

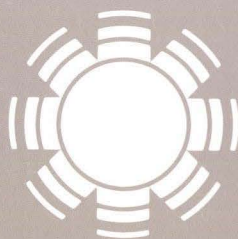
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SERI/PR-635-770

November 1980

# Wind Energy Systems Quarterly Review April 1, 1980 — June 30, 1980

Prepared for the  
U.S. Department of Energy  
Division of Solar Technology  
Under Contract No. EG-77-C-01-4042



# SERI

**Solar Energy Research Institute**

1536 Cole Boulevard  
Golden, Colorado 80401

A Division of Midwest Research Institute

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### FOREWORD

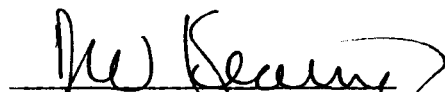
THE QUARTERLY REVIEW FOR THE WIND ENERGY SYSTEMS (WES) PROGRAM IS PREPARED BY THE SOLAR ENERGY RESEARCH INSTITUTE (SERI) AS AN OVERVIEW OF THE PROGRAM EFFORTS. THIS QUARTERLY REVIEW IS DELIVERED TO FULFILL SERI'S ANNUAL OPERATING PLAN (AOP) REPORTING REQUIREMENTS. THE REVIEW PRESENTS THE OBJECTIVES, ACCOMPLISHMENTS, PLANNED ACTIVITIES, AND OUTPUTS OF EACH TASK IN THE WES PROGRAM.


DISTRIBUTION OF THIS REPORT IS LIMITED TO THOSE DIRECTLY INVOLVED IN THIS PROJECT AS DEFINED BY DOE. THE REVIEW IS PREPARED FOR DOE BY THE STAFF OF THE SOLAR ENERGY RESEARCH INSTITUTE, A DIVISION OF THE MIDWEST RESEARCH INSTITUTE (MRI) UNDER CONTRACT No. EG-77-C-01-4042.

PR-770  
JULY 28, 1980

REPORT No. SERI/PR-635-770  
DATE: JULY 1980  
PROGRAM: WIND ENERGY SYSTEMS  
TASK: 3531.10  
CONTRACT: EG-77-C-01-4042  
START DATE: OCTOBER 1978  
COMPLETION DATE: CONTINUOUS  
CONTRACTOR: SOLAR ENERGY RESEARCH INSTITUTE  
1617 COLE BOULEVARD  
GOLDEN, COLORADO 80401

APPROVED FOR:  
SOLAR ENERGY RESEARCH INSTITUTE

  
DAVID KEARNEY  
DIVISION MANAGER (ACTING)  
SOLAR THERMAL, OCEAN AND  
WIND DIVISION

  
IRWIN E. VAS  
BRANCH CHIEF (ACTING)  
WIND ENERGY BRANCH


  
IRWIN E. VAS  
PROGRAM COORDINATOR

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SERI WIND ENERGY RELATED TASKS FY80

SEVENTEEN SUBTASKS IN THE SERI WIND ENERGY SYSTEMS PROGRAM AND THE FOLLOWING 3 SUBTASKS IN OTHER PROGRAM AREAS.

TECHNICAL INFORMATION DISSEMINATION <sup>A</sup>	P. WEIS
WIND INQUIRIES AND REFERRALS <sup>B</sup>	S. NORMANN
MASS PRODUCTIVITY OF SMALL HORIZONTAL <sup>C</sup> AXIS WIND TURBINE SYSTEMS	C. NORDQUEST

<sup>A</sup>COMMERCIALIZATION ACTIVITIES - PROGRAM AREA 15.

<sup>B</sup>INFORMATION SYSTEMS - PROGRAM AREA 12

<sup>C</sup>BASIC AND APPLIED RESEARCH - PROGRAM AREA 11.



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PROGRAM HIGHLIGHTS

IRWIN E. VAS

3RD QUARTER FY80

- O REVISED THE MARKET CHARACTERIZATION SUBTASK INTO A TWO PHASE STUDY, TESTED THE METHODOLOGY, AND BEGAN WORK ON PHASE I.
- O AWARDED A CONTRACT TO A. D. LITTLE, INC. TO DEVELOP THE RESIDENTIAL SEGMENT OF THE SMALL USER DECISION ANALYSIS.
- O COMPLETED REVISIONS OF "ELECTRIC UTILITY VALUE DETERMINATIONS; VOLUME 1 - METHODOLOGY", AND SENT TO EDITING FOR THE UTILITY ANALYTICAL MODELING SUBTASK.
- O OBTAINED DATA AND STARTED ANALYSIS ON SOUTHERN CALIFORNIA EDISON'S SAN GORGONIO PASS AND THE CONSUMERS POWER CO.'S LUDINGTON, MICHIGAN SITES FOR THE SELECTED UTILITY VALUE ANALYSIS SUBTASK.
- O PRESENTED A PAPER ENTITLED "A FIELD STUDY ON THE AESTHETICS OF SMALL WIND MACHINES: PRELIMINARY REPORT" AT THE AIAA/SERI WIND ENERGY CONFERENCE IN BOULDER, CO.
- O AWARDED A CONTRACT FOR \$95K TO THE UNIVERSITY OF MICHIGAN FOR CONTINUED TVI STUDIES FOR AN ADDITIONAL 12 MONTHS.
- O COMPLETED DETAILED FIELD NOISE SURVEY OF MOD-1, MOD-0 IN BOTH UPWIND AND DOWNWIND CONFIGURATIONS, AND BACKGROUND NOISE MEASUREMENTS AT THE MOD-2 SITE.
- O PRESENTED TECHNICAL PAPER ENTITLED "PRODUCT LIABILITY INSURANCE FOR WECS" AT THE ANNUAL AS/ISES MEETING IN PHOENIX.

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- 0 AWARDED A CONTRACT TO PLANNING RESEARCH CORP. (PRC) ENTITLED "WIND ENERGY SYSTEMS COORDINATION STUDY OF THE RESEARCH AND ANALYSIS ELEMENT OF THE FWEP". CONTRACT WAS FOR \$165K FOR AN 11 MONTH EFFORT.
- 0 COMPLETED DRAFT REPORT OF VOLUME I OF THE WECS COST STUDY SUBTASK AND SENT IT OUT FOR EXTERNAL REVIEW BY INDUSTRY EXPERTS AND MANUFACTURERS.
- 0 ACTED AS TECHNICAL CHAIRMAN FOR THE AIAA/SERI WIND ENERGY CONFERENCE AND CHAIRED THE WIND SESSION AT THE AS/ISES CONFERENCE.
- 0 COMPLETED THE 1ST AND 2ND QUARTERLY REPORTS AND SUBMITTED TO WESD/DOE.
- 0 COMPLETED TECHNICAL AND COST EVALUATIONS ON ALL PROPOSALS IN RESPONSE TO THE LETTERS OF INTEREST ON TETHERED AND INNOVATIVE WECS ASSESSMENT STUDIES AND SUBMITTED FUNDING RECOMMENDATIONS TO SERI SUBCONTRACTS.
- 0 COMPLETED ENGINEERING ANALYSIS OF THREE SERI SUBCONTRACTORS INNOVATIVE WECS CONCEPTS (POLYTECHNIC INSTITUTE OF NEW YORK - VORTEX AUGMENTED CONCEPT, GRUMMAN - DAWT AND TORNADO CONCEPTS).

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PROGRAM OVERVIEW

IRWIN E. VAS

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A TOTAL OF 17 TASKS ARE CURRENTLY IDENTIFIED IN THE WIND ENERGY SYSTEM PROGRAM AREA 3.

FIVE ADDITIONAL WIND ENERGY RELATED TASKS ARE CARRIED OUT IN OTHER PROGRAM AREAS.

TABLE 1. WIND ENERGY SYSTEMS SUBTASK BUDGET SUMMARY(1)

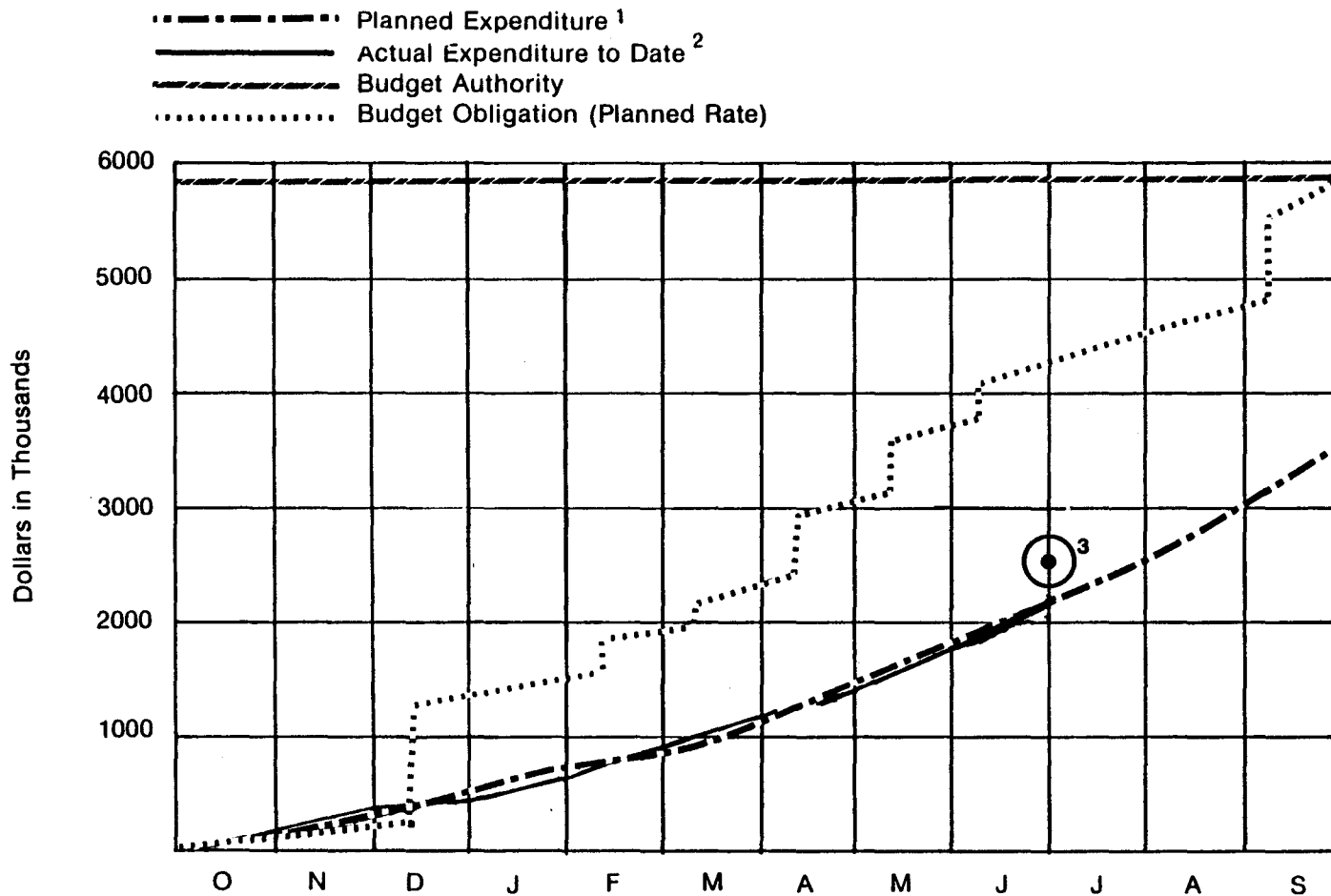
SUBTASK	FTE TOTAL	BURDENED SALARIES	ODC's, FEES, ETC.	FY80(2) SUBCONTRACTS	FY80(3) TOTAL	FY79 CARRYOVER FUNDS	TOTAL FY(4) SUBCONTRACTS	TOTAL FY(5) BUDGET
MARKET CHARACTERIZATION	2.35	149	176	355	680	-0-	355	680
SMALL USER DECISION ANALYSIS	0.80	38	57	45	140	-0-	45	140
ECONOMICS OF WECS OWNED BY THE END USER	1.00	61	45	109	215	36	145	251
WECS UTILITY ANALYTICAL MODELING	0.37	30	100	0	90	40	0	130
SELECTED UTILITIES VALUE ANALYSIS	1.10	77	81	442	600	470	912	1070
ECONOMICS OF WECS TIED TO THE UTILITY	0.60	44	11	-0-	55	-0-	-0-	55
A COMPREHENSIVE GUIDE, WECS CONNECTED TO ELECTRIC UTILITIES	1.40	82	77	-0-	-0-	180	21	180
ECOLOGICAL, SOCIO-ENVIRON- MENTAL ASSESSMENT OF WIND SYSTEMS	0.97	55	12	-0-	60	38	10	98
TELEVISION INTERFERENCE AND WECS	0.35	28	14	137	160	10	137	170
NOISE MEASUREMENTS AT SELECTED WIND SYSTEM SITES	0.55	202	138	0	295	145	100	440
LAND USE ISSUES	0.90	52	28	35	125	10	35	135
STRATEGY ANALYSIS	0.70	34	26	-0-	60	-0-	-0-	60
WIND SYSTEMS COORDINATION	1.40	83	57	290	430	-0-	290	430
WECS COST STUDY	0.60	34	12	4	50	-0-	4	50

TABLE 1. WIND ENERGY SYSTEMS SUBTASK BUDGET SUMMARY (CONCLUDED)

PROGRAM REVIEW AND PLANNING	1.11	63	112	-0-	180	(5)	-0-	175
WIND ENERGY INNOVATIVE SYSTEMS	1.30	72	167	751	990	447	1198	1437
ENGINEERING ANALYSIS AND COST ESTIMATING OF INNOVATIVE WECS	<u>1.45</u>	<u>99</u>	<u>60</u>	<u>191</u>	<u>350</u>	<u>17</u>	<u>208</u>	<u>367</u>
	16.95	1203	1173	2359	4480	1388	3460	5868

- (1) REFLECTS INTERNAL REPROGRAMMING OF FUNDS.
- (2) FY80 FUNDS PLANNED TO BE OBLIGATED FOR SUBCONTRACTS DURING FY80.
- (3) TOTAL FY80 FUNDS AUTHORIZED FOR THE SUBTASK.
- (4) TOTAL FUNDS PLANNED TO BE OBLIGATED FOR SUBCONTRACTS DURING FY80 (INCLUDES FY79 FUNDS, COMMITTED OR UNCOMMITTED) FOR SUBCONTRACTS.
- (5) TOTAL FUNDS AUTHORIZED FOR THE SUBTASK IN FY80 INCLUDING FY79 CARRYOVER FUNDS.





