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Intermediate Photovoltaic System Application Experiment Operational Performance Report

**Volume 3
for G. N. Wilcox Memorial Hospital
Kauai, HI**

Boeing Computer Services, Inc.
Seattle, WA 98124

Prepared by Sandia National Laboratories Albuquerque, New Mexico 87185
and Livermore, California 94550 for the United States Department of Energy
under Contract DE-AC04-76DP00789

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**INTERMEDIATE PHOTOVOLTAIC SYSTEM APPLICATION EXPERIMENT
OPERATIONAL PERFORMANCE REPORT**

for G. N. Wilcox Memorial Hospital, Kauai, Hawaii

Boeing Computer Services Company
Seattle, Washington 98124

Prepared under contract No. 16-4997 for
Sandia National Laboratories
Albuquerque, New Mexico 87185

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ABSTRACT

This report presents the project description, list of participants, and system specifications for the intermediate photovoltaic project at G. N. Wilcox Memorial Hospital, Kauai, Hawaii.

*This work, performed at Sandia National Laboratories, was supported by the U.S. Department of Energy under contract number DE-AC04-76DP00789.

Hospital
Kauai, Hawaii
May 1982

FOREWORD

The United States Department of Energy has funded a number of System Application Experiments (SAEs) to stimulate development of photovoltaic energy conversion systems. Sandia National Laboratories has responsibility for monitoring the SAE contracts and collecting and disseminating data generated during these experiments.

Data to be disseminated is grouped into a series of report modules which pertain to a given site. Each module, except No. 1, is included in the monthly performance reports issued for each site. Module No. 1, which is contained in this document, is only issued once when a site becomes selected to reduce the number of pages in the monthly reports inasmuch as Module No. 1 contains a site description and other information that will not ordinarily change from month to month. The present document should be retained as a reference to facilitate interpretation of certain performance data in the corresponding monthly site reports which are being published.

Questions relative to a specific site should be referred to either the contact person listed for the site contractor or to the contact person listed for the cognizant field center (Sandia National Laboratories). Questions pertaining to data collection and dissemination in general should be referred to the Sandia contact person listed below.

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Photovoltaic Data and Information System
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Hospital
Kauai, Hawaii
May 1982

C O N T E N T S

	<u>Page</u>
FOREWORD	5
INDEX OF AVAILABLE REPORTS	8
1.1 PROJECT IDENTIFICATION AND DESCRIPTION	9
1.2 PARTICIPANTS IN PROJECT	11
1.3 GENERAL INFORMATION	13
1.4 SYSTEM SPECIFICATIONS	17
1.5 SUBSYSTEM DESCRIPTION	19
1.6 PROJECT DOCUMENTATION	32
DISTRIBUTION	D-1

Index of Available Reports for Photovoltaic System at
G. N. Wilcox Memorial Hospital, Kauai, Hawaii

I. General

<u>Report</u>	<u>Contents</u>
1. SAND81-7080/3	Project description, list of participants, system specifications

I. Monthly Performance Reports

1. SAND81-7080/1	Data for January, February, and March 1982.
2. SAND81-7080/2	Data for April and May 1982.

Report Module 1.0

1.1 PROJECT IDENTIFICATION AND DESCRIPTION

1.1.1	Project name	G. N. Wilcox Memorial Hospital
1.1.2	Project location:	G. N. Wilcox Memorial Hospital
	Address	3420 Kuhio Highway
Lihue, Kauai, Hawaii 96766
	Time zone	10
	Latitude	21.98° north
	Longitude	159.35° west
	Elevation	45.0 meters
1.1.3	Project application	A photovoltaic power project to provide electricity and a heating source for the hospital.
1.1.4	Project objectives	o Utilize one of the first truly economic markets for solar energy. Since the state of Hawaii is dependent on imported fuels to meet its electrical needs, some of the nation's highest utility rates may be found there, making photovoltaic projects desirable.o Provide practical experience of photovoltaic systems used in the generation of electricity and heat.o Assess problems associated with utility power tie-in during any period of excessive or insufficient power generation.o Assess problems associated with PV concentrator systems.

