration is evaluated. A review includes comments on the PIR as a whole, and also provides detailed critiques of the various topics, strategies, and scenarios as they are discussed by the PIR, including energy and fuel supplies, conservation and demand management, environmental assessment, economic and social impacts, international assessment, and the analytical approach. Special attention is given to the policy implications of the PIR strategies. GRA

N75-22112# Oak Ridge National Lab., Tenn.
NUCLEAR REACTOR PROCESS HEAT CAPABILITIES, POTENTIAL, AND ECONOMICS
D. B. Trauger and L. L. Bennett 1974 4 p Presented at the 1st Natl. Topical Meeting on Nuclear Process Heat Appl., Los Alamos, New Mexico, 1 Oct. 1974 Sponsored by ERDA
(Conf-741032-1) Avail: NTIS HC $3.25

A present-day limitation of nuclear power plants is that they are all steam producers, whereas many industries need high-temperature process heat in addition to steam. Achievement of high temperature capabilities would allow the gas-cooled reactors to supply process heat as well as industrial steam requirements. The cost of steam from nuclear reactors for industrial uses was evaluated. Nuclear energy costs were compared with coal or refined-coal fuels at a U.S. Gulf Coast location. These studies indicate that, in large sizes, the LWR and HTGR can provide process steam at lower cost than coal-based plants. While the CNSG is smaller than conventional LWRs, and therefore a more appropriate size for many industrial applications, the unit energy cost is significantly higher than from larger nuclear plants (due to economies of scale) or from a variety of coal fuel cycles. Author (NSA)

N75-22113# California Univ., Livermore. Lawrence Livermore Lab.
ADVANCED CONCEPTS IN FUSION-FISSION HYBRID REACTORS
J. A. Maniscalco and L. L. Wood 26 Jul. 1974 40 p refs Presented at Am. Nucl. Soc. Natl. Meeting, Washington, D. C., 27 Oct. - 1 Nov. 1974 Submitted for publication Sponsored by ERDA
(UCRL-75835; Conf-741086-6) Avail: NTIS HC $3.75

Fusion-fission hybrid reactors are viewed as sub-critical nuclear fission reactors driven and controlled by an internal high energy neutron source the fusion reactor. Such hybrids combine naturally the neutron richness of fusion power sources with the power richness of fission sources, thereby eliminating the intrinsic power poverty and neutron deficiency of these respective sections. Also eliminated in uncontrived fashions are the somewhat marginal specific tritium breeding rates of relistic fusion power reactor designs, the low specific fissile material breeding rates of conventional fast breeder fission reactors, the criticality control problems of fast breeder reactors, the demands of both fast breeder and light water reactors for both mined uranium and separative work capacity, and possible cost and technology complexity problems of fusion power reactor designs. Dissert. Abstr.

N75-22114# Army Foreign Science and Technology Center, Charlottesville, Va.
RESULTS OF WORK ON THERMOEMISSION CONVERSION
D. Karetnikov 20 May 1974 5 p Transl. into ENGLISH from Russian paper presented at an Intern. Meeting on Thermionics, Vienna, 1972
(AD-A002655; FSTC-HT-23-147-74) Avail: NTIS CSCL 10/2

The paper reports that tests of the TOPAZ-3 thermionic reactor, similar in design to its 2 predecessors, began in 1972. By 1 March 1973, it had operated about 3000 hours at 5-7 kV, and efficiency was 30% higher than that of the first reactors. At the same time, tests of 1- and 5-element generating channels were conducted, with a 5-element channel operating for over 3000 hours at 1.7 W/sq cm. A single element with tungsten-rhenium emitter and niobium collector operated 2670 hours with initial power density of 7 W/sq cm dropping to nearly 3.5 W/sq cm by the end of the test. Unexpectedly great reduction in neutral component concentration was found in theoretical-experimental study of nonstationary cesium plasma. A triode thermionic converter, as a high-temperature thyratron, using a cesium-barium mixture at low pressure can close the circuit at up to 100 V, cathode temperature 1600C, current density up to 20 A/sq cm and voltage drop of not over 5 V. GRA

N75-22199# General Research Corp., Santa Barbara, Calif.
IMPACT OF FUTURE USE OF ELECTRIC CARS IN THE LOS ANGELES REGION. VOLUME 1: EXECUTIVE SUMMARY AND TECHNICAL REPORT Final Report
W. F. Hamilton Oct. 1974 117 p refs 3 Vol.
(Contract EPA-68-01-2103)
(PB-238877/5; EPA-460/3-74-020-A-Vol-1) Avail: NTIS HC $5.25 HC also available from NTIS $24.00/set of 3 reports as PB-238876-SET CSCL 13F

Impacts of the use of electric cars in the Los Angeles region in 1980-2000 were projected for four-passenger subcompact electric cars using lead-acid and advanced batteries, with urban driving ranges of about 55 to 140 miles, respectively. Data from Los Angeles travel surveys shows that such cars could replace 17-74 percent of future Los Angeles autos with little sacrifice of urban driving. Adequate raw materials and night-time recharging power should be available for such use in the Los Angeles Region. The electric subcompacts would appear to be 20-60% more expensive overall than conventional subcompacts until battery development significantly reduces battery depreciation costs. This volume makes an overall review. GRA

N75-22200# General Research Corp., Santa Barbara, Calif.
IMPACT OF FUTURE USE OF ELECTRIC CARS IN THE LOS ANGELES REGION. VOLUME 2: TASK REPORTS ON ELECTRIC CAR CHARACTERIZATION AND BASELINE PROJECTIONS Final Report
W. F. Hamilton, J. C. Eisenhut, G. M. Houser, and A. R. Sjovold Oct. 1974 331 p refs 3 Vol.
(Contract EPA-68-01-2103)
(PB-238878/3; EPA-460/3-74-020-B) Avail: NTIS HC $9.50 HC also available from NTIS $24.00/set of 3 reports as PB-238876-SET CSCL 13F

Volume 2 of a three volume report projects future characteristics of electric cars and of the Los Angeles region in which they would be used. It postulates electric vehicle performance requirements, projects area population by county and age group, studies Los Angeles freeway and transit networks for auto usage, and fuel consumption, forecasts employment and income for the South Coast Air Basin, and the payroll of businesses involved in production, distribution, and maintenance of automobiles and parts, and notes the energy available for electric car recharging and its basic sources. GRA

N75-22201# General Research Corp., Santa Barbara, Calif.
IMPACT OF FUTURE USE OF ELECTRIC CARS IN THE LOS ANGELES REGION. VOLUME 3: TASK REPORTS ON IMPACT AND USAGE ANALYSIS Final Report
W. F. Hamilton, J. A. Cattani, J. C. Eisenhut, F. J. Markovich, and J. R. Martinez Oct. 1974 447 p refs 3 Vol.
(Contract EPA-68-01-2103)
(PB-238879/1; EPA-460/3-74-020-C) Avail: NTIS HC $11.25 HC also available from NTIS $24.00/set of 3 reports as PB-238876-SET CSCL 13F

Volume 3 of a three volume report on possible impacts due to various levels of urban electric car use describes the DIFKIN computer model and linear rollback for analyzing future air quality in the South Coast Air Basin, forecasts stationary and vehicular pollutant emissions with and without electric cars, analyzes possible reductions of community noise from electric car use, projects life cycle costs of alternative electric cars in comparison with conventional cars as well as changes in employment and payroll in industry segments impacted by electric cars, and analyzes 1967 data to determine distributions of daily driving. GRA

N75-22264# Merchant Marine Academy, Kings Point, N.Y.
SUBMARINE TANKER CONCEPTS AND PROBLEMS Final Report
Patrick Moloney Oct. 1974 195 p refs
(COM-75-10009/9; NMRC-KP-129) Avail: NTIS HC $7.00 CSCL 13J

The National energy crisis of the U.S. can be responded to and diminished by the use of the large deposits of oil in the Arctic. The use of nuclear powered submarine tankers for the transportation of oil from the Arctic regions is discussed. The advantages and disadvantages of the submarine tankers as compared with the conventional methods of transportation such as surface tankers, tug-barges and oil pipe lines are discussed. GRA

N75-22476# RAND Corp., Santa Monica, Calif.
A USAF ENERGY PROJECTION MODEL
W. D. Gosch and W. E. Mooz Nov. 1974 71 p refs
(Contract DAHC15-73-C-0181)
(AD-A006928; R-1553-ARPA) Avail: NTIS CSCL 21/4

This report discusses a computer model that can be used to project future energy needs for the Air Force based on force posture elements and operational activity. The model gives Air Force planners a rapid method of systematically comparing the energy impact of present and alternative programs, the effects of changed flying activities, and current and hypothetical weapon systems. GRA

N75-22477# Stevens Inst. of Tech., Hoboken, N.J. Dept. of Mechanical Engineering.
HYDROGEN AS A FUEL
Richard B. Cole, J. W. Hollenberg, R. S. Magee, R. F. McAlevy, III, and K. H. Weil 28 Feb. 1975 14 p ref
(Contracts N00014-75-C-0220; N00014-67-A-0202-0046; ARPA Order 2615)
(AD-A006984; ME-TR-75001) Avail: NTIS CSCL 21/4

A short summary is given of continuing efforts directed toward evaluating the performance and problems of hydrogen-fueled piston engines and gas turbines and toward investigating the potential and problems of hydride and cryogenic storage of hydrogen. GRA

N75-22478# Southwest Research Inst., San Antonio, Tex. Dept. of Automotive Research.
TECHNOLOGICAL IMPROVEMENTS TO AUTOMOBILE FUEL CONSUMPTION. VOLUME 1: EXECUTIVE SUMMARY Final Research, Jun. 1973 - Jan. 1974
C. W. Coon Dec. 1974 14 p Prepared in cooperation with Environmental Protection Agency, Ann Arbor, Mich.
(Contract DOT-TSC-628)
(PB-238677/9; DOT-TSC-OST-74-39-1) Avail: NTIS HC $3.25 CSCL 21D

The design changes, which are recommended for the purpose of maximizing fuel economy, were derived after lengthy review against a series of constraints including regulatory requirements, technical feasibility, and cost effectiveness. Several possible technological improvements are identified, documented, and evaluated with respect to fuel economy. Results are reported as percentage improvement in fuel economy by comparison with 1973 model year vehicles. The effect of vehicle emission control systems is considered in the evaluation procedure. The most promising individual improvements are incorporated into three synthesized vehicle designs, and the projected fuel economy improvement for these vehicles is reported. GRA

N75-22479# Southwest Research Inst., San Antonio, Tex. Dept. of Automotive Research.
TECHNOLOGICAL IMPROVEMENTS TO AUTOMOBILE FUEL CONSUMPTION. VOLUME 2A: SECTIONS 1 THROUGH 23 Final Report, Jun. 1973 - Jan. 1974
C. W. Coon Dec. 1974 216 p Prepared in cooperation with Environmental Protection Agency, Ann Arbor, Mich.
(Contract DOT-TSC-628)
(PB-238678/7; DOT-TSC-OST-74-39-2BA) Avail: NTIS HC $7.25 CSCL 21D

The technological feasibility of reducing the fuel consumption of automobiles is investigated. Design changes recommended for the purpose of maximizing fuel economy are derived after a series of constraints including regulatory requirements, technical feasibility, and cost effectiveness are reviewed. GRA

N75-22480# Southwest Research Inst., San Antonio, Tex. Dept. of Automotive Research.
TECHNOLOGICAL IMPROVEMENTS TO AUTOMOBILE FUEL CONSUMPTION. VOLUME 2B: SECTIONS 24 AND 25 AND APPENDIXES A THROUGH I Final Report, Jun. 1973 - Jan. 1974
C.W. Coon Dec. 1974 178 p refs Prepared in cooperation with EPA, Ann Arbor, Mich.
(Contract DOT-TSC-628)
(PB-238679/5; DOT-TSC-OST-74-39-2B) Avail: NTIS CSCL 21D

The design changes, which are recommended for the purpose of maximizing fuel economy, have been derived after lengthy review against a series of constraints including regulatory requirements, technical feasibility, and cost effectiveness. Several possible technological improvements are identified, documented, and evaluated with respect to fuel economy. This volume covers the following: Summary of individual improvements; synthesis of designs for maximum fuel consumption reduction; list of references; bibliography; and various appendices. GRA

N75-22481# Little (Arthur D.), Inc., Cambridge, Mass.
A STUDY OF TECHNOLOGICAL IMPROVEMENTS IN AUTOMOTIVE FUEL CONSUMPTION. VOLUME 1: EXECUTIVE SUMMARY Final Report, Jun. 1973 - Jan. 1974
Donald A. Hurter Dec. 1974 52 p refs Prepared in cooperation with EPA, Ann Arbor, Mich.
(Contract DOT-TSC-627)
(PB-238693/6; DOT-TSC-OST-74-40-1) Avail: NTIS HC $4.25 HC also available from NTIS $23.00/set of 4 reports as PB-238692-SET CSCL 21D

Potential improvements in automobile fuel consumption based on innovative design and components. Standard and compact-size reference vehicles were selected, and a study of how power is used was conducted. Obvious technological innovations that would save on fuel consumption were identified and evaluated, and then screened against program constraints. Operation of reference vehicles equipped with innovative components or redesigned was computer simulated to predict fuel usage and performance. Techniques to measure fuel economy performance were also developed, and a statistical evaluation of published driving modes was performed. Author

N75-22482# Little (Arthur D.), Inc., Cambridge, Mass.
A STUDY OF TECHNOLOGICAL IMPROVEMENTS IN AUTOMOBILE FUEL CONSUMPTION. VOLUME 2: COMPREHENSIVE DISCUSSION Final Report, Jun. 1973 - Jan. 1974
Donald A. Hurter Dec. 1974 234 p refs Prepared in cooperation with EPA, Ann Arbor, Michigan
(Contract DOT-TSC-627)
(PB-238694/4; DOT-TSC-OST-74-40-2) Avail: NTIS HC $7.50 HC also available from NTIS $23.00/set of 4 reports as PB-238692-SET CSCL 21D

This volume is the main body of the report and provides a comprehensive discussion of each improvement option, the

Government constraints, the synthesized vehicles and the possible fuel economy gains. The contents cover: Fuel economy versus governmental constraints, operating conditions, and user/market requirements; fuel economy technology; the synthesis and evaluation of alternative vehicle designs. GRA

N75-22483# Little (Arthur D.), Inc., Cambridge, Mass.
A STUDY OF TECHNOLOGICAL IMPROVEMENTS IN AUTOMOBILE FUEL CONSUMPTION. VOLUME 3A: APPENDIXES 1 - 111 Final Report, Jun. 1973 - Jan. 1974
Donald A. Hurter Dec. 1974 199 p Prepared in cooperation with EPA, Ann Arbor, Mich.
(Contract DOT-TSC-627)
(PB-238695/1; DOT-TSC-OST-74-40-2a) Avail: NTIS HC $7.00 HC also available from NTIS $23.00/set of 4 reports as PB-238692-SET CSCL 21D

The original data collected as part of a study to determine potential improvements in automobile fuel consumption based on innovative design and components are presented. The contents of this volume include: Summary of sources and types of data collected; characteristics of the composite car; responses from industry to findings of this study; and performance data on innovative devices. GRA

N75-22484# Little (Arthur D.), Inc., Cambridge, Mass.
A STUDY OF TECHNOLOGICAL IMPROVEMENTS IN AUTOMOBILE FUEL CONSUMPTION. VOLUME 3B: APPENDIXES 4 - 7 Final Report, Jun. 1973 - Jan. 1974
Donald A. Hurter Dec. 1974 227 p refs Prepared in cooperation with EPA, Ann Arbor, Mich.
(Contract DOT-OST-627)
(PB-238696/9; DOT-TSC-OST-74-40-3b) Avail: NTIS HC $7.50 HC also available from NTIS $23.00/set of 4 reports as PB-238692-SET CSCL 21D

Data on various fuel economy test procedures, exhaust emission test procedures and standards are reported, including a final letter report of ADL subcontractor and a bibliography. This report is part of a study conducted to determine potential improvements in automobile fuel consumption based on innovative design and comnonents. GRA

N75-22486*# Union Carbide Corp., Tonawanda, N.Y. Linde Div.
SURVEY STUDY OF THE EFFICIENCY AND ECONOMICS OF HYDROGEN LIQUEFACTION
8 Apr. 1975 158 p refs
(Contract NAS1-13395)
(NASA-CR-132631) Avail: NTIS HC $6.25 CSCL 20L

The production of liquid hydrogen, with coal as the starting material, is reported. The minimum practicable energy and cost for liquefaction of gaseous hydrogen in the 1985-2000 time period is presented to investigate the possible benefits of the integration of coal gasification processes with the liquefaction process. M.C.F.

N75-22584*# Kanner (Leo) Associates, Redwood City, Calif.
A DIRECT VOLTAGE CONVERTER WITHOUT TRANSFORMER
T. Kuzmiszkina and A. Matusewicz Washington NASA [1975] 16 p Transl. into ENGLISH from Przeglad Telekomunikacyjny (Poland), V. 46, no. 1, 1973 p 23-28
(Contract NASw-2481)
(NASA-TT-F-16174) Avail: NTIS HC $3.25 CSCL 09C

The operating principle is described for a direct voltage converter without a transformer, and an analysis, together with an example of a circuit is presented. The converter can be applied to supply electronic devices operating at low and high power consumption. The converter has a high power efficiency. Because the converter operates without a transformer, it can be designed using IC technology. Author

N75-22669# Oregon State Univ., Corvallis.
APPLIED AERODYNAMICS OF WIND POWER MACHINES
Robert E. Wilson and Peter B. S. Lissaman Jul. 1974 116 p refs
(Grant NSF GI-41840)
(PB-238595/3; NSF/RA/N-74-113) Avail: NTIS HC $5.25 CSCL 20D

Aerodynamics of various types of wind power machines, and advantages and disadvantages of various schemes for obtaining power from the wind are reviewed. Simple, one-dimensional models for various power producing machines are given along with their performance characteristics, and presented as a function of their elementary aerodynamic and kinematic characteristics. Propeller type wind turbine theory is reviewed to level of strip theory including both induced axial and tangential velocities. GRA

N75-22722 Polish Academy of Sciences, Warsaw.
CONVERSION OF ELECTRICAL ENERGY INTO LASER RADIATION ENERGY IN HIGH PRESSURE MIXTURES OF MOLECULAR GASES [KONWERSJA ENERGII ELEKTRYCZNEJ W ENERGIE PROMIENIOWANIA LASEROWEGO W WYSOKOCISNIENIOWEJ MIESZANINIE GAZOW MOLEKULARNYCH]
Wojciech W. Byszewski 1974 181 p refs In POLISH
Avail: Issuing Activity

The physical processes taking place in the plasma of a carbon dioxide laser and their influence on electrical energy conversion were investigated. Other topics discussed include kinetics of electron collisions, variations in energy transport coefficients during electron-molecule collisions, differential equations (which describe changes in molecular density, electron density, and radiation intensity), the dependence of energy characteristics on gas pressure and electron energy, and numerical modelling of electron beam controlled high pressure discharge. Transl. by M.J.S.

N75-22745*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DOT/NASA COMPARATIVE ASSESSMENT OF BRAYTON ENGINES FOR GUIDEWAY VEHICLES AND BUSSES. VOLUME 2: ANALYSIS AND RESULTS
Washington 1975 284 p refs
(NASA-SP-354-Vol-2) Avail: NTIS HC $8.75 CSCL 21G

Gas turbine engines were assessed for application to hear duty transportation. A summary of the assumptions, applications, and methods of analysis is included along with a discussion of the approach taken, the technical program flow chart, and weighting criteria used for performance evaluation. The various engines are compared on the bases of weight, performance, emissions and noise, technology status, and growth potential. The results of the engine screening phase and the conceptual design phase are presented. Author

N75-22746*# National Aeronautics and Space Administration. Pasadena Office, Calif.
SOLAR POWERED PUMP Patent Application
Charles C. Kirsten, inventor (to NASA) (JPL) Filed 9 Apr. 1975 19 p
(Contract NAS7-100)
(NASA-Case-NPO-13567-1; US-Patent-Appl-SN-566493) Avail: NTIS HC $3.25 CSCL 13I

A low cost water pump suitable for use in agricultural irrigation in underdeveloped regions is disclosed. The pump is adopted to use unconcentrated sunlight as a source of energy and atmospheric air as a working fluid for intermittently delivering a stream of water from a given source. NASA

N75-22747*# National Aeronautics and Space Administration. Pasadena Office, Calif.
STIRLING CYCLE ENGINE AND REFRIGERATION SYSTEMS Patent Application
Walter H. Higa, inventor (to NASA) (JPL) Filed 5 May 1975 23 p
(Contract NAS7-100)
(NASA-Case-NPO-13613-1; US-Patent-Appl-SN-574208) Avail: NTIS HC $3.25 CSCL 13I

A Stirling cycle heat engine is described in which displacer motion is controlled as a function of the working fluid pressure and a substantially constant pressure. The heat engine includes an auxiliary chamber at the constant pressure, and an end surface of a displacer piston is disposed in the auxiliary chamber. During the compression portion of the engine cycle when the fluid pressure rises above the constant pressure, the displacer forces the working fluid to pass from the cold chamber to the hot chamber of the engine. During the expansion portion of the engine cycle the heated working fluid in the hot chamber does work by pushing down on the engine's drive piston. As the working fluid pressure drops below the constant pressure, the displacer forces most of the working fluid in the hot chamber to pass through the regenerator to the cold chamber. The engine is easily combinable with a refrigeration section to provide a refrigeration system in which the engine's single drive piston serves both the engine and the refrigeration section. NASA

N75-22783# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ERECTING GAS STORAGE FACILITIES AND OIL CENTERS
T. T. Stulov, B. V. Popvskii, and O. M. Ivanov 21 Jan. 1975 518 p refs Transl. into ENGLISH of the monograph "Sooruzhenie Gazokhranilishch i Neftebaz" 1973 p 1-368
(AD-A006559; FTD-HC-23-1722-74) Avail: NTIS CSCL 13/4

This text book sets forth basic information about oil centers and modern methods of constructing steel and concrete tanks for storing petroleum and petroleum products. Problems in designing steel and concrete oil tank members for strength and durability are also discussed. Information is given about the design and construction of gas storage tanks. A separate chapter is devoted to the latest methods of building storage tanks. A detailed description is given on erecting reinforced concrete oil storage tanks as well as underground gas storage tanks. The final chapter covers the machinery which must be used with steel or reinforced concrete storage tanks. GRA

N75-22858 Oklahoma Univ., Norman.
OIL DISPLACEMENT BY DIFFERENT SURFACTANT AND POLYMER WATERFLOOD SYSTEMS Ph.D. Thesis
Adel El-Sayed Ali El-Messidi 1974 178 p
Avail: Univ. Microfilms Order No. 75-11244

Rheological studies for four different fluid systems of oil recovery by waterflooding were conducted. The fluid systems are: conventional waterflooding, polymer waterflooding, polymer-surfactant waterflooding, and surfactant waterflooding. The cone and plate viscometer was used for such purpose for most of the investigated solutions, and the obtained data fit the power law equation. A Cannon Ubbelohde Capillary Viscometer was also used for the viscosity measurements for different solutions used in the oil displacement experiemtns. A Du Nouy tensiometer was also used to investigate the property of surface and interfacial tension of the different solutions. It was clear that the surfactants always had a great influence on these properties when added to either brine or polymer-brine solutions. A study of the oil displacement mechanism was also conducted using Berea sandstone core samples. Dissert. Abstr.

N75-22897# Auburn Univ., Ala. Engineering Experiment Station.
SOLVENT REFINED COAL STUDIES Progress Report, 1 Oct. 1973 - 31 May 1974
25 Jun. 1974 108 p refs
(Grant NSF GI-38701)
(PB-238532/6; NSF/RA/N-74-075) Avail: NTIS HC $5.25 CSCL 21D

Experimental results and model studies of solvent refining of coal are presented. The experimental apparatus, procedures, analyses, and results obtained to date are summarized. The following major topics are included: analysis of coal dissolution products; solvent characterization; hydrogenation apparatus, gas and liquid sampling, and analyses; preliminary results of autoclave runs, heat effects in coal dissolution-hydrogenation; effect of coal mineral matter upon coal conversion rate; rotating disc experiments; and the continuous reactor. Heat and mass transfer effects in solvent refining of coal are discussed along with theoretical investigation of coal structure and solubility. GRA

N75-22898# Federal Power Commission, Washington, D.C. Bureau of Natural Gas.
A REALISTIC VIEW OF US NATURAL GAS SUPPLY
Dec. 1974 27 p
(PB-238964/1) Avail: NTIS HC $3.75 CSCL 21D

The realities of the U.S. domestic natural gas shortage and the prospects for the future are discussed. GRA

N75-22899# Bureau of Mines, Washington, D.C. Div. of Ferrous Metals.
THE 1973 FUEL AND ELECTRICAL ENERGY REQUIREMENTS OF SELECTED MINERAL INDUSTRIES ACTIVITIES
7 May 1975 13 p ref
Avail: NTIS HC $3.25

Results of a nationwide canvass of fuels and electrical energy requirements for mineral extraction and processing are presented. Mines, quarries, pits, mills, coal preparation plants, plants using chemical and solution extraction methods, and smelters were surveyed along with selected mineral processing plants such as cement plants, exfoliating operations, and plants that process primary minerals. Data are reported for 1973 and are compared with total U.S. energy use data published in 1975. Author

N75-22900*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PHOTOVOLTAIC CELL ARRAY Patent Application
Jon T. Eliason, inventor (to NASA) (Sperry Rand Corp., Huntsville, Ala.) Filed 25 Apr. 1975 9 p Sponsored by NASA
(NASA-Case-MFS-22458-1; US-Patent-Appl-SN-571458) Avail: NTIS HC $3.25 CSCL 10A

A construction technique for making high density solar cell arrays at lowered costs is presented. Closely spaced filaments of silicon are prepared to have a continuous layer-type semiconductor junction formed by creating an internal P-type conductivity region and outer N-type conductivity region. Electrical output connections are made to the P and N layer regions by means of P bus members and N bus members. The filaments of silicon and connecting buses are appropriately woven to form what is regarded as a solar cell blanket with an effective density of 100 to 1,000 photocells per square inch. NASA

N75-22901*# TRW Systems, Redondo Beach, Calif.
TECHNOLOGY ASSESSMENT OF PORTABLE ENERGY RDT AND P, PHASE 1 Executive Summary Report
J. R. Spraul, comp. 7 Apr. 1975 13 p
(Contract NAS2-8445)
(NASA-CR-137654) Avail: NTIS HC $3.25 CSCL 10A

A technology assessment of transportation energy research, development, technology, and production was undertaken to assess the technical, economic, environmental, sociopolitical issues associated with transportation energy options, and to determine those courses of action impacting aviation and air transportation research and technology. A technology assessment workshop was used to determine the problem statements that would be considered. Study tasks are summarized along with the problem statements. M.J.S.

N75-22902*# TRW Systems, Redondo Beach, Calif.
TECHNOLOGY ASSESSMENT OF PORTABLE ENERGY RDT AND P, PHASE 1 Final Report
J. R. Spraul, comp. 7 Apr. 1975 240 p refs
(Contract NAS2-8445)
(NASA-CR-137653) Avail: NTIS HC $7.50 CSCL 10A

A technological assessment of portable energy research, development, technology, and production was undertaken to assess the technical, economic, environmental, and sociopolitical issues associated with portable energy options. Those courses of action are discussed which would impact aviation and air transportation research and technology. Technology assessment workshops were held to develop problem statements. The eighteen portable energy problem statements are discussed in detail along with each program's objective, approach, task description, and estimates of time and costs. M.J.S.