Analysis of Variance as of 6-28-80

1. 2213K

2. 1969K

3. Total Obligated and Costed  
(624+1969=2593)

TABLE 2. WIND ENERGY SYSTEMS PROGRAM (ACTUAL) EXPENDITURES - 1ST, 2ND AND 3RD QUARTERS FY80

<u>TASK</u>	<u>LEAD BRANCH</u>	<u>BURDENED SALARIES</u>	<u>ODC'S FEE'S ETC.</u>	<u>SUBCONTRACTS</u>	<u>TOTAL EXPENDED*</u>	<u>COMMITTED**</u>	<u>PLANNED TOTAL EXPENDITURES</u>
MARKET CHARACTERIZATION	UTILITY APPLICATIONS AND POLICY	156	15	20	191	8	160
SMALL USER DECISION ANALYSIS	INDUSTRIAL APPLICATIONS AND POLICY	37	2	14	53	32	65
ECONOMICS OF WECS OWNED BY THE END USER	INDUSTRIAL APPLICATIONS AND POLICY	36	4	-0-	40	10	71
WECS UTILITY ANALYTICAL MODELING	UTILITY APPLICATIONS AND POLICY	23	56	-0-	79	-0-	66
SELECTED UTILITIES VALUE ANALYSIS	UTILITY APPLICATIONS AND POLICY	51	14	266	331	234	448
ECONOMICS OF WECS TIED TO THE UTILITY	UTILITY APPLICATIONS AND POLICY	14	8	-0-	22	-0-	38
A COMPREHENSIVE GUIDE, WECS CONNECTED TO ELECTRIC UTILITIES	UTILITY APPLICATIONS AND POLICY	45	5	-0-	50	-0-	79
ECOLOGICAL, SOCIO-ENVIRONMENTAL ASSESSMENT OF WIND SYSTEMS	ENVIRONMENTAL AND SOCIAL IMPACTS GROUP	59	4	9	72	1	59
TELEVISION INTERFERENCE AND WECS	WIND ENERGY BRANCH	12	1	-0-	13	95	53
NOISE MEASUREMENTS AT SELECTED WIND SYSTEM SITES	WIND ENERGY BRANCH	134	89	62	285	53	282
LAND USE ISSUES	ENVIRONMENTAL AND SOCIAL IMPACTS GROUP	47	8	14	69	29	64

TABLE 2. WIND ENERGY SYSTEMS PROGRAM EXPENDITURES (CONCLUDED)

STRATEGY ANALYSIS	WIND ENERGY BRANCH	19	5	-0-	24	-0-	45
WIND SYSTEMS COORDINATION	WIND ENERGY BRANCH	24	11	-0-	35	56	76
WECS COST STUDY	SYSTEMS DEVELOPMENT	44	3	-0-	47	5	31
PROGRAM REVIEW AND PLANNING	WIND ENERGY BRANCH	52	26	-0-	78	11	84
WIND ENERGY INNOVATIVE SYSTEMS	WIND ENERGY BRANCH	70	31	392	493	82	479
ENGINEERING ANALYSIS AND COST ESTIMATES OF INNOVATIVE WECS	WIND ENERGY BRANCH	74	13	-0-	87	8	113
		<u>897</u>	<u>295</u>	<u>777</u>	<u>1969</u>	<u>624</u>	<u>2213</u>

\*As of 6-28-80 COMPUTER ACCOUNTING REPORTS, SOME EXPENDITURES AND/OR COMMITMENTS MAY NOT YET BE PUNCHED INTO COMPUTER.  
 \*\*OBLIGATED BUT NOT YET COSTED.

FY80 WES PROGRAM SUBCONTRACT SUMMARY

	<u>NUMBER</u>	<u>(\$ x K) AMOUNT</u>
PLANNED SUBCONTRACTS	33	3460
PURCHASE REQUESTS APPROVED	24	1928
SUBCONTRACTS AWARDED/\$ COMMITTED	14	1178

TABLE 3. FY80 WES PROGRAM SUBCONTRACT SCHEDULE

CONTRACTOR	WORK TITLE	PLANNED					ACTUAL			
		AMOUNT \$K	PR. COMPL. DATE	START DATE	END DATE	AMOUNT TO BE COSTED DURING FY80	AMOUNT \$K	START DATE	AMOUNT TO BE COSTED \$K	
<u>3531.15 MARKET CHARACTERIZATION</u>										
ARTHUR D. LITTLE	NEAR-TERM MARKET ANALYSIS	100	6/80	6/80	10/80	100	104	7/80	85	
PLANNING RESEARCH CORP.	WIND REGIME DATA ANALYSIS	35	3/80	9/80	12/80	20	--	--	--	
TBD (LIMITED COMPETITIVE)	DEMOGRAPHIC PROFILE	30	3/80	9/80	12/80	15	--	--	--	
ARTHUR D. LITTLE	DATA BASE AND ANALYSIS MODEL	150	3/80	9/80	8/81	30	--	--	--	
TBD	MARKET RESEARCH	40	4/80	9/80	12/80	20	--	--	--	
<u>3531.25 SMALL USER DECISION ANALYSIS</u>										
ARTHUR D. LITTLE	SMALL USER DECISION ANALYSIS	40	1/80	5/80	10/80	40	45	5/80	35	
<u>3532.25 ECONOMIC OF WECS OWNED BY THE END USER</u>										
TBD (RENEWAL)	WECS FOR RECS	117	3/80	7/80	3/81	80	--	--	--	
TBD (COMPETITIVE)	ECONOMICS OF WECS	28	1/80	8/80	11/80	9	--	--	--	
<u>3532.20 SELECTED UTILITIES VALUE MODELING</u>										
JBF CORP.	SITE VALUE ANALYSIS	370	--	11/79	11/80	300	355	12/79	296	
AEROSPACE CORP.	SITE VALUE ANALYSIS	210	--	11/79	11/80	176	212	12/79	177	
JBF CORP.	LADWP vs SCI ANALY.	20	2/80	4/80	6/80	20	--	--	--	
JBF CORP.	SITE ANALYSIS EXT.	172	9/80	11/80	5/81	-0-	--	--	--	
AEROSPACE CORP.	SITE ANALYSIS EXT.	150	9/80	11/80	5/81	-0-	--	--	--	
<u>3532.60 A COMPREHENSIVE GUIDE: WECS CONNECTED TO ELECTRIC UTILITIES</u>										
TBD (SOLE SOURCE)	LARGE WECS ASSESSMENT	21	1/80	9/80	12/81	-0-	--	--	--	

TABLE 3. FY80 WES PROGRAM SUBCONTRACT SCHEDULE (CONTINUED)

CONTRACTOR	WORK TITLE	PLANNED					ACTUAL		
		AMOUNT \$K	PR. COMPL. DATE	START DATE	END DATE	AMOUNT TO BE COSTED DURING FY80	AMOUNT \$K	START DATE	AMOUNT TO BE COSTED \$K
<u>3531.35 ECOLOGICAL/SOCIO-ENVIRONMENT ASSESSMENT</u>									
FRANKLIN ASSOC.	POLLUTION	10	4/80	5/80	8/80	10	10	5/80	10
<u>3532.50 TELEVISION INTERFERENCE AND WECS</u>									
UNIV. OF MICHIGAN	TVI HANDBOOK	50	2/80	4/80	10/80	50	95	4/80	40
POLYTECHNIC INSTITUTE OF NEW YORK	TVI GHOST SUPPRESSION	19	2/80	6/80	10/80	19	42	9/80	10
<u>3532.55 NOISE MEASUREMENT AT SELECTED SITES</u>									
BATTELLE PNL	TETHER SOUND MEASUREMENTS	25	2/80	5/80	7/81	25	50	3/80	50
TBD (COMPETITIVE)	SYSTEMATIC MEASUREMENTS	59	2/80	5/80	12/80	20	--	--	--
MIT	AERODYNAMIC NOISE						21	4/80	21
PENN STATE UNIV.	NOISE PROPAGATION						28	12/79	28
<u>3531.30 LAND USE ISSUES</u>									
TSG (MIKE LOTKER)	WECS/UTILITY SITING ANALYSIS	25	3/80	5/80	9/80	25	25	5/80	25
UNIVERSITY OF DENVER	LEGAL SUPPORT	10	1/80	1/80	10/80	10	10	1/80	10
<u>3532.10 WIND PROGRAM COORDINATION</u>									
PLANNING RESEARCH CORP.	COORDINATION	169	2/80	6/80	12/80	109	165	6/80	110
COLORADO STATE UNIVERSITY	WIND BIBLIOGRAPHY	16	4/80	6/80	8/80	16	16	6/80	16
SAN BERNADINO CDC	WECS LABOR INVENTORY	51	6/80	8/80	2/81	17	--	--	--
<u>3532.45 WECS COST STUDY</u>									
TBD (SOLE SOURCE)	CONFIGURATION STUDY	4	6/80	8/80	9/80	4	--	--	--

TABLE 3. FY80 WES PROGRAM SUBCONTRACT SCHEDULE (CONCLUDED)

CONTRACTOR	WORK TITLE	PLANNED					ACTUAL		
		AMOUNT \$K	PR. COMPL. DATE	START DATE	END DATE	AMOUNT TO BE COSTED DURING FY80	AMOUNT \$K	START DATE	AMOUNT TO BE COSTED \$K
<u>3533.35 WEIS</u>									
WEST VIRGINIA UNIV. GRUMMAN	INNOVATIVE WECS DAWT	51 120	1/80 2/80	7/80 9/80	2/81 4/81	30 0	-- --	-- --	-- --
DAYTON UNIV. GRUMMAN	EFT STUDIES TORNADO	120 70	3/80 2/80	9/80 9/80	9/81 2/81	0 10	-- --	-- --	-- --
TBD (COMPETITIVE)	ASSESSMENT OF SPECIFIC WEIS	191	2/80	9/80	8/81	15	--	--	--
<u>3533.40 ENGINEERING ANALYSIS AND COST ESTIMATING OF IMECS</u>									
TBD	DEVELOPMENT AND PREPRODUCTION COSTING METHODOLOGY	123	8/80	2/81	8/81	0	--	--	--
TBD (SOLE SOURCE) CACI - FEDERAL, INC.	PRODUCTION COSTING METHODOLOGY	85	2/80	7/80	2/81	40	--	--	--



TABLE B. SUBTASK ADVISORY BOARD MEMBERS  
 MARKET CHARACTERIZATION

<u>NAME</u>	<u>ORGANIZATION</u>
RICHARD WILLIAMS	ROCKWELL INTERNATIONAL
DR. LEO H. SODERHOLM	U.S. DEPARTMENT OF AGRICULTURE
DR. FRANK GOODMAN	EPRI
DR. W. R. BARCHET	BATTELLE PACIFIC NORTHWEST LAB.
DR. DONALD VINSON	UNIVERSITY OF SOUTHERN CALIFORNIA
MARSHALL F. MERRIAM	UNIVERSITY OF CALIFORNIA
BILL REDDICK	WSB/DOE

SMALL USER DECISION ANALYSIS

LLOYD WALKER	CSU AGRICULTURE EXTENSION SERVICE
REX TYNES	MORGAN COUNTY REA
BRUCE HUTTON	UNIVERSITY OF DENVER

ECONOMICS OF WECS BY THE END USER

JUDY PORPOTOG	ROCKWELL INTERNATIONAL
RICHARD BARCHET	BATTELLE PNL
EDGAR DEMEO	EPRI
TOM REDDOCK	UNIVERSITY OF TENNESSEE
FRANKLIN STERMOLE	COLORADO SCHOOL OF MINES

SELECT UTILITY VALUE ANALYSIS

DR. FELIX WU	UNIVERSITY OF CALIFORNIA
DR. ROBERT SULLIVAN	UNIVERSITY OF FLORIDA
OLIVER GILDERSLEEVE	EPRI
DR. GEORGE GROSS	PACIFIC GAS & ELECTRIC
DR. TOM REDDOCH	UNIVERSITY OF TENNESSEE
DR. JEFF RUMBAUGH	DOE

NOISE MEASUREMENT AT SELECTED  
WIND SYSTEM SITES

<u>NAME</u>	<u>ORGANIZATION</u>
DR. FRED H. SCHMITZ	AMES RESEARCH CENTER
PROFESSOR DENNIS W. THOMSON	PENNSYLVANIA STATE UNIVERSITY
SCOTT A. TURNER	PORTLAND GENERAL ELECTRIC
DR. WESLEY HARRIS	M.I.T.