Hospital
Kauai, Hawaii
May 1982

1.1 PROJECT IDENTIFICATION AND DESCRIPTION (Continued)

1.1.5	Project contract	DE-AC04-79ET20G23
1.1.6	Site ownership	G. N. Wilcox Memorial Hospital
1.1.7	Peripheral sites	None
1.1.8	Project code	PHVC-KHI

Hospital
Kauai, Hawaii
May 1982

1.2 PARTICIPANTS IN PROJECT

<u>Role</u>	<u>Name/Address</u>	<u>Contact Person/Phone No.</u>
PV system owner	Acurex Corporation 485 Clyoe Avenue Mountain View, CA 94042	Darius Rafinejad (415) 964-3200
Operator	Acurex Corporation 485 Clyoe Avenue Mountain View, CA 94042	Darius Rafinejad (415) 964-3200
Site land owner	G. N. Wilcox Memorial Hospital 3420 Kuhio Highway Lihue, Kauai, Hawaii 96766	Charles Gustafson
Prime contractor	Acurex Corporation 485 Clyde Avenue Mountain View, CA 94042	Bob Spencer (415) 964-3200 Ext. 3441
Function(s)	Design Engineer, Construction Management	
Subcontractor	Westinghouse Company P.O. Box 989 Lima, OH 45802	G. F. Laurent Wayne Niederjohn (419) 226-3211
Function(s)	Power Conditioner Manufacturer	

Hospital
Kauai, Hawaii
May 1982

1.2 PARTICIPANTS IN PROJECT (Continued)

<u>Role</u>	<u>Name/Address</u>	<u>Contact Person/Phone No.</u>
Subcontractor	Applied Solar Engineering Company 15251 East Dohjulian Road City of Industry, CA 91744	Janine Smith (213) 968-6581
Function(s)	Solar Cell Manufacturer	
Participant	Kauai Electric Company (Citizens' Utilities) P.O. Box 278 Eleele, Kauai, Hawaii 96705	Kelvin Kai (808) 335-3131
Function(s)	Utility and Advisory Board	
Participant	Hawaiian Natural Energy Institute University of Hawaii at Manoa 2450 Dole Street Honolulu, Oahu, Hawaii 96822	George Curtis Art Seki (808) 948-8890
Function(s)	Contributes approximately 25% of the cost of the project and provides manpower to support system testing.	
Cognizant field center	Sandia National Laboratories P.O. Box 5800, Division 4718 Albuquerque, NM 87185	T.D. Harrison (505) 844-6394

1.3 GENERAL INFORMATION

1.3.1 Measurement reference conditions

Performance Insolation
Spectrum (PIS)

Air mass 1.5 reference solar
spectrum.

Standard Operating
Conditions (SOC)

1000 W/m², air mass 1.5
insolation; and nominal oper-
ating cell temperature.

Nominal Operating
Conditions (NOC)

800 W/m², air mass 1.5
insolation; 20°C
air temperature; and
1 m/sec wind velocity.

Nominal Operating Cell
Temperature (NOCT)

800 W/m², air mass 1.5 in-
solation; 20°C air tempera-
ture and 1 m/sec wind velocity.

1.3.2 PV operational and collection modes

Description

Collection mode identifies
the time period and power
generation conditions for
which data are collected. Four
modes are defined as follows:

Mode 1 -

After sunset and before sun-
rise. Only weather station
data are collected in this
mode. The usual recording
interval is 30 min.

1.3 GENERAL INFORMATION (Continued)

Mode 2 -

Any period between sunrise and sunset during which the PV system is not generating power. During these periods only weather and insolation data are collected.

Mode 3 -

Any period between sunrise and sunset during which the PV is generating power. All data (weather, insolation and power) are collected in mode 3.

Mode 0 -

~~On-site-Data-Acquisition-~~
System is inoperative. No data are acquired.