N75-22903*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SOLAR RESIDENTIAL HEATING AND COOLING SYSTEM DEVELOPMENT TEST PROGRAM
William R. Humphries and Darrell E. Melton Sep. 1974 129 p
(NASA-TM-X-64924) Avail: NTIS HC $5.75 CSCL 10A
A solar heating and cooling system is described, which was installed in a simulated home at Marshall Space Flight Center. Performance data are provided for the checkout and initial operational phase for key subsystems and for the total system. Valuable information was obtained with regard to operation of a solar cooling system during the first summer of operation. Areas where improvements and modifications are required to optimize such a system are discussed. Author

N75-22904*# Kanner (Leo) Associates, Redwood City, Calif.
WIND ENGINES AND WIND INSTALLATIONS
Ye. M. Fateyev Washington NASA Mar. 1975 391 p refs Transl. into ENGLISH of the book "Vetrodvigateli i Vetroustanovki" *Moscow, State Publishing House of Agricultural Literature, 1948* p 1-544
(Contract NASw-2481)
(NASA-TT-F-16170) Avail: NTIS HC $10.25 CSCL 10A
A comprehensive theoretical treatment of aerodynamics is presented along with a description of windtunnels, the aerodynamic characteristics of wind engines, towers, and related equipment. Methods of adjustment of wind engines to the wind are described along with several ways of regulating the number of revolutions and the power of wind engines. Wind energy, anemographs, wind engines working with piston and centrifugal pumps, and various agricultural machines are discussed along with windmills and windpower stations. Author

N75-22906*# General Electric Co., Cincinnati, Ohio.
POTASSIUM TOPPING CYCLES FOR STATIONARY POWER Final Report
R. J. Rossbach Washington NASA Mar. 1975 130 p refs
(Contract NAS3-17354)
(NASA-CR-2518; GESP-741) Avail: NTIS HC $5.75 CSCL 10A
A design study was made of the potassium topping cycle powerplant for central station use. Initially, powerplant performance and economics were studied parametrically by using an existing steam plant as the bottom part of the cycle. Two distinct powerplants were identified which had good thermodynamic and economic performance. Conceptual designs were made of these two powerplants in the 1200 MWe size, and capital and operating costs were estimated for these powerplants. A technical evaluation of these plants was made including conservation of fuel resources, environmental impact, technology status, and degree of development risk. It is concluded that the potassium topping cycle could have a significant impact on national goals such as air and water pollution control and conservation of natural resources because of its higher energy conversion efficiency. Author

N75-22909# Atomic Energy Board, Pretoria (South Africa).
BRIEF EXAMINATION OF THE STATUS OF NUCLEAR POWER IN THE REPUBLIC, USING 1974 COSTS
Aug. 1974 17 p refs
(PEL-237E; ISBN-0869605186) Avail: ERDA Depository Libraries HC $4.00
Nuclear power was introduced to the South African grid in the form of a light-water reactor (LWR) resulting in lower system-averaged costs to the end of the century. An installed nuclear capacity of 12,250 MWe is predicted by the year 2000. The economic date for reliable full-power operation for the first plant is computed to be 1983, with the second following a year later, and a third in 1987. Predictions of the installed nuclear capacity are sensitive to future fuel costs, but insensitive to future interest rates. Emphasis is placed on middle-term planning for the foreseeable future. Nuclear power is competitive only if the price of coal escalates at a rate of 4 per cent per annum and nuclear fuel costs remain as predicted. The introduction of nuclear power results in a significant saving in the amount of coal used for power generation at the expense of only a 1 per cent depletion of our low-cost uranium reserves. Author (NSA)

N75-22910# European Space Research Organization, Paris (France).
ON THE APPLICATION OF HYDROGEN AS A FUEL FOR AUTOMOTIVE VEHICLES
A. Gann Feb. 1975 18 p refs Transl. into ENGLISH of "Ueber die Verwendung von Wasserstoff als Triebstoff fuer Automobile" DFVLR, Porz, West Ger. Report DLR-Mitt-73-22, 27 Apr. 1973 Original German report available from DFVLR, Porz, West Ger. 8.90 DM
(ESRO-TT-132; DLR-Mitt-73-22) Avail: NTIS HC $3.25
The advantages and disadvantages of storing the gaseous, liquid, and metal hydride form of hydrogen for future hydrogen-air fueled automobiles are discussed. Safety problems are not taken into account. ESRO

N75-22911# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THERMAL DIAGRAMS OF THERMOELECTRICAL DEVICES
G. K. Kotyrlo and G. M. Shchegolev 1 Oct. 1974 126 p refs Transl. into ENGLISH of the book "Teplovye Skhemy Termo-Elektricheskikh Ustroistv" Kiev, 1973 p 1-107
(FTD Proj. T74-04-03)
(AD-787420; FTD-HC-23-1567-74) Avail: NTIS CSCL 10/2
A classification of the thermal configurations of thermoelectric, electrical generating, and cooling-heating devices is given. Principal attention is given to a description of new thermal schemes of thermoelectric devices of such types. GRA

N75-22914# National Bureau of Standards, Washington, D.C. *Center for Building Technology.*
RETROFITTING EXISTING HOUSING FOR ENERGY CONSERVATION: AN ECONOMIC ANALYSIS Final Report
Stephen R. Peterson Dec. 1974 78 p refs Prepared in cooperation with Federal Energy Administration, Washington, D. C.
(COM-75-50049/6; NBS-BSS-64) Avail: NTIS MF $2.25; SOD HC as C13.29/2:64 CSCL 13M
The study examines the economic aspects of energy conservation techniques suitable for retrofitting into existing housing, including insulation, storm windows and doors, and weather stripping. The objective is to determine a combination of techniques which will maximize net dollar savings in life-cycle operating costs for heating and cooling operations in existing homes, subject to specific climate conditions, fuel costs, and retrofitting costs. Microeconomic marginal analysis indicates that such a combination must be balanced so that the ratio of savings to cost is equal at the margin for each technique. GRA

N75-22915# Martin Marietta Corp., Denver, Colo.
SOLAR POWER SYSTEM AND COMPONENT RESEARCH PROGRAM Quarterly Report, 15 Jan. - 15 Apr. 1974
Floyd A. Blake Apr. 1974 133 p refs
(Grant NSF GI-41305)
(PB-238642/3; MCR-74-141(1); NSF/RA/N-74-103) Avail: NTIS HC $15.75 CSCL 10B
Progress is reported on system definition and performance analysis of a 100-MWe solar power system; user application analyses of direct hydroelectric integration, tie-line integration, and industrial augmentation systems; and meteorological analyses to model direct vs total insolation data. Component design studies concentrate on the boiler and superheater steam generator equipment. GRA

N75-22916# Boston Coll., Chestnut Hill, Mass. Dept. of Physics.
COLUMNAR SILICON FILM SOLAR CELLS FOR TER-

RESTRIAL APPLICATIONS Quarterly Progress Report, 1 Jul. - 30 Sep. 1974
P. H. Fang 20 Oct. 1974 31 p refs
(Grant NSF GI-34975)
(PB-238534/2; NSF/RANN/SE/GI-34975/PR/74/3;
NSF/RA/N-74-140) Avail: NTIS HC $3.75 CSCL 10B

Research on the development of a new solar cell structure to convert solar energy into electrical energy for terrestrial application is presented. Crystal growth is investigated, especially from the point of view of the role played by the aluminum surface and a possible extension of this mechanism to other types of surfaces for crystal growth. Doping of the silicon film to obtain a specific conductivity type principally by aluminum for a p-type silicon film, and formation of a p-n junction by the growth of a superimposed silicon layer with conductivity type opposite to that of the base layer are discussed. Phosphorus doped silicon layers on p-type silicon single crystals were investigated. GRA

N75-22917# Energy Research Corp., Bethel, Conn.
ELECTROLYTE FOR HYDROCARBON AIR FUEL CELLS Final Report
Bernard S. Baker Feb. 1975 23 p refs
(Contract DAAK02-73-C-0084; DA Proj. 1T0-611023-A-34A)
(AD-A007220; ERC-2597F) Avail: NTIS CSCL 10/3

In this final report early experiments on a variety of organic acids used as fuel cell electrolytes are summarized. The selection of tetrafluoroethanedisulfonic acid (TFEDSA) is reviewed and an improved synthesis for the acid is presented. Fuel cell data using high surface area polytetrafluoroethylene bonded platinum black electrodes is given for phosphoric acid, organic acid-phosphoric acid mixtures and TFEDSA electrolytes. For the latter a variety of paraffinic fuels ranging from ethane to pentane have been explored and polarization data is presented. Endurance data extending to 400 hours is given for propane and butane fuels. Levels of performance are similar to results obtained with direct propane oxidation in phosphoric acid. GRA

N75-22918# Aerojet Liquid Rocket Co., Sacramento, Calif.
DEVELOPMENT AND EVALUATION OF A STIRLING-CYCLE ENERGY CONVERSION SYSTEM Annual Report, May 1973 - Jul. 1974
S. Andrus, R. J. Faeser, J. Moise, L. C. Hoffman, and M. I. Rudnicki Aug. 1974 113 p refs
(Contract PHS-73-2930)
(PB-239086/2; ALRC-9280-74-11-10; NIH/NHLI-73-2930-1)
Avail: NTIS HC $3.75 CSCL 10B

The Stirling-Cycle engine is designed to power implantable heart-assist and total-heart-replacement systems. Heat is provided by a PU-238 radioisotope capsule. Program activity during the report period included development and in vivo testing of the Heart Assist System including the PAC-4 actuator and the MK V engine: design of an advanced actuator, PAC-5; and design, fabrication and testing of the THA-1 Total Heart Actuator. GRA

N75-22919# National Center for Energy Management and Power, Philadelphia, Pa.
TECHNOLOGY FOR THE CONVERSION OF SOLAR ENERGY TO FUEL GAS Quarterly Report
30 Apr. 1973 25 p
(Grants NSF GI-27976; NSF GI-34991)
(PB-238545/8; NSF/RA/N-73-078;
NSF/RANN/SE/GI-27976/73/1) Avail: NTIS HC $3.25 CSCL 07A

The development of increased laboratory-scale digester capacity is discussed. Active and stably operating digester cultures are established to allow initiation of the experimental effort. Emphasis is placed on the achievement of two-stage digestion. GRA

N75-22925# National Research Council, Washington, D.C.
EVALUATING INTEGRATED UTILITY SYSTEMS Final Report
Sep. 1974 125 p refs
(Contract HUD-H-1875)
(PB-238765/2) Avail: NTIS HC $5.25 CSCL 13A

Various concepts developed to provide utility systems designed to serve the needs of residential complexes ranging for from 300 to 1,000 dwelling units are reviewed and evaluated. It is found that the commercial hardware is available to achieve separate objectives of an integrated system but no system that effectively integrates these functions has been designed. GRA

N75-22926# Wisconsin Univ., Madison. Solar Energy Lab.
MODELING OF SOLAR HEATING AND AIR CONDITIONING Semiannual Progress Report, 1 Feb. - 31 Oct. 1974
John A. Duffie and William A. Beckman 31 Oct. 1974 87 p refs
(Grant NSF GI-40457)
(PB-239189/4; NSF/RANN/SE/GI-34029/PR/74/2;
NSF/RA/N-74-170) Avail: NTIS HC $4.75 CSCL 13A

The basic objective of this research is to develop a general and easy to use method for simulating a variety of solar energy thermal systems. The result of this study has been TRNSYS, a method for transient systems simulation. The TRNSYS program is described, from the point of view of a user. GRA

N75-22927# Hudson Inst., Inc., Croton-on-Hudson, N.Y.
A STUDY OF ENERGY SYSTEMS COMMAND, CONTROL AND COMMUNICATION FOR ENERGY CRISIS MANAGEMENT
Nicholas Fedoruk, Uzi Arda, Herman Kahn, Michael C. Macrakis, and Barry J. Mernoff Oct. 1974 142 p refs Sponsored by ERDA
(PB-239290/0; HI-2132-RR; NSF/RA/N-74-164) Avail: NTIS HC $5.75 CSCL 10A

An energy crisis management system which provides contingency plans and capabilities for far-fetched events whose impact could be very significant for the nation is considered. GRA

N75-22928# Florida Univ., Gainesville. Dept. of Mechanical Engineering.
FORMULATION OF A DATA BASE FOR THE ANALYSIS, EVALUATION AND SELECTION OF A LOW TEMPERATURE SOLAR POWERED AIR CONDITIONING SYSTEM Final Summary Report
E. A. Farber, C. A. Morrison, and H. A. Ingley 31 Jul. 1974 275 p refs
(Grant NSF GI-39323)
(PB-238683/7; NSF/RANN/SE/GI-39323/FR/74/2;
NSF/RA/N-74-0-67) Avail: NTIS HC $8.50 CSCL 13A

Various methods by which solar energy can be used for comfort cooling are presented. Data necessary for system analysis and computer analysis of the best methods are included. The ammonia-water absorption system was selected as the best present system with the greatest promise of ultimate success for solar air conditioning and refrigeration. A study of the state-of-the-art for both water- and air-cooled systems is presented together with a study of properties of refrigerants and absorber combinations, a computer performance analysis on two systems showing promise, and recommendations based upon the analyses. GRA

N75-22930# Martin Marietta Corp., Denver, Colo.
SOLAR POWER SYSTEM AND COMPONENT RESEARCH PROGRAM Final Report, 15 Jan. - 15 Nov. 1974
F. A. Blake and J. D. Walton 31 Jan. 1975 463 p refs
(Grant NSF AER-74-07570)
(PB-239185/2; MCR-75-9; NSF/RA/N-75-002) Avail: NTIS HC $11.50 CSCL 10B

System analysis and component design for a 100-MWe solar energy conversion power system are presented. The component design phase is concentrated on the boiler/superheater steam generation equipment. Results from the user application analyses, meteorological analysis, economic analysis, and boiler/superheater component design are included. GRA

N75-22953# Ocean Systems, Inc., Reston, Va.
AT-SEA TESTING OF A HIGH SEAS OIL RECOVERY SYSTEM Final Report, 30 Jul. - 18 Aug. 1973
Thomas N. Blockwick, Robert L. Beach, Frank A. March, and

Louis S. Brown Jul. 1974 124 p refs
(Contract DOT-CG-32781-A)
(AD-A006938; USCG-D-57-75) Avail: NTIS HC $5.25 CSCL 13/2

This report summarizes the at-sea tests of the 2000 gpm Ocean Systems, Inc., Weir-Basin Oil Recovery System (ORS) conducted at Port Hueneme, California, and at Point Conception, California. These tests were conducted without oil, with the purpose being to qualify the ORS with respect to strength, stability, operational function, ease of handling, compatibility with the Coast Guard lightweight oil containment barrier, and compatibility with Coast Guard buoy tenders. The tests showed that the 2000 gpm ORS was compatible with the barrier in both of the deployment configurations tested. Conformance to waves was very good, indicating that a high probability of obtaining high oil recovery efficiencies (percent oil in the recovered stream) could be expected. Launch and recovery from a buoy tender were successful, although a shorter length for the ORS was indicated to be desirable. Design modifications to minimize fabric wear and to increase the structural adequacy in certain areas are recommended. GRA

N75-22961 Princeton Univ., N.J.
STRATIGRAPHY, SEDIMENTOLOGY AND OIL AND GAS GEOLOGY OF THE LOWER CRETACEOUS IN CENTRAL ALBERTA Ph.D. Thesis
Peter C. Badgley 1952 293 p
Avail: Univ. Microfilms Order No. 75-6717

A regional stratigraphic and sedimentological analysis of the Lower Cretaceous series in central Alberta, embracing a region in which a number of important oil and gas discoveries were made, is presented. Structure contour, isopach and isolith maps, and stratigraphic and structural cross-sections were constructed based on subsurface core, sample, and electric logs data. The Lower Cretaceous series was subdivided over a large area, and a comprehensive nomenclature scheme is recommended. The significance and lateral persistence of each subdivision is established, and correlations recommended. Significant facies changes were determined for the various formations. Petrographic methods were applied to the analysis of the Lower Cretaceous formations and a comparison of methods as well as a statement of results was possible. Several structural trends significant to the location of oil and gas fields were determined. Rapid up regional dip porous sandstone pinch outs, found in the Joseph Lake region, are considered to be the most favorable areas for light crude production. Dissert. Abstr.

N75-23365 Joint Publications Research Service, Arlington, Va.
INSUFFICIENT UTILIZATION OF SCIENTIFIC ADVANCES

Sergiu Tamas *In its* Transl. on Eastern Europe: Sci. Affairs, No. 462 (JPRS-64632) 25 Apr. 1975 p 9-18 Transl. into ENGLISH from ERA Socialista (Bucharest), no. 6, Mar. 1975 p 9-13

Sociopolitical and economic management is discussed in terms of the scientific and technological revolution in Romania. It is indicated that the efficiency of the economic and social processes must be increased. The following factors are discussed: reduction of resources, raw materials, and energy on a world-wide level, production based on biological procedures, reduction of the research to production cycles, rise in labor productivity and reduction in consumption; and the principle of recycling. J.M.S.

N75-23387# RAND Corp., Santa Monica, Calif.
PROTECTING THE US PETROLEUM MARKET AGAINST FUTURE DENIALS OF IMPORTS Interim Report
Horst Mendershausen and Richard Nehring Oct. 1974 108 p
(Contract DAHC15-73-C-0181)
(AD-A006643; R-1603-ARPA) Avail: NTIS CSCL 05/3

The report considers precautionary policies to counter the threat of future disruptions in the supply of U.S. oil imports. Such disruptions are highly possible, since the conditions that produced the Arab embargo of 1973-74 have not been eliminated. The authors review the recent oil embargo and U.S. responses to it, examine the history of U.S. petroleum imports, and weigh the outlook for future imports by source and relative vulnerability. GRA

N75-23391# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
THE ROLE FOR FEDERAL R AND D ON ALTERNATIVE AUTOMOTIVE POWER SYSTEMS Interim Report, 1 Jun. - 31 Oct. 1974
John B. Heywood, Henry D. Jacoby, Lawrence H. Linden, Patricia D. Mooney, and Joe M. Rife Nov. 1974 175 p refs
(Grant NSF EN-44166)
(PB-238771/0; MIT-EL-74-013) Avail: NTIS HC $6.25 CSCL 21G

The question: Is it appropriate for the Federal Government to support R and D on alternative automotive power systems is examined. Potential alternatives to the internal combustion engine (ICE) include the stratified charge, Wankel, diesel, Rankine cycle, Stirling cycle, gas turbine, electric and hybrid systems. These engines may offer advantages over the ICE but considerable development would be required, and Federal support has been proposed. The five sections of the report are: a description of the central issue and a set of underlying issues, a review of the relevant technology, an exploration of the role for Federal R and D in overall Federal policy concerning the automobile, an analysis of present programs in industry and government, and conclusions. Appendices review the history of Federal programs and describe the content of present industry and government programs. GRA

N75-23392# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EVALUATION OF THE ENERGY PERFECTION OF THE DIFFERENT FORMS OF TRANSPORT
A. A. Borin 18 Feb. 1975 29 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 2, no. 6, 1971 p 140-145
(AD-A006562; FTD-MT-24-0455-75) Avail: NTIS CSCL 20/11

Direct comparative evaluation of power engineering of transport vehicles is discussed which is based on different methods of lift formation and thrust. It is shown that the criteria of transport vehicles are divided into four categories characterized by different dependence of energy criterion on the motion speed. Other topics discussed include flow rates, hydrofoils, lift devices, air intakes, and cost analysis. M.J.S.

N75-23582 Air Force Aero Propulsion Lab., Wright-Patterson AFB Ohio.
THE ROLE OF COMPUTERS IN FUTURE PROPULSION CONTROLS
Charles E. Bentz *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 9 p refs

The role of computers in future propulsion controls is reviewed from two different viewpoints - the integrated avionics approach and the dedicated propulsion system approach. The discussion presented suggests that a dedicated computer for the propulsion system control will provide a more optimum solution in the future in terms of cost, complexity, and reliability. An integrated avionic systems approach that also includes the propulsion system control poses many new problems in the areas of system management and hardware development that may overshadow any of the immediate benefits of using a central processor. Author

N75-23678*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ELECTRIC POWER FOR SPACE SATELLITES
Charles M. MacKenzie 4 Apr. 1974 32 p Presented at the Solar Energy Lecture 4, Washington, D. C., Mar. - May 1974; sponsored by IEEE, Washington Acad. of Sci., and Washington Soc. of Eng.
(NASA-TM-X-66808) Avail: NTIS HC $3.75 CSCL 21C

The development of electric power systems for satellites is discussed as an evolutionary process requiring the integration of power generation, power storage, and power control and distribution. The growth of space electric power systems is traced. The capabilities and limitations of the various elements (i.e. silicon solar cells) are discussed together with their impact on future technological growth. Author

N75-23681*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SUMMARY OF HIGH EFFICIENCY SILICON SOLAR CELL MEETING HELD AT NASA-LEWIS
Daniel T. Bernatowicz 1975 4 p Presented at the 11th Photovoltaic Specialists Conf., Phoenix, 6-8 May 1975; Sponsored by the Inst. of Elec. and Electron. Engr.
(NASA-TM-X-71729; E-8353) Avail: NTIS HC $3.25 CSCL 10B

Attempts made to raise the efficiency of solar cells for space use are reported. The Helios, violet, and non-reflective cells were studied and it was concluded that the maximum practical efficiency of silicon solar cells is between 17 and 20%. Author

N75-23682*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
NATURAL ENVIRONMENT DESIGN CRITERIA FOR THE SOLAR ELECTRIC PROPULSION STAGE (SEPS)
Jerry J. Wright 20 May 1975 16 p refs
(NASA-TM-X-64929) Avail: NTIS HC $3.25 CSCL 21C

The natural environment design criteria are given for six different solar electric propulsion stage missions. These environment data include the neutral atmosphere; ionosphere, trapped radiation; free-space radiation environment; and meteoroid, asteroid, and comet environments. The electromagnetic radiation environment (direct, reflected, or scattered) at the planets and interplanetary regions is also included. Author

N75-23683*# Little (Arthur D.), Inc., Cambridge, Mass.
FEASIBILITY STUDY OF A SATELLITE SOLAR POWER STATION Final Report
Peter E. Glaser, Owen E. Maynard (Raytheon Co., Sudbury, Mass.), John J. R. Mackovciak (Grumman Aerospace Corp., Bethpage, Mass.), and Eugene I. Ralph (Spectrolab, Inc., Sylmar, Calif.) Washington NASA Feb. 1974 199 p refs
(Contract NAS3-16804)
(NASA-CR-2357; ADL-C-74830) Avail: NTIS HC $7.00 CSCL 10B

A feasibility study of a satellite solar power station (SSPS) was conducted to: (1) explore how an SSPS could be flown and controlled in orbit; (2) determine the techniques needed to avoid radio frequency interference (RFI); and (3) determine the key environmental, technological, and economic issues involved. Structural and dynamic analyses of the SSPS structure were performed, and deflections and internal member loads were determined. Desirable material characteristics were assessed and technology developments identified. Flight control performance of the SSPS baseline design was evaluated and parametric sizing studies were performed. The study of RFI avoidance techniques covered (1) optimization of the microwave transmission system; (2) device design and expected RFI; and (3) SSPS RFI effects. The identification of key issues involved (1) microwave generation, transmissions, and rectification and solar energy conversion; (2) environmental-ecological impact and biological effects; and (3) economic issues, i.e., costs and benefits associated with the SSPS. The feasibility of the SSPS based on the parameters of the study was established. Author

N75-23691# Indian National Scientific Documentation Centre, New Delhi.
CHEMISTRY OF ORGANIC SULFUR COMPOUNDS CONTAINED IN PETROLEUMS AND PETROLEUM PRODUCTS, VOLUME 7
1974 536 p refs Transl. into ENGLISH of the book "Khimiya seraorganicheskikh soedinenii soderzhashchikhsya v neftyakh i nefteprodukakh, tom 7" Moscow, 1964 529 p Conf. held in Ufa, USSR, 12-16 Feb. 1963 Sponsored in part with the Bureau of Mines, Washington, D.C.
(Contract NSF C-466)
(TT-70-57759). Avail: NTIS HC $12.50 CSCL 07C

Papers given at a conference on organic sulfur compounds are presented. Topics discussed include development of processes for the preparation of organic sulfur compounds, the synthesis and study of the properties, reactivities, and applications of organic sulfur compounds, the composition of organic sulfur compounds contained in petroleums and petroleum products, methods for their removal and isolation, methods for their removal and isolation, methods for the analysis and determination of structure of the organic sulfur compounds, and thermocatalytic conversions. M.J.S.

N75-23719 Illinois Univ., Urbana.
THE OXIDATION OF ETHYLENE IN AUTOMOTIVE ENGINE EXHAUST GAS: AN EXPERIMENTAL INVESTIGATION Ph.D. Thesis
Richard William Deller 1974 185 p
Avail: Univ. Microfilms Order No. 75-11763

The removal of the hydrocarbon emissions from automotive engine exhaust gas was effected by a thermal reactor. The removal of ethylene from exhaust gas under simulated thermal reactor conditions is studied. The exhaust gas is of variable composition and the composition of the reacting mixtures is quench sampled and analyzed by chemical and instrumental means. Results show that the ethylene removal rate was dependent not only on the oxygen concentration and the temperature but that it was also influenced by the nitric oxide concentration. The concentration of the active radicals, which is available to attack ethylene, is controlled by nitric oxide through a complex inhibition and reintroduction mechanism. Dissert. Abstr.

N75-23740# Wyoming Univ., Laramie.
THE DIRECT PRODUCTION OF HYDROCARBONS FROM COAL-STEAM SYSTEMS Final Report, Nov. 1968 - Nov. 1973
Jan. 1975 87 p refs
(Contract DI-14-01-0001-1196)
(PB-239356/9; OCR-80-f) Avail: NTIS MF $2.25; SOD HC $4.65 as C.I163.10:80 CSCL 07A

Experiments were carried out on the use of a multiple catalyst system consisting of potassium carbonate and a commercial nickel methanation catalyst for the direct production of methane from coal-steam reactions. This system combines the effects of these catalysts to produce in a single-step conversion a product gas consisting primarily of methane and carbon dioxide with a CO2-free heating value as high as 850 Btu per SCF. Two of the apparent problems inherent with such a system were catalyst recovery and the loss of catalyst activity over prolonged periods of time at the conversion temperatures in the presence of the various reactants produced from the coal gasification. GRA

N75-23880*+ TRW Systems Group, Redondo Beach, Calif. Materials Science Staff.
AMES HEAT PIPE EXPERIMENT (AHPE) EXPERIMENT DESCRIPTION DOCUMENT
Bruce D. Marcus Jan. 1972 133 p refs
(Contract NAS2-5503)
(NASA-CR-114413; TRW-13111-6033-R0-00) Avail: NTIS HC $5.75 CSCL 13K

A gas-controlled variable-conductance heat pipe was qualified for flight aboard orbiting astronomical observatory (OAO3). Experiments were conducted to determine the performance and reliability of the pipe in the vacuum environment of space, and to demonstrate in a specific engineering application its effectiveness in providing temperature stability for spacecraft equipment which experiences varying electronic duty cycles and changing thermal boundary conditions. System design and hardware are discussed in detail. Author

N75-23882*# B & K Engineering, Inc., Towson, Md.
ERTS-C (LANDSAT 3) CRYOGENIC HEAT PIPE EXPERIMENT DEFINITION Final Report

P. J. Brennan and E. J. Kroliczek Mar. 1975 87 p refs
(Contract NAS5-20968)
(NASA-CR-143797; BK005-1009) Avail: NTIS HC $4.75 CSCL 13A

A flight experiment designed to demonstrate current cryogenic heat pipe technology was defined and evaluated. The experiment package developed is specifically configured for flight aboard an ERTS type spacecraft. Two types of heat pipes were included as part of the experiment package: a transporter heat pipe and a thermal diode heat pipe. Each was tested in various operating modes. Performance data obtained from the experiment are applicable to the design of cryogenic systems for detector cooling, including applications where periodic high cooler temperatures are experienced as a result of cyclic energy inputs. Author

N75-24074# Bureau of Mines, Pittsburgh, Pa. Mining and Safety Research Center.
LOW-TEMPERATURE EVOLUTION OF HYDROCARBON GASES FROM COAL M.S. Thesis
Ann G. Kim Nov. 1974 28 p refs
(PB-238322/2; BM-RI-7965) Avail: NTIS HC $3.75 CSCL 08D

Hydrocarbon gases, are by-products of coal formation. An experiment was performed to determine if observable changes in the gases from coal could be produced at temperatures below 200C in relatively short periods of time. The experiment involved heating coal samples from six coalbeds at constant temperatures and analyzing evolved gases. The composition of the gases at three temperatures was compared. At 35C, over 99 percent of the gas is methane; at 125 and 150, methane constitutes approximately half of the hydrocarbon gas. Iso-butane and pentane are the predominant higher hydrocarbon at temperatures between 100 and 150C. GRA

N75-24096 Connecticut Univ., Storrs.
ELECTRIC POWER GENERATION UTILIZING A HEAT PIPE TURBINE-GENERATOR Ph.D. Thesis
Urho Sulonantti Haapala 1975 168 p
Avail: Univ. Microfilms Order No. 75-10625

The generation of electrical power utilizing a turbine-generator unit situated within the adiabatic section of a heat pipe is investigated. The analytical model is established to ascertain the interacting constraints upon the electrical power output due to fluid physical properties, total axial thermal energy transport, gravitational effects, and geometrical parameters of the heat pipe and turbine-generator unit. The analysis for the wickless heat pipe includes the effects of the rate of change of momentum, frictional losses at the liquid-vapor interface, viscous drag of the liquid at the pipe wall, variations of the rate of mass transport across the liquid-vapor interface with liquid film thickness, and the axial pressure gradients of the vapor. It is shown that optimum power output occurs at the maximization of the product of the mass flux and the available pressure gradient across the adiabatic section. The design analysis of a terrestrial power generation station utilizing solar energy or the oceanic-atmospheric temperature gradient occurring in the arctic or antarctic regions is presented. Dissert. Abstr.

