

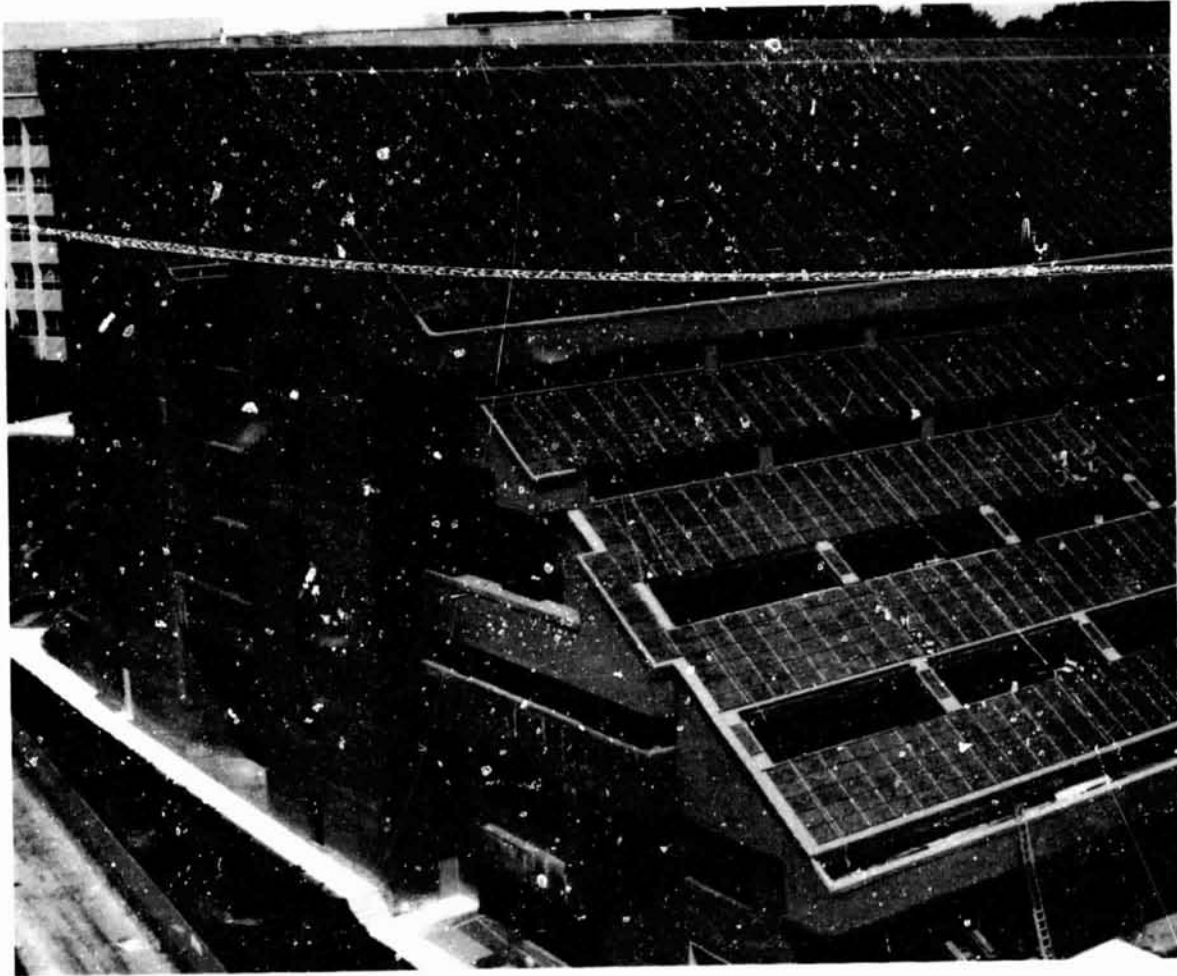
ORIGINAL PAGE IS  
OF POOR QUALITY

N85-32400

GEORGETOWN UNIVERSITY PHOTOVOLTAIC HIGHER  
EDUCATION NATIONAL EXEMPLAR FACILITY (PHENEF)