1.3 GENERAL INFORMATION (Continued)

1.3.3 Project milestone chart.

Hospital
Kauai, Hawaii
May 1982

WILCOX HOSPITAL PROJECT PHASE III EVENTS THRU: 3/82

1. TEST PLAN WRITE-UP
2, 3 SPECIAL TESTS
4, 5 TRAINING SESSIONS

6, 7 PREVENT MAINT.
8 O&M MANUAL UPDATE
9, 10 PV SYSTEM EVALUATION

11, 12, 13 & 14 } PROJECT REVIEW
15, 16 SYSTEM FINAL REPORTS (1ST & 2ND YEAR)
17, 18 DATA SUMMARY REPORT

SED (0382)

1.3 GENERAL INFORMATION (Continued)

1.3.4 SAE site insolation data.

Hospital
Kauai, Hawaii
May 1982

Month	Long term average monthly total horizontal insolation ** (W/m ²)	Long term average monthly total direct normal insolation ** (W/m ²)	Long term average monthly total horizontal energy ** (kWh/m ²)	Long term average monthly total direct normal energy ** (kWh/m ²)	Long term average monthly total beam energy incident on tracking aperture ** (kWh/m ²)	Predicted monthly heating degree days °C	Predicted monthly cooling degree days °C
JAN	324.3	327.9	108.9	110.1	86.4	0	108
FEB	362.2	305.6	114.6	96.7	82.5	0	97
MAR	392.3	253.3	144.8	93.5	87.9	0	117
APR	412.4	231.1	155.1	86.9	85.6	0	138
MAY	454.2	312.3	183.9	126.5	125.8	0	181
JUN	439.7	266.8	175.7	117.3	116.2	0	208
JUL	441.9	312.6	180.8	127.9	127.1	0	230
AUG	451.4	359.3	178.4	142.0	141.0	0	242
SEP	453.2	367.1	165.2	133.8	129.2	0	230
OCT	404.1	375	144.3	133.9	119.9	0	211
NOV	343.5	353.3	113.0	115.9	93.0	0	170
DEC	303.9	325.8	102.3	107.9	81.3	0	129

Degree days reference temperature 18.3°C.

Temperature degradation coefficient .0048 for solar cell material, efficiency at 25°C.

References: * Insolation Data Manual - SERI
** TMY data for Lihue, Kauai, HI

1.4 SYSTEM SPECIFICATIONS

1.4.1 System description

The photovoltaic system consists of:

- o 10 rows of 16 solar collectors each for a total of 160 parabolic-trough concentrating collectors;
- o Power conditioning unit to meter power (for hospital credit) to the utility grid;
- o Thermal energy recovery and cell-cooling subsystem;
- o Meteorological station, and;
- o Data acquisition and instrumentation.

1.4.2 Total array aperture area 445.9 m²

1.4.3 System capacity at standard operating conditions (SOC)

Solar insolation	1000 W/m ²
Nominal operating cell temperature	50°C
Operating voltage	272 Vdc ($\pm$ 136 Vdc to ground)
Operating current	130 Adc
Electrical capacity	35 kW (peak)
Thermal capacity	198 kW (peak)

1.4.4 Annual energy rating

Electrical energy	22 MWh (net)
Thermal energy	124 MWh (net)

1.4 SYSTEM SPECIFICATIONS (Continued)

1.4.5 Load description

The photovoltaic total energy system supplies hot water directly to the Wilcox Memorial Hospital and meters its 3-phase, 480-Vac power into the utility grid, for energy credit. Except during utility power outages, the hospital buys the electrical power back from the utility. If power outages by the utility occur during mode 3 conditions, the photovoltaic system supplies energy directly to the hospital. In non-mode 3 utility failures, power is supplied by a backup diesel generator. Under normal weather and circumstance conditions, the photovoltaic system generates more than enough electrical and heat energy to be self-sufficient.

1.4.6 On-site load

Average continuous
PV-parasitic load

319. kWac

Collector tracking motor, pumps, etc. not available. Hot water load continuous 11,204 liters per day with 25°C heating at 45% occupancy which is equivalent to 10.0 kW steady load.