N75-24098# Spectrolab, Inc., Sylmar, Calif.
PHOTOVOLTAIC SOLAR POWER SYSTEMS
E. L. Ralph 23 Mar. 1974 27 p Presented at the Solar Energy Lecture 2, Washington, D. C., Mar.-May 1974; sponsored by IEEE, Washington Acad. of Sci., and Washington Soc. of Eng.
Avail: NTIS HC $3.75

An introduction into photovoltaic device theory and design is given to provide a background for discussing applications for solar power system. The potential for using silicon solar cells to provide large amounts of electrical power is shown and a proposed plan for developing solar power systems for a wide range of applications is described. Solar power systems utilized in remote locations where conventional power lines are not available are described along with the satellite solar power station which is designed to generate 5,000 megawatts of power. Author

N75-24099*# Little (Arthur D.), Inc., Cambridge, Mass.
SPACE SATELLITE POWER SYSTEM
Peter E. Glaser 28 Mar. 1974 24 p Presented at the Solar Energy Lecture 3, Washington, D. C., Mar.-May 1974; sponsored by IEEE, Washington Acad. of Sci., and Washington Soc. of Eng. Sponsored by NASA
(NASA-CR-142799) Avail: NTIS HC $3.25 CSCL 10A

The concept of a satellite solar power station was studied. It is shown that it offers the potential to meet a significant portion of future energy needs, is pollution free, and is sparing of irreplaceable earth resources. Solar energy is converted by photovoltaic solar cell arrays to dc energy which in turn is converted into microwave energy in a large active phased array. The microwave energy is beamed to earth with little attenuation and is converted back to dc energy on the earth. Economic factors are considered. Author

N75-24100# Arizona Univ., Tucson. Optical Sciences Center.
SOLAR PHOTOTHERMAL POWER CONVERSION
Aden B. Meinel and Marjorie P. Meinel 11 Apr. 1974 28 p Presented at the Solar Energy Lecture 5, Washington, D. C., Mar.-May 1974; sponsored by IEEE, Washington Acad. of Sci., and Washington Soc. of Eng.
Avail: NTIS HC $3.75

The photothermal conversion of sunlight into heat and then into electric power is examined. The application of solar energy for heating and cooling domestic and commercial buildings is discussed in terms of efficiency, convenience, and economics. The concept of solar energy farms for the production of electrical power on a large scale is considered to be cost effective. J.M.S.

N75-24101# Massachusetts Univ., Amherst. Dept. of Civil Engineering.
OCEANIC AND ATMOSPHERIC ENERGY SOURCES
William E. Heronemus 18 Apr. 1974 59 p Presented at the Solar Energy Lecture 6, Washington, D. C., Mar.-May 1974; sponsored by IEEE, Washington Acad. of Sci., and Washington Soc. of Eng.
Avail: NTIS HC $4.25

Solar energy processes are discussed in terms of decreasing consumption of fossil fuels and utilization of renewable energy sources. Emphasis is placed on the windpower process and the ocean thermal differences process which are based on natural collection of solar energy. J.M.S.

N75-24102# Maryland Univ., College Park. Dept. of Mechanical Engineering.
THE NATIONAL SOLAR ENERGY PROGRAM
Frederick H. Morse 25 Apr. 1974 42 p Presented at the Solar Energy Lecture 7, Washington, D. C., Mar.-May 1974; sponsored by IEEE, Washington Acad. of Sci., and Washington Soc. of Eng.
Copyright. Avail: NTIS HC $3.75

The major efforts within the National Solar Energy Program are described. The following areas are included: heating and cooling of buildings, solar thermal energy conversion, photovoltaics, bioconversion, wind energy conversion, and ocean thermal energy conversion. J.M.S.

N75-24103# InterTechnology Corp., Warrenton, Va.
THE ENERGY PLANTATION
Clinton C. Kemp 2 May 1974 24 p Presented at the Solar Energy Lecture 8, Washington, D. C., Mar.-May 1974; sponsored by IEEE, Washington Acad. of Sci., and Washington Soc. of Eng.
Avail: NTIS HC $3.25

Conversion of solar energy accomplished by using photosynthesis to grow plant materials for their fuel value is discussed. It is shown that an energy plantation is self renewing and is cost competitive with coal or oil at equal environmental impact. Author

N75-24104# Joint Committe on Atomic Energy (U. S. Congress).
SOLAR ENERGY RESEARCH AND DEVELOPMENT
Washington GPO 1975 851 p refs Hearings on S. 2819

and S. 3234 before Joint Comm. on Atomic Energy, 93d Congr., 2d Sess., 7-8 May 1974
(GPO-40-684) Avail: SOD HC $6.70

Testimony is provided on the present status and future prospects for solar energy utilization and technology. Emphasis is placed on focusing the scattered energy programs in a single agency, the Energy Research and Development Administration. The following major areas of solar energy research are considered: solar heating and cooling of buildings; solar thermal conversion systems; wind electric power; bioconversion to fuels; ocean thermal electric power; and photovoltaic electric power. J.M.S.

N75-24105*# Barber-Colman Co., Irvine, Calif. Resources Recovery Systems.
PRODUCTION OF GASEOUS FUEL BY PYROLYSIS OF MUNICIPAL SOLID WASTE Final Report
T. H. Crane, H. N. Ringer, and D. W. Bridges 20 Mar. 1975 65 p
(Contract NAS9-14305)
(NASA-CR-141791) Avail: NTIS HC $4.25 CSCL 10A

Pilot plant tests were conducted on a simulated solid waste which was a mixture of shredded newspaper, wood waste, polyethylene plastics, crushed glass, steel turnings, and water. Tests were conducted at 1400 F in a lead-bath pyrolyser. Cold feed was deaerated by compression and was dropped onto a moving hearth of molten lead before being transported to a sealed storage container. About 80 percent of the feed's organic content was converted to gaseous products which contain over 90 percent of the potential waste energy; 12 percent was converted to water; and 8 percent remained as partially pyrolyzed char and tars. Nearly half of the carbon in the feed is converted to benzene, toluene and medium-quality fuel gas, a potential credit of over $25 per ton of solid waste. The system was shown to require minimal preprocessing and less sorting then other methods. Author

N75-24106*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AERODYNAMIC DESIGN OF A FREE POWER TURBINE FOR A 75 KW GAS TURBINE AUTOMOTIVE ENGINE
Milton G. Kofskey, Theodore Katsanis, and Lawrence F. Schumann (Army Air Mobility Res. and Develop. Lab.) Apr. 1975 62 p refs
(NASA-TM-X-71714; E-8335) Avail: NTIS HC $4.25 CSCL 21E

A single stage axial-flow turbine having a tip diameter of 15.41 centimeters was designed. The design specifications are given and the aerodynamic design procedure is described. The design includes the transition duct and the turbine exit diffuser. The aerodynamic information includes typical results of a parametric study, velocity diagrams, blade surface and wall velocities, and blade profile and wall coordinates. Author

N75-24107*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE DEVELOPMENT OF A SOLAR RESIDENTIAL HEATING AND COOLING SYSTEM
4 Apr. 1975 53 p
(NASA-CR-142728; M-TU-75-3) Avail: NTIS HC $4.25 CSCL 10A

The MSFC solar heating and cooling facility was assembled to demonstrate the engineering feasibility of utilizing solar energy for heating and cooling buildings, to provide an engineering evaluation of the total system and the key subsystems, and to investigate areas of possible improvement in design and efficiency. The basic solar heating and cooling system utilizes a flat plate solar energy collector, a large water tank for thermal energy storage, heat exchangers for space heating, and an absorption cycle air conditioner for space cooling. A complete description of all systems is given. Development activities for this test system included assembly, checkout, operation, modification, and data analysis, all of which are discussed. Selected data analyses for the first 15 weeks of testing are included, findings associated with energy storage and the energy storage system are outlined, and conclusions resulting from test findings are provided. An evaluation of the data for summer operation indicates that the current system is capable of supplying an average of 50 percent of the thermal energy required to drive the air conditioner. Preliminary evaluation of data collected for operation in the heating mode during the winter indicates that nearly 100 percent of the thermal energy required for heating can be supplied by the system. Author

N75-24108*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE HIGH INTENSITY SOLAR CELL: KEY TO LOW COST PHOTOVOLTAIC POWER
Bernard L. Sater and Chandra Goradia (Cleveland State Univ.) 1975 12 p refs Presented at the 11th Photovoltaic Specialists Conf., Phoenix, Ariz., 6-8 May 1975
(NASA-TM-X-71718; E-8338) Avail: NTIS HC $3.25 CSCL 10A

The design considerations and performance characteristics of the 'high intensity' (HI) solar cell are presented. A high intensity solar system was analyzed to determine its cost effectiveness and to assess the benefits of further improving HI cell efficiency. It is shown that residential sized systems can be produced at less than $1000/kW peak electric power. Due to their superior high intensity performance characteristics compared to the conventional and VMJ cells, HI cells and light concentrators may be the key to low cost photovoltaic power. Author

N75-24109*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE EFFECT OF SUNSHINE TESTING ON TERRESTRIAL SOLAR CELL SYSTEM COMPONENTS
Americo F. Forestieri and Evelyn Anagnostou 1975 8 p refs Presented at the 11th photovoltaic Specialists Conf., Phoenix, Ariz., 6-8 May 1975; sponsored by IEEE
(NASA-TM-X-71722) Avail: NTIS HC $3.25 CSCL 10A

Samples of FEP encapsulated silicon solar cells and various potential encapsulation or cover materials were subjected to accelerated and real time testing. By measuring changes in solar cell output or optical transmission as a function of exposure the durability of the samples was evaluated. Results are presented. Author

N75-24110*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COST COMPETITIVENESS OF A SOLAR CELL ARRAY POWER SOURCE FOR ATS-6 EDUCATIONAL TV TERMINAL
R. M. Masters Apr. 1975 9 p refs
(NASA-TM-X-71720; E-8327) Avail: NTIS HC $3.25 CSCL 10B

A cost comparison is made between a terrestrial solar cell array power system and a variety of other power sources for the ATS-6 Satellite Instructional Television Experiment (SITE) TV terminals in India. The solar array system was sized for a typical Indian location, Lahore. Based on present capital and fuel costs, the solar cell array power system is a close competitor to the least expensive alternate power system. A feasibility demonstration of a terrestrial solar cell array system powering an ATS-6 receiver terminal at Cleveland, Ohio is described. Author

N75-24111*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OUTDOOR FLAT-PLATE COLLECTOR PERFORMANCE PREDICTION FROM SOLAR SIMULATOR TEST DATA
Frederick F. Simon and Edgar H. Buyco 29 May 1975 17 p refs Presented at 10th Thermal Phys. Conf., Denver, 27-29 May 1975; sponsored by AIAA
(NASA-TM-X-71707; E-8320) Avail: NTIS HC $3.25 CSCL 10B

Solar collector performance data obtained from tests with a simulator was modified for real-life conditions. The data obtained with the simulator was corrected for the variable conditions of ambient temperature, wind, incident angle, flow rate, etc., that are encountered outdoors. Modification of simulator data was accomplished by combining experiment with theory. The technique was demonstrated by application to a spectrally selective and a nonselective type of collector. This kind of modified simulator collector performance data should be valuable in solar systems analysis and for collector performance ranking based on all-day calculated conditions. Author

N75-24113*# Institute of Gas Technology, Chicago, Ill.
HYDROGEN PRODUCTION FROM COAL Interim Report
24 Apr. 1975 16 p Presented at NASA Symp., Huntsville, Ala., 24 Apr. 1975
(Contract NAS1-13620)
(NASA-CR-142816) Avail: NTIS HC $3.25 CSCL 10A

The gasification reactions necessary for the production of hydrogen from montana subbituminous coal are presented. The coal composition is given. The gasifier types mentioned include: suspension (entrained) combustion; fluidized bed; and moving bed. Each gasification process is described. The steam-iron process, raw and product gas compositions, gasifier feed quantities, and process efficiency evaluations are also included. L.B.

N75-24114# Joint Economic Committee (U. S. Congress).
ENERGY IMPORTS AND THE US BALANCE OF PAYMENTS
Washington GPO 1974 166 p refs Hearings before Subcomm., on Intern. Economics of Joint Economic Comm. 93d Congr., 1st Sess., 6-8 Nov. 1973
(GPO-28-965) Avail: Subcomm. on Intern. Economics

Testimony is provided on the U.S. balance of payments in terms of availability of imported oil and high prices. Import policy is reassessed in order to reduce reliance on foreign sources and minimize overall energy cost. An analytical model developed and designed to evaluate basic assumptions with respect to oil prices and oil import levels is presented. J.M.S.

N75-24115# Committee on Banking and Currency (U. S. House).
THE ECONOMICS OF ENERGY AND NATURAL RESOURCE PRICING
Washington GPO Mar. 1975 797 p refs Compilation of Reports and Hearings of the Ad Hoc Comm. on the Domestic and International Monetary Effect of Energy and other Natural Resource Pricing of Comm. on Banking, Currency, and Housing, 94th Congr., 1st Sess., Mar. 1975
(GPO-48-071) Avail: Comm. on Banking and Currency

The economic impact of the drastic increase in energy prices is assessed along with the problems which may occur with similar price increases in other natural resources. The historical development of the international petroleum market was surveyed, and the problems of adjusting to the petroleum shortages of 1973-1974 are analyzed. The issue of energy security for the United States in the light of current and projected policies of the Organization of Petroleum Exporting Countries were examined. This includes a series of recommendations to enhance American energy security, taking cognizance of the various costs attached to alternative policies. The effects were investigated of the long run upward trend in energy prices on the domestic economy with particular reference to structural shifts in production consumption, and the distribution of income. International monetary problems and the particular difficulties facing less-developed countries are discussed along with the balance-of-payments problems confronting the United States and its major trading partners. The United States future resource needs and policies are discussed. M.J.S.

N75-24116*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A COMPRESSOR DESIGNED FOR THE ENERGY RESEARCH AND DEVELOPMENT AGENCY AUTOMOTIVE GAS TURBINE PROGRAM
Michael R. Galvas May 1975 32 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Cleveland
(NASA-TM-X-71719; E-8365) Avail: NTIS HC $3.75 CSCL 21E

A centrifugal compressor was designed for a gas turbine powered automobile as part of the Energy Research and Development Agency program to demonstrate emissions characteristics that meet 1978 standards with fuel economy and acceleration which are competitive with conventionally powered vehicles. A backswept impeller was designed for the compressor in order to attain the efficiency goal range required for the objectives of this program. Details of the design and method of flow analysis of the compressor are presented. Author

N75-24118*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STANDARDIZED SOLAR SIMULATOR TESTS OF FLAT PLATE SOLAR COLLECTORS. 1: SOLTEX COLLECTOR WITH TWO TRANSPARENT COVERS
Frederick Simon May 1975 13 p refs
(NASA-TM-X-71738; E-8362) Avail: NTIS HC $3.25 CSCL 10B

A Soltex flat plate solar collector was tested with a solar simulator for inlet temperatures of 77 to 201 F, flux levels of 240 and 350 Btu/hr-sq ft, a collant flow rate of 10.5 lb/hr sq ft, and incident angles of 0 deg, 41.5 deg, and 65.2 deg. Collector performance is correlated in terms of inlet temperature, flux level, and incident angle. Author

N75-24119*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
V-GROOVED SILICON SOLAR CELLS
Cosmo R. Baraona and Henry W. Brandhorst [1975] 10 p refs Presented at 11th Photovoltaic Specialists Conf., Phoenix, Ariz., 6-8 May 1975; sponsored by IEEE
(NASA-TM-X-71715; E-8336) Avail: NTIS HC $3.25 CSCL 10B

Silicon solar cells with macroscopic V-shaped grooves and microscopically texturized surfaces were made by preferential etching techniques. Various conditions for potassium hydroxide and hydrazine hydrate etching were investigated. Optical reflection losses from these surface were reduced. The reduced reflection occurred at all wavelengths and resulted in improved short circuit current and spectral response. Improved collection efficiency is also expected from this structure due to generation of carriers closer to the cell junction. Microscopic point measurements of collected current using a scanning electron microscope showed that current collected at the peaks of the texturized surface were only 80 percent of those collected in the valleys. Author

N75-24121*# Old Dominion Univ. Research Foundation, Norfolk, Va.
INTERDISCIPLINARY STUDY OF ATMOSPHERIC PROCESSES AND CONSTITUENTS OF THE MID-ATLANTIC COASTAL REGION. ATTACHMENT 3: DATA SET FOR CRANEY ISLAND OIL REFINERY INSTALLATION EXPERIMENT
Earl C. Kindle, Alan Bandy, Gary Copeland, Roger Blais, Gerald Levy, Daniel Sonenshine, Donald Adams, and George Maier May 1975 120 p
(Grant NGL-47-003-067)
(NASA-CR-142823) Avail: NTIS HC $5.25 CSCL 01A

Data tables and maps are presented which include background information and experimental data on the Craney Island oil refinery installation experiment. The experiment was to investigate air pollution effects. M.J.S.

N75-24122*# Old Dominion Univ. Research Foundation, Norfolk, Va.
INTERDISCIPLINARY STUDY OF ATMOSPHERIC PROCESSES AND CONSTITUENTS OF THE MID-ATLANTIC COASTAL REGION. ATTACHMENT 4: DATA SET FOR BACKGROUND INVESTIGATION OF ATMOSPHERIC CONSTITUENTS FOR NANSEMOND RIVER SITE
Earl C. Kindle, Earl C. Bandy, Gary Copeland, Roger Blais, Gerald Levy, Daniel Sonenshine, Donald Adams, and George Maier May 1975 261 p
(Grant NGL-47-003-067)
(NASA-CR-142821) Avail: NTIS HC $8.50 CSCL 01A

Background data was provided for the assessment of the environmental impact of a proposed oil refinery location. Climatic background, particulate data, digitized portrayal of site molecular and meteorological data, graphical portrayal of molecular data, hourly meteorological data, and streamflow charts and radiosonde data are given M.J.S.

N75-24123# Committee of Conference (U. S. Congress).
ENERGY REORGANIZATION ACT OF 1974
Washington GPO 9 Oct. 1974 39 p refs Conference Rept. to accompany H.R. 11510, 93d Congr., 2d Sess., 9 Oct. 1974
(S-Rept-93-1252; GPO-38-010) Avail: US Capitol, Senate Document Room

The formation of the Energy Research and Development Administration is discussed in detail, along with a Nuclear Energy Commission. Topics included are duties of the Administration, personnel, appropriations, personnel qualifications, and research activities. M.J.S.

N75-24124# Committee on Government Operations (U. S. Senate).
ENERGY REORGANIZATION ACT OF 1974
Washington GPO 1974 118 p refs Rept. to accompany S. 2744 presented by the Comm. on Government Operations at the 93d Congr., 2d Sess., 27 Jun. 1974
(S-Rept-93-980; GPO-34-980) Avail: SOD HC $1.20

A Congressional Report is presented to reorganize and consolidate certain functions of the Federal Government in a new Energy Research and Development Administration. A new nuclear safety and licensing commission is discussed in order to promote more efficient management of such functions. M.C.F.

N75-24125# Committee on Foreign Relations (U. S. Senate).
ENERGY AND FOREIGN POLICY
Washington GPO 1974 241 p refs Hearings before Comm. on Foreign Relations, 93d Congr., 1st Sess., 30-31 May 1973
(GPO-22-562) Avail: Comm. on Foreign Relations

A general survey of the energy problem and its implications on American foreign policy are presented. In particular, the energy requirements of the United States in relation to the Persian Gulf were examined. Topics discussed include our domestic oil supply, politics in the Middle East, research and development of energy sources, international monetary reform negotiations, oil and gas distribution in the United States, demand and supply, energy consumption, domestic production, taxes, and international relations. M.J.S.

N75-24126# Oak Ridge National Lab., Tenn.
STUDY OF THE APPLICATION OF HTGR TO A PETROLEUM REFINERY PETROCHEMICAL COMPLEX
Truman D. Anderson and Irving Spiewak 1975 11 p refs Presented at the BNES Intern. Conf. on the HTGR Process Appl., London, Eng., 26/28 Nov. 1974
(Conf-741144-1) Avail: NTIS HC $3.25

The high-temperature gas-cooled reactor (HTGR) is discussed as a source of industrial energy for applications in petroleum refining and petrochemical plants. Applications are limited to joint uses of a nuclear power station due to the mismatch in size between nuclear plants and industrial plants and the need for multiple nuclear units to provide reliability. It is suggested that the electric utilities generate electricity for the grid and thermal energy for local industries, thus HTGR would have significant economic advantages over alternative fossil energy systems. Author (NSA)

N75-24127# Parsons (Ralph M.) Co., Pasadena, Calif.
DEMONSTRATION PLANT, CLEAN BOILER FUELS FROM COAL. VOLUME 3: PRELIMINARY DESIGN/ECONOMICS ANALYSIS Interim Report
J. B. OHara, S. N. Rippee, and R. V. Teeple Dec. 1974 60 p
(Contract DI-14-32-0001-1234)
(PB-238529/2; OCR-82-INT-1-Vol-3) HC $4.25 CSCL 07A

A preliminary economic analysis for a demonstration plant designed to produce clean boiler fuels from coal is summarized. Investment and operating cost estimates are provided based on mid-1973 values. Product selling prices required to provide a specified discounted cash flow return are included for various financial structures. GRA

N75-24128# Bechtel Corp., San Francisco, Calif.
PATH TO SELF-SUFFICIENCY DIRECTIONS AND CONSTRAINTS Final Report
M. Carasso, J. M. Gallagher, and K. J. Sharma Aug. 1974 168 p
(Grant NSF C-867)
(PB-239099; BECHTEL-10900-74-43-I) Avail: NTIS HC $6.25 CSCL 21D

A model of the U.S. energy supply system is described which calculates direct resources required to bring on-line the additional required energy supply facilities for specified future U.S. energy programs. A computer program is presented which calculates resource requirements and summarizes results for any fuel mix by tabulating an annual schedule of capital, manpower, and materials requirements. The model is exercised for two fuel mixes and the implications are discussed in terms of capital, manpower, and materials constraints. Author

N75-24129# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN INTERDISCIPLINARY ENGINEERING APPROACH TO A FACILITY DESIGN STUDY WITH EMPHASIS ON ENERGY CONSERVATION. VOLUME 2: MAIN REPORT TEXT Facility Systems Integration Design Study
Robert J. Garlow, John F. Gjlg, Charles A. Jackson, Jay N. Magill, and Robert S. Najaka Nov. 1974 275 p refs
(AD-A006804; GCE/MC/74-1-Vol-2) Avail: NTIS CSCL 15/5

A discussion of the method used in the interdisciplinary engineering approach to the study is discussed in Chapter II. Chapter III covers the design of the structural components of the facility with a detailed discussion of the loads used in the design and other factors which weighed upon the selection of the components. Chapter IV discusses the determination of loads used in the design of mechanical systems, a comparison of various heating and air conditioning systems, the design of the heating and cooling systems, and the design of an energy recovery system. Chapter V presents a detailed analysis of the A/E electrical design, along with the design of a lighting system and the coordination of circuit protection devices. Chapter VI summarizes the results of the civil, electrical and mechanical designs, and Chapter VII presents conclusions drawn from the study and recommendations for future application of the techniques used in the study. GRA

N75-24130# Versar, Inc., Springfield, Va.
INDUSTRIAL ENERGY STUDY OF THE DRUG MANUFACTURING INDUSTRIES FOR THE FEDERAL ENERGY ADMINISTRATION/US DEPARTMENT OF COMMERCE Final Report
30 Sep. 1974 209 p refs
(PB-238994/8; FEA/EI-1669) Avail: NTIS HC $7.25 CSCL 10A

Information is provided on the basic structure and characteristics of the drug manufacturing industries. Particular emphasis is placed on fuel use by major type and production process as well as exploring the possibilities for fuel substitutability and conservation alternatives. GRA

N75-24131# Bureau of Mines, Grand Forks, N.Dak. Energy Research Labs.
TECHNOLOGY AND USE OF LIGNITE Information Circular
Gordon H. Gronhovd, comp. and Wayne R. Kube, comp. Nov. 1974 272 p refs Presented at the 1973 Lignite Symp., Grand Forks, N. D., 9-10 May 1973; sponsored in part by North Dakota Univ.
(PB-238666/2; BM-IC-8650) Avail: NTIS MF $2.25; SOD HC $3.30 as C.128.27:8650 CSCL 21D

Papers concerned with the technology and utilization of low-rank fossil fuels are presented. The following topics were included: air pollution; coal gasifaction and coal liquefaction; thermal power plants; stream electric power generation; and coal handling, storage, and transportation. J.M.S.