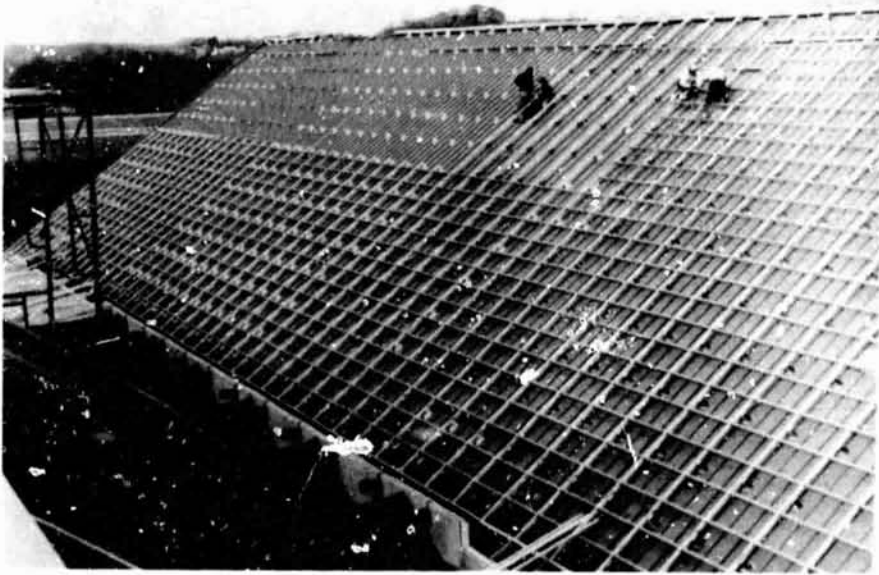
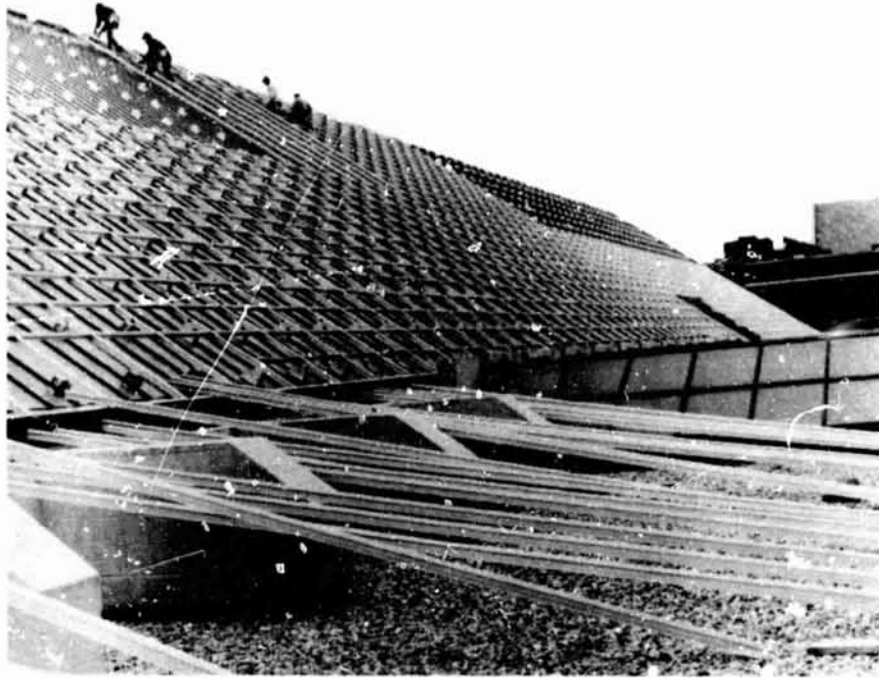
HUGHES AIRCRAFT CO.