1.4.7 Interface with utility

Parallel-sharing

1.5 SUBSYSTEM DESCRIPTIONS

1.5.1 Solar Array

Array description

- o 1 field array
- o 5 subfield arrays/field array
 - 2 strings/subfield array
 - 8 modules/string
- o 16 concentrator modules/subfield
 - 18 cell modules/concentrator module
 - 6 cells/cell module
- o Strings have 16 concentrator modules in series with the center tap grounded.
- o Concentrator modules have 3 parallel strings of 36 series cells that bypass the diode every 3 cells.
- o Solar cell modules have 6 cells in series with 2 bypass diodes.
- o The field has 5 series strings in parallel.

Optical type

Parabolic-trough concentrating collectors

Tracking type

Aligned to north/south, tracks east to west

Tilt angle

+90° to -160° (to allow for stowing)

Concentration ratio

Geometric

35 suns

Optical

21 suns

Total aperture area

445.9 m²

Cell material

Silicon

Cell type

P-N-N⁺

Module manufacturer

Applied Solar Energy Corporation

Nominal operating cell

Temperature at SOC 50°C

Cell design peak power rating at NOCT

4.17 W

1.5 SUBSYSTEM DESCRIPTIONS (Continued)

1.5.1 Solar Array (Continued)

Cell peak power voltage rating at NOCT	0.45 Vdc
Cell peak power current rating at NOCT	9.27 Adc
Nominal cell efficiency @ 50°C	14.5%
Total array efficiency	6.7%
blockage	4.0%
wiring loss	1.0%

1.5.2 Power Conditioning Unit (PCU)

Description	Consists of one inverter that has: <ul style="list-style-type: none">o Automatic startupo Automatic shutdown during normal conditions and during utility grid failures, low power output, and other abnormal situations.
Power conditioner type	<ul style="list-style-type: none">o Self-commutationo Solid-state DC/AC inverter package unit
Efficiency	
Initial (specified)	42% at full load
Measured	
Output harmonic distortion	
Initial (specified)	Less than or equal to 3%
Measured	

1.5 SUBSYSTEM DESCRIPTIONS (continued)

Manufacturer	Westinghouse
Design power rating	62.5 kVA @ 60 Hz
Operating input voltage range	200 to 280 Vdc
Operating output voltage	480 V - 3 phase
Phase angle	0.91 PF leading or lagging

1.5.3 Thermal subsystem

Description	Thermal energy recovery/cell-cooling system <ul style="list-style-type: none"> o Closed-loop coolant circuit (water) o Thermal storage tank o Heat exchanger o Circulation pumps o Cooling convectors
Thermal load type	Cooling the parabolic-trough concentrating collectors solar cells.
Storage capacity	11355 liters 25°C
Cooling tower exhaust capacity	Coolant water can be bypassed from the storage tank to cooling bins.
Coolant specific heat(s)	1.00 kCal/kg - °C (water)

1.5 SUBSYSTEM DESCRIPTIONS (continued)

1.5.4 Energy storage subsystem Not applicable

Type

Size

1.5.5 Tracking subsystem

Description

- o Automatic concentrator tracking and output control
- o Constant coolant flow rate and automatic inlet T-control
- o Safety interlocks and diagnostic warnings

Control input variables

- o Direct normal solar flux
- o Wind speed
- o Coolant fluid temperature and flow

Control output variables

- o Track
- o Destine
- o Stow

Controller type

Relay logic with 110-V logic signal level parameters

Manufacturer

Acurex

1.5 SUBSYSTEM DESCRIPTIONS (Continued)

1.5.6 Protection subsystem

Description	Lightning protection by varistor trap and blocking diode on each string
Trip variables	± 170 Vdc varistor
Manufacturer	General Electric

1.5.7 Data acquisition and instrumentation subsystems

Description	Provides the means for automatic control to the collector field, thermal subsystem, and power conditioning unit. It also controls the data acquisition subsystem including the system parameters and meteorological data of the site. See tables 1.5.7-1, 1.5.7-2 and 1.5.7-3 for complete descriptions of the two subsystems.
Manufacturer	HP 3052 system furnished GFE
Data measured	<ul style="list-style-type: none"> o Standard weather station sensors o Reference cell temperature o String currents o Subfield voltage and current o Subfield inverter output power o Coolant temperatures and flow
Sample and recording interval code use in table 1.5.7-1	<p>0 = 1 minute</p> <p>1 = 10 minutes</p> <p>2 = 30 minutes</p> <p>3 = 60 minutes</p> <p>4 = daily</p>