N75-24132# Boston Univ., Mass. Dept. of Chemistry.
PHOTOCHEMICAL CONVERSION OF SOLAR ENERGY Quarterly Report, 1 Jul. - 30 Sep. 1974
Norman N. Lichtin 31 Oct. 1974 37 p refs
(Grant NSF AER-72-03579)
(PB-238533/4; NSF/RA/N-74-138;
NAS/RANN/SE/AER-72-03597/A03) Avail: NTIS HC $3.75 CSCL 07E

Photogalvanic cell chemistry research results are discussed. High conversion efficiencies were obtained using the trifluoromethane-sulfonate anion (TFMS(-)) than with chloride. Conversion efficiency of the SNO2/Pt cell illuminated perpendicular to the electrode surfaces increased with increase of solution depth up to .05mm. Using values of the Kosower solvent parameter, Z, logarithms of specific rates of disproportionation of semithionine (TH2(+)) in a wide variety of organic solvents show the same positive linear dependence on Z. The effects of a number of variables on the (second order) kinetics of oxidation of leucothionine (TH3(+)) by Fe(III) were determined. A number of coordination complexes of iron with formal reduction potentials varying over a factor of about 3 were prepared. GRA

N75-24133# Battelle Pacific Northwest Labs., Richland, Wash.
ASSESSMENT OF URANIUM AND THORIUM RESOURCES IN THE UNITED STATES AND THE EFFECT OF POLICY ALTERNATIVES Final Report
J. B. Burnham, R. E. Brown, W. I. Enderlin, M. S. Hanson, and J. N. Hartley Dec. 1974 223 p refs
(Contract NSF C-914)
(PB-238658/9) Avail: NTIS HC $7.25 CSCL 08I

Uranium and thorium resources of the United States were examined along with the state-of-the-art of uranium exploration, mining, milling, and environmental practices. The effects of alternative governmental policy options on the price and availability of uranium were investigated. GRA

N75-24134# Massachusetts Univ., Amherst. Dept. of Mechanical Engineering.
VARIATIONS IN HEAT EXCHANGER DESIGN FOR OCEAN THERMAL DIFFERENCE POWER PLANTS
J. G. McGowan, J. W. Connell, and R. Braren Feb. 1974 51 p refs
(Grant NSF GI-34979)
(PB-238572/2; NSF/RANN/SE/GI-34979/TR-74/4;
NSF/RA/N-74-110) Avail: NTIS HC $4.25 CSCL 10B

Variation in heat exchanger design and configuration for a class of ocean thermal power plants is discussed. Details of the heat exchanger models are summarized and analytical results for component and cycle variations are presented. A heat exchanger optimization program is discussed in detail. GRA

N75-24135# Gordian Associates, Inc., New York.
WHERE THE BOILERS ARE: A SURVEY OF ELECTRIC UTILITY BOILERS WITH POTENTIAL CAPACITY FOR BURNING SOLID WASTE AS FUEL Final Report
Barry G. Tunnah, Adel Hakki, and Roger J. Leonard 1974 337 p refs
(Contract EPA-68-01-1132)
(PB-239392/4; EPA-SW-530-88c) Avail: NTIS HC$9.50 CSCL 10B

The use of prepared solid waste as a supplementary fuel is investigated as a method for recovering energy from commercial and residential solid wastes. Survey results intended to help local decision-makers in assessing the availability of electric utility boilers with potential for using prepared solid waste as supplementary fuel are presented. Details are given for investor-owned and municipally-owned plants on the following items: (1) boiler characteristics; (2) energy requirements for electricity generation; (3) potential energy available from combustion of solid waste derived from specified areas around each plant; (4) typical transportation distances from the centers of waste generation to the plants, and (5) the potential waste-burning capacity per day of each boiler if solid waste replaced 10 percent of its fossil fuel. GRA

N75-24136# Arizona State Univ., Tempe. Engineering Research Center.
TERRESTRIAL PHOTOVOLTAIC POWER SYSTEMS WITH SUNLIGHT CONCENTRATION Quarterly Report, 1 Jul. - 30 Sep. 1974
C. E. Backus Oct. 1974 52 p Prepared in cooperation with Textron, Inc., Sylmar, Calif.
(Grant NSF GI-41894)
(PB-238506/0; ERC-R-74017;
NSF/RANN/SE/GI-41894/PR-74-3; NSF/RA/N-74-129) Avail: NTIS HC $4.25 CSCL 10B

Basic parametric relationships in a solar system that concentrates sunlight onto solar cells are investigated. These relationships are used to determine the optimum combination of components that minimize the cost per watt of these systems. Progress is reported in the following study tasks: solar cell design; solar concentrator; fh heat rejection; solar tracker; and systems analysis. GRA

N75-24137# Arizona Univ., Tucson. Optical Sciences Center.
CHEMICAL VAPOR DEPOSITION RESEARCH FOR FABRICATION OF SOLAR ENERGY CONVERTERS Quarterly Report, 1 Jul. - 30 Sep. 1974
B. O. Seraphin 28 Oct. 1974 41 p
(Grant NSF GI-36731)
(PB-238947/6; NSF/RANN/SE/GI-36731/PR/74/3;
NSF/RA/N-74-128; QR-3) Avail: NTIS HC $3.75 CSCL 10B

A selective solar energy convertor that can be used to transform solar radiation into high temperature heat is discussed. The selective solar energy convertor is basically a two-layered construction in which the top layer is a semiconductor material, such as silicon, having high absorption for solar radiation and high transparency for blackbody radiation from the heated unit. The bottom layer is a metal film having high reflectance. The completion of the entire stack, including an antireflection coating of silicon nitride is described. GRA

N75-24138# National Center for Energy Management and Power, Philadelphia, Pa.
ELECTRIC POWER RIGHTS: ONE APPROACH TO RATIONING
Ann L. Strong Jul. 1973 34 p refs
(Grant NSF GI-29729)
(PB-238537/5; NSF/RANN/SE/GI-29729/TR-73-4;
NSF/RA/N-73-082) Avail: NTIS HC $3.75 CSCL 10A

A description is given of the system of water rights used in certain western states. It is proposed that such a system might be employed as electricity rights in a region in which electricity supplies are insufficient to meet demand. The various problems which would arise are examined. GRA

N75-24139# Systems Control, Inc., Palo Alto, Calif.
ELECTRIC POWER SYSTEMS ANALYSIS RESEARCH
John Peschon and Leif Isaksen Jul. 1974 249 p refs
(Contract NSF C-756)
(PB-239236/3; NSF/RA/N-74-171) Avail: NTIS HC $7.50 CSCL 09C

The special systems analysis needs of large-scale interconnected electric power systems are considered. Procedures to encourage and facilitate the implementation of successful research projects, through more effective professional interactions, are investigated. Technical descriptions of eleven major functional activity areas are presented in order to provide a structured overview of the problems and associated systems analysis research needs of interconnected electric power systems. Specific research opportunities are summarized. GRA

N75-24140# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
ENERGY SYSTEM MODELING-INTERFUEL COMPETITION Progress Report
M. L. Baughman and P. L. Joskow Feb. 1974 28 p refs
(Grant NSF GI-39150)
(PB-239292/6; NSF/RA/N-74-165) Avail: NTIS HC $3.75 CSCL 21D

The Energy System Modeling program addresses issues of interfuel substitution on the national and state level. Construction of policy planning tools that can be used for analysis and evaluation of policies that impinge upon the economics and investment strategies of suppliers and/or consumers of various energy producing and consuming subsectors is discussed. GRA

N75-24141# Naval Intelligence Support Center, Washington, D.C. Translation Div.
THERMODYNAMICS OF LIQUID METAL MHD CONVERTERS
D. D. Kalafati and V. B. Kozlov 13 Feb. 1975 181 p refs
Transl. into ENGLISH from Termodinam. Zhidkometallicheskikh MGD Preobrazovatelei, (Moscow), 1972
(AD-A007415; NISC-Trans-3622) Avail: NTIS CSCL 10/2
Contents: Thermophysical principles of liquid metal MHD converters; Thermodynamic cycles and heat systems of MHD converters with a liquid metal working substance; Basic principles for the thermodynamic analysis of cycles of liquid metal MHD converters; Thermodynamics of cycles with condensation of the vapor phase by mixing before the MHD generator; Thermodynamics of cycles with separation of vapor phase before the MHD generator; Thermodynamics of binary cycles for stationary power plants using liquid metal MHD converters. GRA

N75-24142# Army Chemical Center, Edgewood, Md.
PROCEEDINGS OF 5TH ANNUAL SYMPOSIUM: ENERGY RESEARCH AND DEVELOPMENT
Donald Falconer, Bernard Gerber, and William Magee Jan. 1975 179 p refs Conference held at Washington, D. C., 13-14 Mar. 1974; sponsored by the Amer. Defense Preparedness Assoc.
(AD-A007799; EO-SP-74026) Avail: NTIS CSCL 10/1
Contents: Energy research and development programs of the United States Department of the Interior; Energy R and D programs of the U.S. Atomic Energy Commission; National Science Foundation energy research and development programs; The energy problem and defense; American Petroleum Institute; Coal research and development; Thermonuclear fusion energy; Pictorial overview of the hydrogen-energy concept; Review of power from the wind; Bioconversion of solar energy-photosynthesis; Enzymatic hydrolysis of cellulosic wastes; Coal liquefaction and gasification; Beneficial uses of waste heat from steam electric power plants; Energy systems analysis. GRA

N75-24143# Office of Oil and Gas, Washington, D.C.
VULNERABILITY OF NATURAL GAS SYSTEMS Final Report
Maynard M. Stephens and Joseph A. Golasinski Jun. 1974 130 p refs
(AD-A007583; OCD-PS-66-100) Avail: NTIS CSCL 21/4
This report describes the general manner and pattern in which the natural gas industry operates within the U.S. and describes in detail the transmission aspect of the system within the region encompassing all of Louisiana and thirteen counties of Mississippi. It brings together a description of all segments of the industry, relates some of the operational problems, and projects, in some instances, future problems as they relate to national security and emergency planning. GRA

N75-24144# Drexel Univ., Philadelphia, Pa.
UTILIZATION ANALYSIS OF ENERGY SYSTEMS Summary Report
H. L. Brown Jan. 1974 83 p
(Contract NSF GI-36598)
(PB-239291/8; NSF/RA/N-74-163) Avail: NTIS HC $4.75 CSCL 13A
An index of relative efficiency for energy systems in the commercial, industrial, and residential sector is developed. An effectiveness is developed based upon the concept of thermodynamic availability. Characterization of energy consumption in Philadelphia by census tracts using census data integrated with local utility data and a regional input-output study is covered. GRA

N75-24145# California Inst. of Tech., Pasadena. Guggenheim Jet Propulsion Center.
WORKSHOP PROCEEDINGS ON SOLAR COOLING FOR BUILDINGS, HELD IN CONJUNCTION WITH THE SEMIANNUAL MEETING OF THE AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR CONDITIONING ENGINEERS (ASHRAE)
Francis deWinter 1974 241 p refs Proc. held at Los Angeles, 6-8 Feb. 1974
(Grant NSF AG-502)
(PB-239419/5; NSF/RA/N-74-063) Avail: NTIS MF $2.25; SOD HC $5.50 CSCL 13A
A partial listing of papers given at the workshop includes: overview of NSF solar energy program; costs of implementing new technology; product acceptance and market demand of the consumer; technical problems remaining; role of major urban government; current lithium bromide hardware as used in solar applications; solar heat pump system; ammonia and other absorption systems; solar assisted heat pumps; solar desiccant system analysis and materials; retrofittable solar dehumidifier; Heat engine using crystal transformations; and solar powered rankine cycle cooling systems. GRA

N75-24147# Massachusetts Univ., Amherst. Energy Alternatives Program.
A PRELIMINARY TECHNOLOGY ASSESSMENT OF OCEAN THERMAL GRADIENT ENERGY GENERATION
Philip David Cloutier Jul. 1974 216 p refs
(Grant NSF GI-34979)
(PB-238646/4; NSF/RANN/SE/GI-34979/TR-74/1; NSF/RA/N-74-085) Avail: NTIS HC $7.25 CSCL 10B
A technology assessment of the Ocean Thermal Gradient Energy Generation process is discussed. The methodology developed consists of: defining the problem, defining alternative solutions to the problem, defining a set of goals to compare alternatives, defining the state of society or societal characteristics, carrying out impact analyses of the various alternatives, developing action-options to alleviate some of the adverse impacts, performing a final impact analysis, and presenting the overall and specific results for the Ocean Thermal Gradient Energy Generation process. The impact analysis is based on questionnaires that are evaluated by cross-impact matrix techniques. GRA

N75-24148# Electric Power Research Inst., Palo Alto, Calif.
CONFERENCE PROCEEDINGS, STEAM POWER PLANT WORKSHOP Special Report
George J. Silvestri, Jr. Apr. 1974 14 p Conf. held at Palo Alto, Calif. 4-5 Apr. 1974
(PB-239514/3; EPRI-SR-4) Avail: NTIS HC $3.25 CSCL 10B
The objectives were to assess current steam power plant technology, focusing on technological constraints, operational difficulties and potential research and development (R and D) funding by Electric Power Research Institute. GRA

N75-24150# Arizona Univ., Tucson. Optical Sciences Center.
SYMPOSIUM ON THE MATERIAL SCIENCE ASPECTS OF THIN FILM SYSTEMS FOR SOLAR ENERGY CONVERSION
B. O. Seraphin Jul. 1974 441 p refs Conference held at Tucson, Ariz., 20-22 May 1974
(Grant NSF GI-43795)
(PB-239270/2; NSF/RA/N-74-124) Avail: NTIS HC $11.25 CSCL 10B
Thin-film technology associated with solar thermal coatings and photovoltaics is discussed in terms of university, industrial, and governmental research. GRA

N75-24151# National Center for Energy Management and Power, Philadelphia, Pa.
AN APPROACH TO THE POWER SHORTAGE PROBLEM: OPTIMAL ALLOCATION OF EXISTING EXCESS RESERVES THROUGH INTERREGIONAL TRANSMISSION
Michael A. Moses 1 Aug. 1974 55 p
(Grant NSF GI-29729)

(PB-238578/9; NSF/RANN/SE/GI-29729/TR/73/2; NSF/RA/N-73-090) Avail: NTIS HC $4.25 CSCL 10A

A coordinated national grid system should lessen or eliminate the energy shortage. This idea relies on the presence of 'staggered peak loads' as the time zones from the East Coast to the West are transversed. When the New York City area experiences its peak demands between 12-2 P. M., the Los Angeles area is approximately three hours away from their peak. If L.A. could transfer electrical power to the east, the frequency of brown - or black-outs could be substantially decreased. This model attempts to work within the confines of existing capacity limits, and without decreasing demands. Efficient allocation and routes of distribution of electrical energy given the existing system capabilities are discussed. GRA

N75-24152# National Center for Energy Management and Power, Philadelphia, Pa.

THE RESIDENTIAL USER AND THE ELECTRICAL LOAD FACTOR

Kenneth A. Fegley Jul. 1973 40 p refs
(Grant NSF GI-29729)
(PB-238535/9; NSF/RANN/SE/GI-29729/TR/73/1) Avail: NTIS HC $3.75 CSCL 10A

The electrical load factor (the ratio of the average load to the peak load) has an important influence on the cost of delivering electrical energy to customers. The electrical use pattern for the average residential customer yields a low load factor for the individual residential customer and holds the total electric utility company load factor at a relatively low value. The relative importance of the residential customer in influencing the total load factor of the electric utility company is not likely to decrease in the future. There are a number of possible means for improving the residential load factor and so reap the very large savings that accompany a high total load factor fo the electric utility company. GRA

N75-24153# Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Minerals Engineering.

DESIGN OPTIMIZATION IN UNDERGROUND COAL SYSTEMS Interim Report, Dec. 1973 - Jul. 1974

Dec. 1974 89 p refs
(Contract DI-14-32-0001-1231)
(PB-239075/5; OCR-91-INT-1) Avail: NTIS MF $2.25; SOD HC $3.45 as 163.10:91/INT.1 CSCL 08I

Progress is described on three areas of research. Under Part 1, longwall mining system strata simulator and structural parameters of coal measure rocks, a theoretical model of yield pillar design based on a three-dimensional finite element analysis, was developed. Work is underway on a photoelastic model technique to represent the effects of stratification. Current status is also described of parts 2 and 3, design criteria for underground roof-truss support systems, and vent-control, an expanded computer program for design of mining ventilation systems. GRA

N75-24154# Thermo Electron Corp., Waltham, Mass.

SOLAR ENERGY FOR PROCESS STEAM GENERATION

Jerry P. Davis 25 Nov. 1974 40 p ref Sponsored by NSF, Washington, D.C.
(PB-238109/3; TE-5392-34-75) Avail: NTIS HC $3.75 CSCL 13A

The performance and economic possibilities of process steam generation by the coupling of low temperature solar collectors (120-240F) producing low pressure saturated or wet steam to a fuel-driven diesel/compressor which compresses the steam to the desired final conditions (320F, 60 psig) are discussed. The system concept is analogous to a heat pump, which extracts low temperature ambient heat, and raises its temperature to a useful level via mechanical work. An economic evaluation of annual fuel savings, at $1.50/10 to the 6th power Btu fuel cost, to incremental investment required for $2/sq ft solar collectors or $4/sq ft solar collectors yielded 14 percent and 8 percent respectively. GRA

N75-24155# Bechtel Corp., San Francisco, Calif.

PATH TO SELF-SUFFICIENCY DIRECTIONS AND CONSTRAINTS, APPENDICES Final Report

Aug. 1974 267 p refs
(Grant NSF C-867)
(PB-239100/1; BECHTEL-10900-74-43-I-App) Avail: NTIS HC $8.50 CSCL 21D

A computer program that calculates resource requirements and summarizes results for any fuel mix is presented. The program tabulates an annual schedule of required facilities to be brought on-line and attendant annual schedules of capital (2 classes), manpower (4 types), and materials (9 categories) requirements. The model is exercised for two likely fuel mixes and the implications in terms of anticipated capital, manpower, and materials constraints are discussed. GRA

N75-24156# Syracuse Univ., N.Y. Dept. of Electrical and Computer Engineering.

GLASS-Si HETEROJUNCTION SOLAR CELLS Quarterly Report, 1 Aug. - 30 Sep. 1974

Richard L. Anderson, Gordon Kent, and Steven Lai Oct. 1974 32 p
(PB-239282/7; NSF/RANN/SE/AER7417631/PR/74/3; NSF/RA/N-74-141; QR-3) Avail: NTIS HC $3.75 CSCL 10B

The feasibility of fabricating low-cost solar cells suitable for terrestial application is investigated. These cells consist of glass-silicon heterojunctions. Specific goals include the preparation and characterization of glass-monocrystalline Si and glass polycrystalline Si heterojunctions, and modeling of these devices. Heterojunction solar cells comprised of p-type semiconducting glass on n-type Si and n-type semiconducting glass on p-type Si are investigated. The glass acts as an integral part of the heterojunction, but is transparent to solar radiation, thus permitting the radiation to penetrate to the junction transition region. It also acts as a low resistance contact and as an antireflection coating. Although efforts at making p-glass/p Si cells have been unsuccessful to date, n-glass/n Si cells have been fabricated. These have short circuit currents of 40 ma/sq cm, open circuit voltages of 0.3 volts, and conversion efficiencies (AMI) of 5 percent. GRA

N75-24157# Maryland Univ., College Park. Dept. of Mechanical Engineering.

PROCEEDINGS OF THE SOLAR THERMAL CONVERSION WORKSHOP

E. R. G. Eckert, R. C. Jordan, E. M. Sparrow, G. K. Wehner, and J. W. Ramsey Nov. 1974 135 p refs Workshop held at Arlington, Va., 11-12 Jan. 1973
(Grant NSF GI-32488)
(PB-239277/7; NSF/RANN/SE/GI-32488/TR/73; NSF/RA/N-74-125) Avail: NTIS HC $5.75 CSCL 10A

Alternative means of collecting and storing solar heat energy to drive boilers of central-station steam-electric power plants are presented and discussed. Systems analysis aspects and means of forecasting the costs of solar thermal conversion power plants are included in the presentations. GRA

N75-24158# Booz-Allen and Hamilton, Inc., Bethesda, Md.

THE IMPACT OF ENERGY SHORTAGES ON THE IRON AND STEEL INDUSTRIES Final Report

Aug. 1974 300 p refs
(Contract DI-14-01-0001-1657)
(PB-238749/6; FEA/EI-1657) Avail: NTIS HC $8.75 CSCL 10A

A study, conducted in an effort to obtain information on the basic structure or characteristics of the iron and steel industry, is reported. Particular emphasis is placed on fuel use by major type and production process as well as exploring the possibilities for fuel substitutability and conservation alternatives in the iron and steel industry. GRA

N75-24179# Research Triangle Inst., Durham, N.C.

SYMPOSIUM PROCEEDINGS: ENVIRONMENTAL ASPECTS OF FUEL CONVERSION TECHNOLOGY Final Report

Franklin A. Ayer Oct. 1974 356 p refs Conference held at St. Louis, 13-15 May 1974
(Contract EPA-68-02-1325)

(PB-238304/0; EPA-650/2-74-118) Avail: NTIS HC $10.00 CSCL 13B

This document is the final report covering EPA's symposium to review and discuss environmentally related information of coal conversion technology. More specifically, papers were presented that covered environmental quality and standards, fuel contaminants, environmental aspects of specific fuel conversion systems, fuel utilization and total environmental assessment, and research and development needs. GRA

N75-24183# National Bureau of Standards, Washington, D.C.
MARINE POLLUTION MONITORING (PETROLEUM): PROCEEDINGS OF A SYMPOSIUM AND WORKSHOP HELD AT THE NATIONAL BUREAU OF STANDARDS
R. C. Junghans Dec. 1974 293 p refs Conf. held in Gaithersburg, Md., 13-17 May 1974 Sponsored in part by World Meteorological Organization, Geneva
(COM-75-50071/0; NBS-SP-409) Avail: NTIS MF $2.25; SOD HC as C13.10:409 CSCL 13B

Pertinent scientific, environmental, and regulatory aspects of petroleum hydrocarbon measurements are discussed along with specific scientific developments and recommendations. Specific recommendations for the initiation of a coordinated project for marine pollution monitoring are given. The following major areas are discussed: sampling methods and techniques; oil slicks, tar balls, and particulates; standards and intercomparison criteria; oil in marine organisms and sediments; and analytical methods and biological assessment. GRA

N75-24191# Rhode Island Univ., Kingston. Dept. of Plant Pathology-Entomology.
PETROLEUM DEGRADATION IN LOW TEMPERATURE MARINE AND ESTUARINE ENVIRONMENTS Annual Report, 1 May - 31 Dec. 1974
Richard W. Traxler and Anthony M. Cundell Mar. 1975 30 p refs
(Contract N00014-68-A-0215-0013; NR Proj. 133-076)
(AD-A007588; AR-2) Avail: NTIS CSCL 06/13

Enrichment of hydrocarbon and fuel oil utilizing bacteria was shown following an oil spill in Narragansett Bay and chemical analyses of sediments from the spill site confirmed the role of biodegradation. Biodegradation did occur during the winter months at a rate of 1-1.8 micrograms of hydrocarbon per gram of sediment per day. Laboratory culture and BOD methods showed degradation rates higher than the measured in situ rates but demonstrated the presence of psychrophilic hydrocarbon metabolizing microbial populations in the natural environment during the winter. Laboroatory Q10 values at 10 and 20C for psychrotolerant isolates were less than 2.0. Filamentous fungi were isolated which metabolized petroleum hydrocarbons with the formation of inclusions peculiar to hydrocarbon grown cultures. GRA

N75-24198# Berkshire County Regional Planning Commission, Pittsfield, Mass.
EVALUATION OF POWER FACILITIES: A REVIEWER'S HANDBOOK Final Report
Apr. 1974 392 p refs Prepared in cooperation with Curran Associates, Inc.
(PB-239221/5) Avail: NTIS HC $10.25 CSCL 10B

The handbook identifies and discusses the positive and negative impacts of power facilities on regional and local areas. The emphasis is on assisting planners in developing the local perspective of evaluation and to prepare them for an active participatory role in decision-making. In order that the comprehensive aspects of power facilities be fully explored, breadth rather than depth is emphasized. It thus serves as a primer addressed to planners, citizens and public agencies with the intent of imparting an objective and unbiased understanding of the major issues involved in the planning, design, licensing, construction, operation, and regulation of generation and transmission facilities. It further analyzes and summarizes the mass of regulatory legislation. GRA

N75-24285# Woods Hole Oceanographic Institution, Mass.
ENERGY EXCHANGE AT THE SURFACE OF THE WESTERN NORTH ATLANTIC OCEAN
Andrew F. Bunker Jan. 1975 111 p refs
(Contract N00014-74-C-0262; NR Proj. 083-004)
(AD-A007296; WHOI-75-3) Avail: NTIS CSCL 04/2

To supplement hydrographic studies of changes in the heat content of water masses, the energy fluxes through the ocean's surface has been estimated. These estimates have been computed from several million surface marine observations utilizing bulk aerodynamic exchange equations. The dependence of the transfer coefficients on wind speed and stability of the air was determined from the literature and used with the ship's data in the equations. The fluxes also have been computed following Budyko's method to serve as a check and comparison. The computations yield the monthly and annual fluxes of latent heat, sensible heat, momentum, and radiational exchange as well as averages of meteorological and oceanographical parameters. Monthly and annual charts of the net heat loss or gain by the ocean have been constructed for 150 acres which extend from the east coast to 30W and from 20N to 50N. Charts of the latent heat, sensible heat, and radiational fluxes also are presented. Time series of the fluxes in different areas have been drafted. Several features revealed by the charts are analyzed and discussed. GRA

N75-24532# Oak Ridge National Lab., Tenn.
NSF-RANN ENERGY ABSTRACTS. A MONTHLY ABSTRACT JOURNAL OF ENERGY RESEARCH
M. P. Guthrie, ed. Jun. 1974 88 p refs
(Contract W-7405-eng-26)
(ORNL-EIS-74-52-Vol-2-No-6) Avail: NTIS HC $4.75

The published results of work performed under the "energy research and analysis" category of RANN are cited along with other energy research results. The following areas are included: energy sources; electric power generation, supply and demand, transmission, environmental effects, and use; and energy production, consumption, supply and demand, and policy. NSA

N75-24539# Mitre Corp., McLean, Va.
NATIONAL ENERGY FLOW ACCOUNTS
J. Just, B. Borko, and J. Morris Sep. 1974 206 p refs
(Contract NSF GI-14024)
(PB-239275/1; MTR-6753; NSF/RA/N-74-189) Avail: NTIS HC $7.25 CSCL 05B

A comprehensive, integrated framework for structuring energy data of many types was developed. This set of National energy accounts is designed to be integrated with the National economic accounts and other major data bases. This report outlines the overall concept of four major interlocking accounts dealing with energy flow, energy technology, energy resources and other data. The energy flow account consists of seven subaccounts on energy sources, energy uses, interindustry energy flows, energy prices, energy transportation, energy distribution, and energy supply and demand time profiles. The structure of these accounts is fixed but the level of detail is flexible so that data could be utilized in different degrees of aggregation. GRA

N75-24739*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRELIMINARY STUDY OF ADVANCED TURBOPROPS FOR LOW ENERGY CONSUMPTION
G. Kraft and W. Strack May 1975 48 p refs
(NASA-TM-X-71740; E-8371) Avail: NTIS HC $3.75 CSCL 21E

The fuel savings potential of advanced turboprops (operational about 1985) was calculated and compared with that of an advanced turbofan for use in an advanced subsonic transport. At the design point, altitude 10.67 km and Mach 0.80, turbine-inlet temperature was fixed at 1590 K while overall pressure ratio was varied from 25 to 50. The regenerative turboprop had a pressure ratio of only 10 and an 85 percent effective rotary heat exchanger. Variable camber propellers were used with an efficiency of 85 percent. The study indicated a fuel savings of

33 percent, a takeoff gross weight reduction of 15 percent, and a direct operating cost reduction of 18 percent was possible when turboprops were used instead of the reference turbofan at a range of 10 200 km. These reductions were 28, 11, and 14 percent, respectively, at a range of 5500 km. Increasing overall pressure ratio from 25 to 50 saved little fuel and slightly increased takeoff gross weight. Author

N75-24741*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TURBINE DESIGN AND APPLICATION, VOLUME 3
Arthur J. Glassman, ed. Washington 1975 141 p refs
(NASA-SP-290-Vol-3; LC-79-185105) Avail: NTIS MF $2.25; SOD HC $2.10 CSCL 21E

Turbine technology concepts for thermodynamic and fluid dynamics are presented along with velocity diagrams, losses, mechanical design, operation and performance. Designs discussed include: supersonic turbines, radial-inflow turbines, and turbine cooling. F.O.S.

N75-24802*# Boeing Aerospace Co., Seattle, Wash.
FUTURE SPACE TRANSPORTATION SYSTEMS SYSTEMS ANALYSIS STUDY, PHASE 1 TECHNICAL REPORT
May 1975 363 p
(Contract NAS9-14323)
(NASA-CR-141856; D180-18768-1) Avail: NTIS HC $10.00 CSCL 22A

The requirements of projected space programs (1985-1995) for transportation vehicles more advanced than the space shuttle are discussed. Several future program options are described and their transportation needs are analyzed. Alternative systems approaches to meeting these needs are presented. D.M.L.