LAND USE ISSUES

BILL OSTRANDER	SOUTHERN CALIFORNIA EDISON
DONALD BAIN	OREGON DEPARTMENT OF ENERGY
JEFF PEARSON	COLORADO CONSUMER ADVOCATE
GERRY FARBER	PENNSYLVANIA POWER AND LIGHT
JIM WELCH	CONSULTANT
GEORGE PRING	ATTORNEY

WIND SYSTEMS COORDINATION

PETER MORETTI	OKLAHOMA STATE UNIVERSITY
TERRY HEALY	ROCKWELL INTERNATIONAL
LOU LILJEDAHL	USDA - BELTSVILLE, VA
TOM REDDOCK	UNIVERSITY OF TENNESSEE
ROBERT THRESHER	OREGON STATE UNIVERSITY
RON THOMAS	NASA-LEWIS RESEARCH CENTER
BILL REDDICK	DOE
MARSHALL MERRIAM	UNIVERSITY OF CALIFORNIA

WECS COST STUDY

<u>NAME</u>	<u>ORGANIZATION</u>
MR. NICK PATAPOFF	SOUTHERN CALIFORNIA EDISON
DR. AARON ROSE	UNIVERSITY OF SOUTHERN CALIFORNIA
MR. GEORGE SCOTT	HUGHES AIRCRAFT
MR. ARLYAN FEIGHT	ROCKWELL INTERNATIONAL
MR. RON BOONE	FIRST BANK OF DENVER
MR. STU CAMERON	FLUOR ENGINEERS AND CONSTRUCTORS
MS. KATHERINE SEELMAN	NATIONAL COUNCIL OF CHURCHES
MS. BETTY HUNTER	ECOLOGY CENTER OF LOUISIANA
MR. KEN WILLIAMSON	LOS ALAMOS LABORATORY

WEIS

RON THOMAS	NASA/LeRC
OREE DYES	DOE
DUANE CROMAK	UNIVERSITY OF MASSACHUSETTS
PETER MORETTI	OKLAHOMA STATE UNIVERSITY
BOB THRESHER	OREGON STATE UNIVERSITY
AL MILLER	BATELLE PNL
PAUL KLIMAS	ROCKWELL INTERNATIONAL

TABLE C. WECS PROGRAM PUBLICATIONS

<u>SUBTASK</u>	<u>TITLE AND AUTHOR</u>	<u>STATUS</u>
ECONOMICS OF SWECS TIED TO THE UTILITY (FY79 SUBTASK)	"THE EFFECT OF THE SUBSTITUTION OF WIND POWER FOR CONVENTIONAL POWER ON THE END USER'S RATE OF RETURN ON INVESTMENT" - MICHAEL EDESESS	DRAFT
LAND USE ISSUES	"PRODUCT LIABILITY AND SMALL WIND ENERGY CONVERSION SYSTEMS (SWECS) AN ANALYSIS OF SELECTED ISSUES AND POLICY ALTERNATIVES." - ROBERT NOUN	FINAL
PROGRAM REVIEW AND PLANNING	WIND ENERGY SYSTEMS QUARTERLY REVIEW, OCTOBER 1, 1979-DECEMBER 31, 1979	FINAL
	WIND ENERGY SYSTEMS QUARTERLY REVIEW, JANUARY 1, 1980-MARCH 31, 1980	FINAL
WIND ENERGY INNOVATIVE SYSTEMS	"A REVIEW OF THE CURRENT STATUS OF THE WIND ENERGY INNOVATIVE SYSTEMS PROJECTS" - IRWIN E. VAS	FINAL
	"WIND ENERGY INNOVATIVE SYSTEMS CONFERENCE PROCEEDINGS" EDITED BY IRWIN E. VAS	FINAL
UTILITY ANALYTICAL MODELING	"ELECTRIC UTILITY VALUE DETERMINATION - WIND: VOLUME 1, METHODOLOGY; VOLUME 2, USER'S GUIDE."	DRAFT
ECOLOGICAL/SOCIO-ENVIRONMENTAL ASSESSMENT OF WIND SYSTEMS	"ENVIRONMENTAL ASSESSMENT OF SMALL WIND SYSTEMS PROGRESS REPORT" LAWRENCE/STROJAN/O'DONNELL	FINAL
	"A FIELD STUDY ON THE AESTHETICS OF SMALL WIND MACHINES: PRELIMINARY REPORT" STROJAN/LAWRENCE/O'DONNELL	FINAL
	"ENVIRONMENTAL EFFECTS OF SMALL WIND ENERGY CONVERSION SYSTEMS (SWECS)" LAWRENCE/STROJAN	FINAL
ENGINEERING ANALYSIS AND COST ESTIMATING OF INNOVATIVE WECS	"A SCREENING METHODOLOGY FOR WIND ENERGY CONVERSION SYSTEMS," ROBERT D. MCCONNELL	FINAL

<u>SUBTASK</u>	<u>TITLE AND AUTHOR</u>	<u>STATUS</u>
UTILITY ANALYTICAL MODELING	"PLANNING FOR ELECTRIC UTILITY SOLAR APPLICATIONS: THE EFFECTS ON RELIABILITY AND PRODUCTION COST ESTIMATES OF THE VARIABILITY IN DEMAND." GEORGE R. FEGAN, C. DAVID PERCIVAL	FINAL
UTILITY ANALYTICAL MODELING	"INTEGRATION OF INTERMITTENT SOURCES INTO BALERIAUX-BOTH PRODUCTION COST MODELS." GEORGE R. FEGAN, C. DAVID PERCIVAL	FINAL
	"PROBLEMS IN THE INTEGRATION OF INTERMITTENT SOURCES INTO UTILITY PRODUCTION COSTING MODELS." GEORGE R. FEGAN, C. DAVID PERCIVAL	FINAL
WIND ENERGY INNOVATIVE SYSTEMS	"THIRD ANNUAL PROGRESS REPORT ON THE ELECTROFLUID DYNAMIC WIND GENERATOR" MINARDI, J. E., ET AL., UNIVERSITY OF DAYTON	FINAL
	"AN ANALYSIS OF THE MADARAS ROTOR POWER PLANT - AN ALTERNATE METHOD FOR EXTRACTING LARGE AMOUNTS OF POWER FROM THE WIND" WHITFORD, D. H., ET AL., UNIVERSITY OF DAYTON	FINAL
	"VERTICAL AXIS WIND TURBINE DEVELOPMENT" WALTERS, R. E., ET AL., WEST VIRGINIA UNIVERSITY	FINAL
	"ENERGY FROM THE AIR" OLIVER, T. K., ET AL., SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY	FINAL
ENGINEERING ANALYSIS AND COST ESTIMATING	"SCREENING METHODOLOGY FOR INNOVATIVE WIND SYSTEMS" MOORE, E., ET AL., SCIENCE APPLIATIONS, INC.	FINAL
WIND ENERGY INNOVATIVE SYSTEMS	"TECHNICAL DEVELOPMENT OF THE DIFFUSER AUGMENTED WIND TURBINE (DAWT) CONCEPT" FOREMAN, K. M., GILBERT, B. L., GRUMMAN AEROSPACE	FINAL
	"A DEFINITIVE GENERIC STUDY OF AUGMENTED HORIZONTAL AXIS WIND ENERGY SYSTEMS" LISSAMAN, P. B. S., ET AL., AEROVIRONMENT INC.	FINAL

<u>SUBTASK</u>	<u>TITLE AND AUTHOR</u>	<u>STATUS</u>
WIND ENERGY INNOVATIVE SYSTEMS	"DEFINITIVE GENERIC STUDY FOR THE EFFECT OF HIGH LIFT AIRFOILS ON WIND TURBINE COST EFFECTIVENESS" LISSAMAN, P. B. S., ET AL., AEROVIRONMENT INC.	FINAL
	"AUGMENTED HORIZONTAL AXIS WIND ENERGY SYSTEMS ASSESSMENT" HARPER, M. R., ET AL., TETRA-TECH INC.	FINAL
	"A DEFINITIVE GENERIC STUDY FOR SAIL WING WIND ENERGY SYSTEMS" HOHENEMSER, K. H., ET AL., WASHINGTON UNIVERSITY TECHNOLOGY ASSOC.	FINAL
	"FURTHER INVESTIGATIONS OF DIFFUSER AUGMENTED WIND TURBINES" FOREMAN, K. M., GILBERT, B. L., GRUMMAN AEROSPACE CORP.	FINAL
	"A REVIEW OF THE CURRENT STATUS OF THE WIND ENERGY INNOVATIVE SYSTEMS PROJECTS" IRWIN E. VAS, SOLAR ENERGY RESEARCH INSTITUTE	FINAL
	"WIND ENERGY INNOVATIVE SYSTEMS CONFERENCE PROCEEDINGS" DOE/SOLAR ENERGY RESEARCH INSTITUTE, JBF SCIENTIFIC	FINAL
	"GIROMILL OVERVIEW" McCONNELL, R. D., SOLAR ENERGY RESEARCH INSTITUTE	FINAL
	"A REVIEW OF THE WIND PROGRAM AT SERI" IRWIN E. VAS, SOLAR ENERGY RESEARCH INSTITUTE	FINAL
	"TORNADO-TYPE WIND ENERGY SYSTEM" YEN, J. T., GRUMMAN AEROSPACE CORP.	DRAFT
	"WIND POWER CHARGED AEROSOL GENERATOR" MARKS, A. M., MARKS POLARIZED CORP.	DRAFT
	"AUGMENTED VERTICAL AXIS WIND ENERGY SYSTEMS EVALUATION" HOFFERT, M. I., MILLER, G., NEW YORK UNIVERSITY	DRAFT

<u>SUBTASK</u>	<u>TITLE AND AUTHOR</u>	<u>STATUS</u>
WIND ENERGY INNOVATIVE SYSTEMS	"PRELIMINARY TECHNICAL AND ECONOMIC EVALUATION OF VORTEX EXTRACTION DEVICES" KORNREICH, T. R., JBF SCIENTIFIC CORP.	FINAL
	"VERTICAL AXIS WIND TURBINE EXPERIMENTS AND ANALYSIS - SOME EFFECTS OF FLOW CURVATURE ON THE AERODYNAMICS OF DARRIEUS WIND TURBINES" MIGLIORE, P. G., WOLFE, W. P., WEST VIRGINIA UNIVERSITY	DRAFT
SELECTED UTILITY VALUE ANALYSIS	"ELECTRIC UTILITY VALUE ANALYSIS METHODOLOGY FOR WIND ENERGY CONVERSION SYSTEMS" KEITH, C. CRETCHER, TED H. DAVEY, THE AREOSPACE CORP.	DRAFT
	"METHODOLOGY FOR DETERMINING THE VALUE OF WIND ENERGY CONVERSION SYSTEMS (WECS) FOR SPECIFIC UTILITY SYSTEMS," JBF SCIENTIFIC CORP.	DRAFT
WIND ENERGY INNOVATIVE SYSTEMS	"THE CIRCULATION CONTROL VERTICAL AXIS WIND TURBINE" WALTERS, R. E., ET AL., WEST VIRGINIA UNIVERSITY	DRAFT
	"A FREE-VORTEX MODEL WITH NUMERICAL SOLUTION FOR THE UNSTEADY LIFTING CHARACTERISTICS OF STRAIGHT BLADED DARRIEUS WIND TURBINES" MIGLIORE, P. G., ET AL., WEST VIRGINIA UNIVERSITY	DRAFT
	"VERTICAL AXIS WIND TURBINE DEVELOPMENT" WALTERS, R. E., ET AL., WEST VIRGINIA UNIVERSITY	DRAFT
WIND TID	"PROCEEDINGS - PANEL ON INFORMATION DISSEMINATION FOR WIND ENERGY," WEIS	FINAL
	"CAPITAL FORMATION FOR SMALL WIND ENERGY CONVERSION SYSTEM MANUFACTURERS - A GUIDE TO METHODS AND SOURCES," AWEA	FINAL
	"WIND ENERGY INFORMATION DIRECTORY," WEIS/MOONEY	FINAL
	PAMPHLET - "WIND" AN ENERGY ALTERNATIVE," WEIS/EVANS	FINAL