Neil Marshall



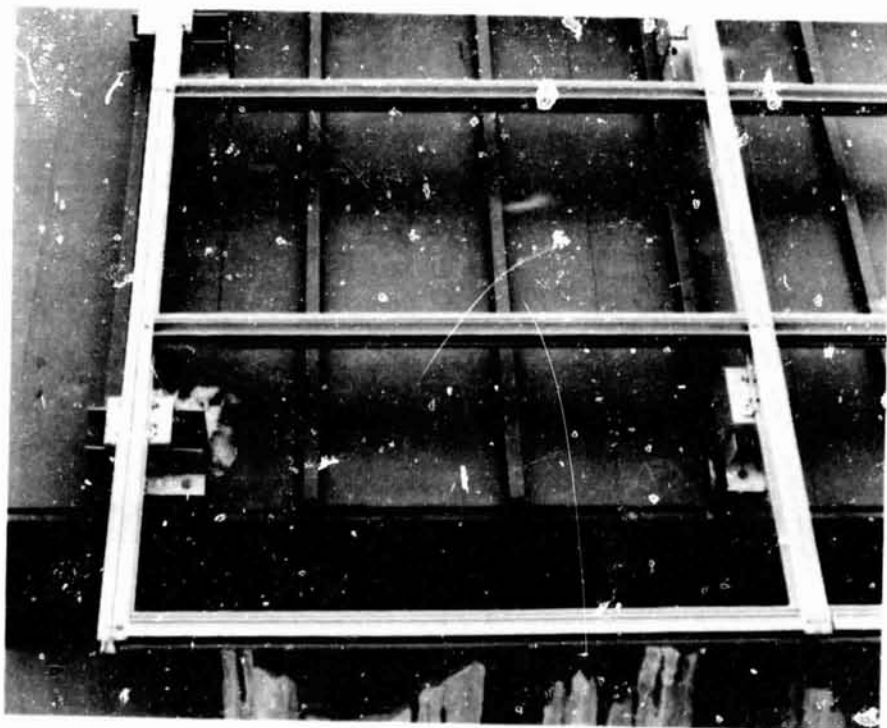
PLENARY SESSIONS

ORIGINAL PAGE IS  
OF POOR QUALITY

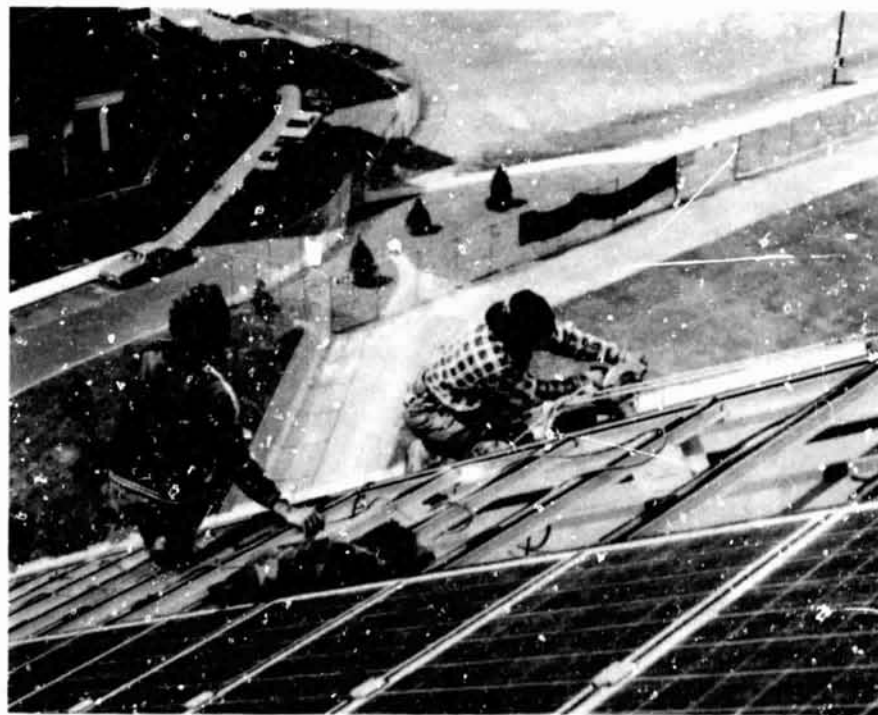


ORIGINAL PAGE IS  
OF POOR QUALITY

PLENARY SESSIONS



PLENARY SESSIONS

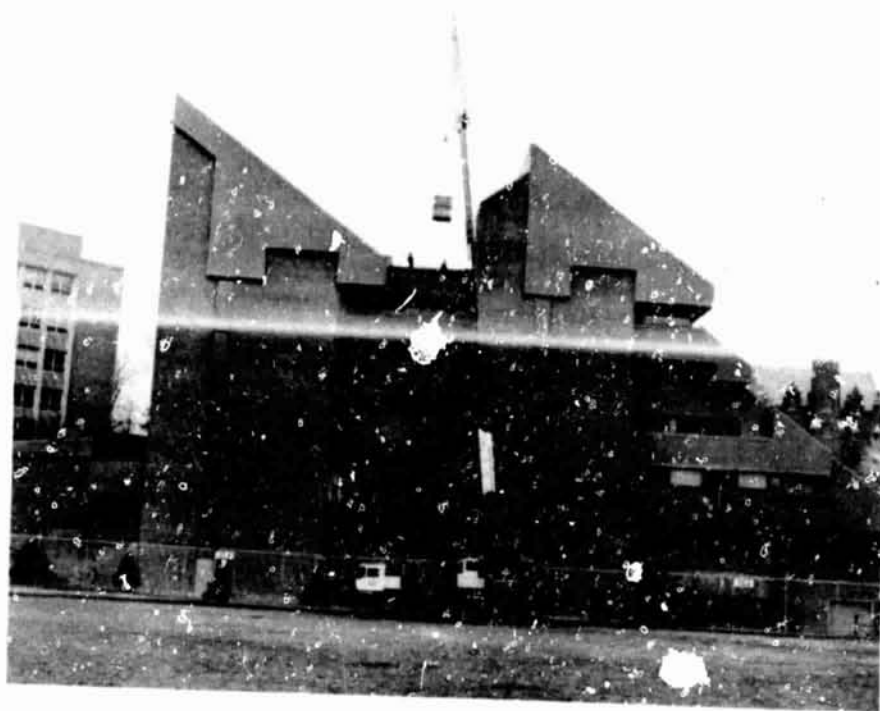


ORIGINAL PAGE IS  
OF POOR QUALITY