N75-24842*# Rockwell International Corp., Downey, Calif. Space Div.
SOLAR ELECTRIC PROPULSION SYSTEM THERMAL ANALYSIS Final Report, 27 Dec. 1973 - 27 Feb. 1975
28 Feb. 1975 193 p refs
(Contract NAS8-30542)
(NASA-CR-120770; SD-75-SA-0012) Avail: NTIS HC $7.00 CSCL 21C

Thermal control elements applicable to the solar electric propulsion stage are discussed along with thermal control concepts. Boundary conditions are defined, and a thermal analysis was conducted with special emphasis on the power processor and equipment compartment thermal control system. Conclusions and recommendations are included. Author

N75-24852# Bureau of Mines, Laramie, Wyo. Energy Research Center.
THE IDENTIFICATION OF GAMMA-VALEROLACTONE IN WASTE FROM AN OIL-SHALE IN SITU RETORT
F. R. McDonald Nov. 1974 13 p refs
(PB-240098/4; BM-RI-7918) Avail: NTIS HC $3.25 CSCL 07C

The compound gamma-valerolactone was identified in an acid fraction isolated from waste water collected from an in situ oil-shale retort. Infrared, nuclear magnetic resonance, and mass spectrometry are used to confirm the identification of the fraction collected from a gas chromatograph. GRA

N75-24957*# Scientific Translation Service, Santa Barbara, Calif.
HYDROCARBON POWER FUEL FROM THE GASOLINE BOILING RANGE
G. W. Eckert, H. V. Hess, and E. C. Knowles Washington NASA Jun. 1975 26 p Transl. into ENGLISH from German patent no. 1144971 (US Appl., 11 Oct., 23 Dec. 1957, 7 Mar., 10 Mar., 14 Apr., 19 Jun., 27 Jun. 1958)
(Contract NASw-2483)
(NASA-TT-F-16399) Avail: NTIS HC $3.75 CSCL 21D

Blends of catalytically cracked and reformed gasolines are discussed which have high octane numbers due to their high aromatic and olefinic content. The addition of a lead organic compound does not give as great an increase to the octane numbers for such a gasoline as for one which has high percentages of saturated paraffins. When a gasoline blend containing at least 10% aromatic and olefinic hydrocarbons is treated with 0.1-5.0 volume percent of saturated monocarboxylic acid, the Et4Pb-type compound markedly increases the octane number. The antiknock performance and characteristics of these gasolines are discussed in detail. Author

N75-24966# Sun Oil Co., Marcus Hook, Pa. Applied Research Dept.
PREPARATION OF GAS TURBINE ENGINE FUEL FROM SYNTHETIC CRUDE OIL DERIVED FROM COAL Final Report
F. S. Eisen 6 Feb. 1975 74 p refs
(Contract N00014-74-C-0568)
(AD-A007923) Avail: NTIS CSCL 07/1

A 232 gallon gas turbine fuel sample containing 23 vol.% aromatics (20-25 vol.% specification target) was prepared from synthetic crude oil (syncrude) derived from Western Kentucky coal. The seven fuel specifications designated as most important were all met with the exception of smoke point. The following major processing steps were used to prepare the sample: Initial distillations (atmospheric distillation of the syncrude to remove light hydrocarbons and water, and vacuum distillation to remove the material boiling above about 500F); Hydrogenation of the resulting kerosene fraction to produce a 20-25 vol.% aromatics product; Final atmospheric distillation to remove light ends and produce a 140 to 155F flash point product. GRA

N75-25088*# Grumman Aerospace Corp., Bethpage, N.Y.
DEPLOYABLE HEAT PIPE RADIATOR Final Report
F. Edelstein Apr. 1975 115 p refs
(Contract NAS8-29905)
(NASA-CR-143863; DHPR-75-13) Avail: NTIS HC $5.25 CSCL 20M

A 1.2- by 1.8-m variable conductance heat pipe radiator was designed, built, and tested. The radiator has deployment capability and can passively control Freon-21 fluid loop temperatures under varying loads and environments. It consists of six grooved variable conductance heat pipes attached to a 0.032-in. aluminum panel. Heat is supplied to the radiator via a fluid header or a single-fluid flexible heat pipe header. The heat pipe header is an artery design that has a flexible section capable of bending up to 90 degrees. Radiator loads as high as 850 watts were successfully tested. Over a load variation of 200 watts, the outlet temperature of the Freon-21 fluid varied by 7 F. An alternate control system was also investigated which used a variable conductance heat pipe header attached to the heat pipe radiator panel. Author

N75-25200# Merchant Marine Academy, Kings Point, N.Y.
APPLICATION OF SUPERCONDUCTING ELECTRICAL MACHINERY TO THE PROPULSION SYSTEMS OF COMMERCIAL VESSELS
David C. Hicks Oct. 1974 66 p refs
(COM-75-10137; NMRC-KP-115) Avail: NTIS HC $4.25 CSCL 13J

The classical problem of the need for a high power density transmission system is investigated. Proposed solutions using gas turbines and superconducting machinery are analyzed. The general advantages and disadvantages of conventional and superconducting electrical transmission systems are presented with verification of conclusions obtained using existing operational systems. The system analysis includes the machine system, its feasibility, and economic cost benefits for the present maritime industry needs. A final experimental system is proposed based on the conclusions obtained from this investigation. GRA

N75-25237*# Eason Oil Co., Oklahoma City, Okla.
EVALUATION OF THE SUITABILITY OF SKYLAB DATA FOR

THE PURPOSE OF PETROLEUM EXPLORATION Quarterly Report, Jan. - Mar. 1975
Robert J. Collins, Principal Investigator, Gerald Petzel, and John R. Everett (Earth Satellite Corp., Washington, D. C.) Mar. 1975 20 p refs EREP
(Contract NAS9-13297)
(E75-10257; NASA-CR-142632) Avail: NTIS HC $3.25 CSCL 08G

The author has identified the following significant results. Comparisons of the various photographic bands of Skylab imagery indicate that, overall, standard color (particularly S190B) is the most valuable for geological purposes. Detailed examination of all bands indicates that as with ERTS imagery each band contains useful information that is unique to it. The results of geological interpretations based on ERTS and Skylab imagery are strikingly similar. It appears that more information can be extracted from a single Skylab overpass than a single ERTS overpass, but that with repeated passes the lower resolution ERTS imagery may yield information comparable to that contained in S190B imagery. Comparison of Skylab photography to high altitude aircraft photography suggests that there are distinct advantages to using Skylab imagery for regional geologic interpretations. This is primarily because of the synoptic view provided by the space acquired imagery allows and encourages integration of regional geologic features.

N75-25283# Bureau of Mines, Laramie, Wyo. Energy Research Center.
PULSED NUCLEAR MAGNETIC RESONANCE STUDIES OF OIL SHALES--ESTIMATION OF POTENTIAL OIL YIELDS Report of Investigations, 1974
F. P. Miknis, A. W. Decora, and G. L. Cook Nov. 1974 53 p refs
(PB-240023/2; BM-RI-7984) Avail: NTIS HC $4.25 CSCL 07D

It is shown that broad-line nuclear magnetic resonance (NMR) techniques have potential applications for rapid evaluation of oil-shale deposits. The basis for the pulsed NMR oil-shale assay method lies in the assumption that the free induction decay (FID) amplitude following a 90 degree pulse is proportional to the potential oil yield. This assumption was tested on two groups of oil-shale samples, numbering 141 and 263 samples, from two different oil-shale cores. For both groups of samples a small number were selected as calibration samples. Free induction decay amplitude measurements were made. GRA

N75-25288# Bureau of Mines, Pittsburgh, Pa. Eastern Field Operation Center.
THE MINE MAP REPOSITORY: A SOURCE OF MINE MAP DATA Information Circular
Curtis D. Edgerton Nov. 1974 13 p refs
(PB-240136/2; BM-IC-8657) Avail: NTIS HC $3.25 CSCL 08I

The Pittsburgh Mine Map Repository of the Bureau of Mines, U.S. Department of the Interior, serves as a basic reference file, and for the archival preservation of mine map data of mines east of the Mississippi River. About 22,000 of an estimated 500,000 available mine maps have been microfilmed. A computerized index serves as the mechanism for retrieval of any microfilmed mine map. The operation, equipment, and index are described in the report. GRA

N75-25292*# Houston Univ., Tex.
ENERGY RECOVERY FROM SOLID WASTE. VOLUME 2: TECHNICAL REPORT Final Report, 1974
C. J. Huang and Charles Dalton Washington NASA Apr. 1975 245 p refs
(Grant NGT-44-005-114)
(NASA-CR-2526; S-443-Vol-2) Avail: NTIS HC $7.50 CSCL 10A

A systems analysis of energy recovery from solid waste demonstrates the feasibility of several current processes for converting solid waste to an energy form. The social, legal, environmental, and political factors are considered in depth with recommendations made in regard to new legislation and policy. Biodegradation and thermal decomposition are the two areas of disposal that are considered with emphasis on thermal decomposition. A technical and economic evaluation of a number of available and developing energy-recovery processes is given. Based on present technical capabilities, use of prepared solid waste as a fuel supplemental to coal seems to be the most economic process by which to recover energy from solid waste. Markets are considered in detail with suggestions given for improving market conditions and for developing market stability. A decision procedure is given to aid a community in deciding on its options in dealing with solid waste, and a new pyrolysis process is suggested. An application of the methods of this study are applied to Houston, Texas. Author

N75-25293# Electrotechnical Lab., Tokyo (Japan).
STUDIES ON IMPROVEMENT OF THE CHARACTERISTICS OF MHD POWER GENERATING CHANNEL
Takenobu Kajikawa Dec. 1974 106 p refs In JAPANESE; ENGLISH summary
(Rept-749) Avail: NTIS HC $5.25

Magnetohydrodynamic power generation expected to contribute to the conservation of energy resources and the protection of the environment is experimentally studied. The physical properties of the conducting fluid in the MHD power generating channel are identified along with its electrical properties. A small scale MHD power generation facility is used in experimental studies on the following aspects of magnetohydrodynamic power generation: (1) thermodynamic characteristics; (2) nonuniformity effects in the generating channel cross-section; (3) effects of the thermal boundary layer in front of the electrodes on the power generation; and (4) control of boundary layer by means of plasma injection and protrusion electrodes. Results are presented and discussed. J.M.S.

N75-25294# Committee on Finance (U. S. Senate).
WORLD OIL DEVELOPMENTS AND US OIL IMPORT POLICIES
Washington GPO 1973 158 p refs Rept. presented by the US Tariff Commission to the Comm. on Finance, 93d Congr., 1st Sess., 12 Dec. 1973 Prepared by Tariff Commission
(GPO-22-893) Avail: SOD HC $1.35

This report responds to a request by the Senate Committee on Finance, dated March 16, 1970, that the Tariff Commission give a full description of all considerations which should be weighed in reaching a decision on the question of substituting tariffs for quotas to control oil imports. The committee suggested that the commission consider costs of production in major exporting countries, tanker rates, most-favored-nation obligations of the United States, and the effect on U.S. revenues and the U.S. consumer of various tax and royalty adjustments by petroleum exporting countries. Author

N75-25295# Joint Publications Research Service, Arlington, Va.
PROPULSION UNITS FOR HIGH SPEED SHIPS
M. A. Mavlyudov, A. A. Rusetskiy, Yu. M. Sadovnikov, and E. A. Fisher 3 Jun. 1975 246 p refs Transl. into ENGLISH of the book "Dvizhiteli Bystrokhodnykh Sudov" Leningrad, Izdatelstvo Sudostroyeniye, 1973 p 1-239
(JPRS-64897) Avail: NTIS HC $7.50

Methods of designing propulsion systems for ships with hydrodynamic and aerodynamic support principles are examined along with the characteristic features of propulsion systems for high-speed ships and the problems of their structural composition. Emphasis is placed on the following propulsion systems: cavitating propellers; propulsion systems with angular power transmission; water-jet propulsion systems; and gas-water and air propulsion systems. J.M.S

N75-25296*# United Aircraft Corp., East Hartford, Conn.
STUDY OF FUEL CELL POWERPLANT WITH HEAT RECOVERY Final Report, 15 Aug. 1974 - 15 Feb. 1975
J. M. King, A. P. Grasso, and J. V. Clausi 24 Apr. 1975

112 p refs
(Contract NAS9-14220)
(NASA-CR-141854; FCR-0021) Avail: NTIS HC $5.25 CSCL 10C

It was shown that heat can be recovered from fuel cell power plants by replacing the air-cooled heat exchangers in present designs with units which transfer the heat to the integrated utility system. Energy availability for a 40-kW power plant was studied and showed that the total usable energy at rated power represents 84 percent of the fuel lower heating value. The effects of design variables on heat availability proved to be small. Design requirements were established for the heat recovery heat exchangers, including measurement of the characteristics of two candidate fuel cell coolants after exposure to fuel cell operating conditions. A heat exchanger test program was defined to assess fouling and other characteristics of fuel cell heat exchangers needed to confirm heat exchanger designs for heat recovery.
Author

N75-25297# Stanford Research Inst., Menlo Park, Calif.
MEETING CALIFORNIA'S ENERGY REQUIREMENTS, 1975 - 2000
May 1973 422 p
(SRI Proj. ECC-2355)
Avail: NTIS HC $10.50

The energy outlook in the state of California was investigated within the perspective of the national and world outlook and with emphasis on the electric power sector of the state. The following factors were assessed: (1) California's economic framework and related demand for energy; (2) various means for altering the projected demand pattern, requirements for implementing each of these means, and appraisal of their significance; (3) California's future supply from each source of energy, as well as analysis of factors affecting availability and use; and (4) probable future trends in price. Conclusions are presented.
Author

N75-25299# Committee on Science and Astronautics (U. S. House).
SOLAR ENERGY RESEARCH, DEVELOPMENT, AND DEMONSTRATION ACT OF 1974
Washington GPO 1974 385 p refs Hearings on H.R. 15612 before Subcomm. on Energy of Comm. on Sci. and Astronaut., 93d Congr., 2d Sess., No. 42, 30 Jul. and 2 Aug. 1974
(GPO-39-827) Avail: Subcomm. on Energy

The hearings concerning research and development for solar energy are presented. The major research programs covered are: (1) solar heating and cooling of housing, commercial, and public buildings; (2) direct solar heat as a source for industrial processes; (3) thermal energy conversion; (4) the conversion of cellulose and other organic materials to useful energy or fuels; (5) photovoltaic and other direct conversion processes; (6) sea thermal power conversion; and (7) windpower conversion. The planning and implementation of the programs are discussed.
J.R.T.

N75-25300# Committee on Science and Astronautics (U. S. House).
ENERGY POLICY AND RESOURCE MANAGEMENT
Bert Cooper, Theodor Galdi, Susan Drake, David Hack, James Mielke, Warren Donnelly, David Lindahl, Susan Abbasi, John Jimison, Wendy Grffin, ed. et al Washington GPO Jul. 1974 101 p refs Presented by Library of Congr. to Subcomm. on Energy of Comm. on Sci. and Astronaut., 93d Congr., 2d Sess., Jul. 1974 Prepared by the Library of Congr., Sci. Policy Res. Div.
(GPO-33-634) Avail: Subcomm. on Energy

A collection of papers is presented on the topic of energy policy and resource management. Topics discussed include energy research and development policy, project independence, the licensing of nuclear power plants, enriched uranium supplies for nuclear power plants, federal tax treatment of oil and gas, regulation of natural gas products, energy shortage and the petrochemicals, rail freight discrimination against recyclable materials, the energy problem and national defense, and foreign policy implications of the energy shortage.
M.J.S.

N75-25301# Committee on Science and Astronautics (U. S. House).
ENERGY LEGISLATION
Washington GPO May 1974 25 p refs Rept. of the Subcomm. on Energy of the Comm. on Sci. and Astronaut., 93d Congr., 2d Sess., May 1974
(GPO-33-571) Avail: Sucomm. on Energy

Legislative activities on energy-related issues are summarized. Legislation in the areas of energy organization and regulation, environmental energy legislation, energy resources, energy research and development, energy conservation, and urban and rail transportation is described.
M.J.S.

N75-25304# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN INTERDISCIPLINARY ENGINEERING APPROACH TO A FACILITY DESIGN STUDY WITH EMPHASIS ON ENERGY CONSERVATION. VOLUME 1: EXECUTIVE SUMMARY Facility Systems Integration Design Study.
Robert J. Garlow, John F. Gilg, Charles A. Jackson, Jay N. Magill, and Robert S. Najaka Nov. 1974 33 p
(AD-A006803; GCE/MC/74-1-Vol-1) Avail: NTIS CSCL 15/5

An interdisciplinary engineering design study is made for a depot maintenance facility. The initial costs, performance, and energy and operating costs of various structural, electrical, and mechanical systems were investigated with the goal of attaining maximum conservation of energy. Where applicable, the impact of each of these subsystems on energy and operating costs for the integrated facility is evaluated to obtain data on which to base the final equipment and system selections. The following systems have been selected for the project facility to provide optimum energy conservation: (1) Spot cooling using an evaporative process for industrial applications, (2) a variable-volume air conditioning system for remaining building cooling requirements, (3) a cooling tower to supply process cooling water at 85F, and (4) a heat recovery system to reclaim excess heat energy.
GRA

N75-25305# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN INTERDISCIPLINARY ENGINEERING APPROACH TO A FACILITY DESIGN STUDY WITH EMPHASIS ON ENERGY CONSERVATION. VOLUME 3: APPENDICES Facility Systems Integration Design Study.
Robert J. Garlow, John F. Gilg, Charles A. Jackson, Jay N. Magill, and Robert S. Najaka Nov. 1974 283 p
(AD-A006805; GCE/MC/74-1-Vol-3-App) Avail: NTIS CSCL 15/5

The volume contains calculations of costs, performance, and energy and operating costs of structural, electrical, and mechanical systems.
GRA

N75-25306# Hittman Associates, Inc., Columbia, Md.
ENVIRONMENTAL IMPACTS, EFFICIENCY, AND COST OF ENERGY SUPPLY AND END USE, VOLUME 2 Final Report
Jan. 1975 271 p refs Sponsored in part by NSF and EPA
(Contract EQC-308)
(PB-239159; HIT-593-Vol-2) Avail: NTIS HC $8.50

The environmental impacts, efficiency, and costs associated with supply and end use of fossil fuels are determined. The output is this 2-volume report, which presents tabular, footnoted, and referenced data quantifying the energy related environmental impacts on land, water, air, solid waste, and occupational health. Characterized are six technologies with respect to their environmental impacts, efficiency, and cost: both low- and high-Btu gasification of coal, oil shale, fluidized bed boiler combustion, solvent refined coal, and coal liquefaction.
Author

N75-25307# Army Foreign Science and Technology Center, Charlottesville, Va.
INVESTIGATION OF CHARACTERISTICS OF MAGNETOHYDRODYNAMIC GENERATORS IN INDUSTRIAL POWER PLANTS
L. S. Popyrin, N. N. Pshenichnov, A. P. Rogachev, A. G. Sokolskii, and L. K. Khokhlov 27 Oct. 1974 36 p refs Transl. into

ENGLISH from Ref. Zh., Fiz. (USSR), no. 12, 1972 p 288-307 (AD-A008343; FSTC-HT-23-0121-75) Avail: NTIS CSCL 10/2

The authors studied a magnetohydrodynamic generator of the Faraday type with segmented electrodes in order to determine the main characteristics of the generator, including characteristics relevant to engineering-economic indices. The different variants were calculated using a mathematical model developed at the Power Institute of the Siberian Branch of the U.S.S.R. Academy of Sciences which was programmed for the Besm-4 electronic digital computer. GRA

N75-25313# National Center for Energy Management and Power, Philadelphia, Pa.
INTERIM STANDARD FOR SOLAR COLLECTORS, FIRST DRAFT Semiannual Progress Report, 1 Jan. - 30 Jun. 1974
Noam Lior Jul. 1974 36 p
(Grant NSF GI-29729)
(PB-239757/8; NSF/RANN/SE/GI-29729D/PR-74-2; NSF/RA/N-74-152(2)) Avail: NTIS HC $3.75 CSCL 10B

This document is a first draft of a proposed standard which is to establish (1) methods for testing and evaluating solar collectors for water and space heating; and (2) a basis for their certification. It will provide manufacturers, distributors, installers, contractors and purchasers with a common understanding of these products. Considered are such subjects as: (1) scope and classification; (2) requirements; (3) inspection and test procedures; and (4) history of project. GRA

N75-25314# InterTechnology Corp., Warrenton, Va.
SOLAR ENERGY SCHOOL HEATING AUGMENTATION EXPERIMENT. DESIGN, CONSTRUCTION AND CONSTRUCTION AND INITIAL OPERATION Report, 16 Jan.-15 May 1974
4 Dec. 1974 84 p
(Grant NSF C-868)
(PB-239397/3; ITC-090974; NSF/RA/N-74-019) Avail: NTIS HC $4.75 CSCL 13A

The Fauquier High School Proof-Of-Concept experiment is described, a solar heating system, designed and built under the joint sponsorship of the National Science Foundation and InterTechnology Corporation. The system consists of a 2540 square foot collector array on a collector building 126 ft. by 26 ft., with a net absorber area of 2,415 square feet, two 5,500 gallon concrete, insulated storage tanks, a control room/pump house and an automatic control system. The solar heating system was designed to provide 100% of the heat required for five, modular construction classrooms. GRA

N75-25315# Oklahoma State Univ., Stillwater.
DEVELOPMENT OF AN ELECTRICAL GENERATOR AND ELECTROLYSIS CELL FOR A WIND ENERGY CONVERSION SYSTEM Progress Report
William Hughes, H. J. Allison, and R. G. Ramakumar 15 Oct. 1974 127 p refs
(Grant NSF GI-39547)
(PB-239272/8; NSF/RANN/SE/GI-39457/PR-74-3; NSF/RA/N-74-142) Avail: NTIS HC $5.75 CSCL 10B

Described is research whose purpose is threefold: (1) to develop and build a working generator system in the 10 to 20 kilowatt range (suitable for use with a windmill); (2) to develop and build a working high pressure moderate temperature electrolysis storage system, in the three kilowatt range: and (3) to construct, debug, and gain significant operational experience on a windmill farm. Included are reports on the following topics: Economical and technical aspects of wind generation systems, solar and wind energy systems for large scale power generation, of large scale utilization of solar and wind energy, and operation of parallel bridge rectifier systems with capacitors at bridge-inputs. GRA

N75-25317# Massachusetts Univ., Amherst.
TECHNICAL AND ECONOMIC FEASIBILITY OF THE OCEAN THERMAL DIFFERENCES PROCESS AS A SOLAR-DRIVEN ENERGY PROCESS Quarterly Progress Report, 1 Jan. - 31 Mar. 1974
William Heronemus 30 Apr. 1974 50 p refs Prepared in cooperation with United Aircraft Corp., East Hartford, Conn.
(Grant NSF GI-34979)
(PB-239374/2; NSF/RA/N-74-160; QPR-1) Avail: NTIS HC $3.75 CSCL 10B

One total system configuration for a 400 mWe ocean thermal power plant has been conceptualized. Enough work has been accomplished to show that the concept could be replicated in a broad swath in the Gulf Stream along the U.S. southeast coast. Subsystems have been reduced to diagrams and major components have been sized. A complete math model of the total heat engine cycle has been created and parametric studies are now possible with reasonable computer time expenditures. GRA

N75-25318# Massachusetts Univ., Amherst. Energy Alternatives Program.
OCEAN THERMAL DIFFERENCE POWER PLANT TURBINE DESIGN
L. L. Ambs and J. Marshall Nov. 1973 34 p refs
(Grant NSF GI-34979)
(PB-239371/8; NSF/RANN/SE/GI-34979/TR-13-17; NSF/RA/N-73-119) Avail: NTIS HC $3.75 CSCL 10B

Thermodynamic and fluid dynamic criteria are considered for an ocean thermal difference power plant turbine. The influence of the working fluid on the turbine design is discussed. Results of the study show that the actual size of the turbine used for any of the working fluids depends upon the site conditions and the heat exchanger design. Of the ten working fluids investigated, ammonia is found to be the preferred fluid. Propane requires a larger and slower unit of less power than ammonia but is also acceptable. GRA

N75-25319# Massachusetts Univ., Amherst. Energy Alternatives Program.
HEAT EXCHANGERS FOR SEA SOLAR POWER PLANTS
J. Hilbert Anderson Sep. 1973 48 p refs
(Grant NSF GI-34979)
(PB-239369/2; NSF/RANN/SE/GI-34979/TR-73/15; NSF/RA/N-73-137) Avail: NTIS HC $3.75 CSCL 10B

The following aspects of heat exchangers for solar sea power plants are considered: (1) exchanger requirements (heat flow, temperature difference, multiple circuits, boiling heat transfer, condensing heat transfer, water side heat transfer, marine fouling, corrosion, debris and leaks); (2) heat exchanger materials; (3) heat exchanger design; and (4) heat exchanger performance and cost. It is that costs of heat exchangers should not be a barrier to successful economics for solar sea power. GRA

N75-25320# National Center for Energy Management and Power, Philadelphia, Pa.
CONSERVATION AND BETTER UTILIZATION OF ELECTRIC POWER BY MEANS OF THERMAL ENERGY STORAGE AND SOLAR HEATING. SOLAR COLLECTOR PERFORMANCE STUDIES
Noam Lior and Alan P. Saunders Aug. 1974 126 p refs
(Grant NSF GI-27976)
(PB-239355/1; NSF/RANN/SE/GI-279976/TR-73-1; NSF/RA/N-74-188) Avail: NTIS HC $5.75 CSCL 10B

Comparative evaluation of 24 types of flat-plate solar collector configurations was performed. In addition to insolation collection tests, separate experiments were conducted to determine heat losses. The experimental facilities utilized are described. The various collector configurations were designed with a view to improving the absorption of solar energy and to reducing the heat losses from the collector window. The collectors, as well as the major materials used in their construction, were experimentally evaluated. GRA

N75-25321# National Bureau of Standards, Washington, D.C. Thermal Engineering Systems.
METHOD OF TESTING FOR RATING SOLAR COLLECTORS BASED ON THERMAL PERFORMANCE
James E. Hill and Tamami Kusuda Dec. 1974 64 p refs
(Grant NSF AG-493)
(COM-75-10276/4; NBSIR-74-635) Avail: NTIS HC $4.25 CSCL 10B

A study was made of the different techniques that could be used for testing solar collectors and rating them on the basis of thermal performance. This document outlines a standard test procedure based on that study. It is written in the format of a standard of the American Society of Heating, Refrigerating, and Air Conditioning Engineers and specifies the recommended apparatus, instrumentation, and test procedure. GRA

N75-25322# Illinois Univ., Urbana. Center for Advanced Computation.
US ENERGY AND FUEL DEMAND TO 1985, A COMPOSITE PROJECTION BY USER WITHIN PETROLEUM ADMINISTRATION FOR DEFENSE (PAD) DISTRICTS Final Report
Michael Rieber and Ronald Halcrow May 1974 173 p refs
(Grant NSF GI-35821)
(PB-239343/7; UIUC-CAC-DN-74-108R; NSF/RA/N-74-167) Avail: NTIS HC $6.25 CSCL 10A

Demand projections are presented for the years 1975, 1980 and 1985. These are subdivided by Petroleum Administration Defense (PAD) district, major consuming group within each district and the specific fuel. Fuel projections are presented on both a BTU and a commercial unit basis. Projections are a composite of several recent studies including those of the National Petroleum Council, Federal Power Commission, Bureau of Mines and National Economic Research Associates, Inc. Analyses of and comparisons among these studies are presented along with methodology for the present projection. GRA

N75-25323# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
ENERGY CONSERVATION: A CASE STUDY FOR A LARGE MANUFACTURING PLANT Final Report
Lewis A. Felton and Leon R. Blicksman May 1974 111 p refs
(PB-239302/3; MIT-EL-74-010) Avail: NTIS HC $5.25 CSCL 10A

The methods of formulating, implementing, and evaluating a conservation program in a commercial building or light industrial plant are examined and the results of one case study are presented. In commercial and light industrial applications, most energy is consumed to maintain proper environmental conditions; light levels, heat levels, and fresh air levels. This report presents a method that can be used by many commercial and light industrial concerns to establish a conservation program. Guidelines are presented that can be used to examine environmental conditions and determine ways they must be changed. A system of program analysis is also presented. GRA

N75-25324# National Center for Energy Management and Power, Philadelphia, Pa.
PRELIMINARY INVESTIGATION INTO REGULATORY POWERS AND POLICIES ON ELECTRIC UTILITY PEAK LOAD PRICING
1974 54 p refs
(PB-239761/0; NSF/RA/N-74-152(6)) Avail: NTIS HC $4.25 CSCL 10A

The development of regulatory powers related to peak pricing and peak pricing policy is discussed along with possible modifications in national and state regulatory processes necessary to accommodate changes in rate structure. M.J.S.