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<u>SUBTASK</u>	<u>TITLE AND AUTHOR</u>	<u>STATUS</u>
WIND TID	"WINDPOWER - MOD 2," (PAMPHLET FOR DEDICATION), WEIS	FINAL
	POSTER - "THE DOE WIND ENERGY PROGRAM," WEIS	FINAL
	FILM - "WIND: AN ENERGY ALTERNATIVE," WEIS/EVANS	FINAL
	VIDEOTAPE - "WIND ENERGY THEATER," WEIS	FINAL
	"DOE LARGE WIND TURBINE DEVELOPMENT PROGRAM" (TECHNICAL BRIEF)	DRAFT
	"DOE LARGE WIND TURBINE PROGRAM" (TECHNICAL SUMMARY)	DRAFT
	"MOD 2 WIND TURBINE DEVELOPMENT PROJECT" (TECHNICAL BRIEF)	DRAFT
	"COMMUNITY APPLICATIONS OF WECS, HANDBOOK FOR PRELIMINARY FEASIBILITY STUDIES, SERI/RSSG	DRAFT

### Wind Energy Systems — Milestones (continued)

Task or Subtask Activities		Fy 80												
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Noise Measurements at Selected Wind System Sites Land Use Issues Strategy Analysis Wind Systems Coordination WECS Cost Study Program Review and Planning Wind Energy Innovative Systems Engineering Analysis and Cost Estimating of Innovative WECS		17 ●				18 ●			19 ●					
											△			
													21 ○	22 ○
		23 ●									24 ●			
				25 ●										
						26 ●								27 ○
														28 ○
Accrued Costs	b. Planned	145.0	287.0	504.0	729.0	943.0	1218	1565	1889	2213	2600	3007	3498	
	c. Actual	130.1	297.6	481.4	696.1	966.2	1231	1456	1807	1969				
	d. Variance	14.9	(10.6)	22.6	32.9	(23.2)	(13)	109	82	244				

△ Begin Milestone  
 ▲ Milestone Complete

○ Start or Scheduled Intermediate Event  
 ● Completed Intermediate Event

- 17. Preliminary measurements at Boone, NC
- 18. Systematic measurements at Boone, NC
- 19. Progress report on noise measurements
- 20. Draft final report on land use issues
- 21. Preliminary data base format
- 22. Centralization and consolidation of the data base
- 23. Prepared base cost estimate for Millville 10kW system
- 24. Perform sensitivity analysis for WECS

- 25. Complete draft summary program development plan.
- 26. Issue letters of interest for assessment studies
- 27. Award contracts on assessment.
- 28. Draft report on engineering analysis of innovative WECS

## Wind Energy Systems — Milestones

Task or Subtask Activities	Fy 80											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Market Characterization											1 △	2 △
Small User Decision Analysis					3 ▲							4 △
Economics of WECS Owned by the End User										5 △		6 △
WECS Utility Analytical Modeling								7 ▲				
Selected Utilities Value Analysis										8 △	9 △	
Economics of WECS Ties to the Utility					10 ▲							11 △
A Comprehensive Guide, WECS Connected to Electric Utilities									12 △			
Ecological, Socio-Environmental Assessment of Wind Systems					13 ▲							△ 14
Television Interference and WECS	15 ●							16 ○				

- △ Milestone
- ▲ Milestone Complete
- Start of Scheduled Intermediate Event
- Completed Intermediate Event

1. Planned completion of Phase I
2. Planned completion of Draft Report Phase I
3. Develop decision model
4. Draft report on small user decision analysis
5. Revise Task Plan
6. Complete computer program modifications
7. Complete draft methodology report and users manual
8. Complete analysis of San Gorgonio site
9. Complete analysis for the first 11 sites
10. Complete computer models for study
11. Complete analysis of economics of WECS tied to utilities
12. Draft final report
13. Draft final report on environmental assessment of SWECS
14. Draft final report
15. Systematic measurements on Block Island, RI
16. Systematic measurements at Boone, NC

## MARKET CHARACTERIZATION

MARTIN DEUTSCH

### OBJECTIVES

IDENTIFY THE NEAR-TERM POTENTIAL MARKET FOR SWECS IN RESIDENTIAL AND AGRICULTURAL MARKET SECTORS (PHASE I). DETERMINE THE SWECS MARKET POTENTIAL FOR A LIMITED NUMBER OF APPLICATIONS/MARKET SECTORS IN A SINGLE GEOGRAPHICAL REGION (PHASE II).

### ACCOMPLISHMENTS

DEVELOPED METHODOLOGY FOR PHASE I MARKET ANALYSIS (NEAR-TERM MARKET POTENTIAL FOR SWECS IN RESIDENTIAL AND AGRICULTURAL SECTORS). REVIEWED METHODOLOGY WITH WESD/DOE, RAYTHEON SERVICE Co. AND SIX SWECS MANUFACTURERS.

REVISED STATEMENT OF WORK FOR ARTHUR D. LITTLE SUBCONTRACT TO ENCOMPASS THE WORK REQUIRED IN PHASE I.

COMPLETED COLLECTION AND TABULATION OF WIND MACHINE DESIGN, PERFORMANCE, AND COST TABLES.

CANCELLED DETAILED WORK PLAN CONTRACT AND PROJECT INTEGRATION POTENTIAL CONTRACT.

PLANNED ACTIVITIES

COMPLETE PHASE I MARKET ANALYSIS.

DEVELOP OPTIONS FOR PHASE II STUDY, OBTAIN REVIEW BY ADVISORY COMMITTEE AND DEVELOP APPROPRIATE METHODOLOGY.

REVISE STATEMENTS OF WORK FOR ALL PLANNED SUBCONTRACTS AND SELECT SUBCONTRACTORS FOR EACH.

SELECT GEOGRAPHICAL REGION FOR PHASE II AND INITIATE STUDY.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
680K	191K	160K	8K

SUBCONTRACT SUMMARY

	<u>NUMBER</u>	<u>(\$ x K) AMOUNT</u>
PLANNED SUBCONTRACTS	5	355
PURCHASE REQUESTS APPROVED	5	355
SUBCONTRACTS AWARDED/\$ COMMITTED	1	104

## SMALL USER DECISION ANALYSIS

J. GRESHAM

### OBJECTIVES

DEVELOP A QUANTITATIVE DESCRIPTION OF THE SMALL USER DECISION PROCESS WITH REGARD TO PURCHASE OF A SMALL WIND ENERGY CONVERSION SYSTEM.

### ACCOMPLISHMENTS

AWARDED SUBCONTRACT TO ARTHUR D. LITTLE, INC., TO DEVELOP A DECISION MODEL FOR THE RESIDENTIAL CONSUMER. WORK WAS BEGUN IN JUNE.

CONDUCTED SET OF INTERVIEWS WITH DECISION MAKERS IN THE AGRICULTURAL, COMMERCIAL/INSTITUTIONAL SECTORS TO EVALUATE THE DECISION MODEL FOR THOSE SECTORS.

### PLANNED ACTIVITIES

CONTINUE DECISION MAKER CONTACTS IN JULY AND AUGUST.



BEGIN PREPARATION OF SUBTASK FINAL REPORT.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
140K	53K	65K	32K

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SUBCONTRACT SUMMARY

	<u>NUMBER</u>	<u>(\$ x K) AMOUNT</u>
PLANNED SUBCONTRACTS	1	40
PURCHASE REQUESTS APPROVED	1	45
SUBCONTRACTS AWARDED/\$ COMMITTED	1	45

## ECONOMICS OF WECS OWNED BY THE END USER

ROGER TAYLOR

### OBJECTIVES

DETERMINE THE ECONOMIC VIABILITY OF DISPERSED WIND TURBINE GENERATORS OWNED BY THE END USER.

### ACCOMPLISHMENTS

AN INDEPTH REVIEW OF THE RELEVANT PREVIOUS PROGRESS ON THIS TASK HAS BEEN MADE, AND A PLANNING MEETING WAS HELD TO DETERMINE THE DIRECTION FOR FUTURE PROGRESS. THE TASK WAS REEVALUATED AND A REVISED PLAN HAS BEEN OUTLINED.

DUE TO THIS REEVALUATION, ALL RESPONSES TO THE RFP ENTITLED "GUIDES FOR REPRESENTING ELECTRIC UTILITY RATE STRUCTURES AND RATES" WERE REJECTED.

THE RSSG DRAFT REPORT WAS REVIEWED, AND THE TECHNICAL PROBLEMS WERE IDENTIFIED. A MEETING WAS HELD WITH WAYNE STAFFORD OF RSSG TO DISCUSS THOSE PROBLEMS. DIRECTION FROM DOE IS NOW EXPECTED AS TO HOW TO PROCEED WITH THE REPORT REVISION.

PLANNED ACTIVITIES

- o FINALIZE TASK REDEFINITION, AND COMPLETE THE STATEMENT OF WORK FOR PLANNED SUBCONTRACTED ACTIVITIES.
- o COMPLETE REVISION OF RSSG DRAFT REPORT.

PROBLEMS

KEY STAFF WORKING ON THIS PROJECT HAS SHIFTED ONCE AGAIN. IT IS NECESSARY TO PROCEED ON THE REVISED PLAN, TO AVOID CONFUSION AND SPEED PROGRESS.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
251K	40K	71K	10K

SUBCONTRACT SUMMARY

	<u>NUMBER</u>	<u>(\$ x K) AMOUNT</u>
PLANNED SUBCONTRACTS	2	145
PURCHASE REQUESTS APPROVED	1	28
SUBCONTRACTS AWARDED/\$ COMMITTED	0	0

## UTILITY ANALYTICAL MODELING

DAVID PERCIVAL

### OBJECTIVE

ESTABLISH THE CAPABILITY TO REPRESENT WIND-DERIVED GENERATION IN ELECTRIC UTILITY GENERATION PLANNING MODELS SO THAT THE ECONOMIC VALUE OF THE WECS OPTION MAY BE EXAMINED.

### ACCOMPLISHMENTS

DELIVERABLE REPORT "ELECTRIC UTILITY VALUE DETERMINATION - WIND = VOLUME I, METHODOLOGY" COMPLETED REVIEW BY INTERNAL STAFF AND TECHNICAL EDITOR.

MODELS EXTENDED TO ALLOW USE OF A TABLE OF ELECTRICAL OUTPUTS AT CORRESPONDING WIND SPEEDS.

### PLANNED ACTIVITIES

FINALIZE DELIVERABLE REPORTS.

COMPLETE VALUE DETERMINATION FOR SOUTHERN CALIFORNIA EDISON'S (SCE) SAN GORGONIO SITE AS PART OF THE MODEL VALIDATION PROCESS AND COMPARE THE RESULTS WITH THOSE OF THE 16 SITE STUDY SUBCONTRACTORS

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
130K	79K	66K	-0-

SUBCONTRACTS

NONE

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## SELECTED UTILITIES VALUE ANALYSIS

ROGER TAYLOR

### OBJECTIVE

DETERMINE THE VALUE OF WECS AT SPECIFIC SITES IN RELATIONSHIP TO SYSTEM MIX OF SELECTED UTILITIES.

### ACCOMPLISHMENTS

MET WITH CONSUMERS POWER Co. REPRESENTATIVE AND OBTAINED MOST OF NEEDED UTILITY DATA FOR THE LUNDINGTON SITE STUDY.

JBF AND AEROSPACE DRAFT METHODOLOGY REPORTS UNDERWENT INTERVAL REVIEW.

SAN GORGONIO WIND DATA REHABILITATED.

CONTINUED SOUTHERN CALIFORNIA EDISON (SCE) UTILITY DATA ACQUISITION AND INCORPORATION.



PLANNED ACTIVITIES

COMPLETE SAN GORGONIO SITE ANALYSIS.

CONDUCT A REVIEW OF SAN GORGONIO RESULTS.

BEGIN LUDINGTON SITE ANALYSIS.

BUDGET SUMMARY

TOTAL BUDGET (FY80) 1070K	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES 331K	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES 448K	COMMITMENTS 234K
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SUBCONTRACT SUMMARY

	<u>NUMBER</u>	<u>(\$ x K) AMOUNT</u>
PLANNED SUBCONTRACTS	5	922
PURCHASE REQUESTS APPROVED	5	922
SUBCONTRACTS AWARDED/\$ COMMITTED	2	567

## ECONOMICS OF WECS TIED TO UTILITIES

DAVID PERCIVAL

### OBJECTIVES

COMPARE EPRI UTILITY DATA TO DATA OBTAINED FROM UTILITIES IN 16 SITE VALUE STUDY.

DETERMINE THE SENSITIVITY OF WECS VALUE TO UTILITY OPERATIONAL AND ECONOMIC PARAMETERS.