PLENARY SESSIONS



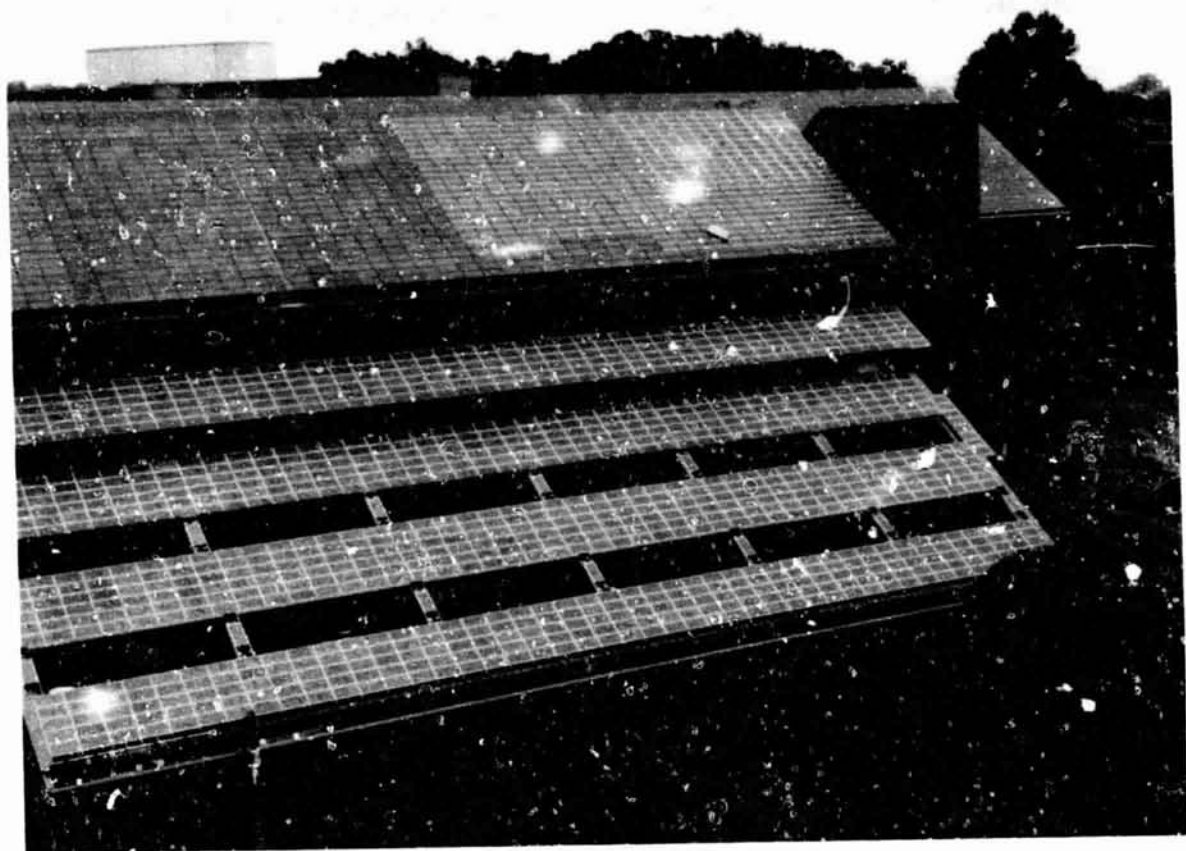
PLENARY SESSIONS





ORIGINAL PAGE  
OF POOR QUALITY

PLENARY SESSIONS



## PLENARY SESSIONS

### Systems Requirements

- PV ARRAY DESIGN LIFETIME           – 20 YEARS MINIMUM
- AVAILABLE ROOFTOP AREA           – ABOUT 36,000 SQ. FT.
- ARRAY ROOFTOPS                   – WATERTIGHT
- INSTRUMENTATION NETWORK       – ODAS; WEATHER STATION;  
  MODULES AND ROOFTOP  
  TEMPERATURE
- MAINTENANCE AND REPAIR       – MODULE REMOVAL; TEST  
  EQUIPMENT; REMOTE MONITOR;  
  ALARMS
- SAFETY                               – ELECTRICAL; MECHANICAL;  
  SNOW/ICE