N75-25325# Fluor Utah, San Mateo, Calif.
ECONOMIC SYSTEM ANALYSIS OF COAL PRECONVERSION TECHNOLOGY Interim Report, Aug. 1973 - Jun. 1974
Jan. 1975 388 p refs Prepared in cooperation with Bonner and Moore Associates Inc., Houston, Texas
(Contract DI-14-32-0001-1520)
(PB-239383/3; OCR-99-INT-1) Avail: NTIS HC $10.25; SOD HC as I63.10:99/INT-1 CSCL 08I

A comprehensive economic system analysis of coal preconversion technology to identify and define the physical, technical, social, economic, legal and environmental problems of producing 75,000 tons per day of coal from surface mines in the United States is described. Progress is reported in the collection of data on the geology of coal resources, mining equipment, processing equipment, socioeconomic and physioeconomic factors, and financial statistics. In addition, efforts are outlined for the development of a mathematical model to simulate mining operations and project the cost of various alternative cases. GRA

N75-25326# Battelle Columbus Labs., Ohio.
CHARACTERIZATION OF SULFUR RECOVERY FROM REFINERY FUEL GAS Final Report
J. M. Genco and S. S. Tam Jun. 1974 138 p refs
(Contract EPA-68-02-0611)
(PB-239777/6; EPA-450/3-74-055) Avail: NTIS HC $5.75 CSCL 07A

Processes for removing and recovering sulfur from refinery fuel gas are reviewed. Flowsheets, heat, and material balances for Claus sulfur recovery plants and commercially available processes for sulfur removal from Claus tail gas are presented. Statistics on sulfur recovery are presented. The environmental impact gas processes including emission reduction, liquid and solid by-products, and energy consumption is discussed. GRA

N75-25327# Pennsylvania State Univ., University Park. Dept. of Geosciences.
THE RELATION OF COAL CHARACTERISTICS TO COAL LIQUEFACTION BEHAVIOR
P. H. Given, W. Spackman, A. Davis, P. L. Walker, Jr., and H. L. Lovell Aug. 1974 98 p
(Grant NSF GI-38974)
(PB-239261/1; NSF/RA/N-74-154; Rept-2) Avail: NTIS HC $4.75 CSCL 07A

Various factors of coal are studied systematically to determine their relevancy to liquefaction behavior of coals and the character of the products. A continuous flow reactor, batch autoclaves, low pressure reaction vessels and other equipment are used in this investigation. This report runs from sample collection and characterization to characterization of mineral matter in coals by scanning electron microscope and preparation of maceral concentrations for liquefaction research. GRA

N75-25328# Bureau of Mines, Laramie, Wyo. Energy Research Center.
SHALE RETORTING IN A 150-TON BATCH-TYPE PILOT PLANT
A. E. Harak Dec. 1974 37 p refs
(PB-240263/4; BM-RI-7995) Avail: NTIS HC $3.75 CSCL 07A

To determine the retorting characteristics of a column of mine-run, ungraded oil shale ranging in size from fines to 5-ton pieces, a 150-ton retort was designed and constructed. Mine-run shale assaying about 25 gallons of oil per ton, was used as the test shale. The results of 10 runs of these are reported. In one run, the average particle size of the shale was substantially increased to determine its effect on oil yield. Oil recoveries ranged from a low of 39.3 to a high of 5.8 volume-percent of Fischer assay. GRA

N75-25329# Battelle Columbus Labs., Ohio.
VARIOUS RESEARCH TASKS RELATED TO ENERGY INFORMATION AND DATA ACTIVITIES: TASK 4 PRIORITIES ANALYSIS Final Report
David M. Liston, Jr., John W. Murdock, and Immanuel J. Klette 15 Nov. 1974 42 p
(Grant NSF GN-42243)
(PB-240424/2) Avail: NTIS HC $3.75 CSCL 05D

Priority actions for NSF to consider are defined in the field of energy research and development information. Energy policy, science policy, and information policy concepts were summarized and integrated to form a summary of energy research and development information policy concepts. GRA

N75-25330# National Bureau of Standards, Washington, D.C.
DIMENSIONS/NBS, VOLUME 59, NUMBER 2, FEBRUARY 1975 Monthly Technical News Bulletin
Feb. 1975 24 p
(COM-75-50141/02; LC-25-26527; NBS/DIM-59/2) Avail: NTIS MF $2.25; SOD HC as C13.13:59 CSCL 05B

Major technical developments in the areas of energy conservation, energy consumption, hazardous materials, and safety management are summarized. J.M.S.

N75-25331# Federal Energy Administration, Washington, D.C.
FIVE YEAR PROGRAM PLANNING DOCUMENT FOR END USE ENERGY CONSERVATION, RESEARCH, DEVELOPMENT, AND DEMONSTRATION
Douglas C. Bauer Jun. 1974 259 p refs
(PB-240406/9; FEA/PD-226-D) Avail: NTIS HC $8.50 CSCL 05A

The nation's resources are organized into task forces under national government leadership. Projects and funding needed for energy conservation studies in areas of transportation, industry, and building research are included. GRA

N75-25348# Nuclear Regulatory Commission, Washington, D.C. Office of Special Studies.
NUCLEAR ENERGY CENTER SITE SURVEY: SCOPE OF WORK
13 Mar. 1975 28 p
(PB-240453/1; NUREG-75/018) Avail: NTIS HC $3.75 CSCL 18E

The scope of a study to conduct a national survey to identify potential nuclear energy center sites has been outlined by the Nuclear Regulatory Commission (NRC). The study will include evaluation of the technical feasibility and practicality of NEC's, and will be done in cooperation with Federal, State, and local government agencies. Three basic NEC concepts will be evaluated: (1) electric power generating centers with a capacity of from 12,000 to 48,000 MWe of installed capacity; (2) integrated fuel cycle centers with sufficient fuel reprocessing, fabrication, and waste management capacity to support from 50,000 to 300,000 MWe; and (3) various combinations of fuel cycle and electric generating facilities. GRA

N75-25349# Nuclear Regulatory Commission, Washington, D.C. Office of Nuclear Reactor Regulation.
ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED CALLAWAY PLANT UNITS 1 AND 2. UNION ELECTRIC COMPANY DOCKET NOS. STN 50-483 AND STN 50-486 Final Report
Mar. 1975 196 p refs
(PB-240193/3; NUREG-75/011) Avail: NTIS HC $7.00 CSCL 18E

A final environmental statement for the proposed Callaway plant units in Callaway County, Missouri has been prepared. This statement provides: (1) a summary of environmental impact and adverse effects of the proposed facility; and (2) a consideration of major alternatives. Also included are comments of Federal agencies and other state and local organizations. The NRC staff has concluded that construction permits could be granted for the proposed facility, subject to certain conditions for the protection of the environment. GRA

N75-25354# Bureau of Mines, Pittsburgh, Pa. Safety Research Center.
METHANE EMISSION FROM U.S. COAL MINES IN 1973, A SURVEY Information Circular 1974
M. C. Irani, P. W. Jeran, and Maurice Deul Dec. 1974 52 p refs
(PB-240154/5; BM-IC-8659) Avail: NTIS HC $4.25 CSCL 13B

Daily methane emissions from U.S. coal mines are reported. It is indicated that total daily emissions have declined. GRA

N75-25695# Battelle Pacific Northwest Labs., Richland, Wash.
[STRONTIUM FLUORIDE RESEARCH IN HEAT SOURCE AND COMPATIBILITY TESTS] Monthly Report on Space Nuclear Systems, Jul. 1974
H. T. Fullam Jul. 1974 14 p
(Contract AT(45-1)-1830)
(BNWL-1845-2) Avail: NTIS HC $3.25

At Hanford, strontium was separated from the high-level waste, then converted to the fluoride, and doubly encapsulated in small, high-integrity containers for subsequent long-term storage. The fluoride conversion, encapsulation, and storage place in the waste encapsulation and storage facilities (WESF). This encapsulated strontium fluoride represents an economical source of Sr-90 if the WESF capsule can be licensed for heat source applications under anticipated use conditions. The objectives of this program are to obtain the data needed to license Sr-90F2 heat sources and specifically the WESF Sr-90f2 capsules. Progress is reported on the following areas of research: SrF2 compatibility tests; SrF2 dissolution rates in aqueous media; SrF2 physical property measurements; WESF Sr-90f2 capsule analysis; thermodynamic analysis of Sr-90f2 compatibility; and SrF2 compatibility program plan. NSA

N75-25696# Battelle Pacific Northwest Labs., Richland, Wash.
[STRONTIUM HEAT SOURCE DEVELOPMENT PROGRAMS] Monthly Report on Space Nuclear Systems Programs Oct. 1974
H. T. Fullam Oct. 1974 29 p refs
(BNWL-1845-4) Avail: NTIS HC $3.75

At Hanford, strontium was separated from the high-level waste, then converted to the fluoride, and doubly encapsulated in small, high-integrity containers for subsequent long-term storage. The fluoride conversion, encapsulation, and storage took place in the waste encapsulation and storage facilities (WESF). This encapsulated strontium fluoride represents an economical source of Sr-90 if the WESF capsule can be licensed for heat source applications under anticipated use conditions. The objectives of this program are to obtain the data needed to license Sr-90F2 heat sources and specifically the WESF Sr-90F2 capsules. Progress on the following areas of research is reported: short-term compatibility tests, SrF2 dissolution rate studies, thermodynamic analysis of Sr-90F2 compatibility, and the Sr-90F2-tungsten system. NSA

N75-25774# Battelle Columbus Labs., Ohio.
VARIOUS RESEARCH TASKS RELATED TO ENERGY INFORMATION AND DATA ACTIVITIES. TASK 2 NATIONAL ENERGY INDEXING SCHEMES: CHARACTERIZATION OF PROBLEM Final Report
R. T. Niehoff, W. D. Penniman, and R. L. Little Nov. 1974 63 p refs
(Grant NSF GN-42243)
(PB-240423/4) Avail: NTIS HC $4.25 CSCL 05B

The development of an integrated vocabulary of energy terminology, problems and potential research hypothesis in the area of multiple data base interrogation, and the potential for a fully developed energy vocabulary conversion guide were investigated. Eleven system vocabularies were analyzed and over 24000 entries were selected and fully integrated. Thesaural origins and key semantic and generic relationships were preserved for each term. GRA

N75-25775# Commerce Dept., Washington, D.C.
COMMERCE TODAY, VOLUME 5, NUMBER 10
17 Feb. 1975 44 p
(COM-74-50944/10) Avail: NTIS MF $2.25; SOD HC CSCL 05C

The overall rise in the gross national product price indicator and the improvement of inflation in the fourth quarter are discussed. Other topics discussed include: national business alliance joining NFL players seeking young talent, the U.S. trade rise in 1974 and the oil price increase leading to a deficit, disposal of hazardous wastes, energy management, domestic business, and international commerce. M.J.S.

N75-26484# Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Economics.
ALTANTIC OUTER CONTINENTAL SHELF ENERGY RESOURCES: AN ECONOMIC ANALYSIS
Robert J. Kalter, Wallace E. Tyner, and Thomas H. Stevens Nov. 1974 95 p refs
(Grant NOAA-15-81188)

(COM-75-10330/9; AE-Res-74-17; NOAA-75021104) Avail: NTIS HC $4.75 CSCL 08G

The Atlantic Outer Continental Shelf (AOCS) acreage available for future leasing is considered. The geology and petroleum potential of the AOCS region is examined and alternative scenarios are developed with respect to the quantity and location of possible hydrocarbon resources. The potential costs of energy exploration, discovery, and production in various regions of the AOCS are described and forecast. Current leasing policy and resource management procedures are discussed and alternative leasing and management policy issues with respect to the AOCS are delineated. An analytical framework is formulated and used to analyze impacts forthcoming from the adoption of such alternative policies. GRA

N75-26485# Stanford Univ., Calif.
STIMULATION AND RESERVOIR ENGINEERING OF GEOTHERMAL RESOURCES Progress Report
Paul Kruger Jun. 1974 149 p refs
(Grant NSF GI-34925)
(PB-239718/0; SU-SGT-TR-1; NSF/RA/N-74-132; PR-3) Avail: NTIS HC $5.75 CSCL 08H

Experimental and computational data are developed to evaluate the optimum performance of fracture stimulated geothermal reservoirs along with a geothermal reservoir model to evaluate important thermophysical, hydrodynamic, and chemical parameters based on fluid-energy-volume balances as part of standard reservoir engineering practice. A laboratory model is constructed of an explosion produced chimney to obtain experimental data on the processes of in-place boiling, moving flash fronts, and two phase flow in porous and fracture hydrothermal reservoirs. GRA

N75-26486# National Academy of Sciences - National Research Council, Washington, D.C. Committee on Mineral Resources and the Environment.
MINERAL RESOURCES AND THE ENVIRONMENT
Feb. 1975 362 p refs Sponsored in part by the Dept. of the Interior and NSF
(PB-239579/6; ISBN-0-309-02343-2) Avail: NTIS MF $2.25; HC $6.00 available from National Academy of Sciences, Washington, D. C. 20418 CSCL 08G

This report studies the general issues involved with the continued availability and efficient use of our minerals and mineral resources: demand, supply, technology, and environmental impact of production. Among the topics discussed are technological opportunities in the materials cycle to offset shortages; a conservation ethic with regard to our resources; capital, manpower, and time constraints on technology; world resources of petroleum and natural gas, discovered reserves and undiscovered recoverable resources; production of copper; environmental effects of coal production and use; mine safety and health; effects of sulfur pollutants on the public health; evaluation of demand projections; methods for estimating minerals resources and reserves. GRA

N75-26487# National Academy of Sciences - National Research Council, Washington, D.C. Committee on Mineral Resources and the Environment.
MINERAL RESOURCES AND THE ENVIRONMENT. APPENDIX TO SECTION 1: REPORT OF PANEL ON MATERIALS CONSERVATION THROUGH TECHNOLOGY
Feb. 1975 580 p refs Conf. held 10-11 Apr. 1974 Sponsored in part by the Interior Dept., NSF, and Population Council
(PB-239580/4) Avail: NTIS HC $13.25 CSCL 08G

Under six general headings - Background, Technology for Materials Cycle, Critical Materials for Energy Technology, Materials Conservation in User Industries, and Institutional Aspects of Materials Conservation - these twenty-two papers constitute the extensive information base used in preparing the section on Materials Conservation Through Technology of the report 'Mineral Resources and the Environment'. Portions of this document are not fully legible. GRA

N75-26488# National Academy of Sciences - National Research Council, Washington, D.C. Committee on Mineral Resources and the Environment.
MINERAL RESOURCES AND THE ENVIRONMENT. APPENDIX TO SECTION 2: REPORT OF PANEL ON ESTIMATION OF MINERAL RESERVES AND RESOURCES
W. W. Mallory and M. King Hubbert Feb. 1975 27 p refs Sponsored in part by the Interior Dept., NSF, and Population Council
(PB-239581/2) Avail: NTIS HC $3.75 CSCL 08G

As background material to the estimates of oil and natural gas reserves and resources presented in the report 'Mineral Resources and the Environment', three brief U.S.G.S. communications are reproduced for those who wish to go further into the detail of the estimated figures. These are: U.S.G.S. releases revised, U.S. oil and gas resource estimates; Synopsis of Procedure: Accelerated National Oil and Gas Resource Evaluation; (ANOGRE), W. W. Mallory, USGS, January 1974 and, Ratio Between Recoverable Oil Per Unit Volume of Sediments for Future Exploratory Drilling to that of the Past for the Conterminous United States. GRA

N75-26489# National Academy of Sciences - National Research Council, Washington, D.C. Committee on Mineral Resources and the Environment.
MINERAL RESOURCES AND THE ENVIRONMENT. APPENDIX TO SECTION 3: REPORT OF PANEL ON THE IMPLICATIONS OF MINERAL PRODUCTION FOR HEALTH AND THE ENVIRONMENT
W. K. C. Morgan, Daniel B. Botkin, Thomas D. Brock, Lester B. Lave, and Joseph Costello Feb. 1975 122 p refs Sponsored in part by the Interior Dept., NSF, and Population Council
(PB-239582/0) Avail: NTIS HC $5.25 CSCL 08G

Selected background material contributed to the section on the environmental implications of coal extraction and use in the report 'Mineral Resources and the Environment' is given. Topics covered are: SO2 emissions in the context of the global sulfur cycle, short-term health considerations regarding the choice of coal as a fuel, the economic impact of coalworkers' pneumoconiosis, and natural ecosystems and the industrial production of carbon dioxide. GRA

N75-26490# National Academy of Sciences - National Research Council, Washington, D.C. Committee on Mineral Resources and the Environment.
MINERAL RESOURCES AND THE ENVIRONMENT. APPENDIX TO SECTION 4: REPORT OF PANEL ON DEMAND FOR FUEL AND MINERAL RESOURCES
Feb. 1975 95 p refs Sponsored in part by the Interior Dept., NSF, and Population Council
(PB-239583/8) Avail: NTIS HC $4.75 CSCL 08G

This bibliographic review provides an overview of the methodologies recently used to forecast demand for minerals and commodities. The selected forecasts described and analyzed are primarily for fossil fuels, with some included for nickel, copper and sand and gravel. The review provides a data base for the discussion of demand forecasting that appears in the fourth section of the report 'Mineral Resources and the Environment'. GRA

N75-26491 British Library Lending Div., Boston Spa (England).
USING SYSTEMS METHODS FOR ANALYSING INTEGRATED ENERGY SUPPLY, SUMMARY
A. Voss 18 Feb. 1975 3 p Transl. into ENGLISH from proceedings of VDI-DK Conf. on Integrated Energy Supply (Hamburg), 7-9 May 1974
(BLL-CE-Trans-6473-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The use of cybernetics to solve technological problems involving energy supply, environment pollution, industrial and urban planning are briefly summarized. J.R.T.

N75-26492 British Library Lending Div., Boston Spa (England).
UTILISATION OF WASTE HEAT FROM INDUCTIVE MELTING INSTALLATIONS
H. J. Schwindt 7 Oct. 1974 12 p Transl. into ENGLISH from Elektrowaerme Intern. (West Germany), v. 32, no. B2, Apr. 1974 p 78-82
(BLL-OA-Trans-949-(6196.3)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Principles and technical solutions are given for the utilization of waste heat from industrial inductive melting installations. Examples of existing systems and their design are presented. Among the possible applications discussed are space heating, hot water preparation and the heating of swimming pools. D.M.L.

N75-26493 Pennsylvania State Univ., University Park.
FUEL USE IN THE US ELECTRICAL UTILITY INDUSTRY, 1971 - 1990 Ph.D. Thesis
W. Noel Gillatt 1974 183 p
Avail: Univ. Microfilms Order No. 75-10810

Factors influencing the supply of and demand for electricity are discussed in terms of the decisions facing an individual electrical utility. A quantitative model is developed and utilized to simulate the decisions taken by an electrical utility to use primary fuels over time. Emphasis is given to environmental legislation and how it affects the different primary fuels in the electrical utility market. The model is premised on the assumption that the basic objective of the regulated utility is to minimize the present value of foreseeable costs while servicing the anticipated electrical load demanded. By varying the parameters representing fuel prices, technological factors, and public policy regression analysis is used to obtain response functions giving fuel use for the horizon years as a function of these parameters. Specific cases examined include coal-oil intercompetition for the year 1980 and coal-nuclear position in the 1990 electrical utility market. Dissert. Abstr.

N75-26495*# Honeywell, Inc., Minneapolis, Minn.
DEVELOPMENT OF FLAT-PLATE SOLAR COLLECTORS FOR THE HEATING AND COOLING OF BUILDINGS Final Report
J. W. Ramsey, J. T. Borzoni, and T. H. Holland Jun. 1975 209 p refs
(Contract NAS3-17862)
(NASA-CR-134804; HONEYWELL-2852-40057) Avail: NTIS HC $7.25 CSCL 10A

The relevant design parameters in the fabrication of a solar collector for heating liquids were examined. The objective was to design, fabricate, and test a low-cost, flat-plate solar collector with high collection efficiency, high durability, and requiring little maintenance. Computer-aided math models of the heat transfer processes in the collector assisted in the design. The preferred physical design parameters were determined from a heat transfer standpoint and the absorber panel configuration, the surface treatment of the absorber panel, the type and thickness of insulation, and the number, spacing and material of the covers were defined. Variations of this configuration were identified, prototypes built, and performance tests performed using a solar simulator. Simulated operation of the baseline collector configuration was combined with insolation data for a number of locations and compared with a predicted load to determine the degree of solar utilization. Author

N75-26496*# Pratt and Whitney Aircraft, South Windsor, Conn.
DEVELOPMENT OF ADVANCED FUEL CELL SYSTEM, PHASE 3 Final Report
L. M. Handley, A. P. Meyer, and W. F. Bell 30 Jan. 1975 131 p refs
(Contract NAS3-15339)
(NASA-CR-134818; PWA-5201) Avail: NTIS HC $5.75 CSCL 10A

A multiple task research and development program was performed to improve the weight, life, and performance characteristics of hydrogen-oxygen alkaline fuel cells for advanced power systems. Gradual wetting of the anode structure and subsequent long-term performance loss was determined to be caused by deposition of a silicon-containing material on the anode. This deposit was attributed to degradation of the asbestos matrix, and attention was therefore placed on development of a substitute matrix of potassium titanate. An 80 percent gold 20 percent platinum catalyst cathode was developed which has the same performance and stability as the standard 90 percent gold - 10 percent platinum cathode but at half the loading. A hybrid polysulfone/epoxy-glass fiber frame was developed which combines the resistance to the cell environment of pure polysulfone with the fabricating ease of epoxy-glass fiber laminate. These cell components were evaluated in various configurations of full-size cells. The ways in which the baseline engineering model system would be modified to accommodate the requirements of the space tug application are identified. Author

N75-26497*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SUMMARY OF NASA LEWIS RESEARCH CENTER SOLAR HEATING AND COOLING AND WIND ENERGY PROGRAMS
Richard W. Vernon 1975 23 p refs Presented at the Southeastern Conf. on Appl. of Solar Energy, Huntsville, Ala., 24-26 Mar. 1975; sponsored by Ala. Univ.
(NASA-TM-X-71745; E-8383) Avail: NTIS HC $3.25 CSCL 10A

Plans for the construction and operation of a solar heating and cooling system in conjunction with an office building being constructed at Langley Research Center, are discussed. Supporting research and technology includes: testing of solar collectors with a solar simulator, outdoor testing of collectors, property measurements of selective and nonselective coatings for solar collectors, and a solar model-systems test loop. The areas of a wind energy program that are being conducted include: design and operation of a 100-kW experimental wind generator, industry-designed and user-operated wind generators in the range of 50 to 3000 kW, and supporting research and technology for large wind energy systems. An overview of these activities is provided. Author

N75-26499# Army War Coll., Carlisle Barracks, Pa.
MATERIALS AND THE NEW DIMENSIONS OF CONFLICT, REVISED VERSION
Alwyn H. King and John R. Cameron 15 Dec. 1974 30 p refs Revised
(AD-A004263; MIRM-74-10-Rev) Avail: NTIS CSCL 05/4

The implications of domestic shortages of critical materials, in terms of possible U.S. vulnerability to future military, political, or economic coercion, are discussed. Political and economic developments in a supplier nation which can create the environment for economic coercion are outlined, as are measures which the United States and other user nations can undertake to prevent or mitigate such coercion, i.e., development of domestic resources, development of substitute materials, encouragement of user-supplier interdependency, and maintenance of an adequate stockpile of critical materials. GRA

N75-26500*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
POTENTIAL STRUCTURAL MATERIAL PROBLEMS IN A HYDROGEN ENERGY SYSTEM
Hugh R. Gray, Howard G. Nelson, Robert E. Johnson, Bryan McPherson, Frank S. Howard, and James H. Swisher (Sandia Labs., Livermore, Calif.) Jun. 1975 29 p refs
(NASA-TM-X-71752; E-8380) Avail: NTIS HC $3.75 CSCL 10A

Potential structural material problems that may be encountered in the three components of a hydrogen energy system - production, transmission/storage, and utilization - were identified. Hydrogen embrittlement, corrosion, oxidation, and erosion may occur during the production of hydrogen. Hydrogen embrittlement is of major concern during both transmission and utilization of hydrogen. Specific materials research and development programs necessary to support a hydrogen energy system are described. Author

N75-26501# Mitre Corp., Bedford, Mass.
RESIDENTIAL ENERGY CONSUMPTION AND SMALL SCALE OPTIONS OF ENERGY SYSTEMS FOR SPACE HEATING Interim Report
D. C. Chan Nov. 1974 64 p refs
(Grant NSF CG-00007)
(PB-239941/8; MTR-2951) Avail: NTIS HC $4.25 CSCL 13A

The recent oil crisis has drawn attention to New England's extreme dependence upon oil as a source of energy and, in particular, for space heating. In this study some alternatives to conventional fossile fueled space heating systems are evaluated in terms of total annual costs to the consumer and fuel demand. It is concluded that a solar collector system back-up by conventionally fueled systems will be economically competitive if mass production is successful in reducing the manufacturing costs of solar panels. GRA

N75-26502# Avco-Everett Research Lab., Everett, Mass.
MHD POWER GENERATION (VIKING SERIES) WITH HYDROCARBON FUELS, PART 3 Final Report, Apr. 1971 - Oct. 1974
R. Kessler, O. K. Sonjou, J. Teno, L. Lontai, and D. Meader Nov. 1974 282 p refs
(Contract F33615-71-C-1456; AF Proj. 3145)
(AD-A004216; AFAPL-TR-74-47-Pt-3) Avail: NTIS CSCL 10/2

A two-part program is described, which had as its objective the development of compact high performance MHD generators to meet the need for burst-power portable power supplies for a variety of military and industrial applications. The first part of the program, referred to as VIKING I, was an experimental program performed using a high performance MHD generator operating on toluene and oxygen for bursts of about two seconds duration. This generator produced a maximum power of 1.42 MW, and a maximum specific power output (electrical output per unit mass flow) of 0.62 MW/kg/sec. The second part of the program was the design of a compact MHD generator (VIKING II), of 10 MW power output and 2000 kg dry weight. The design was carried to the point of having completed the basic designs and fabrication plans of all major components and subsystems, and their interfaces. GRA

N75-26503# Bureau of Mines, Washington, D.C.
SULFER IN COALS
A. Z. Yurovskii 1974 463 p refs Transl. into ENGLISH from Akad. Nauk. SSSR, Inst. Gorynchikh Iskopaemykh Tr. (USSR), 1960
(Contract NSF C-466)
(TT-70-57216) Avail: NTIS HC $11.50 CSCL 21D

Various aspects of the origin of coal sulfur, interrelationships of sulfur compounds of different types, and topochemical transformations of pyrite (one of the main constituents of sulfur compounds in coal) were investigated. The theoretical principles underlying the separation of coal-pyrite complexes are discussed along with technological processes of coal cleaning. M.J.S.