### ACCOMPLISHMENTS

CONTINUED CONTACT WITH EPRI AS SOURCE OF REGIONAL UTILITY DATA. AVAILABILITY DATE HAS BEEN MOVED TO AUGUST 1980.

PLANNED ACTIVITIES

ACQUISITION OF REGIONAL UTILITY DATA AND CONVERSION TO PROMOD FORMAT.

BEGIN ANALYSIS.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
55K	22K	38K	0

SUBCONTRACT SUMMARY

NONE

A COMPREHENSIVE GUIDE: WECS CONNECTED TO ELECTRIC UTILITIES

ROGER TAYLOR

OBJECTIVES

PROVIDE A COMPREHENSIVE, CONSOLIDATED, READABLE SOURCE OF INFORMATION OF WECS AS IT RELATES TO ELECTRIC UTILITIES.

PROVIDE A KEY REFERENCE DOCUMENT TO UTILITIES, PUBLIC UTILITY COMMISSIONS, STATE ENERGY OFFICES, AND OTHERS ON PAST AND CURRENT DEVELOPMENTS IN THE FIELD OF WIND ENERGY.

ACCOMPLISHMENTS

NONE.

PLANNED ACTIVITIES

NONE.

PROBLEMS

MAJOR DELAYS DUE TO INVOLVEMENT IN SAWHILL PROJECT AND STAFF ASSIGNED TO THIS TASK LEAVING SERI.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	180K	50K	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	79K	COMMITMENTS	0
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SUBCONTRACT SUMMARY

NONE

## ECOLOGICAL, SOCIO-ENVIRONMENTAL ASSESSMENT OF WIND SYSTEMS

CARL STROJAN

### OBJECTIVES

IDENTIFY AND QUANTIFY THE LIFE-CYCLE ENVIRONMENTAL EFFECTS OF BOTH SMALL AND LARGE WIND ENERGY SYSTEMS.

ASSESS COMPARATIVELY THE ENVIRONMENTAL EFFECTS OF SMALL AND LARGE WIND ENERGY SYSTEMS UNDER SELECTED DEPLOYMENT OPTIONS; E.G., COMMUNITY SCALE USE OF MANY SMALL WECS COMPARED WITH FEWER LARGE WECS.

### ACCOMPLISHMENTS

BEGAN WORK ON A TECHNICAL SERVICES CONTRACT WITH FRANKLIN ASSOCIATES TO OBTAIN ESTIMATES OF AIR AND WATER POLLUTANTS EMITTED AND ENERGY CONSUMED DURING PRODUCTION OF RAW MATERIALS USED FOR WECS.

### PLANNED ACTIVITIES

COMPLETE DRAFT FINAL REPORT ON THE ENVIRONMENTAL EFFECTS OF SWECS AND DELIVER TO WSB/DOE AND OUTSIDE REVIEWERS FOR CRITICAL EVALUATION.

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PREPARE DRAFT REPORT ON THE ENVIRONMENTAL ASPECTS OF THE PRODUCTION AND DEPLOYMENT OF MEDIUM AND LARGE SCALE WECS FOR INCORPORATION INTO FY80 SUBTASK.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
98K	72K	59K	1.0K



SUBCONTRACT SUMMARY

	<u>NUMBER</u>	<u>(\$ x K) AMOUNT</u>
PLANNED SUBCONTRACTS	1	31
PURCHASE REQUESTS APPROVED	1	10
SUBCONTRACTS AWARDED/\$ COMMITTED	0	0

TELEVISION INTERFERENCE AND WECS

N. KELLEY

OBJECTIVES

DETERMINE THE EXTENT AND CAUSES OF THE INTERFERENCE TO TELEVISION SIGNALS IN THE VICINITY OF OPERATIONAL WIND TURBINES AND TO IDENTIFY METHODS OF ALLEVIATING OR ELIMINATING THAT INTERFERENCE.

ACCOMPLISHMENTS

AWARDED CONTRACT TO THE UNIVERSITY OF MICHIGAN TO CONTINUE TVI STUDIES (\$95K FOR A 12 MONTH EFFORT).

INITIATED SUBCONTRACT PROCUREMENT FOR A STUDY OF THE FEASIBILITY OF DEVELOPING AN ELECTRONIC ANTI-GHOSTING DEVICE FOR REDUCING TVI FROM WIND TURBINES.

POTENTIAL TVI/COMMUNICATIONS PROBLEMS ARISING AT HAWAIIAN MOD-0A AND GOODNOE HILLS MOD-2 SITES WERE RESOLVED BY THE UNIVERSITY OF MICHIGAN.

CONTINUE REVIEW OF TVI SITING HANDBOOK AND DRAFT OF BLOCK ISLAND TVI REPORT.

PLANNED ACTIVITIES

DEVELOP AN ANTENNA EVALUATION PROGRAM FOR THE BOONE INSTALLATIONS WHICH WILL MEET THE REQUIREMENTS OF ALL INVOLVED AND RESCHEDULE FIELD MEASUREMENTS.

NEGOTIATE SUBCONTRACT FOR ANTI-GHOSTING DEVICE WITH POLYTECHNIC INSTITUTE OF NEW YORK.

UNIVERSITY OF MICHIGAN TO BEGIN WORK ON TVI ASSOCIATED WITH SWECS AND VAWT.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
170K	13K	53K	95K

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SUBCONTRACT SUMMARY

	<u>NUMBER</u>	<u>(\$ x K) AMOUNT</u>
PLANNED SUBCONTRACTS	2	128
PURCHASE REQUESTS APPROVED	2	128
SUBCONTRACTS AWARDED/\$ COMMITTED	1	95

## NOISE MEASUREMENTS AT SELECTED WIND SYSTEM SITES

N. KELLEY

### OBJECTIVES

DOCUMENT AND QUANTIFY THE NOISE ASSOCIATED WITH THE OPERATION OF EXISTING LARGE WIND TURBINES AND IDENTIFY THE PRINCIPLE MECHANISMS WHICH ARE RESPONSIBLE FOR THE GENERATION, PROPAGATION, AND OTHER POSSIBLE IMPACTS BY UTILIZING FIELD MEASUREMENTS AND EXISTING ANALYTICAL TOOLS.

FORMULATE RECOMMENDATIONS FOR METHODS TO MINIMIZE THE NOISE GENERATED BY MOD-1 AND ITS IMPACT ON THE PUBLIC.

### ACCOMPLISHMENTS

COMPLETED SYSTEMATIC NOISE SURVEY OF MOD-1, BOONE, N. C., INCORPORATING ACOUSTIC, METEOROLOGICAL, AND SEISMIC MEASUREMENTS.

COMPLETED NOISE SURVEY OF MOD-0 IN BOTH UPWIND AND DOWNWIND CONFIGURATIONS.

PRESENTED SERI RESULTS ON MOD-1 NOISE INVESTIGATION TO WESD/DOE ON MAY 21, 1980.

COMPLETED ACOUSTIC MEASUREMENTS ASSOCIATED WITH LOAD BANK TESTS OF THE MOD-1 AT BOTH 23 AND 35 RPM.

COMPLETED FIELD MEASUREMENTS OF NOISE BACKGROUND AT GOODNOE HILLS MOD-2 SITE.

PLANNED ACTIVITIES

COMPLETE DATA REDUCTION AND ANALYSIS OF SERI MEASUREMENTS TAKEN IN THE FIELD AT THE MOD-0, MOD-1, AND MOD-2 SITES.

INVESTIGATE THE NOISE GENERATED BY A 25-kW SWECS INSTALLED BY ROCKY FLATS THAT APPEARS TO BE SIMILAR TO THE NOISE GENERATED BY MOD-1 AND TEST THE EFFECTIVENESS OF A TEMPORARY SPOILING DEVICE ON THE TOWER, AT REDUCING THE IMPULSE.

HOST THE SECOND QUARTERLY NOISE REVIEW AT SERI AUGUST OR SEPTEMBER. PRIMARY SUBJECT: WIND TURBINE NOISE PROPAGATION.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
440K	285K	282K	53K

SUBCONTRACT SUMMARY

	<u>NUMBER</u>	<u>(\$ x K) AMOUNT</u>
PLANNED SUBCONTRACTS	2	100
PURCHASE REQUESTS APPROVED	3	77
SUBCONTRACTS AWARDED/\$ COMMITTED	3	77

LAND USE ISSUES

ROBERT NOUN

OBJECTIVES

PROVIDE UTILITIES WITH AN ASSESSMENT OF THE SIMILARITIES AND DIFFERENCES BETWEEN WECS AND CONVENTIONAL POWER SYSTEMS IN TERMS OF SITING AND LICENSING REQUIREMENTS.

ACCOMPLISHMENTS

TASK ADVISORY COMMITTEE MET AT SERI ON APRIL 18 TO REVIEW TASK PLAN AND PROPOSED SUBCONTRACTOR STATEMENT OF WORK.

SUBCONTRACT AWARDED TO TSG, INC. (MIKE LOTKER) TO CONDUCT CASE STUDIES OF EXISTING OR PLANNED WECS/UTILITY INSTALLATIONS.

APPROVED CONSULTING AGREEMENT WITH DR. PAUL FRIESEMA, NORTHWESTERN UNIVERSITY.

COMPLETED ALL IN-HOUSE RESEARCH; BEGUN PREPARATION OF DRAFT FINAL REPORT.

SUBCONTRACTOR AND CONSULTANT BEGAN CASE STUDY SITE VISITS.



PLANNED ACTIVITIES

COMPLETE CASE STUDY VISITS.

MEET WITH SUBCONTRACTOR AND CONSULTANT TO PLAN CONTENT OF CASE STUDIES IN DRAFT FINAL REPORT.

PREPARE DRAFT FINAL REPORT AND CIRCULATE FOR INTERNAL SERI AND TASK ADVISORY COMMITTEE REVIEW.

PREPARE FINAL REPORT TO COMPLETE TASK.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
135K	69K	64K	29K

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SUBCONTRACT SUMMARY

	<u>NUMBER</u>	<u>(\$ x K) AMOUNT</u>
PLANNED SUBCONTRACTS	2	35
PURCHASE REQUESTS APPROVED	2	35
SUBCONTRACTS AWARDED/\$ COMMITTED	2	35

STRATEGY ANALYSIS  
(WECS/PURPA ANALYSIS)

DAVID SCHALLER

OBJECTIVES

IDENTIFY THE IMPACT OF FEDERAL ENERGY REGULATORY COMMISSIONS'S RULES UNDER PURPA ON DEVELOPMENT OF WIND ENERGY.

DEVELOP A GUIDE AND INFORMATION SOURCE ON PURPA RULES FOR USE BY STATE UTILITY COMMISSIONS AND NONREGULATED UTILITIES.

ACCOMPLISHMENTS

REVISED SUBTASK WORK PLAN DEVELOPED AND APPROVED.

DRAFT REPORT. OUTLINE COMPLETED AND ISSUE DEFINITION BEGUN, WITH FOCUS ON TECHNICAL AND INSTITUTIONAL QUESTIONS RAISED BY PURPA RULES.

PUC GUIDE EXPANDED AND TEST PREPARATION BEGUN. CONTACTS WITH PUC STAFF ESTABLISHED AND GUIDE REVIEW SCHEDULES DEVELOPED.

PLANNED ACTIVITIES

CONTINUE INVESTIGATION OF PURPA RULE IMPACT ON PUBLIC UTILITY COMMISSIONS AND  
NONREGULATED UTILITIES.

DRAFT REPORT AND GUIDE DUE FOR INTERNAL/DOE REVIEW BY AUGUST 1, 1980.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
60K	24K	45K	0

SUBCONTRACT SUMMARY

NONE

## WIND SYSTEMS COORDINATION

IRWIN E. VAS

### OBJECTIVES

PROVIDE TECHNICAL COORDINATION OF THE FEDERAL WIND ENERGY PROGRAM'S RESEARCH AND ANALYSIS ELEMENTS, INTEGRATION OF THE RESEARCH RESULTS INTO A DECISION DATA BASE AND INTEGRATION OF ACTIVITIES WITH DOE MANAGEMENT AND PRIME CONTRACTORS.

### ACCOMPLISHMENTS

AWARDED A CONTRACT TO COLORADO STATE UNIVERSITY FOR \$16,836 FOR A TWO MONTH EFFORT TO PRODUCE "ENERGY FROM THE WIND - ANNOTATED BIBLIOGRAPHY."

AWARDED A CONTRACT TO PLANNING RESEARCH CORPORATION (PRC) FOR \$165,433 FOR AN 11 MONTH EFFORT ENTITLED "WIND ENERGY SYSTEMS COORDINATION STUDY OF RESEARCH AND ANALYSIS."

COMPLETED A TECHNICAL AND COST EVALUATION OF THE PROPOSAL SUBMITTED BY SAN BERNADINO COMMUNITY DEVELOPMENT CENTER.

MET WITH MORE THAN 30 INDIVIDUALS AND GROUPS TO DISCUSS THE SERI WIND ENERGY PROGRAM.