Table 1.5.7-1 Data Acquisition and Instrumentation Subsystem - Wilcox Memorial Hospital Weather and Insolation Block

Page 1 of 3

DATA MEASURED	DATA RANGE	DATA UNITS	SENSOR - TRANSDUCER							COMMENTS
			LOCATION	DESCRIPTION	ACCURACY	RANGE	CALIBRATION	TEMPERATURE EFFECT	MANUFACTURER	
Temperature - Ambient Air	-30 to 90	°C	Weather Station	Weather Measure	± 0.2°C	-30° to 50°C	Per SNL	Compensated	Climatronics Model 100093	• And motor aspirated shield Climatronics Model 100325-2
Temperature - Dew Point	-30 to 90	°C	Weather Station	Weather Measure	± 0.5°C	-30° to 50°C	Per SNL	Compensated	Climatronics Model 100743	
Temperature - Solar Cell	0 to 150	°C	Cell String	T-type t/c	± 0.5°C	1-5 V 4-20ma	Per SNL	Compensated	Action Pack I Type t/c	Located at filed fluid outlet. Spot welded to cell back
Wind Speed - Peak	0 to 30	m/sec	Weather Station	Weather Measure	± 0.12 m/s	0 to 65 m/s	Per SNL	Compensated	Climatronics Model 100108	
Wind Speed - Average	0 to 30	m/sec	Weather Station	Weather Measure	± 0.12 m/s	0 to 65 m/s	Per SNL	Compensated	Climatronics Model 100108	1 Data is not applicable for this site
Wind Direction	0 to 360	°ARC	Weather Station	Weather Measure	± 1.5°ARC	0 to 360 mech.	Per SNL	Compensated	Climatronics Model 100108	
Barometric Pressure	950 to 1050	mbars	Weather Station	Weather Measure	± 1mb	any 100 mb interval	Per SNL	Compensated	Climatronics Model 100099	
Precipitation	0 to 20	cm/hr	Weather Station	Weather Measure	± 1%	0 to infinite	Per SNL	Compensated	Climatronics Model 100508-1	
Solar Intensity - Direct Normal	0 to 1100	W/m ²	Weather Station	Pyroheliometer	± 0.5%	0 to + 2800 W/m ²	Integrating hemisphere*	Compensated	Eppler Model 100 NIP	× On Carson Astronomical Tracker Model 365
Solar Intensity - Horizontal	0 to 1100	W/m ²	Weather Station	Pyranometer	± 0.5%	0 to + 2800 W/m ²	Integrating hemisphere*	Compensated	Eppler Model 100 PSP	+ Linearity
Solar Intensity - Plane of Array ¹	0 to 1100	W/m ²	Weather Station	Pyranometer	± 0.5%	0 to + 2800 W/m ²	Integrating hemisphere*	Compensated	Eppler Model 100 PSP	* Approx. 1 cal/(cm ² min.) ambient temperature + 25 °C
Ref. Cell Solar Int. Horizontal	0 to 1100	W/m ²	Weather Station	Reference Cell						
Ref. Cell Solar Int. - Plane of Array ¹	0 to 1100	W/m ²	Weather Station	Reference Cell						

Hospital
Kauai, Hawaii
May 1982

Table 1.5.7-1 Data Acquisition and Instrumentation Subsystem— Wilcox Memorial Hospital Instrumentation Block

