



Sandia Laboratories
Solar Energy



San Francisco
Operations
Office

SOLAR THERMAL POWER

**Large
Power
Systems
Applications**

**STATUS LETTER FOR
AUGUST 1979**

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PROGRAM ELEMENT SUMMARY

LARGE POWER SYSTEMS APPLICATIONS

This report, issued monthly, covers the portion of the Solar Thermal Power Systems Program which is directed toward large-scale systems applications -- primarily Central Receiver system applications to electrical power generation at 10 MWe and above, but also with consideration of direct, high temperature thermal applications and of alternative collector configurations. The Central Receiver concept employs a field of individually guided mirrors called heliostats that redirect the sun's energy to a receiver mounted on top of a tower. In the receiver, the radiant solar energy is absorbed in a circulating fluid and is then transported to an electrical power generation subsystem or to an industrial thermal process; excess thermal energy may be stored for later use, if operationally desirable and economically justifiable. Alternative systems for large-scale energy collection, such as linear central receivers with single-axis heliostats and individual, distributed collectors in manifolded arrays, are also under study.

Responsibility for managing the development and assessment of large solar thermal power systems for various applications has been delegated by DOE Headquarters to the San Francisco Operations Office. Technical management is drawn from Sandia Laboratories, Livermore, the Aerospace Corporation, and other public and private organizations. The Large Power Systems Applications program element is organized according to a work breakdown structure which includes: Overall planning and coordination activities; storage-coupled systems; utility repowering/industrial retrofit systems; solar/non-solar hybrid systems; and programmatic support to the 10-MWe Solar Thermal Pilot Plant construction project.

HIGHLIGHTS

Major Accomplishments

- Planning was initiated for the implementation of the Fort Hood Project by SAN (page).
- The technology assessment document was completed and released (page).
- Final technical reviews were held for the Central Receiver Solar/Fossil Hybrid Contracts (page).

MAJOR ACCOMPLISHMENTS

Planning Initiated at SAN for Implementation of Fort Hood Project (WBS TBA)

Financial Plan operating funds were received at SAN to support the conceptual re-design of the proposed Fort Hood Solar Total Energy System demonstration project to accommodate a Central Receiver "front end" in lieu of the previously proposed parabolic trough system. Key personnel from American Technological University, McDonnell Douglas Astronautics Co. and the Aerospace Corporation met with the SAN Solar Team August 7-8, to brief SAN on the previous work and on the design developed by MDAC under the Small Power Systems contract with JPL. A recommended draft Scope of Work was developed and agreed to by ATU and MDAC. Following a meeting of the Solar Team during which possible approaches to implementing the project were discussed and recommendations formulated, the Team made a presentation August 14 to the three SAN Assistant Managers (Programs, Projects and Administration). The decision was made to proceed with a sole-source procurement with ATU as prime contractor. The question of whether or not to accept MDAC's design and have ATU subcontract them was deferred pending further discussion with HQ; it was agreed that Aerospace should continue through the next design stage as Systems Integrator, and that a more specific response be solicited from the Army Corps of Engineers as to their proposed role as Construction Manager during the construction and operation phase. SAN Procurement personnel undertook to support and coordinate with HQ Procurement the required Sole-source Justification, while Program and Project personnel initiated development of an overall project schedule and funding estimate, in preparation for submission early in September of a Short Form Project Data Sheet ("Mini-44"), to be used as a basis for requesting appropriate design and construction authorization and funding.

Technology Assessment Document

(WBS 01.01.01)

The technology assessment document, SAND79-8015, was completed and released during August. It summarizes the systems being developed by DOE, and includes the technical concepts on which the systems are based and, to the extent possible, estimated cost, performance, and assessment of typical systems.

Hybrid Contracts - Final Technical Reviews

(WBS 01.04.01)

The final technical reviews of the solar central receiver solar/fossil hybrid contracts of Bechtel, Energy Systems Group, and Martin Marietta were held during the last week of August and first week of September. The systems studied were an air cooled receiver combined cycle with #2 oil, liquid sodium

cooled receiver Rankine cycle with coal, and molten salt cooled receiver Rankine cycle with #6 oil, respectively. The conclusions were that the salt and sodium hybrid systems become competitive with coal at delivered coal prices of about \$1.60 (1979 \$) per million BTU, i.e., at the upper end of the range of recent new-contract coal prices. The air cooled combined cycle system becomes cost competitive with oil fired combined cycle systems in the 1990-2000 time frame with fuel escalation rates of about 12%.