PLANNED ACTIVITIES

CONTINUE PLANNING/LIAISON ACTIVITIES WITHIN THE FEDERAL WIND ENERGY PROGRAM AND WITH OTHER FEDERAL, STATE, PUBLIC, AND PRIVATE INSTITUTIONS.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
430K	35K	76K	56K

SUBCONTRACT SUMMARY

	<u>NUMBER</u>	<u>(\$ x K) AMOUNT</u>
PLANNED SUBCONTRACTS	3	233
PURCHASE REQUESTS APPROVED	2	182
SUBCONTRACTS AWARDED/\$ COMMITTED	2	182

## WECS COST STUDY

JOE LAVENDER

### OBJECTIVES

TO PROVIDE UP-TO-DATE AND WELL-DOCUMENTED INFORMATION CONCERNING COSTS, PERFORMANCE, AND OTHER CHARACTERISTICS OF SPECIFIC WIND ENERGY SYSTEMS TO DOE DECISION MAKERS.

### ACCOMPLISHMENTS

COMPLETED COST SENSITIVITY ANALYSIS ON ALL FOUR SELECTED SYSTEMS.

o	MILLVILLE	10 kW
o	ENERGY DEVELOPMENT Co.	40 kW
o	DOE/SANDIA	100 kW
o	MOD-2	2500 kW

ANALYSED MULTIPLE INSTALLATION OF 40-KW AND 100-KW SYSTEMS.

PERFORMED INVESTIGATION INTO SCHEDULE SENSITIVITIES OF THE FOUR SYSTEMS.



PLANNED ACTIVITIES

COMPLETE INTERNAL REVIEW OF VOLUME I (COST & PERFORMANCE) BY JULY 15, 1980.  
EXTERNAL REVIEW WILL BE INITIATED JULY 18.

COMPLETE COST AND PHYSICAL RELATIONSHIPS ON COMMERCIALY AVAILABLE SYSTEMS WILL  
BE DISTRIBUTED BY MEMO FOR EXTERNAL REVIEW.

BUDGET SUMMARY

BUDGET	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
50K	47K	31K	5K

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SUBCONTRACT SUMMARY

	<u>NUMBER</u>	<u>(\$ x K) AMOUNT</u>
PLANNED SUBCONTRACTS	1	4
PURCHASE REQUESTS APPROVED	1	4
SUBCONTRACTS AWARDED/\$ COMMITTED	0	0

## PROGRAM REVIEW AND ADMINISTRATION

IRWIN E. VAS

### OBJECTIVES

PROVIDE THE PLANNING AND ADMINISTRATION FOR THE SERI WIND ENERGY SYSTEMS PROGRAM.

### ACCOMPLISHMENTS

PRESENTED THE DRAFT QUARTERLY REPORT TO WESD/DOE FOR THE 2ND QUARTER FY80 ON MAY 21st.

COMPLETED AND SUBMITTED TO WESD/DOE THE FINAL VERSIONS OF THE 1ST AND 2ND QUARTERLY REPORTS FOR THE SERI WIND ENERGY SYSTEMS PROGRAM.

PROVIDED DETAILS RELATING TO THE "SOLAR ENERGY OBJECTIVES" TO WESD/DOE.

COMPLETED THE REPROGRAMMING OF SERI WIND SUBTASKS WITH BUDGET CHANGES REFLECTING THE ACTIVITIES OF THE FIRST TWO QUARTERS AND PROPOSED ACTIVITIES OF THE LAST TWO QUARTERS OF FY80.

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DEVELOPED WIND ENERGY PROGRAM INSTITUTIONAL PLAN FOR FY81 AND SUBMITTED TO SERI MANAGEMENT.

DEVELOPED AN OUTLINE FOR A WECS/UTILITY WORKSHOP AND SUBMITTED IT FOR REVIEW.

ACTED AS TECHNICAL CHAIRMAN FOR THE AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS (AIAA)/SERI WIND ENERGY CONFERENCE HELD IN BOULDER APRIL 9-11, 1980.

PROVIDED DRAFT RESPONSES TO FIVE LETTERS CONCERNING WIND FOR SERI MANAGEMENT SIGNATURE.

MET AND DISCUSSED SERI WIND EFFORTS WITH A NUMBER OF PEOPLE FROM VARIOUS FOREIGN COUNTRIES, UNIVERSITIES, OTHER NATIONAL LABS, DOE CONTRACTORS, WESD/DOE, AND OTHER STATE AND FEDERAL AGENCIES.

SUPPORTED TWO WORKSHOPS, AN ADVISORY COMMITTEE MEETING AND A SEMINAR.

#### PLANNED ACTIVITIES

CONTINUE REVIEW, PLANNING, AND REPORTING ACTIVITIES AS REQUIRED.

COMPLETE FY81 DRAFT PROGRAM DEVELOPMENT PLAN.

COMPLETE REVISED INSTITUTIONAL PLAN.

BUDGET SUMMARY

	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
BUDGET	78K	84K	11K
225K			

SUBCONTRACT SUMMARY

NONE

## WIND ENERGY INNOVATIVE SYSTEMS

IRWIN VAS

### OBJECTIVE

DETERMINE TECHNICAL AND ECONOMIC FEASIBILITY OF INNOVATIVE WIND ENERGY SYSTEMS.

### ACCOMPLISHMENTS

REVIEWED CURRENT R&D PROJECTS ON A CONTINUING BASIS.

REVIEWED EIGHT UNSOLICITED PROPOSALS, RECOMMENDED FUNDING TWO OF THEM BY OTHER SERI SUBTASKS.

REVIEWED FOUR DRAFT FINAL REPORTS ON SUBCONTRACTS, ACCEPTED TWO OF THEM AND INITIATED CONTRACT CLOSE OUT.

COMPLETED A CONTRACT MODIFICATION OF THE AEROVIRONMENT, DYNAMIC INDUCER CONTRACT FOR \$11K TO COVER INCREASED G&A RATES.

RECEIVED 35 ABSTRACTS IN RESPONSE TO A CALL FOR PAPERS FOR THE SECOND WIND ENERGY INNOVATIVE SYSTEMS CONFERENCE AND INITIATED REVIEWS.

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COMPLETED EVALUATIONS OF THE PROPOSALS RECEIVED IN RESPONSE TO THE TETHERED AND INNOVATIVE LOI'S. RECOMMENDED FUNDING THREE OF THE TETHERED AND TWO OF THE INNOVATIVE PROPOSALS.

COMPLETED NO COST CONTRACT EXTENSIONS FOR THE UNIVERSITY OF DAYTON, SOUTH DAKOTA SCHOOL OF MINES, MARKS POLARIZED CORP., AND GRUMMAN AEROSPACE CORP (DAWT).

WUTA COMPLETED ASSEMBLY AND CHECKOUT OF THEIR ATMOSPHERIC TEST EQUIPMENT, HOWEVER LIGHTING STRIKES ON POWER LINES HAVE DAMAGED SOME INSTRUMENTATION AND COMPUTER EQUIPMENT. REPAIRS ARE ESTIMATED TO TAKE ONE MONTH AND \$3K. (WIND TURBINE WAS PROTECTED IN THE "TOWER DOWN" POSITION.)

#### PLANNED ACTIVITIES

AWARD SUBCONTRACTS IN RESPONSE TO THE TETHERED AND INNOVATIVE ASSESSMENT LOI'S.

ESTABLISH SECOND WEIS CONFERENCE AGENDA AND SELECT PAPERS TO BE PRESENTED.

REVIEW UNSOLICITED PROPOSALS.

COMPLETE CONTRACT MODIFICATION TO THE WUTA CONTRACT TO ALLOW FOR INCREASED INSTRUMENTATION AND TESTING OF TURBINE.

COMPLETE REVIEWS OF DRAFT FINAL REPORTS SUBMITTED.

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AWARD FOLLOW ON FUNDING TO WEST VIRGINIA UNIVERSITY.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
1437K	493K	479K	82K



SUBCONTRACT SUMMARY

	<u>NUMBER</u>	<u>(\$ x K) AMOUNT</u>
PLANNED SUBCONTRACTS	5	751
PURCHASE REQUESTS APPROVED	3	242
SUBCONTRACTS AWARDED/\$ COMMITTED	0	0

## ENGINEERING ANALYSIS AND COST ESTIMATING OF INNOVATIVE WECS

PETER SOUTH

### OBJECTIVES

ESTABLISH COSTING METHODOLOGIES SUITABLE FOR INNOVATIVE WECS (IWECS) IN THEIR CONCEPTUAL, DEVELOPMENTAL, AND PRODUCTION PHASES TO ESTIMATE THEIR COST OF ENERGY.

PROVIDE AERODYNAMIC AND ENGINEERING ANALYSES OF IWECS TO ASCERTAIN THEIR PERFORMANCE, STRUCTURAL, AND MATERIAL CHARACTERISTICS.

### ACCOMPLISHMENTS

PREPARED SUBCONTRACT TO DEVELOP SAMICS PROGRAM FOR PRODUCTION COSTING OF IWECS. INTERNAL AND EXTERNAL TECHNICAL REVIEWS WERE COMPLETED. DOE SUBCONTRACT REVIEW IS IN PROGRESS.

CONTINUED WRITING MANUAL DESCRIBING ESSENTIAL CHARACTERISTICS OF IWECS AND THEIR SUBSYSTEMS.

BEGAN STUDY TO DEVELOP COST ESTIMATES FOR MADARAS SYSTEM FOUNDATION.

PRELIMINARY REVIEW OF RESULTS FROM THE SUBCONTRACT ISSUED TO A CONSULTANT (ROBERT ALLEN) TO ANALYZE THE PRODUCTION COSTS OF A MADARAS WIND SYSTEM.

BEGAN DEVELOPMENT OF PERFORMANCE ESTIMATING METHODOLOGY.

SUBTASK PROGRESS IMPROVED DUE TO ADDITION OF REQUIRED PERSONNEL.

PLANNED ACTIVITIES

CONTINUE AERODYNAMIC ANALYSES OF DAWT AND TORNADO WHILE INITIATING OTHER ANALYSES (E.G., CIRCULATION CONTROLLED VAWT, VORTEX AUGMENTOR CONCEPT).

MODIFY SAMICS METHOD FOR IWECS PRODUCTION COSTING.

WRITE, ACQUIRE REVIEW FOR, AND SEND RFP FOR IWECS DEVELOPMENT COSTING.

CONTINUE WORK ON REPORT DESCRIBING FUNDAMENTAL AERODYNAMIC CHARACTERISTICS OF GENERIC IWECS.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
367K	87K	113K	8

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SUBCONTRACT SUMMARY

	<u>NUMBER</u>	<u>(\$ x K) AMOUNT</u>
PLANNED SUBCONTRACTS	2	208
PURCHASE REQUESTS APPROVED	1	85
SUBCONTRACTS AWARDED/\$ COMMITTED	0	0

## WIND ENERGY INFORMATION DISSEMINATION

PATRICIA WEIS

### OBJECTIVES

ENHANCE MARKET DEVELOPMENT FOR WECS BY CONVERTING THE TECHNICAL RESULTS OF THE FEDERAL R&D PROGRAM INTO TOOLS FOR WIDER AUDIENCES, ESPECIALLY DEVELOPERS, INFLUENCERS, AND USERS.

### ACCOMPLISHMENTS

PUBLISHED - CAPITAL FORMATION FOR SMALL MANUFACTURERS OF WIND ENERGY CONVERSION SYSTEMS - A GUIDE TO METHODS AND SOURCES.

PUBLISHED - PROCEEDINGS - PANEL ON INFORMATION DISSEMINATION FOR WIND ENERGY.

COMPLETED UPDATE OF WIND ENERGY INFORMATION DIRECTORY.

### PLANNED ACTIVITIES

PRINT AND DISTRIBUTE REVISED "WIND ENERGY INFORMATION DIRECTORY."

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PRINT AND DISTRIBUTE FOUR NASA INFORMATION MATERIALS.

TECHNICAL REVIEW OF SITING COURSE FOR SMALL WECS.

TECHNICAL REVIEW OF A/V MATERIALS KIT.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
373K	183K	240K	55K

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SUBCONTRACT SUMMARY

	<u>NUMBER</u>	<u>(\$ x K) AMOUNT</u>
PLANNED SUBCONTRACTS	3	98
PURCHASE REQUESTS APPROVED	3	98
SUBCONTRACTS AWARDED/\$ COMMITTED	2	48

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## SMALL WIND TURBINE PRODUCTION EVALUATION AND COST ANALYSIS

CARL NORDQUEST

### OBJECTIVE

THE OBJECTIVE OF THIS TASK IS TO DEVELOP TECHNICAL AND COST EVALUATIONS OF SMALL WIND ENERGY CONVERSION SYSTEMS (WIND TURBINES OF LESS THAN 100 kW RATING), TO IDENTIFY THE BENEFITS OF AUTOMATION FOR REDUCING PRICES, AND TO UNDERSTAND THE TECHNICAL REQUIREMENTS FOR LOW-COST HIGH VOLUME PRODUCTION. THIS TASK HAS A FURTHER OBJECTIVE OF PROVIDING AN ANALYTICAL FOUNDATION FOR THE EVALUATION OF FUTURE WIND TURBINE DESIGNS.