Page 2 of 3

DATA MEASURED	DATA RANGE	DATA UNITS	SENSOR - TRANSDUCER							COMMENTS
			LOCATION	DESCRIPTION	ACCURACY	RANGE	CALIBRATION	TEMPERATURE EFFECT	MANUFACTURER	
PV Field Array Voltage	0-200 + to GND	Vdc	Collector Group 1	Signal Transmitter	± 0.25%	1-5V 4-20ma	By Acurex	Compensated	Rochester Instrument System	Rochester Model SC-1326X
PV Field Array Current	0-30	Adc	Collector Group 1	Signal Transmitter	± 0.25%	1-5V 4-20ma	By Acurex	Compensated	Rochester Instrument System	Rochester Model SC-1326X
PV Field Array Voltage	0-200 + to GND	Vdc	Collector Group 2	Signal Transmitter	± 0.25%	1-5V 4-20ma	By Acurex	Compensated	Rochester Instrument System	Rochester Model SC-1326X
PV Field Array Current	0-30	Adc	Collector Group 2	Signal Transmitter	± 0.25%	1-5V 4-20ma	By Acurex	Compensated	Rochester Instrument System	Rochester Model SC-1326X
PV Field Array Voltage	0-200 + to GND	Vdc	Collector Group 3	Signal Transmitter	± 0.25%	1-5V 4-20ma	By Acurex	Compensated	Rochester Instrument System	Rochester Model SC-1326X
PV Field Array Current	0-30	Adc	Collector Group 3	Signal Transmitter	± 0.25%	1-5V 4-20ma	By Acurex	Compensated	Rochester Instrument System	Rochester Model SC-1326X
PV Field Array Voltage	0-200 + to GND	Vdc	Collector Group 4	Signal Transmitter	± 0.25%	1-5V 4-20ma	By Acurex	Compensated	Rochester Instrument System	Rochester Model SC-1326X
PV Field Array Current	0-30	Adc	Collector Group 4	Signal Transmitter	± 0.25%	1-5V 4-20ma	By Acurex	Compensated	Rochester Instrument System	Rochester Model SC-1326X
PV Field Array Voltage	0-200 + to GND	Vdc	Collector Group 5	Signal Transmitter	± 0.25%	1-5V 4-20ma	By Acurex	Compensated	Rochester Instrument System	Rochester Model SC-1326X
PV Field Array Current	0-30	Adc	Collector Group 5	Signal Transmitter	± 0.25%	1-5V 4-20ma	By Acurex	Compensated	Rochester Instrument System	Rochester Model SC-1326X
PV Field Array Total Voltage	0-200 + to GND	Vdc	PV Field	Signal Transmitter	± 0.25%	1-5V 4-20ma	By Acurex	Compensated	Rochester Instrument System	Rochester Model SC-1326X
PV Field Array Total Current	0-150	Adc	PV Field	Signal Transmitter	± 0.25%	1-5V 4-20ma	By Acurex	Compensated	Rochester Instrument System	Rochester Model SC-1326X
PCU Voltage Phase A-N	0-300	Vac	Inverter Output	Voltage Transducer	± 0.25%	1-5V 4-20ma	By Acurex	Compensated	Rochester Instrument System	Rochester Model VCC-1B
PCU - Voltage Phase B-N	0-300	Vac	Inverter Output	Voltage Transducer	± 0.25%	1-5V 4-20ma	By Acurex	Compensated	Rochester Instrument System	Rochester Model VCC-1B
PCU - Voltage Phase C-N	0-300	Vac	Inverter Output	Voltage Transducer	± 0.25%	1-5V 4-20ma	By Acurex	Compensated	Rochester Instrument System	Rochester Model VCC-1B

Table 1.5.7-1 Data Acquisition and Instrumentation Subsystem- Wilcox Memorial Hospital Instrumentation Block (con't)