MILESTONE SCHEDULE AND STATUS REPORT

ID-- LARGE POWER SYSTEMS		WBS- 1.0 SYSTEM APPLIC START 10/01/78 END 09/30/79												REPORTING PERIOD 08/01/79 THRU 08/31/79												
		FY 79												FY 80				FY 81				82	PL	AC		
		O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	Q2	Q3	Q4	Q1	Q2	Q3	Q4			
01.01.00	GENERAL ACTIVITIES																									
01.01.01	---PLANNING AND AD-HOC TASKS																								18	18
01.01.02	---UNSOLICITED PROPOSALS																								18	18
01.02.00	STORAGE COUPLED SYSTEMS																									
01.02.01	---SYSTEMS ANALYSIS/PLANNING																								31	31
01.02.02	---RECEIVER TESTING																								100	100
01.02.03	---ALT CENTRAL RECEIVER SYSTEM																								31	31
01.02.04	---LINE FOCUS SYSTEM STUDIES																								41	41
01.03.00	REPOWERING/INDUSTRIAL RETROFIT																									
01.03.01	---SYSTEMS ANALYSIS/PLANNING																								23	23
01.03.02	---REPOWERING/RETROFIT CONCEPT																								56	56
01.03.03	---W SYN EPRI UTILITY-E STUDY																								94	94
01.04.00	HYBRID POWER SYSTEMS																									
01.04.01	---SYSTEMS ANALYSIS/PLANNING																								31	31
01.04.02	---HYBRID PWR SYSTEMS STUDIES																								42	42
01.04.03	---UTILITY COOPERATIVE PROGRAM																								18	18
01.04.04	---DOE/BU-REC HYB NETWK STUDY																								56	56
01.04.05	---W UTIL/TECH SENS ANALYSIS																								74	74
01.05.00	10MWE PILOT PLANT																									
01.05.01	---STMPO OPERATIONS																								23	23
01.05.02	---PP OPERATIONAL TESTING																								23	23

IDENT

DESCRIPTION

IDENT	DESCRIPTION
01.01.00.A	GENERAL ACTIVITIES
01.01.01.A	---PLANNING AND AD-HOC TASKS
01.01.01.P	A MIRVAL CODE ISSUE
01.01.01.C	C TECHNOLOGY DOCUMENT DRAFT
01.01.01.C	D UTILITY DOCUMENT DRAFT
01.01.01.D	D UTIL DOC DRAFT RESCHEDULED
01.01.01.F	E AOP/APP DRAFT
01.01.01.F	F TECHNOLOGY COMPARISON
01.01.01.G	G TECHNOLOGY COMPARISON
01.01.02.A	---UNSOLICITED PROPOSALS
01.01.02.R	B START SRI MESOSCALE STUDY
01.01.02.C	C SRI STUDY COMPLETE
01.02.00.A	STORAGE COUPLED SYSTEMS
01.02.01.A	---SYSTEMS ANALYSIS/PLANNING
01.02.01.P	B TECHNOLOGY COMPARISON
01.02.01.C	C TECHNOLOGY COMPARISON
01.02.02.A	---RECEIVER TESTING
01.02.02.B	B BOEING TEST START
01.02.02.C	C BOEING TEST COMPLETE
01.02.03.A	---ALT CENTRAL RECEIVER SYSTEM
01.02.03.P	P SELECT PHASE 2 CONTRACTORS
01.02.03.C	C START PHASE 2 ACTIVITIES
01.02.03.D	D PHASE 2 STATUS REVIEW
01.02.03.F	E DECISION TO CONT PHASE 3
01.02.03.F	F PHASE 2 COMPLETE
01.02.04.A	---LINE FOCUS SYSTEM STUDIES
01.02.04.B	B START PHASE 1 ACTIVITIES
01.02.04.C	C DECISION TO CANCEL PHASE 2
01.02.04.D	D PHASE 1 COMPLETE
01.03.00.A	REPOWERING/INDUSTRIAL RETROFIT
01.03.01.A	---SYSTEMS ANALYSIS/PLANNING
01.03.01.P	B SRI STRATEGY ANALYSIS COMP
01.03.01.C	C TECHNOLOGY COMPARISON
01.03.01.D	D TECHNOLOGY COMPARISON
01.03.02.A	---REPOWERING/RETROFIT CONCEPT
01.03.02.B	B PNM STUDY COMPLETE
01.03.02.C	C RELEASE CONCEPT STUDY RFP
01.03.02.C	D START CONCEPT STUDIES
01.03.02.E	E CONCEPT STUDIES COMPLETE
01.03.03.A	---W SYN EPRI UTILITY-E STUDY
01.03.03.B	B UTILITY SELECTION
01.03.03.C	C START WORK
01.03.03.D	D STUDY COMPLETE
01.04.00.A	HYBRID POWER SYSTEMS
01.04.01.A	---SYSTEMS ANALYSIS/PLANNING
01.04.01.B	B TECHNOLOGY COMPARISON
01.04.01.C	C TECHNOLOGY COMPARISON
01.04.02.A	---HYBRID PWP SYSTEMS STUDIES
01.04.02.B	B START PHASE 1 ACTIVITIES
01.04.02.C	C DECISION TO CANCEL PHASE 2
01.04.02.D	D PHASE 1 COMPLETE
01.04.02.F	E PHASE I EVALUATION
01.04.02.F	F START PHASE 1A ACTIVITIES
01.04.02.G	G PHASE 1A COMPLETE
01.04.03.A	---UTILITY COOPERATIVE PROGRAM
01.04.03.B	B EPRI/W MKT SURVEY COMPLETE
01.04.03.F	E DOE/EPRI PP DECISION
01.04.04.A	---DOE/BU-REC HYB NETWK STUDY
01.04.04.B	B START NETWORK STUDY
01.04.04.C	C COMPLETE NETWORK STUDY
01.04.04.C	C STUDY COMPLETION RESCHEDULE
01.04.04.D	D FINAL REPORT
01.04.05.A	---W UTIL/TECH SENS ANALYSIS
01.04.05.B	B SCOPE OF WORK DEFINED
01.04.05.C	C START WORK
01.04.05.D	D STUDY COMPLETE
01.05.00.A	10MWE PILOT PLANT
01.05.01.A	---STHPO OPERATIONS
01.05.01.B	B START COLLECTOR CONTRACTS
01.05.01.C	C START FACILITY DESIGN
01.05.01.D	D START HELIOSTAT WORK
01.05.01.E	E TURBINE ROLL
01.05.01.F	F END ACCEPTANCE TEST
01.05.02.A	---PP OPERATIONAL TESTING
01.05.02.B	B TEST PLAN
01.05.02.B	B TEST PLAN RESCHEDULED
01.05.02.C	C TEST REQUIREMENTS
01.05.02.D	D TEST PROCEDURES
01.05.02.F	E BEGIN OPERATIONAL TESTING