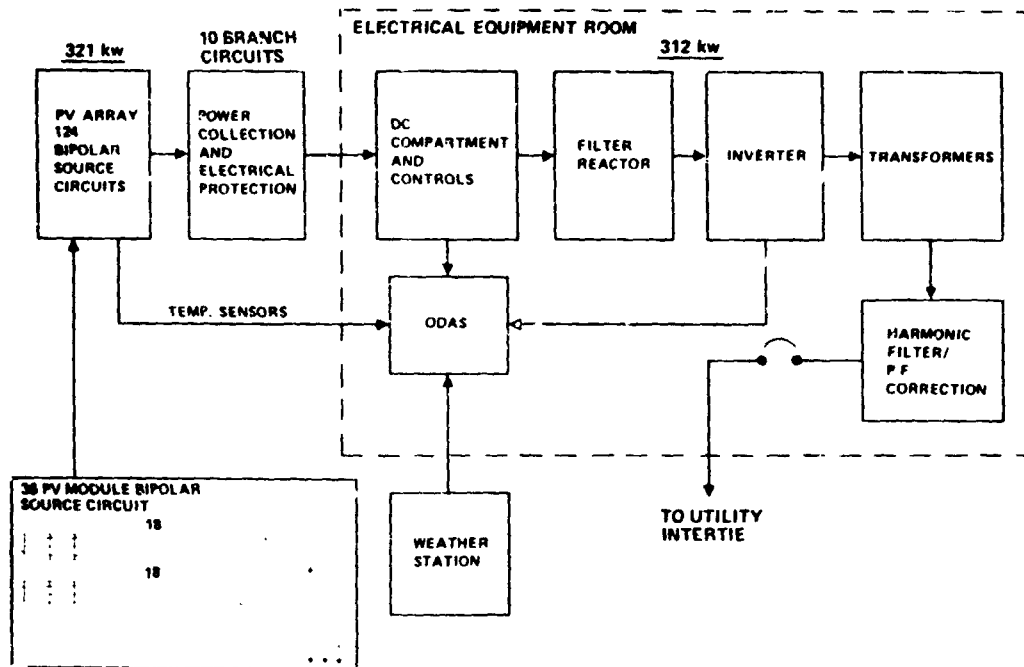
SYSTEM DESIGN AND WIRING TOPOLOGY

System Design and Performance

- PEAK POWER AT STANDARD CONDITIONS — 300 kw, MIN.
  
- ARRAY ELECTRICAL DESIGN — BIPOLAR, NEUTRAL  
RESISTIVELY GROUNDED
  
- ARRAY OUTPUT VOLTAGE —  $\pm 228$  VDC
  
- MAIN BUS CURRENT AT PEAK POWER — 660 ADC

## PLENARY SESSIONS

### PHENEF Simplified Block Diagram



### Module Electrical Characteristics

- 72 WATTS MINIMUM LOT AVERAGE AT 16.2 VOLTS
- 67 WATTS MODULE MINIMUM
- MEASURED AT  $1000 \text{ W/M}^2$ , AM 1.5,  $28^\circ\text{C}$
- 3000 VOLT ELECTRICAL VOLTAGE INSULATION
- 3 ENCAPSULATED BYPASS DIODES (12 CELLS/DIODE)
- SOLARLOK CONNECTORS (UL RECOGNIZED)
- SIZE: TWO FT. BY FOUR FT. LAMINATE

## PV Module

- FULLY TESTED BY JPL PER BLOCK V 5101-162
- PRODUCTION ADHERES TO PREDETERMINED MANUFACTURING PROCESSES
- MODULES SUBJECTED TO UL-790 FIRE RESISTANCE TEST
- FULL MECHANICAL/VISUAL INSPECTION
- PREDETERMINED ACCEPTANCE TEST PROCEDURES
  - HUGHES-FURNISHED REFERENCE CELL STANDARDS (DSET/ASTM #178)
  - CALIBRATED MODULES
  - SOURCE INSPECTION/LOT SAMPLES
- SOLAREX HAS DELIVERED MODULES ABOUT 4 PERCENT ABOVE SPECS.

## PV Module Matching

- MODULES SEGREGATED INTO 12 CURRENT GRADES
- MODULES MATCHED TO WITHIN  $\pm .025$  AMPS PER GRADE
- MODULES PACKAGED 18 PER BOX: SAME GRADE
  - ONE HALF BIPOLE
- ROOFTOP MODULE CIRCUIT LAYOUT MAPPED BY GRADE
  - LOWER PERFORMANCE GRADES INTO SHADOW PRONE AREAS

TEST EQUIPMENT

ORIGINAL PAGE IS  
OF POOR QUALITY