N75-26504# National Center for Energy Management and Power, Philadelphia, Pa.
RESEARCH ON SOLAR CELL ARRAYS AND ELECTRIC ENERGY Semiannual Progress Report, 1 Jan. - 30 Jun. 1974
J. C. Denton Jul. 1974 38 p
(Grant NSF GI-29729)
(PB-239338/7; NSF/RANN/SE/GI-29729/PR-74-2; NSF/RA/N-74-152) Avail: NTIS HC $3.75 CSCL 13A

Four research projects are briefly described: (1) low cost processes for integrated solar arrays; (2) attitudes of financial institutions toward the use of solar heating; (3) integrated solar powered space climate conditioning systems; and (4) electric energy allocation. Budgetary information is included for all the projects. GRA

N75-26505# General Electric Co., Philadelphia, Pa. Space Div.
SOLAR HEATING EXPERIMENT ON THE GROVER CLEVELAND SCHOOL, BOSTON, MASSACHUSETTS
John E. Notestein and Calvin D. Fowler 15 Jul. 1974 206 p
(Contract NSF C-869)
(PB-239516/8; NSF/RA/N-74-064) Avail: NTIS HC $7.25 CSCL 13A

The site selection, design construction, and initial operating period are described of a solar heating system installed on a metropolitan Boston school. The solar array is 4600 square feet with a peak energy output in excess of 1 million BTU/Hr and heats approximately 21,000 square feet (1/3) of the school. The system went from the concept stage to first operation in 41 days and was the first large scale heating system operating in this country. Performance data and operating experiences through May 15, 1974 along with overall conclusions are reported. GRA

N75-26507# TRW Systems Group, Redondo Beach, Calif.
STUDY ON ELECTROFLUID DYNAMIC POWER GENERATION Interim Report, 23 Apr. 1973 - 22 Apr. 1974
M. N. Huberman, H. Shelton, W. Krieve, and J. Ohrenberger Oct. 1974 147 p refs
(Contract F33615-73-C-4085; AF Proj. 7116)
(AD-A004762; ARL-74-0119) Avail: NTIS CSCL 10/2

This report describes the work that has been performed during the first year of a three year Study on Electrofluid Dynamic Power Generation Program. The major goal is to improve the measured performance capabilities of EFD energy conversion devices to the point where their feasibility for specific Air Force missions has been demonstrated and their overall system design implications can be factored into quantitative assessments of total EFD generating systems. GRA

N75-26509# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
HYDROGEN-FUTURE FUEL-A BIBLIOGRAPHY (WITH EMPHASIS ON CRYOGENIC TECHNOLOGY)
N. A. Olien and S. A. Schiffmacher Feb. 1975 134 p refs
(COM-75-10289/7; NBS-TN-664; LC-75-600002) Avail: NTIS; SOD HC as C13.46:664 CSCL 21D

This NBS Technical Note is a compilation of references dealing directly and indirectly with the possible future use of hydrogen as a fuel. The references were selected using an automated information system operated by the Cryogenic Data Center. This bibliography of references emphasizes the use of cryogenic technology in the hydrogen field. Articles are indexed under 40 subject headings and an author index is included. Over 1600 references are included in this bibliography. GRA

N75-26510# Westinghouse Electric Corp., Baltimore, Md.
SOLAR HEATING AND COOLING EXPERIMENT FOR A SCHOOL IN ATLANTA Design Report, Jun. - Sep. 1974
Dec. 1974 268 p refs Prepared in cooperation with Georgia Inst. of Technol., Atlanta
(Contract NSF C-908)
(PB-240611/4; NSF/RA/N-74-122) Avail: NTIS HC $8.50 CSCL 13A

The first large scale integrated system providing heating and cooling for a building utilizing solar energy was designed for the George A Towns Elementary School in Atlanta, Georgia. Solar cooling is provided through the use of a hot water fired lithium bromide absorption chiller to satisfy building cooling loads. Hot water for heating and cooling is provided by a 10,000 sq. ft. solar collector array using reflective surfaces to obtain some concentration during summer months. Approximately 60% of the heating and cooling loads are expected to be met by solar energy, the balance by natural gas. The report contains details of design and principles of operation. GRA

N75-26511# National Center for Energy Management and Power, Philadelphia, Pa.
INVESTMENT POSSIBILITY OF FINANCIAL INSTITUTIONS IN SOLAR HEATING
Paul D. Twombly Jun. 1974 81 p refs
(Grant NSF GI-29729)
(PB-239756/0; NCEMP-25; NSF/RA/N-74-152(1)) Avail: NTIS HC $4.75 CSCL 13A

The influence that financial institutions may have in promoting the implementation of solar heating in commercial and residential buildings was investigated. Emphasis was placed on determining what additional financial commitments would be made by these institutions to owners and operators of buildings using solar heating. The inducements that governments could make for the financial institutions to increase these commitments were also considered. GRA

N75-26512# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
DESIGN AND TEST REPORT FOR TRANSPORTABLE SOLAR LABORATORY PROGRAM
Oct. 1974 164 p
(Grant NSF PTP-74-01555)
(PB-240609/8; HONEYWELL-41433; NSF/RA/N-74-118) Avail: NTIS HC $6.25 CSCL 13A

A portable solar heating and cooling laboratory that provides a means to test the baseline design for a solar heating and cooling system under a variety of climates is described. A means is provided for evaluating and comparing both current and new solar heating and cooling designs. A secondary purpose of the portable laboratory (while it collects experimental data at many population centers) is to demonstrate solar heating and cooling concepts to interested public officials, the building trades, and the general public for educational purposes. GRA

N75-26513# American Transit Association, Washington, D.C.
PAPERS AND PROCEEDINGS OF TWO ENERGY CRISIS SEMINARS
John B. Schnell, Robert F. Comeau, and Karen R. Dinsdale Feb. 1975 111 p refs Prepared in cooperation with Amer. Public Transit Assoc., Inst. for Rapid Transit, and Urban Mass Transportation Admin.
(PB-239164/7; ATA-EC-75-1; UMTA-DC-06-0102) Avail: NTIS HC $5.25

Various aspects of the transit industry's ability to respond to the mobility needs and energy conservation needs of the country in the event of a severe energy shortage are presented. Some of the subjects treated in these papers include: operational techniques and procedures such as preferential transit treatments, busways, bus lanes, and fringe parking lots; fuel and energy conservation techniques; financial aspects; the resolution to interjurisdictional aspects of providing transit service when fuel is short for automobiles; national carpool/bus pool action plan; and UMTA's role in all of these activities. Other subjects included are rail transit - short and long range role in energy conservation and general subjects related to the severity of the energy problem and the allocation procedures as well as a presentation on mandatory allocation procedures. GRA

N75-26514# Army Electronics Technology and Devices Lab., Fort Monmouth, N.J.
NICKEL-ZINC BATTERIES FOR HYBRID VEHICLE OPERATION
Martin J. Sulkes Dec. 1972 58 p refs Sponsored by EPA
(PB-239710/7; EPA-460/3-74-025) Avail: NTIS HC $4.25 CSCL 10C

The characteristics of nickel zinc secondary batteries are evaluated and improved for use in hybrid electric vehicles. Properties which make the nickel zinc secondary battery a strong candidate for use in hybrid electric vehicle propulsion systems include: high energy density, a flat discharge, and the ability to charge and discharge at high rates and low temperatures. Short cycle life and high maintenance are considered problem areas for application of this battery to hybrid propulsion. GRA

N75-26515# Minnesota Univ., Minneapolis. Water Resources Research Center.
DIGEST OF ENERGY FACTS FOR WATER RESOURCES STUDIES IN MINNESOTA
William C. Walton Sep. 1974 84 p refs Sponsored by Dept. of Interior
(PB-239961/6; WRRC-Bull-74; OWRT-A-999-MINN(33)) Avail: NTIS HC $4.75 CSCL 10A

A digest is presented of available information concerning energy-water relationships, energy resources, consumption, sources, production, conservation, and environmental (including water resources) concerns which can serve as a background document for those who are interested in water resources and energy in Minnesota. GRA

N75-26516# National Center for Energy Management and Power, Philadelphia, Pa.
THE STUDY OF PRIORITIES IN THE ELECTRICAL ENERGY ALLOCATION PROBLEM
T. L. Saaty, C. N. Weygandt, and R. S. Mariano Jun. 1974 61 p refs
(Grant NSF GI-29729)
(PB-239762/8; NCEMP-27) Avail: NTIS HC $4.25 CSCL 10B

The problem of allocating electric energy for short periods during times of peak demand is treated. A methodology based on the assignment of priorities over classes of users of energy is applied. How these priorities are obtained and used to allocate electric power are illustrated. GRA

N75-26517# National Center for Energy Management and Power, Philadelphia, Pa.
AN ANALYSIS OF THE POTENTIAL FOR SHIFTING ELECTRIC POWER DEMAND WITHIN DAILY LOAD REQUIREMENT
Pocahontas Gey Lamb 1974 65 p refs
(Grant NSF GI-29729)
(PB-239764/4; NCEMP-29; NSF/RA/N-74-152(9)) Avail: NTIS HC $4.25 CSCL 10A

Data on estimated summer load curves of electric power demands of large commercial and industrial customers are analyzed for load flattening potential. Cost savings to the customers are determined. GRA

N75-26518# National Center for Energy Management and Power, Philadelphia, Pa.
THE PROSPECTS OF ENERGY DEMAND SCHEDULING
Francine Evelyn McQuade 1974 68 p refs
(Grant NSF GI-29729)
(PB-239763/6; NCEMP-28; NSF/RA/N-74-152(8)) Avail: NTIS HC $4.25 CSCL 10B

Industries were surveyed to consider the feasibility of a load shifting policy for electric power demands to delay the need for additional generation capability. Demand shifts would flatten out the daily load curve. The use of thermal energy storage systems is also discussed. GRA

N75-26519# National Center for Energy Management and Power, Philadelphia, Pa.
RESEARCH AND DEVELOPMENT OF LOW COST PROCESSES FOR INTEGRATED SOLAR ARRAYS Semiannual Progress Report, 15 Apr. - 30 Jun. 1974
V. Kapur, A. G. MacDiarmid, G. T. Noel, D. P. Pope, and M. Wolf Jul. 1974 106 p refs
(Grant NSF GI-29729)
(PB-239760/2; NSF/RANN/SE/GI-29729X/PR-74-2; NSF/RA/N-74-152(5); SAPR-1) Avail: NTIS HC $5.25 CSCL 10B

Potential processes for the production of low cost solar-grade silicon are reviewed and evaluated from a thermodynamic point of view. Preliminary experimental studies of a silicon purification process using the SiF_4/SiF_2 silicon transport reaction yielded a transport rate of 10 milligrams of silicon per liter of SiF_4 at a flow rate of 20 liters per hour. Processes for the formation of thin large area crystalline silicon sheets are reviewed and assessed; hot rolling, growth from a binary melt, thermal cycle annealing, and zone melting are identified as processes requiring further study. An effort to develop a methodology for the comparative rating of candidate processes is discussed. GRA

N75-26520# National Center for Energy Management and Power, Philadelphia, Pa.
SOLAR COLLECTOR PERFORMANCE STUDIES
Noam Lior and Alan P. Saunders 1974 126 p refs
(Grant NSF GI-27976)
(PB-239758/6; NSF/RANN/SE/GI-27976/TR-73-1; NSF/RA/N-74-152(3)) Avail: NTIS HC $5.75 CSCL 10B

Comparative evaluation of 24 types of flat-plate solar collector configurations was performed. A dual-glass flat black collector type served as the test reference, and the other configurations were compared to it. In addition to the insolation collection tests, separate experiments were conducted to determine heat losses. The experimental facilities used are described. GRA

N75-26521# National Center for Energy Management and Power, Philadelphia, Pa.
CONSERVATION AND BETTER UTILIZATION OF ELECTRIC POWER BY MEANS OF THERMAL ENERGY STORAGE AND SOLAR HEATING Final Summary Report
Manfred Altman and Hsuan Yeh 31 Jul. 1973 391 p refs
(Grant NSF GI-27976)
(PB-239395/7; NSF/RANN/SE/GI-27976/PR-73-5; NSF/RA/N-73-005-B) Avail: NTIS HC $10.25 CSCL 10B

The use of thermal energy storage and solar energy to provide comfort conditioning and off-peak air conditioning systems which perform much of the power consuming function at night are discussed along with materials for storing thermal energy. The marketing and economic conditions required for successful introduction of the novel systems are defined, and the effect of such systems on electric utilities is investigated. GRA

N75-26522# National Center for Energy Management and Power, Philadelphia, Pa.
CONSERVATION AND BETTER UTILIZATION OF ELECTRIC POWER BY MEANS OF THERMAL ENERGY STORAGE AND SOLAR HEATING, EXECUTIVE SUMMARY Final Summary Report
Manfred Altman and Hsuan Yeh 31 Jul. 1973 31 p refs
(Grant NSF GI-27976)
(PB-239394/0; NSF/RANN/SE/GI-27976/PR-73-5; NSF/RA/N-73-005-A) Avail: NTIS HC $3.75 CSCL 10B

The technical and economic aspects of solar heating, off-peak air conditioning, and thermal energy storage were investigated. A solar heating system, which incorporates a conventional heating as a back-up, was designed. Twenty-four collector configurations were considered, and samples of the better ones were tested in the laboratory and under actual out-door insolation conditions. Two off-peak air conditioning systems were designed, and system prototypes were built and tested. Theoretical and experimental work was performed on latent heat energy storage materials and economic and marketing considerations for solar and off-peak space conditioning were explored. GRA

N75-26523# New York State Atomic and Space Development Authority, N.Y.
STUDY OF AN INTEGRATED POWER, WATER AND WASTEWATER UTILITY COMPLEX Final Report
Dec. 1974 238 p refs Sponsored by EPA
(PB-239408/8; EPA-670/2-74-080) Avail: NTIS HC $7.50 CSCL 10B

An approach is evaluated to siting power generation, wastewater treatment, and water supply facilities. It is concluded that the integrated facility results in more efficient utilization of land and water resources, produces a net reduction in undesirable process effluents, and achieves at a reduced cost many of the environmental quality goals sought today. The use of waste heat for the beneficiation of wastewater treatment was determined to be sufficiently promising to merit further investigatory research. GRA

N75-26524# Utah Univ., Salt Lake City. Div. of Materials Science and Engineering.
REFRACTORY MATERIALS FOR COAL-FUELED MHD POWER GENERATION Progress Report, 1 Jul. - 31 Dec. 1973
May 1974 30 p refs
(Grant NSF GI-34983)
(PB-239607/5; UTEC-MSE-74-068; NSF/RA/N-74-060; PR-4) Avail: NTIS HC $3.75 CSCL 11B

The slag corrosion resistance was investigated of refractory materials which may be used in MHD preheater units. The effort involved building new equipment and upgrading equipment already on hand, finding more suitable crucible materials for containment of the slag, improvement of the slag preparation technique, preparation of corrosion specimens, and continuation of corrosion studies. Materials tested were magnesite, chrome-magnesite, silicon carbide, and Al23 brick. Preparation of La(1-x)Sr(x)CrO3 electrodes is described. GRA

N75-26525# Mitre Corp., McLean, Va.
AN ANALYSIS OF CONSTRAINTS ON INCREASED COAL PRODUCTION Final Report
J. Bhutani, A. Brice, J. Elliott, D. Ellis, W. Jacobsen, J. Just, E. Krajeski, and J. Savadelis Jan. 1975 485 p refs
(Contract DI-14-01-0001-1937)
(PB-240613/0; MTR-6830) Avail: NTIS HC $12.00 CSCL 08I

Potential constraints on the nation's ability to significantly increase coal production are described. The analysis is based on the Project Independence Blueprint 'Business as Usual,' 'Intermediate,' and 'Accelerated' production scenarios through the year 1985. Appropriate action is recommended to eliminate or reduce the impact of the identified constraints. GRA

N75-26526# Scientific Software Corp., Englewood, Colo.
MER: ULTIMATE RECOVERY VS RATE. A RESERVOIR SIMULATION STUDY, VOLUME 1 Final Report
A. Richard Thachuk 7 Jun. 1974 130 p
(Contract DI-14-08-0001-13238)
(PB-239767/7; USGS-CD-74-002-Vol-1) Avail: NTIS HC $5.75 CSCL 08I

Procedures for technical maximum efficient rate (MER) determinations and regulations for oil and gas production are defined and quantified. Emphasis was placed on the determination of actual relationships for reservoirs with different properties and mechanisms using reservoir simulation techniques. Results for twenty different reservoir cases are presented and analyzed. Recommendations for procedures to determine MER's in the Federal Outer Continental Shelf are presented. GRA

N75-26527# Scientific Software Corp., Englewood, Colo.
MER: ULTIMATE RECOVERY VS RATE. A RESERVOIR SIMULATION STUDY. VOLUME 2: APPENDICES Final Report
A. Richard Thachuk 7 Jun. 1974 550 p
(Contract DI-14-08-0001-13238)
(PB-239768/5; USGS-CD-74-003-Vol-2) Avail: NTIS HC $12.50 CSCL 08I

For abstract, see N75-26526.

N75-26528 British Library Lending Div., Boston Spa (England).
SOLIDS EMISSION FROM POWER STATION FURNACES
A. Kantner [1974] 18 p refs Transl. into ENGLISH from VGB Scand. Conf., Goteburg, 13-14 Sep. 1973
(BLL-CE-Trans-6524-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Production and control of soot, flycoke and acid smut emissions from oil fired furnaces are studied. Installations of electrostatic dust precipitors and recording dust content meters are recommended for continuous monitoring of combustion products. An evaluation of gaseous and liquid fuels in regard to their soot forming characteristics is advocated. G.G.

N75-26550# Arizona Univ., Tucson. Office of Arid Lands Studies.
THE IMPACT OF ENERGY DEVELOPMENT ON WATER RESOURCES IN ARID LANDS. LITERATURE REVIEW AND ANNOTATED BIBLIOGRAPHY
Charles Bowden Jan. 1975 288 p refs
(Contract DI-14-31-0001-4258)
(PB-240008/3; Resource-IP-6; OWRT-W-180(4258)(1)) Avail: NTIS HC $8.75 CSCL 13B

Water is basic to energy conversion systems, natural and man-made. Consequences of energy extraction and conversion in arid lands where water is scarce are explored. The historical past is utilized as a record for casting modern development plans into perspective; the worldwide growth in energy consumption rates is considered as the motive force behind many current energy projects in arid lands. Energy sources (coal, oil, gas, oil shale, solar energy, alternative energy sources, fission, fusion, and geothermal) are reviewed in terms of their consequences on the air, land, water, and inhabitants of such regions. Two rivers, the Colorado and the Missouri, provide small-scale models of the rewards and hazards of heavily exploiting water-short areas. In both instances, energy development plans, as now proposed, will seriously deplete the water supply, alter the quality of the water, land, and air, and increase the human population. GRA

N75-27120# Bureau of Mines, Pittsburgh, Pa. Energy Research Center.
MASS SPECTROMETRIC ANALYSIS OF PRODUCT WATER FROM COAL GASIFICATION Technical Progress Report, 1973
C. E. Schmidt, A. G. Sharkey, Jr., and R. A. Friedel Dec. 1974 11 p refs
(PB-240835/9; BM-TPR-86) Avail: NTIS HC $3.25 CSCL 07D

Condensate waters from the Bureau of Mines SYNTHANE process for coal gasification were investigated by mass spectrometric methods to determine the organic contaminants. Waters from the gasification of six coals were extracted with methylene chloride, yielding 0.6 to 2.4 weight-percent extractable material. Using high resolution mass spectrometry, combined gas chromatography-mass spectrometry, and low-voltage mass spectrometry, 60 to 80 percent of the extract was found to be phenolic. About 20 organic contaminants were identified and are present in the condensate waters from each coal gasified. The relative distribution of contaminants in the condensate water was nearly the same for the six coals gasified under various conditions. GRA

N75-27168# Stanford Research Inst., Menlo Park, Calif.
MATERIALS REQUIREMENTS FOR ADVANCED ENERGY SYSTEMS: NEW FUELS. VOLUME 3: MATERIALS RESEARCH NEEDS IN ADVANCED ENERGY SYSTEMS USING NEW FUELS Final Report, 1 May 1973 - 31 Jul. 1974
N. H. G. Daniels, B. C. Syrett, and R. L. Jones Jul. 1974 11 p refs 3 Vol.
(Contract DAHC15-73-C-0313; ARPA Order 2484; SRI Proj PYU-2580)
(AD-A004550) Avail: NTIS CSCL 21/4

This program sought to identify materials-critical aspects of the use, production, transportation, and storage of new fuels derived from nonfossil sources. Hydrogen was the principal new fuel studied; hydrogen-derived fuels considered were ammonia, hydrazine, boranes, silanes, carbon monoxide, and methyl alcohol. The materials implications of the use of oxygen (produced as a by-product in hydrogen generation) as a fuel oxidizer and of the use of active metals in batteries were also examined. Volumes 1 and 2 are not available for public release. GRA

N75-27170# Naval Intelligence Support Center, Washington, D.C. Translation Div.
A SHORT HANDBOOK ON FUELS
K. F. Kushnirenko 23 Oct. 1974 86 p Transl. into ENGLISH from the monograph "Kratkii Spravochnik po Goryuchemu" Moscow, 1973 p 14-63, 108-126, 239-260
(AD-A004358; NISC-Trans-3594) Avail: NTIS CSCL 21/4

Fuels, lubricants, and special fluids are briefly discussed. The properties, composition, the location of deposits, and the methods of extracting and refining petroleum for use in gasoline and motor oils are presented. Antifreezes, antifriction lubricants, protective lubricants, and fuel storage are also discussed. L.B

N75-27324# National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Lab.
WASTE HEAT DISPOSAL FROM NUCLEAR POWER PLANTS
Ralph M. Rotty Sep. 1974 33 p refs
(COM-75-10407/5; NOAA-TM-ERL-ARL-47; NOAA-75032102) Avail: NTIS HC $3.75 CSCL 18E

The global consumption of energy has been growing exponentially at a rate of 5.4 percent per year. In accord with the second law of thermodynamics, all electrical power generation cycles must reject heat, and as larger and larger amounts of electricity are needed, larger amounts of heat must be rejected. The quantity of reject heat is rapidly apporaching a level at which its impact on the atmosphere cannot be neglected. Possible intensification of convective activity and associated concentration of vorticity may be caused by concentrating large amounts of heat rejection in small areas. The type of cooling employed at a given power generation site has a major effect on the heat flux per unit of area. Once-through cooling is recommended. GRA

N75-27511 British Library Lending Div., Boston Spa (England).
THE INFLUENCE OF THE PETROLOGY OF THE KARAGANDIN COALS ON THEIR METHANE CONTENTS
M. A. Ermekov, G. N. Krikunov, and E. Sh. Ortenberg [1974] 8 p refs Transl. into ENGLISH from Khim. Tverd. Topl. (Moscow), no. 3, 1973 p 119-123
(BLL-RTS-9309) Avail: British Library Lending Div., Boston Spa, Engl.: £1.60; 3 BLL photocopy coupons

The results of an investigation of the influence of the petrological composition on the methane sorption capacity of coals of the Karagandin field are presented with the object of obtaining reliable initial data for forecasting the methane output of mines. On the basis of investigations, an empirical relationship of the methane content to the microcomponents of the fusinite group is developed and the meaning of this relationship is explained. Author

N75-27515*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
DETERMINE UTILITY OF ERTS-1 TO DETECT AND MONITOR AREA STRIP MINING AND RECLAMATION Final Report, Aug. 1972 - Feb. 1975
Robert H. Rogers, Principal Investigator and Wayne A. Pettyjohn (Ohio State Univ.) Feb. 1975 62 p refs *Original contains* color illustrations. Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21762)
(E75-10327; NASA-CR-143064; BSR-4179) Avail: NTIS HC $4.25 CSCL 08I

The author has identified the following significant results. Computer techniques were applied to process ERTS tapes acquired over coal mining operations in southeastern Ohio on 21 August 1972 and 3 September 1973. ERTS products obtained included geometrically correct map overlays showing stripped earth, partially reclaimed earth, water, and natural vegetation. Computer-generated tables listing the area covered by each land-water category in square kilometers and acres were produced. By comparing these mapping products, the study demonstrates the capability of ERTS to monitor changes in the extent of stripping, success of reclamation, and the secondary effects of mining on the environment.

N75-27532# Energy Resources Conservation Board, Calgary (Alberta).
CONSERVATION IN ALBERTA, 1973
1973 21 p
HC $3.25

A broad overview of the Energy Resources Conservation Board's activities is given. The following areas are emphasized: the impact of higher gas prices on the physical recovery of natural gas in Alberta, and an outline of available computer facilities including a brief history, current equipment, and its main uses. Author

N75-27540*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE DETECTION OF GEOTHERMAL AREAS FROM SKYLAB THERMAL DATA Final Report
Barry S. Siegal (NAS-NRC), Anne B. Kahle, Alexander F. H. Goetz, Alan R. Gillespie, Michael J. Abrams, and Howard A. Pohn (Geol. Survey) 15 Jun. 1975 34 p refs
(Contract NAS7-100)
(NASA-CR-143133; JPL-TM-33-728) Avail: NTIS HC $3.75 CSCL 08G

Skylab-4 X-5 thermal data of the geysers area was analyzed to determine the feasibility of using midday Skylab images to detect geothermal areas. The hottest ground areas indicated on the Skylab image corresponded to south-facing barren or sparsely vegetated slopes. A geothermal area approximately 15 by 30 m coincided with one of the hottest areas indicated by Skylab. This area could not be unambiguously distinguished from the other areas which are believed to be hotter than their surroundings as a result of their topography, and micrometeorological conditions. A simple modification of a previous thermal model was performed and the predicted temperatures for the hottest slopes using representative values was in general agreement with the observed data. It is concluded that data from a single midday Skylab pass cannot be used to locate geothermal areas. Author

N75-27548# Oregon State Univ., Corvallis. Water Resources Research Inst.
ANIMAL WASTE CONVERSION SYSTEMS BASED ON THERMAL DISCHARGE
L. Boersma, E. W. R. Barlow, J. R. Miner, and H. K. Phinney Sep. 1974 58 p refs Sponsored by Dept. of Interior
(PB-240113; W75-05453) Avail: NTIS CSCL 02C

An animal waste management scheme was developed on the premise that one solution to the problems of pollution and the consumption of nonrenewable resources is the development of integrated production systems with recycled sources. The feasibility of using waste heat from steam electric plants to sustain a food-producing complex which recycles nutrients is analyzed. Specifically, it is proposed to use microorganisms to convert animal waste into a high-protein animal feed and a methane-rich fuel gas. Waste heat from steam electric plants is used as a low-cost source of energy for maintaining stable, elevated temperatures in anaerobic digestion and single cell protein production units. Author

N75-27549# Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
USE OF THERMALLY ENRICHED WATER FOR GROWING FIELD CROPS IN MINNESOTA
E. R. Allred and J. R. Gilley 1974 22 p refs Presented at the Natl. Environ. Conf. Soc. of Civil Engr., Kansas City, Mo., 21-25 Oct. 1974 Sponsored by Dept. of Interior
(PB-240112; W75-05440) Avail: NTIS CSCL 02C

The use of waste heat energy for the growing of agricultural crops near Elk River, Minnesota was evaluated. The base heat transmissibility characteristics of soil was determined and crop frost protection benefits as the result of the soil warming process were examined. Soil warming was shown to be necessary for extension of the growing season for field crops in Minnesota. An irrigation system used alone proved ineffective in soil warming. Artificial warming of a field soil by utilization of waste heat energy failed to provide significant protection for potatoes against frosts at temperatures below 28 F. It was possible to advance the maturity date for early potatoes varieties grown in heated soil between two and three weeks, as compared to potatoes grown in unheated field soils. Only small quantities of waste heat energy were utilized by a field soil in Minnesota during July and August. Author

N75-27554# Bureau of Mines, Laramie, Wyo. Energy Research Center.
DETERMINATION OF CARBONATE MINERALS OF GREEN RIVER FORMATION OIL SHALES, PICEANCE CREEK BASIN, COLORADO
N. B. Young, J. W. Smith, and W. A. Robb Jan. 1975 46 p refs
(PB-240669/2; BM-RI-8008) Avail: NTIS HC $3.75 CSCL 08G

Quantification of carbonate minerals is important for the characterization of oil shale, particularly because of their thermal activity in production of oil from shale. The carbonate minerals found in this oil shale are nahcolite (NaHC O3), dawsonite (NaAl(OH)2CO3), Dolomite (mg(1-x)fe(x))Ca(CO3)2), calcite (CaCO3), and ferroan (Mg(1-x)Fe(x))CO3). While carbonate minerals can be removed by acid extraction from the balance of the oil shale, direct determination of carbonate minerals is complicated by the occurrence of the same cations in more than one mineral. A method for assigning the acid-soluble cations to the individual carbonate minerals was developed from two assumptions based on oil shale geochemistry. GRA