FISCAL STATUS

Obligations (B/A): The SAN Financial Plan was increased in August by \$500K in operating fund obligational authority (designated for the Fort Hood Project conceptual re-design), and by a further \$800K in PE&D funding authority (for the upcoming Cogeneration Preliminary Design solicitation); the total FY79 obligation authority allocated to SAN stands at \$12,400K (including \$2940K transferred to SLL). Of this amount, \$11,700 will be obligated under WBS 1.0 for Large Power Systems Applications, \$600K under WBS 2.0 and \$100K under WBS 4.0 (see SLL Central Receiver Technology report for August).

Obligations under WBS 1.0 for August were \$1834K vs. a planned \$2771K. Cumulative obligations, at \$8504K, are low by \$3894K (31%) with respect to the current approved Annual Procurement Plan (Revision #2). The indicated variance results primarily from deferral to mid-September of the awards resulting from the Repowering/Industrial Retrofit solicitation, and from adjustments associated with the replacement of a portion of the R/IR FY79 funding with funds for Fort Hood and Cogeneration.

Cost Status (B/O): The SAN Financial Plan was increased in August by \$500K in operating fund costing authority (Fort Hood) and by a further \$800K in PE&D costing authority (Cogeneration); the total FY79 costing authority allocated to SAN stands at \$13,010K.

Costs accrued by SAN for August were \$758K vs. a planned \$786K. Cumulative costs through August, at \$5,774K, are low by \$800K (12%) with respect to planned costs. The indicated variance is attributable to delayed start of several contracts.

Current Status for SLL (LPSA) through August 31, 1979 is \$2,090K BA authorized. Year to date costs are \$1,982K; reserved for salaries internal support and other commitments is \$150K.

OVERALL LPSA OBLIGATION STATUS

U.S. DEPARTMENT OF ENERGY

CONTRACT MANAGEMENT SUMMARY REPORT

FORM DOE 536
(1/78)

FORM APPROVED
OMB NO. 38R-0190

1. Contract Identification LARGE POWER SYSTEMS APPLICATIONS (WBS 1.0)										2. Reporting Period 1 Aug through 31 Aug					3. Contract Number AD-03-01-01				
4. Contractor (Name and Address) SAN FRANCISCO OPERATIONS OFFICE															5. Contract Start Date N/A				
															6. Contract Completion Date N/A				