### ACCOMPLISHMENTS

SELECTED WINDWORKS SWECS AS MACHINE FOR STUDY.

AWARDED SUBCONTRACT TO GENERAL MOTORS TO DO PRODUCTION EVALUATION AND COST ANALYSIS ON WINDWORKS MACHINE AT THREE LEVELS OF PRODUCTION.

TOURED WINDWORKS FACTORY TO WITNESS PRESENT PRODUCTION METHODS.



PLANNED ACTIVITIES

G.M. WILL INITIATE WORK ON THEIR SUBCONTRACT JULY 15, 1980.

CONTINUE IN-HOUSE COST ANALYSIS ON MADARAS SYSTEM.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, 3RD QUARTERS EXPENDITURES	COMMITMENTS
279K	54K	187K	0

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SUBCONTRACT SUMMARY

	<u>NUMBER</u>	<u>(\$ x K) AMOUNT</u>
PLANNED SUBCONTRACTS	1	130
PURCHASE REQUESTS APPROVED	1	130
SUBCONTRACTS AWARDED/\$ COMMITTED	1	130

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MARKET CHARACTERIZATION

MARTIN DEUTSCH

OBJECTIVES

IDENTIFY THE NEAR-TERM POTENTIAL MARKET FOR SWECS IN RESIDENTIAL AND AGRICULTURAL MARKET SECTORS (PHASE I). DETERMINE THE SWECS MARKET POTENTIAL FOR A LIMITED NUMBER OF APPLICATIONS/MARKET SECTORS IN A SINGLE GEOGRAPHICAL REGION (PHASE II).

ACCOMPLISHMENTS

- O DEVELOPED METHODOLOGY FOR NEAR-TERM, HIGH POTENTIAL SWECS MARKET ANALYSIS (PHASE I) AND REVIEWED WITH WESD/DOE, RAYTHEON SERVICE Co., AND SIX SWECS MANUFACTURERS. THE STUDY WILL ANALYZE THE RURAL INTER-CONNECTED RESIDENTIAL AND AGRICULTURAL MARKET SECTORS WITH ANNUAL WIND SPEEDS OF 12 MPH OR GREATER WITHIN THE 41 STATES THAT REQUIRE WIND AUDITS UNDER THE RCS PROGRAM.
- O REVISED THE STATEMENT OF WORK (SOW) FOR PHASE I AND REVIEWED WITH WESD/DOE AT AWEA MEETING ON JUNE 9TH AND 10TH.
- O CONTACTED SIX WECS MANUFACTURERS AT AWEA MEETING TO DETERMINE WHAT MARKET INFORMATION THEY NEEDED IN THE NEAR TERM. THEY WERE UNANIMOUSLY IN FAVOR OF THE POTENTIAL RESULTS OF THE PHASE I STUDY (I.E., BROAD-BRUSH APPROACH TO DEVELOP HIGH WIND/HIGH UTILITY RATE OVERLAYS FOR THE 41 RCS STATES AND THE RESIDENTIAL AND AGRICULTURAL MARKET POTENTIAL IN THESE AREAS AS A FUNCTION OF NET SWECS COST).

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- O MET WITH ARTHUR D. LITTLE, INC. TO DISCUSS SOW AND GET THEM UNDER CONTRACT FOR PHASE I. THIS PHASE I SOW IS A SCOPE CHANGE TO THE COMPUTERIZED DATA BASE AND ANALYSIS MODEL AWARDED TO THEM EARLIER.
- O REVIEWED FOUR PREVIOUSLY CONDUCTED SOLAR TECHNOLOGY MARKET STUDIES.
- O COMPLETED COLLECTION AND TABULATION OF MECHANICAL WIND MACHINE DATA AND UPDATED ELECTRICAL WIND MACHINE DESIGN, PERFORMANCE, AND COST SUMMARY TABLES.
- O CANCELLED DETAIL WORK PLAN CONTRACT AND PROJECT INTEGRATION POTENTIAL CONTRACT.

#### PLANNED ACTIVITIES

COMPLETE PHASE I NEAR-TERM, HIGH POTENTIAL SWECS MARKET ANALYSIS.

DEVELOP OPTIONS FOR PHASE II MARKET STUDY, REVIEW THEM WITH OUR ADVISORY COMMITTEE AND DETERMINE THE METHODOLOGY AND PLAN THAT WOULD BEST ACCOMPLISH THE OBJECTIVES IN THE REQUIRED TIME FRAME.

EVALUATE MARKET RESEARCH PROPOSALS AND SELECT SUBCONTRACTOR.

REVISE STATEMENTS OF WORK FOR ALL SUBCONTRACTS (WIND REGIME DATA ANALYSIS, DEMOGRAPHIC PROFILE, COMPUTERIZED DATA BASE AND ANALYSIS MODEL, AND MARKETING RESEARCH).

SELECT GEOGRAPHICAL REGION FOR PHASE II PILOT STUDY.

COMPLETE REVIEW OF ALL PREVIOUS SOLAR TECHNOLOGY MARKETING STUDIES.

INITIATE PHASE II PILOT MARKET CHARACTERIZATION STUDY FOR SELECTED GEOGRAPHICAL REGION.

REVIEW PAST AND CURRENT DECISION ANALYSIS STUDIES.

INTEGRATE ON-GOING SERI WORK ON PURPA, RCS, SMALL USER DECISION ANALYSIS AND OTHER STUDIES, WHERE APPLICABLE, INTO THE MARKET CHARACTERIZATION TASK.

#### OUTPUT

PHASE I DRAFT FINAL REPORT, INCLUDING: DATA IN TABULAR, GRAPHICAL, AND OVERLAY FORMAT; ASSUMPTIONS, GROUND RULES, AND CAVEATS AND CASE STUDIES.

SUMMARY OVERVIEW PAPER ON THE OBJECTIVES, METHODOLOGY, AND RESULTS OF PREVIOUS SOLAR TECHNOLOGY MARKET STUDIES.

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BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
680K	191K	160K	8K

TABLE 4. SUBCONTRACTS

CONTRACTOR	WORK TITLE	PLANNED					ACTUAL		
		AMOUNT \$K	PR. COMPL. DATE	START DATE	END DATE	AMOUNT TO BE COSTED DURING FY80	AMOUNT \$K	START DATE	AMOUNT TO THE COSTED \$K
<u>3531.15 MARKET CHARACTERIZATION</u>									
ARTHUR D. LITTLE	NEAR TERM MARKET ANALYSIS	100	6/80	6/80	10/80	100	104	7/80	85
PLANNING RESEARCH CORP.	WIND REGIME DATA ANALYSIS	35	3/80	8/80	12/80	20	--	--	--
TBD (LIMITED COMPETITIVE)	DEMOGRAPHIC PROFILE	30	3/80	8/80	12/80	15	--	--	--
ARTHUR D. LITTLE	DATA BASE AND ANALYSIS MODEL	150	3/80	8/80	8/81	30	--	--	--
TBD	MARKET ANALYSIS	40	4/80	8/80	12/80	20	--	--	--



### WECS Market Characterization (3531.15)

Task or Subtask Activities	Fy 80												Fy 81										
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar					
<b>Phase I — Near Term High Potential SWECS Market Analysis</b>									△	▽	●	●	●	□								■	
<b>Phase II — Pilot County Level Detailed WECS Market Analysis</b>																							
Planning and Sow Revision									△	▽	▽												
Review of Solar Market Studies									△	▽	▽												
Wind Machine Data Collection				△						▽	▽												
County Level Wind Regime Data Analysis												△										▽	
Demographic Profile (by County) Analysis												△										▽	
Market Research and Analysis													△									▽	
Data Base & Analysis Model Development													△									▽	
Application Analysis													△									▽	
Economic/Market/Sensitivity Analysis														△									
Review of Decision Analysis/ Criteria Studies													△									▽	
Project Management										△	▽		◆									◆	
Subtask Management	△										▽		◆									◆	
Accrued Costs	b. Planned	12.4	28.0	46.5	62.9	79.4	105.7	115.3	137.4	159.9	208.9	263.8	317.1										
	c. Actual	10.5	26.1	45.0	66.6	84.6	102.5	122.6	167.6	190.8													
	d. Variance	1.9	1.9	1.5	(3.7)	(5.2)	3.2	(7.3)	(30.2)	(30.9)													

- |                      |                     |                      |                               |
|----------------------|---------------------|----------------------|-------------------------------|
| △ Begin Milestone    | ○ Equipment Arrival | □ Draft Final Report | ◆ Workshop or Special Meeting |
| ▽ Milestone Complete | ● Progress Report   | ■ Final Report       | ▽ Present Status              |

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SMALL USER DECISION ANALYSIS

JAMES GRESHAM

OBJECTIVE

DEVELOP A QUANTITATIVE DESCRIPTION OF THE SMALL USER DECISION PROCESS WITH REGARD TO PURCHASE OF A SMALL WIND ENERGY CONVERSION SYSTEM.

ACCOMPLISHMENTS

ARTHUR D. LITTLE BEGAN WORK ON DEVELOPING THE DECISION MODEL FOR THE RESIDENTIAL CONSUMER ON MAY 26. THE SUBCONTRACT WAS DELAYED FOR OVER THREE MONTHS BECAUSE OF THE DELAY IN SETTING UP THE SERI BASIC ORDERING AGREEMENT.

WE HAVE BEEN EVALUATING THE DECISION MODEL THROUGH SETS OF INDIVIDUAL INTERVIEWS. THE INTERVIEWS ARE TYPICALLY TWO HOUR FORMAL QUESTION AND ANSWER SESSIONS IN WHICH A DECISION MAKER IN ONE OF THE POTENTIAL MARKET AREAS (AGRICULTURE, COMMERCE, INSTITUTIONS) IMPARTS HIS PREFERENCES WITH REGARD TO THE DECISION CRITERIA.

THE INTERVIEW PROCESS PROCEEDS APPROXIMATELY AS FOLLOWS: 1) DESCRIBE AND DISCUSS RELEVANCE OF THE DECISION CRITERIA (ATTRIBUTES) CHOSEN FOR THE MODEL; 2) RANK THE ATTRIBUTES FROM MOST TO LEAST IMPORTANT; 3) PICK THE MOST IMPORTANT (REFERENCE) ATTRIBUTE AND SCALE THE OTHERS AGAINST IT; 4) ASSESS A UTILITY FUNCTION FOR THE REFERENCE ATTRIBUTE; 5) RANK A SET OF HYPOTHETICAL ATTRIBUTE COMBINATIONS AS A CHECK AGAINST THE MODEL.

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WE HAVE THUS FAR CONDUCTED SETS OF INTERVIEWS FOR THE COMMERCIAL AND INSTITUTIONAL SECTORS IN PENNSYLVANIA AND TEXAS, AND THE AGRICULTURAL SECTOR IN WYOMING. OTHER SETS WILL TAKE PLACE IN JULY AND AUGUST.

THE INTERVIEWS DO NOT SOLICIT INFORMATION OF A PERSONAL OR PRIVATE NATURE THAT COULD LEAD TO LEGAL PROBLEMS.

THE INTERVIEWS HAVE THUS FAR INDICATED THAT THE ATTRIBUTES CHOSEN (CAPITAL COST; PAYBACK PERIOD; FREQUENCY OF REPAIR AND MAINTENANCE; AVAILABILITY OF PARTS, SALES, AND SERVICE; AND PERCENTAGE OF NEEDS DISPLACED) ARE APPROPRIATE TO THE DECISION UNDER STUDY.

THE FOLLOWING CONCLUSIONS REGARDING COMMERCIALIZATION STRATEGIES FOR SWECS CAN BE MADE THUS FAR FROM THE INTERVIEWS: 1) LOAD MATCHING STRATEGIES MAY DO AS MUCH OR MORE FOR INCREASING SWECS ACCEPTANCE AS COST REDUCTION TECHNIQUES; 2) GUARANTEED FINANCING IS ESSENTIAL; 3) HIGHER VISIBILITY IN TERMS OF MORE DEMONSTRATIONS AND ACTIVE PUBLIC INFORMATION (THROUGH SUCH VEHICLES AS STATE AGRICULTURAL EXTENSION SERVICES AND COMMUNITY PROGRAMS) SHOULD BE VERY USEFUL.

#### PLANNED ACTIVITIES

CONTINUE DECISION MAKER CONTACTS IN JULY AND AUGUST.

BEGIN PREPARATION OF SUBTASK FINAL REPORT.