DATA MEASURED	DATA RANGE	DATA UNITS	SENSOR - TRANSDUCER							COMMENTS
			LOCATION	DESCRIPTION	ACCURACY	RANGE	CALIBRATION	TEMPERATURE EFFECT	MANUFACTURER	
PCU-Current Phase-A	0-75	amps	Inverter Output	Current Transducer	$\pm .25\%$	0-5V 4-20ma	By Acurex	Compensated	Rochester Instrument System	Rochester Model CCC-30B
PCU-Current Phase-B	0-75	amps	Inverter Output	Current Transducer	$\pm .25\%$	0-5V 4-20ma	By Acurex	Compensated	Rochester Instrument System	Rochester Model CCC-30B
PCU-Current Phase-C	0-75	amps	Inverter Output	Current Transducer	$\pm .25\%$	0-5V 4-20ma	By Acurex	Compensated	Rochester Instrument System	Rochester Model CCC-30B
PCU-Power	0-50	KVA	Inverter Output	Power Transducer	$\pm .25\%$	0-5V 4-20ma	By Acurex	Compensated	Rochester Instrument System	Rochester Model PCE-25
Potable Hot Water Flow Rate	0-13 (0-20)	g/sec (GPM)	Cold Potable Feed to Heat Exchange	Flow Transmitter	$\pm .25\%$	1-5V 4-20ma	By Acurex	Compensated	Eastech	
Cell Coolant Flow	0-19 (0-30)	liters/sec (GPM)	Pump Output Piping	Orifice Type Flow Meter Transmitter	$\pm .25\%$	1-5V 4-20ma	By Acurex	Compensated	Foxboro	Linear
Collector Field Inlet Temp	-18-121 (0-250)	$^{\circ}\text{C}$ ($^{\circ}\text{F}$)	Downstream of Collant Connectors	100 Ω Platinum Resistance Temp Device	$\pm .7^{\circ}\text{C}$ ($\pm 1.2^{\circ}\text{F}$)	100 Ω RTD	By Manuf.	.385 $\Omega/^{\circ}\text{C}$	Thermo-electric	
Collector Field Outlet Temp	-18-121 (0-250)	$^{\circ}\text{C}$ ($^{\circ}\text{F}$)	Outlet of Field	100 Ω Platinum Resistance Temp Device	$\pm .7^{\circ}\text{C}$ ($\pm 1.2^{\circ}\text{F}$)	100 Ω RTD	By Manuf.	.385 $\Omega/^{\circ}\text{C}$	Thermo-electric	
Tank Inlet Temp Coolant	-18-121 (0-250)	$^{\circ}\text{C}$ ($^{\circ}\text{F}$)	Tank Feed Manifold	100 Ω Platinum Resistance Temp Device	$\pm .7^{\circ}\text{C}$ ($\pm 1.2^{\circ}\text{F}$)	100 Ω RTD	By Manuf.	.385 $\Omega/^{\circ}\text{C}$	Thermo-electric	
Tank, Lower Half Temperature	-18-121 (0-250)	$^{\circ}\text{C}$ ($^{\circ}\text{F}$)	Thermal Storage Tank	100 Ω Platinum Resistance Temp Device	$\pm .7^{\circ}\text{C}$ ($\pm 1.2^{\circ}\text{F}$)	100 Ω RTD	By Manuf.	.385 $\Omega/^{\circ}\text{C}$	Thermo-electric	
Tank, Upper Half Temperature	-18-121 (0-250)	$^{\circ}\text{C}$ ($^{\circ}\text{F}$)	Thermal Storage Tank	100 Ω Platinum Resistance Temp Device	$\pm .7^{\circ}\text{C}$ ($\pm 1.2^{\circ}\text{F}$)	100 Ω RTD	By Manuf.	.385 $\Omega/^{\circ}\text{C}$	Thermo-electric	
Potable Water-Hot supply to Heat Exchanger	-12-121 (0-250)	$^{\circ}\text{C}$ ($^{\circ}\text{F}$)	Potable Water Inlet From Hospital	100 Ω Platinum Resistance Temp Device	$\pm .7^{\circ}\text{C}$ ($\pm 1.2^{\circ}\text{F}$)	100 Ω RTD	By Manuf.	.385 $\Omega/^{\circ}\text{C}$	Thermo-electric	
Potable Water-Hot Supply to Hospital	-18-121 (0-250)	$^{\circ}\text{C}$ ($^{\circ}\text{F}$)	Potable Water Outlet to Hospital	100 Ω Platinum Resistance Temp Device	$\pm .7^{\circ}\text{C}$ ($\pm 1.2^{\circ}\text{F}$)	100 Ω RTD	By Manuf.	.385 $\Omega/^{\circ}\text{C}$	Thermo-electric	