7. Months	O	N	D	J	F	M	A	M	J	J	A	S	FY - 79
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9. Obligation status													Plan date - 10/1/78	
<div style="display: flex;"> <div style="width: 15%;"> a. Planned <hr style="border-top: 1px dashed black;"/> Actual 12M <hr style="border-top: 1px solid black;"/> Authority <hr style="border-top: 3px solid black;"/> </div> <div style="width: 85%;"> </div> </div>													Planned Prior FY\$ Obligations \$8,337K	
													Actual Obligations Prior FYs \$8,337K	
													Total Estimated Accrued Obligations for Contract \$11,600K	

b. B&R Numbers	AD-03-01-01												
Planned APP	1780	1500	410	4470	500	0	0	0	0	240	2050	0	BA - \$10,700K
Planned Rev1	0	0	719	3211	4580	200	0	0	240	0	1500	500	BA - \$10,700K
Planned Rev2	0	100	250	2849	320	719	652	565	674	3500	2771	0	BA - \$12,400K
ACTUAL	0	100	250	2849	320	719	543	22	241	1626	1834		BA - \$12,400K

NOTE: Revision #2 to the LPSA FY 79 Annual Procurement Plan, submitted to HQ April 13, was approved on June 22, and serves as the basis for this and following Obligation Status Reports. Each APP revision shows actual obligations below and to left of the heavy line on the data block, and planned obligations above and to the right. Differences between Rev. #1 and Rev. #2 actual obligations reflect a change to the actual date of contract execution vs. the date of reservation of funds for a given contract action.

SAN COST STATUS

U.S. DEPARTMENT OF ENERGY

FORM DOE 536
(1/78)

CONTRACT MANAGEMENT SUMMARY REPORT

FORM APPROVED
OMB NO. 38R-0190

1. Contract Identification LARGE POWER SYSTEMS APPLICATIONS (WBS-1.0)										2. Reporting Period 1 Aug through 31 Aug					3. Contract Number N/A				
4. Contractor (Name and Address) SAN FRANCISCO OPERATIONS OFFICE															5. Contract Start Date N/A				
															6. Contract Completion Date N/A				
7. Months		O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	& FY 79		
9. Cost Status Dollars in Thousands																			
a. Planned		14															g. Cost Plan Date 24 Jan. 79		
-----		12															h. Planned Costs Prior FYs 4,345 K		
Actual		10															i. Actual Costs Prior FYs 2,650 K		
Authorized		8															j. Total Esti- mated Costs for Contract N/A		
b. B&R Numbers		6															k. Total Con- tract Value N/A		
AD - 03		4															l. Unfilled Orders Outstanding N/A		
01 - 01		2															m. Estimate for Subsequent Reporting Period N/A		
Accrued Costs		c. Planned	364	508	544	575	550	555	658	686	694	656	786	4070					
		d. Actual	230	697	550	548	618	448	811	332	434	348	758						
		e. Variance	134	(189)	(6)	27	(68)	107	(153)	354	260	308	26						
		f. Cum. Variance	134	(55)	(61)	(34)	(102)	5	(148)	206	466	774	800						

NOTE: Costing authority is total for Large Power Systems Applications program element. Cost Plan does not include the \$2,240K transferred to SLL for LPSA Technical Management/Support (see next chart), or \$700K transferred to SLL for Technology Development or International (IEA) Program Support (see July Central Receiver Technology Report).

FORM APPROVED
OMB NO. 38R-0190

1. Contract Identification SOLAR LARGE POWER SYSTEMS APPLICATIONS										2. Reporting Period 1 Aug through 31 Aug				3. Contract Number AD 03 01 837					
4. Contractor (Name and Address) SANDIA LABORATORIES, LIVERMORE, CALIF.														5. Contract Start Date FY-75					
														6. Contract Completion Date N/A					
7. Months		O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	8. FY 79		
9. Cost Status Dollars in Thousands																		g. Cost Plan Date 1 Oct 78	
a.																		h. Planned Costs Prior FYs 6,753K	
		i. Actual Cost Prior FYs 6,695K																	
b. B&R Numbers AD 03 01																		j. Total Estimated Costs for Contract N/A	
																		k. Total Contract Value N/A	
																		l. Unfilled Orders Outstanding N/A	
Accrued Costs		c. Planned	160	160	150	150	160	150	150	140	200	207	145	188				m. Estimate for Subsequent Reporting Period N/A	
		d. Actual	158	123	202	110	231	205	222	223	193	177	139						
		e. Variance	2	37	(52)	40	(71)	(55)	(72)	(83)	7	30	6						
		f. Cum. Variance	2	39	(13)	27	(44)	(99)	(171)	(254)	247	(217)	(211)						

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