N75-27556# Esso Research Center, Abingdon (England).
CHEMICALLY ACTIVE FLUID-BED PROCESS FOR SULPHUR REMOVAL DURING GASIFICATION OF HEAVY FUEL OIL, PHASE 2 Report for Jul. 1972 - May 1974
J. W. T. Craig, G. L. Johnes, Z. Kowszun, G. Moss, and J. H. Taylor Nov. 1974 598 p refs
(Contract EPA-68-02-0300)
(PB-240632/0; EPA-650/2-74-109) Avail: NTIS HC $13.25 CSCL 07A

The chemically active fluid bed process for desulfurizing gasification of heavy fuel oil in a bed of hot lime was studied. The first continuous pilot plant test with U.S. Limestone BCR 1691 experienced local stone sintering and severe production of sticky dust during startup. Batch tests confirmed that BCR 1691 produced more dust than the purer Denbighshire or U.S. BCR 1359 stones. With BCR 1691, 10 times more dust was produced during kerosene combustion at 870C than during gasification/Regeneration. The continuous pilot plant was modified to improve operability under dusty conditions. GRA

N75-27557*+ National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ENERGY: AN ANNOTATED BIBLIOGRAPHY
Sandra J. Blow, comp. Aug. 1974 749 p refs
(NASA-TM-X-66766; Bib-74-01) Avail: NTIS HC $17.25 CSCL 10A

This bibliography is a compilation of approximately 4,300 selected references on energy and energy related topics. The references are arranged by date, with the latest works first, in the following subject categories: (1) energy and power - general; resources, supply/demand, and forecasting; policy, legislation, and regulation; research and development; environment; consumption and economics; and conservation, (2) energy and power sources - general, fossil fuels, hydrogen and methanol, organic wastes and waste heat, nuclear, geothermal, solar, wind, ocean/water, magnetohydrodynamics and electrohydrodynamics, and gas and steam turbines, and (3) energy and power storage and transmission. Literature from bibliographic sources dated January 1972 through July 1974 is covered, with some pertinent literature prior to 1972 included. Author

N75-27558*+ National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ENERGY: AN ANNOTATED BIBLIOGRAPHY
Sandra J. Blow, comp. Feb. 1975 550 p refs
(NASA-TM-X-72433; Bib-74-01-App-1) Avail: NTIS HC $12.50 CSCL 10A

This bibliography is the first update of a previous energy bibliography dated August 1974. It contains approximately 3,300 selected references on energy and energy related topics from bibliographic sources dated August 1974 through December 1974. The references are arranged by date, with the latest works first, in subject categories. (1) Energy and power - general; resources, supply/demand, and forecasting; policy, legislation, and regulation; research and development, environment; consumption and economics; conservation; and systems analysis. (2) Energy and power sources - general; fossil fuels; hydrogen and other fuels; organic wastes and waste heat; nuclear; geothermal; solar; wind; ocean/water; magnetohydrodynamics and electrohydrodynamics; and gas and steam turbines. (3) Energy and power storage and transmission. Author

N75-27559# Massachusetts Inst. of Tech., Cambridge.
CYCLE STUDY OF A MERCURY-COLLOIDAL ELECTRO-FLUID DYNAMIC POWER GENERATOR M.S. Thesis. Interim Report, 18 Apr. - 17 Jul. 1972
Beatriz Urquidi Oct. 1974 70 p refs
(Contracts F33615-72-C-1258; F33615-69-C-114; AF Proj. 7116)
(AD-A004814; ARL-74-0127; pr-3) Avail: NTIS CSCL 10/2

The author presents a study of an Electro-Fluid-Dynamic power system using mercury as the working vapor and hydrogen as the fill gas. Viscous coupling between mercury vapor and hydrogen is assumed. A detailed study of the various components, and related efficiencies, of the system is made and expressions for their dependence on various system parameters are derived. The overall system efficiency is optimized and analytical expressions for the optimum values of the operating parameters are given. A sensitivity analysis is made to determine the effect, on the efficiency of changes in several system parameters. Numerical calculations are carried out using a simple computer program. The results of the calculations are shown in graphical and tabular form. As an illustration, a 12.5 KW output power generator is considered and the main design characteristics are presented. GRA

N75-27560*# National Aeronautics and Space Administration. Pasadena Office, Calif.
SOLAR POND Patent Application
Charles G. Miller (JPL) and James B. Stephens, inventors (to NASA) (JPL) Filed 27 Jun. 1975 18 p
(Contract NAS7-100)
(NASA-Case-NPO-13581-1; US-Patent-Appl-SN-590975) Avail: NTIS HC $3.25 CSCL 10A

Solar ponds were designed for the purpose of collecting low-temperature thermal energy on a large scale. The shallow pools include a number of narrow, elongated, grouped trenches with heat-absorbing black liners, and containing either a brine solution or plain water, depending on the means used to remove the thermal energy from the pond. The heat-absorbing liquid is kept separate from the thermal energy removing fluid by means such as transparent fluid or solid. NASA

N75-27561*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MECHANICAL THERMAL MOTOR Patent Application
Leopold A. Hein and William N. Myers, inventors (to NASA) Filed 30 Jun. 1975 21 p
(NASA-Case-MFS-23062-1; US-Patent-Appl-SN-591569) Avail: NTIS HC $3.25 CSCL 10A

A mechanical thermal motor was designed for converting thermal energy, such as solar energy, into mechanical motion for driving a pump. The thermal motor uses heated fluid produced by solar energy coming directly from the sun or through other fluid heaters. The motor includes a stationary core supported on a base structure. A cylindrical disc plate is carried adjacent a lower portion of the inner core and extends radially. An inner concentric cylinder encircles the inner core and is fixed by a number of radially extending spokes. An outer concentric cylinder encircles the inner concentric cylinder, and a spiral tube is coiled in the space between the two cylinders. The reciprocating motion of the spiral tube as it expands and contracts on the outer concentric cylinder is used as the input drive to a pump. NASA

N75-27562*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FLUID MANIFOLD DESIGN FOR A SOLAR ENERGY STORAGE TANK
W. R. Humphries, H. C. Hewitt (Tennessee Technological Univ.), and E. I. Griggs (Tennessee Technological Univ.) Jun. 1975 21 p
(NASA-TM-X-64940) HC $3.25 CSCL 10B

A design technique for a fluid manifold for use in a solar energy storage tank is given. This analytical treatment generalizes the fluid equations pertinent to manifold design, giving manifold pressures, velocities, and orifice pressure differentials in terms of appropriate fluid and manifold geometry parameters. Experimental results used to corroborate analytical predictions are presented. These data indicate that variations in discharge coefficients due to variations in orifices can cause deviations between analytical predictions and actual performance values. Author

N75-27563*# Kanner (Leo) Associates, Redwood City, Calif.
CARBON ISOTOPES IN OIL-GAS GEOLOGY
E. M. Galimov Washington NASA Jun. 1975 409 p refs
Transl. into ENGLISH of the book "Izotopy Ugleroda v Neftegazovoy Geologii" Moscow, Nedra Press, 1973 p 1-384
(Contract NASw-2481)
(NASA-TT-F-682) Avail: NTIS HC $10.50 CSCL 08G

Analysis of variations in the natural abundances of the carbon isotopes C12 and C13 in petroleum, gases, bitumens, and other materials is treated. A theoretical-calculation division gives data on the thermodynamic isotope effects of organic compounds, and presents a theory of biogenic isotope equilibria and intramolecular isotope nonuniformity of bio-organic compounds. Laboratory studies of processes simulating natural fractionation of carbon isotopes are emphasized; included are data on the isotopic composition of individual hydrocarbons. Possible pathways of their formation were examined, and a general model of the petroleum-forming process is proposed. Within the bounds of a specific region, genetical types of petroleum are found, and their areal and profile distributions were determined. Author

N75-27564*# National Aeronautics and Space Administration. National Space Technology Labs., Bay Saint Louis, Miss.
BIO-CONVERSION OF WATER HYACINTHS INTO METHANE GAS, PART 1
B. C. Wolverton, R. C. McDonald, and J. Gordon Jul. 1974 13 p refs
(NASA-TM-X-72725) Avail: NTIS HC $3.25 CSCL 10A

Bio-gas and methane production from the microbial anaerobic decomposition of water hyacinths (Eichhornia crassipes) (Mart) Solms was investigated. These experiments demonstrated the ability of water hyacinths to produce an average of 13.9 ml of methane gas per gram of wet plant weight. This study revealed that sample preparation had no significant effect on bio-gas and/or methane production. Pollution of water hyacinths by two toxic heavy materials, nickel and cadmium, increased the rate of methane production from 51.8 ml/day for non-contaminated plants incubated at 36 C to 81.0 ml/day for Ni-Cd contaminated plants incubated at the same temperature. The methane content of bio-gas evolved from the anaerobic decomposition of Ni-Cd contaminated plants was 91.1 percent as compared to 69.2 percent methane content of bio-gas collected from the fermentation of non-contaminated plants. Author

N75-27565*# Texas Univ., Austin. Center for Energy Studies.
TECHNOLOGY ASSESSMENT OF PORTABLE ENERGY RDT AND P
John H. Vanston, Jr., W. Parker Frisbie, and Dudley L. Poston [1975] 303 p refs
(Contract NAS2-8444)
(NASA-CR-137655; Study-2B) Avail: NTIS HC $9.25 CSCL 10B

Results are presented of a workshop conducted to assess portable energy technology. The results were evaluated and areas for future research were considered. Several research categories were studied: increasing presently available fuel supplies, developing new fuel sources, utilization of new transportation fuels, improving conservation practices, and equitable distribution of fuel supplies. Several research projects were proposed, and work statements were constructed for those considered suitable. Author

N75-27567*# Hampton Inst., Va. Dept. of Agriculture.
SPACE AND ENERGY CONSERVATION HOUSING PROTOTYPE UNIT DEVELOPMENT Final Report, Apr. - Aug. 1975
Donald R. Sunshine Aug. 1975 50 p refs
(Grant NsG-1162)
(NASA-CR-143201) Avail: NTIS HC $3.75 CSCL 10A

Construction plans are discussed for a house which will demonstrate the application of advanced technology to minimize energy requirements and to help direct further development in home construction by defining the interaction of integrated energy and water systems with building configuration and construction

materials. Housing unit designs are provided and procedures for the analysis of a variety of housing strategies are developed.
Author

N75-27569# Wisconsin Univ., Madison. Mathematics Research Center.
A SIMULATION MODEL OF THE DEVELOPMENT OF PETROLEUM REFINING CAPACITY
M. A. Lindsay Nov. 1974 40 p refs Sponsored in part by NSF
(Contract DA-31-124-ARO(D)-462)
(AD-A003723; MRC-TSR-1500) Avail: NTIS CSCL 05/3

A recursive linear programming model of investment decision making is developed and used to simulate investment behavior in the U. S. petroleum industry. The model approximates industry performance from 1955-1971. This suggests that it would provide a useful tool for exploring the implications of environmental regulations and other policy issues involving the industry. GRA

N75-27570# Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
AN AGRO-POWER-WASTE WATER COMPLEX FOR LAND DISPOSAL OF WASTE HEAT AND WASTE WATER
David R. DeWalle Jun. 1974 208 p refs
(Grant NSF GI-35100)
(PB-239675/2; NSF/RA/E-74-016) Avail: NTIS HC $7.25 CSCL 13B

An agro-power-waste water complex was evaluated as a system in which waste heat from power generation was dissipated by recycling hot water through a pipe network buried in agricultural land. Concurrently, municipal waste water was renovated by sprinkler irrigation on the land and served to maintain a high soil moisture content and soil thermal conductivity. A 0.23 acre field prototype of the agro-power-waste water complex was constructed and measurements were obtained of soil temperature, soil thermal conductivity, heat dissipation, degree of waste water renovation and soil surface temperature used in a system analysis. A nuclear fuel penalty concept was used in comparing this system with conventional heat dissipation systems. GRA

N75-27572# Bureau of Mines, Pittsburgh, Pa. Energy Research Center.
CONVERSION OF CELLULOSIC WASTES TO OIL Report of Investigations 1971 - 1973
H. R. Appell, Y. C. Fu, E. G. Illig, F. W. Steffgen, and R. D. Miller Feb. 1975 34 p refs
(PB-240839/1; BM-RI-8013) Avail: NTIS HC $3.75 CSCL 13B

The Bureau of Mines studied the conversion of a variety of cellulosic wastes (sawdust, bovine manure, sewage sludge, urban refuse (free of metal and ceramics)) to heavy oils. The reactions took place in the presence of synthesis gas and water or carbon monoxide and water under conditions of elevated temperatures and pressures. Waste conversions above 90 percent, often near 99 percent, with oil yields in the range of 40 to 60 percent, were obtained in the temperature range of 250 to 425C and pressure range of 1,500 to 4,000 psig. Cobalt molybdate on alumina catalyst, used with sodium carbonate, gave a product of lower viscosity and lower oxygen content than when using sodium carbonate as the sole catalyst. GRA

N75-27573# General Electric Co., Schenectady, N.Y.
LONG TERM POWER SYSTEM DYNAMICS. VOLUME 1: SUMMARY AND TECHNICAL REPORT Final Report
Jun. 1974 233 p refs Sponsored by Electric Power Res. Inst. 2 Vol.
(PB-240799/7; EPRI-907-0-Vol-1) Avail: NTIS HC$7.50 CSCL 09C

The goal of the project was to analyze longterm (up to 20 min.) dynamic behavior leading to power system 'split-up' and to develop digital simulation techniques to model this behavior. Eighteen disturbances leading to the break-up of a power system into two or more subsystems are documented in the final report. Analysis of these disturbances led to a modeling approach, which combined an aggregate model of system frequency for the long-term dynamic behavior with a detailed model for analysis of high-speed transients. The computation expense for this initial digital computer program was less than 10 percent of the expense for a conventional transient stability program, and it is anticipated that further reduction in computation cost can be achieved. GRA

N75-27574# General Electric Co., Schenectady, N.Y.
LONG TERM POWER SYSTEM DYNAMICS. VOLUME 2: LONG-TERM POWER SYSTEM DYNAMICS SIMULATION PROGRAM Final Report
Oct. 1974 306 p Sponsored by Electric Power Res. Inst. 2 Vol.
(PB-240800/3; EPRI-907-0-Vol-2) Avail: NTIS HC$9.25 CSCL 09C

The report describes the long-term dynamic simulation program (LOTDYS) as it was developed for this project. It is both a programmer's guide and a user's guide for LOTDYS. It contains a list and description of the program variables, the program itself and the data required to run one of the sample cases of Section 1B-4. GRA

N75-27575# Illinois Univ., Chicago. Energy Resources Center.
PROCEEDINGS OF THE 2ND ANNUAL ILLINOIS ENERGY CONFERENCE
1974 222 p refs Conf. held at Chicago, 24-25 Jun. 1974
(Grant NSF GT-44112)
(PB-240548/8; NSF/RA/G-74-022) Avail: NTIS HC $7.25 CSCL 10A

The report includes five major topics: (1) energy conservation in the residential-commercial sector; (2) energy conservation in industry and agriculture; (3) energy management in utilities; (4) energy conservation in transportation; and (5) energy conservation policy. GRA

N75-27576# Committee on Government Operations (U. S. Senate).
CURRENT ENERGY SHORTAGES OVERSIGHT SERIES: OIL BROKERS, PART 7
Washington GPO 1974 98 p refs Hearings pursuant to Section 4, Senate Resolution 46 before Permanent Subcomm. on Investigations of Comm. on Govt. Operations, 93d Congr., 2d Sess., 4 and 10 Apr. 1974
(GPO-32-607) Avail: SOD HC $1.10

The impact of energy shortages is examined in terms of the role of brokers in petroleum transactions. The activities of brokers, traders, and other middlemen who are transacting, or trying to transact, oil deals during periods of petroleum shortages are investigated. An attempt is made to determine if price increases are the result of profiteering. J.M.S.

N75-27577# Applied Urbanetics, Inc., Washington, D.C.
PROJECT CONSERVE, A PILOT PROJECT IN HOMEOWNER ENERGY CONSERVATION Final Report, 26 Feb. - 31 Oct. 1974
Robert Stroh 31 Oct. 1974 88 p
(Contract DI-14-01-001-1676)
(PB-240407/7; FEA/PD-225-D) Avail: NTIS HC $4.75 CSCL 10A

Data voluntarily supplied by homeowners were processed by computer to produce a report containing the costs and savings of do-it-yourself or contractor-installed energy conserving retrofit actions: storm windows and doors, ceiling insulation, weather stripping, caulking, or thermostat set back. Validation demonstrated that data produced conservatively accurate estimates of costs and savings. Project Conserve produced a data base of existing physical and operational energy conserving characteristics of homes in a city, plus potential for conservation. GRA

N75-27578# Wisconsin Univ., Madison. Marine Studies Center.
THE HOUSEHOLD ENERGY GAME

Thomas W. Smith and John Jenkins Dec. 1974 30 p
(COM-75-10304/4; WIS-SG-74-409; NOAA-75020306; Contrib-25) Avail: NTIS HC $3.75 CSCL 10A

A technique is presented which compares the energy consumption rate of such things as transportation, home heating and cooling, and use of electrical appliances. Methods are implemented which modify the 'energy budget' and conserve energy in the home. GRA

N75-27579# National Center for Energy Management and Power, Philadelphia, Pa.

ENERGY RATIONING AND ENERGY CONSERVATION: FOUNDATIONS FOR A SOCIAL POLICY

1974 35 p refs
(Grant NSF GI-29729)
(PB-239766; NSF/RA/N-74-152) Avail: NTIS CSCL 05A

Energy rationing and energy conservation policies are discussed. Topics covered include the nature of and occasions for rationing, two previous rationing programs and their problems, rationing as an allocative law, the social organization of energy consumption, and an energy conservation program. The relation between social activities and energy consumption is illustrated using industrial culture and organization for war. Author

N75-27581# Dynatherm Corp., Cockeysville, Md.

SNOW AND ICE REMOVAL FROM PAVEMENTS USING STORED EARTH ENERGY

W. B. Bienert, M. F. Pravda, H. H. Suelau, and D. A. Wolf 31 May 1974 217 p refs
(Contract DOT-FH-11-7413)
(PB-240623/9; DTM-74-4; FHWA-RD-75-6) Avail: NTIS HC $7.25 CSCL 13B

The technical feasibility of using earth heat in combination with heat pipes for deicing and removing snow from pavement surfaces has been demonstrated (in the Baltimore/Washington climate) in testing conducted at the Fairbank Highway Research Station (located at McLean, Virginia) during two winters. This report describes the analytical models constructed to describe earth heated pavement systems, and the validation of these models as a result of the testing conducted. A highway engineer's user section is included in this report which provides step-by-step examples of how pavement heating systems may be defined and specified. The user section also describes step-by-step procedures for defining electrically heated pavements. GRA

N75-27583# Battelle Columbus Labs., Ohio.

ASSESSMENT OF THE POTENTIAL OF CLEAN FUELS AND ENERGY TECHNOLOGY Final Report

Elton Hall, Paul Choi, and Edward Kropp Feb. 1974 193 p refs
(Contract EPA-68-01-2114)
(PB-239970/7; EPA-600/2-74-001) Avail: NTIS; SOD HC as Stock No. 5501-00960 CSCL 07A

A study was conducted to assess the potential of fuel cleaning, fuel conversion, and emission control technologies, to reduce air emissions from fuel/energy processes to the year 2000. Total emissions and effluents produced by fuelburning systems to the year 2000 were calculated according to three different scenarios reflecting different technology availability and fuel allocation. The impact of these emissions on ambient air quality was analyzed. An overall index was developed for comparison of the potential usefulness of the energy technologies under consideration. Research and development priorities were recommended. GRA

N75-27612# Air Products and Chemicals, Inc., Marcus Hook, Pa. Houdry Div.

ENGINEERING AND COST STUDY OF AIR POLLUTION CONTROL FOR THE PETROCHEMICAL INDUSTRY, VOLUME 3: ETHYLENE DICHLORIDE MANUFACTURE BY OXYCHLORINATION Final Report

W. A. Schwartz, F. G. Higgins, Jr., J. A. Lee, R. Newirth, and J. W. Pervier Nov. 1974 104 p refs
(Contract EPA-68-02-0255)
(PB-240492; EPA-450/3-73-006-C-Vol-3) Avail: NTIS CSCL 07A

The manufacture of ethylene dichloride by oxychlorination is studied, including process and industry description, and engineering description of available emission control systems, the system costs, and the finanical impact of emission control on the industry. Suggested air episode procedures and plant inspection procedures are also presented. Author (GRA)

N75-27618# NATO Committee on the Challenges of Modern Society, Brussels (Belgium).

AIR POLLUTION: CONFERENCE ON LOW POLLUTION POWER SYSTEMS DEVELOPMENT

Feb. 1974 346 p Conf. held at Eindhoven, Netherlands, 23-25 Feb. 1971 Sponsored by EPA
(PB-240564/5; NATO/CCMS-4) Avail: NTIS HC $9.50 CSCL 13B

Papers given at a conference are presented. Topics discussed include federal motor vehicle emission goals for CO, HC, and NOx based on desired air quality levels, advance automotive power systems program, potential of the gas turbine vehicle in alleviating air pollution, the Stirling-cycle engine, Rankine-cycle power system with organic-based fluid and reciprocating expander for low emission automotive propulsion, nitrogen oxide formation in the combustion chamber of the internal combustion engine and its suppression by measures from combustion technology, low emissions from controlled combustion for automotive Rankine cycle engines, hybrid heat engine/electric systems, advanced techniques in electrical vehicles, lithium-sulfur batteries, electric cars, and electrical vehicles with fuel cells. M.J.S.

N75-27619# General Electric Co., Cincinnati, Ohio.

DEVELOPMENT OF LOW EMISSION POROUS PLATE COMBUSTOR FOR AUTOMOTIVE GAS TURBINE AND RANKINE CYCLE ENGINES

Richard J. Rossbach Sep. 1973 255 p
(Contract EPA-68-01-0461)
(PB-240776/5; EPA-460/3-73-001) Avail: NTIS HC $8.50 CSCL 21G

The porous plate combustor was evaluated for use in the gas turbine or Rankine cycle advanced automobile engines to control exhaust emissions. Analytical results concerning the gas turbine engine include the burner area requirements for the various operating conditions of the baseline engine as well as exhaust emission predictions. The design concept of an air-cooled, variable area combustor for this engine is presented. Operational and emissions data on several experimental combustors are presented along with the fabrication development leading to these combustors. Finally the demonstration results for a full-scale fuel-air mixture system are presented. GRA

N75-27626# Exxon Research and Engineering Co., Linden, N.J.

EVALUATION OF POLLUTION CONTROL IN FOSSIL FUEL CONVERSION PROCESSES. LIQUEFACTION, SECTION 1: COED PROCESS Final Report

C. D. Kalfadelis and E. M. Magee Jan. 1975 12 p refs
(PB-240371/5; GRU-7DJ-75; EPA-650/2-74-009) Avail: NTIS HC $4.25 CSCL 07A

The COED coal conversion process was reviewed in terms of its effect on the environment. Estimates of solid, liquid, and gaseous effluents are included as well as the thermal efficiency of the process. Process modifications are proposed and new technology needs, aimed at lessening adverse environmental impact, are indicated. Author

N75-27901# RAND Corp., Santa Monica, Calif.

US AND SOVIET MHD TECHNOLOGY: A COMPARATIVE OVERVIEW

G. Rudins Jan. 1974 112 p refs
(Contract DAHC15-73-C-0181; ARPA Order 189-1)
(AD-A004614; R-1404-ARPA) Avail: NTIS CSCL 10/2

The present Report, in successive sections, briefly reviews MHD technology, traces the evolution of the MHD programs in the United States and U.S.S.R. and their respective development approaches, and compares major U.S. and U.S.S.R. MHD facilities and national program objectives. GRA

N75-27964# National Center for Energy Management and Power, Philadelphia, Pa.
THE PROBLEM OF PEAK LOAD PRICING SUBJECT TO RATE OF RETURN CONSTRAINT
David L. McNicol Mar. 1974 49 p refs
(Grant NSF GI-29729)
(PB-239765; NSF/RA/N-74-152(10)) Avail: NTIS HC $3.75 CSCL 05C

It is shown that Wellisz's and Bailey's analyses of peak pricing subject to regulatory constraint imply the absence of overcapitalization. The error in their analyses is identified and it is established that it is optimal to use more than the cost minimizing quantity of capital, and if inputs are continuously variable, the optimal output exceeds the monopoly output in each period but only peak period output exceeds the monopoly level for a fixed coefficient technology. It is then shown that the type of price discrimination permitted affects the profitability of peak load pricing. Author

N75-27970# Wisconsin Univ., Madison. Engineering Experiment Station.
INCREASED FUEL ECONOMY IN TRANSPORTATION SYSTEMS BY USE OF ENERGY MANAGEMENT. VOLUME 1: GENERAL RESULTS AND DISCUSSION Final Report
N. H. Beachley and A. A. Frank Dec. 1974 174 p refs
(Contract DOT-OS-30112)
(PB-240220/4; DOT-TST-75-2) Avail: NTIS HC $6.25 CSCL 21D

Computer simulation programs were developed, based on experimental data as well as theory, to simulate the performance of current motor vehicles over all types of driving cycles. The simulation includes the effect of the dynamic interactions among the powerplant and drivetrain components, and is quite sophisticated so as to accurately predict the performance changes produced by a wide range of vehicle modifications. Two versions were developed--a real-time hybrid computer simulation and an all-digital batch program. Simulation of vehicles with continuously variable transmissions as a replacement for the current automatic transmission shows that a considerable improvement in fuel mileage over present-day automobiles is possible. GRA

SUBJECT INDEX

Typical Subject Index Listing

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Utilization of solar energy --- an assessment of present technology
[NASA-TT-F-16090] 05 p0033 N75-13382

TITLE OR TITLE AND TITLE EXTENSION — REPORT NUMBER — PAGE NUMBER — NASA ACCESSION NUMBER

The subject heading is a key to the subject content of the document. The title or title and title extension provides the user with a brief description of the subject matter. The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The issue page and accession numbers are located beneath and to the right of the title e.g., 05 p0033 N75-13382. Under any subject heading the accession numbers are arranged in sequence with the *IAA* accession numbers appearing first.

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PERSONAL AUTHOR INDEX

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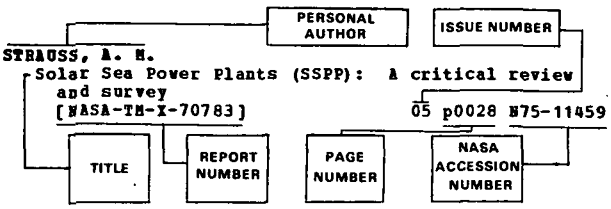

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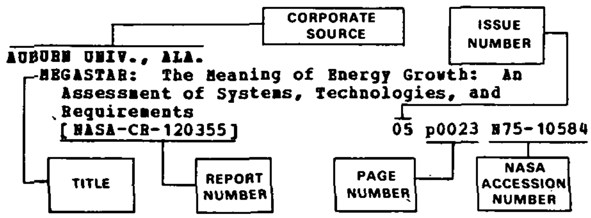

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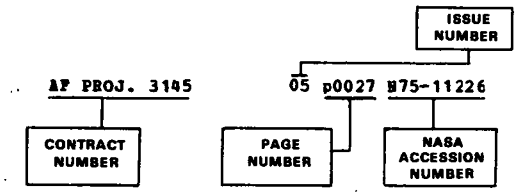

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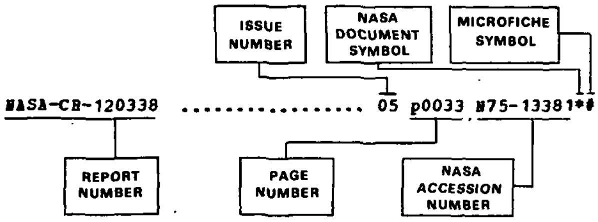

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