Hospital
Kauai, Hawaii
May 1982

Table 1.5.7-2 ODAS - SITE CONFIGURATION DATA

SITE CODE	ON SITE CONTACT	CONTACT PHONE #	SITE DATA PHONE NUMBER
KHI	George Curtis	(808) 948-8788	Not Available

SITE LOCATION			
TIME ZONE	LATITUDE	LONGITUDE	ELEVATION
10	21.98°N	159.35°W	45m

POWER SYSTEM STATUS INDICATORS

[illegible]

Table 1

28

1

Not yet
wired

Not yet
wired

[illegible]

Hospital
Kauai, Hawaii
May 1982

Table 1.5.7.3 ODAS Site Configuration Table—Wilcox Memorial Hospital

COLLECTION MODE 2 Page 2 of 4

[illegible]

Hospital
Kauai, Hawaii
May 1982

Table 1.5.7.3 ODAS Site Configuration Table — Wilcox Memorial Hospital

COLLECTION MODE

3

Page 3 of 4

DATA MEASURED	SIGNAL UNITS	DISPLAY UNITS	VALUE LOCATION	DCS-ID NUMBER	SITE-ID NUMBER	SELECT CODE	FIRST CHANNEL	RECORDING INTERVAL	SAMPLING INTERVAL	NUMBER OF CHANNELS	DISPLAY SUB-PROG	DISPLAY LINE	DISPLAY SUB-ELEMENT	ACQUISITION SUB-PROG	CONVERSION SUB-PROG	RECORDING SUB-PROG	NUMBER OF PARAMS	PARAMETERS			
Total PV Field Voltage	Volts	Volts	10	003		709	9	1	0	1	(new) 7	16	1	1	2	2	2	-100	100		
Total PV Field Current	Volts	Amps	11	004		709	10	1	0	1	0	0	0	1	2	2	2	-37.5	37.5		
Inverter Output Voltage Phase A	Volts	Vac	12	008		709	25	1	0	3	0	0	0	1	2	2	2	0	60		
Inverter Output Current Phase A	Volts	Amps	15	009		709	22	1	0	3	0	0	0	1	2	2	2	0	15		
Inverter Output Power	Volts	KVA	18	093		709	21	1	0	1	1	17	1	1	2	2	2	0	10		
Collector Group Voltage 1-5	Volts	Vdc	19	001		709	11-12-13-14-15	1	0	5	0	0	0	1	2	2	2	-100	100		
Collector Group Current 1-5	Volts	Amps	24	002		709	16-17-18-19-20	1	0	5	0	0	0	1	2	2	2	-7.5	7.5		
Potable Water Flow Rate	Volts	kg/sec l/sec	29	058		709	39	2	0	1	0	0	0	1	2	2	2	-.325	.325		
Cell Temperature	Volts	oC	30	019		709	37	1	0	1	1	14	1	1	2	2	2	-37.5	37.5		
Coolant Inlet Mass Flow Rate	Volts	l/sec	31	022		709	38	2	0	1	1	15	1	1	2	2	2	-.475	.475		
Field Inlet Coolant Temp	Ohms	oC	32	020		709	29	2	0	1	(new) 8	13	1	5	2	2	2	-38.5	.385		
Field Outlet Coolant Temp	Ohms	oC	33	021		709	28	2	0	1	0	0	0	5	2	2	2	-38.5	.385		
Tank Inlet Coolant Temp	Ohms	oC	34	094		709	31	2	0	1	0	0	0	5	2	2	2	-38.5	.385		

Hospital
Kauai, Hawaii
May 1982

Table 1.5.7.3 ODAS Site Configuration Table— Wilcox Memorial Hospital

COLLECTION MODE 3 Page 4 of 4

[illegible]

Hospital
Kauai, Hawaii
May 1982

1.6 PROJECT DOCUMENTATION

Phase I final report

DOE/ET#

Publication date

Phase II final report

DOE/ET#

Publication date

Monthly performance reports

DOE/ET#

Publication date

System audit report

DOE/ET#

Publication date

DOE/ET numbers to be filled in by recipient when reports
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