OUTPUT

FINAL REPORT DETAILING FINDINGS OF THE STUDY AND THE SMALL USER DECISION  
CRITERIA.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
140K	53K	65K	32K

TABLE 5. SUBCONTRACTS

CONTRACTOR	WORK TITLE	PLANNED					ACTUAL		
		AMOUNT \$K	PR. COMPL. DATE	START DATE	END DATE	AMOUNT TO BE COSTED DURING FY80	AMOUNT \$K	START DATE	AMOUNT TO BE COSTED \$K
<u>3531.25 SMALL USER DECISION ANALYSIS</u>									
ARTHUR D. LITTLE	SMALL USER DECISION ANALYSIS	40	1/80	5/80	10/80	40	45	5/80	35

### Small User Decision Analysis (3531.25)

Task or Subtask Activities		Fy 80											Fy 81						
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Develop Decision Criteria Obtain User and System Related Inputs Evaluate Data and Develop Final Report Project Management Subtask Management		▲																	
		▼																	
		▲		▼															
		▲		▼															
Accrued Costs	b. Planned	3.7	7.4	11.1	14.8	17.7	26.8	33.2	43.8	65.4	91.2	110.0	129.7						
	c. Actual	1.8	3.3	7.7	13.1	16.5	21.6	26.4	33.5	53.1									
	d. Variance	1.9	4.1	3.4	1.7	1.2	5.2	6.8	10.3	12.3									

- ▲ Begin Milestone                      ○ Equipment Arrival                      □ Draft Final Report                      ◆ Workshop or Special Meeting
- ▼ Milestone Complete                      ● Progress Report                      ■ Final Report                      ▽ Present Status

1 Revised Completion Schedule

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ECONOMICS OF WECS OWNED BY THE END USER

ROGER TAYLOR



OBJECTIVE

DETERMINE THE ECONOMIC VIABILITY OF DISPERSED WIND TURBINE GENERATORS OWNED BY THE END USER.

ACCOMPLISHMENTS

REEVALUATED TASK AND DEFINED NEW WORK PLAN. ALL PREVIOUS WORK ON THIS TASK HAS BEEN DISCONTINUED.

ALL RESPONDENTS TO THE RFP ENTITLED "GUIDES FOR REPRESENTING ELECTRIC UTILITY RATE STRUCTURES AND RATES" WERE NOTIFIED THAT THE SUBCONTRACT WOULD NOT BE AWARDED DUE TO TASK PLAN REVISIONS.

THE RSSG DRAFT REPORT ON WECS FOR RECS HAS BEEN REVIEWED, AND MANY TECHNICAL PROBLEM AREAS IDENTIFIED. A MEETING WAS HELD AT RSSG TO DISCUSS THOSE PROBLEMS. THE COMPLETION OF THE REVISED FINAL REPORT IS NOW AWAITING GUIDANCE DIRECTION FROM DOE AS TO HOW TO PROCEED.

PLANNED ACTIVITIES

THE TASK HAS BEEN REORGANIZED INTO TWO MAIN PHASES TO REACH THE OBJECTIVE OF DETERMINING THE VALUE OF WECS TO THE END USER. THE FIRST PHASE CONSISTS OF THE

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DEVELOPMENT OF, OR MODIFICATIONS TO, A COMPUTER PROGRAM TO MODEL THE ECONOMIC BENEFITS TO THE END USER OF OWNERSHIP OF A WECS. THIS MODEL WILL HAVE AS INPUTS SUCH FACTORS AS MACHINE PERFORMANCE DATA, WEATHER DATA, USER ECONOMICS, UTILITY RATES AND RATE STRUCTURES, AND USER LOAD PROFILES, AND WILL BE AVAILABLE FOR USE ON THE SERI COMPUTER.

THE SECOND PHASE IS A REQUIREMENTS DEFINITION OF WECS FOR THE END USER AND IMPACT ANALYSIS STUDY THAT WILL UTILIZE THE COMPUTER MODEL. DIFFERENT SCENARIOS WILL BE USED FOR THIS STUDY, USING ACTUAL UTILITY AND PERFORMANCE DATA. UPON THE COMPLETION OF THIS WORK, A REPORT WILL BE PUBLISHED WHICH WILL BE OF USE TO THE END USER TO AID IN DECISIONS CONCERNING PRIVATE OWNERSHIP OF WECS.

THIS PROJECT WILL BE PERFORMED IN CONJUNCTION WITH THE MARKET CHARACTERIZATION TASK, SINCE THE USE OF THE ECONOMIC MODEL IS COMMON TO BOTH PROJECTS.

THE RSSG REPORT WILL BE REVISED.

#### PROBLEMS

LOSS OF KEY PERSONNEL ON THIS SUBTASK HAS AGAIN CAUSED INCONSISTENCIES AND DELAYS, THEREFORE PROGRESS IS MINIMAL. THIS TASK HAS BEEN REDEFINED AND IS EXPECTED TO PROCEED IN A MORE ORGANIZED MANNER.

OUTPUT

PHASE I - COMPUTER MODEL OF ECONOMICS OF WECS FOR THE END USER. ADAPTED FOR USE ON SERI COMPUTER.

PHASE 2 - REQUIREMENTS DEFINITION OF WECS FOR THE END USER AND IMPACT ANALYSIS.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
251K	40K	71K	10K

TABLE 6. SUBCONTRACTS  
(BEING REVISED)

CONTRACTOR	WORK TITLE	PLANNED				ACTUAL		
		AMOUNT \$K	PR. COMPL. DATE	START DATE	END DATE	AMOUNT \$K	START DATE	AMOUNT TO BE COSTED \$K
<u>3532.25 ECONOMICS OF WECS OWNED BY THE END USER</u>								
TBD (RENEWAL)	WECS FOR RECS	157	5/80	7/80	3/81	120	--	--
TBD (COMPETITIVE)	ECONOMICS OF WECS	28	1/80	8/80	11/80	9	--	--

**Economics of WECS Owned by the End User (3532.25)**

Task or Subtask Activities		Fy 80											Fy 81					
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Subtask Redefinition								△	—	—	—	▽						
RFP Preparation									△	—	—	▽						
Contract Solicitation and Negotiation											△	—	—	▽				
Contract Award													▽					
Project Management													△	◆				
Subtask Management			◆		◆			◆			▽	◆		◆				
Accrued Costs	Planned	5.1	10.3	16.7	27.5	33.7	41.8	53.5	62.1	70.6	83.7	92.7	129.9					
	Actual	3.4	10.5	17.8	24.1	30.2	33.5	34.9	36.3	40.1								
	Variance	1.7	(0.2)	(1.1)	3.4	3.5	8.3	18.6	25.8	30.5								

- △ Begin Milestone
- ▽ Milestone Complete
- Equipment Arrival
- Progress Report
- Draft Final Report
- Final Report
- ◆ Workshop or Special Meeting
- ▽ Present Status

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UTILITY ANALYTICAL MODELING

DAVID PERCIVAL

OBJECTIVE

ESTABLISH THE CAPABILITY TO REPRESENT WIND-DERIVED GENERATION IN ELECTRIC UTILITY GENERATION PLANNING MODELS SO THAT THE ECONOMIC VALUE OF THE WECS OPTION MAY BE EXAMINED.

ACCOMPLISHMENTS

EXTENDED MODELS TO ALLOW THE USE OF A TABLE OF ELECTRICAL OUTPUTS AT CORRESPONDING WINDSPEEDS. THIS SHOULD ALLOW THE MODELING OF VERTICAL AXIS AND INNOVATIVE WECS DESIGNS.

DRAFT OF DELIVERABLE REPORT "ELECTRIC UTILITY VALUE DETERMINATION--WIND: VOLUME 1, METHODOLOGY" COMPLETED REVIEW BY INTERNAL STAFF AND TECHNICAL EDITOR. REVISIONS WERE MADE AND VOLUME 1 IS ALMOST READY FOR EXTERNAL REVIEW. VOLUME 2, "USERS' GUIDE" HAS ALSO UNDERGONE MINOR REVISIONS AND WILL BE READY FOR TECHNICAL EDITOR REVIEW SOON.

EXTERNAL REVIEWERS INCLUDE:

DR. TOM REDDOCH, PROF. UNIVERSITY OF TENNESSEE  
DR. ROBERT SULLIVAN, PROF. UNIVERSITY OF FLORIDA  
OLIVER GILDERSLEEVE, EPRI  
DR. JEFF RUMBAUGH, DOE OFFICE OF ELECTRIC ENERGY SYSTEMS  
SHERRELL GREENE, ORNL  
JOHN BANNICK, NEW ENGLAND REGIONAL COMMISSION  
JILL BAYLOR, DUKE POWER CO.  
CLAUDIA GRIEF, PACIFIC GAS AND ELECTRIC

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THE METHODOLOGY IS BEING EXERCISED FOR THE "SELECTING UTILITY VALUE ANALYSIS" STUDY. TO DATE WORK HAS BEEN IN THE ANALYSIS OF THE SAN GORGONIO SITE WIND DATA AND THE SCE UTILITY DATA MODELING.

PLANNED ACTIVITIES

FINALIZE DELIVERABLE REPORTS.

COMPLETE VALUE DETERMINATION FOR SCE AS PART OF 16 SITE STUDY.

OUTPUT

REPORT ON UTILITY PRODUCTION COST MODEL EVALUATIONS.

REPORT ON METHODOLOGY AND USERS MANUAL FOR THE WECS REPRESENTATION.

UTILITY PLANNING PACKAGE INCORPORATING WECS SUCH THAT DOE/SERI STUDIES MAY BE PERFORMED. MODELS DEVELOPED WILL ALSO BE AVAILABLE FOR DISTRIBUTION TO UTILITIES, PUCs, STATE PLANNING OFFICES, ETC.

PLANNED COMPLETION OF DOCUMENTATION--SEPT. 1980.



BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
130K	79K	66K	-0-

SUBCONTRACTS

NONE.

### WECS Utility Analytical Modeling (3532.15)

Task or Subtask Activities		Fy 80												Fy 81					
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Integrated WECS Value Model Probabilistic Wind Enhancement  Model Validation Methodology Report Program Users Manual Innovative WECS Inclusion Subtask Management		▲		▲		▲		▲		▲		▲		▲		▲		▲	
		▲		▲		▲		▲		▲		▲		▲		▲		▲	
		▲		▲		▲		▲		▲		▲		▲		▲		▲	
		▲		▲		▲		▲		▲		▲		▲		▲		▲	
		▲		▲		▲		▲		▲		▲		▲		▲		▲	
Accrued Costs	b. Planned	5.7	11.7	20.7	28.6	36.5	47.5	47.9	54.8	66.2	74.6	83.0	95.5						
	c. Actual	6.2	33.8	54.8	57.6	63.3	66.0	69.8	77.6	79.2									
	d. Variance	(0.5)	(22.1)	(34.1)	(29.0)	(26.8)	(18.5)	(21.9)	(22.8)	(13)									

- ▲ Begin Milestone
- ▼ Milestone Complete
- Equipment Arrival
- Progress Report
- Draft Final Report
- Final Report
- ◆ Workshop or Special Meeting
- ▽ Present Status

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SELECTED UTILITIES VALUE ANALYSIS

ROGER TAYLOR

OBJECTIVE

DETERMINE THE VALUE OF WECS AT SPECIFIC SITES IN RELATIONSHIP TO SYSTEM MIX OF SELECTED UTILITIES.

ACCOMPLISHMENTS

MET WITH CONSUMERS POWER REPRESENTATIVE AND OBTAINED MOST OF NEEDED UTILITY DATA. VERY COOPERATIVE RECEPTION.

JBF AND AEROSPACE METHODOLOGY REPORTS RECEIVED AND REVIEWED INTERNALLY. NO RESPONSES FROM EXTERNAL REVIEW COMMITTEE DUE TO DELAYS IN GETTING CONSULTING AGREEMENTS FINALIZED. REVIEW COMMITTEE MEMBERS ARE:

DR. FELIX WU, ENGINEERING PROFESSOR, UNIVERSITY OF CALIFORNIA  
DR. ROBERT SULLIVAN, ENGINEERING PROFESSOR, UNIVERSITY OF FLORIDA  
OLIVER GILDERSLEEVE, EPRI  
DR. TOM REDDOCH, ENGINEERING PROFESSOR, UNIVERSITY OF TENNESSEE  
DR. JEFF RUMBAUGH, DOE (EX-OFFICIO)

RFP FOR EXTENSION SENT OUT AND RESPONSES RECEIVED. CONFUSION OVER CONTENT OF PHASE I IS BEING RESOLVED.

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THE REHABILITATION OF SAN GORGONIO WIND DATA BY SUBCONTRACTORS AND SERI WAS COMPLETED. QUALITY OF DATA VARIES FROM MONTH TO MONTH. THE AMOUNT OF 150 FT ANEMOMETER READINGS THAT ARE MISSING VARIES FROM 5% TO 48%.

THE PAINFULLY SLOW EXTRACTION OF UTILITY DATA CONTINUED THROUGH THIS QUARTER. CLARIFICATION OF QUESTIONS ARE BEING DONE BY AEROSPACE THROUGH A COMBINATION OF OFFICIAL REQUESTS AND ENQUIRIES OF SCE PLANNING PERSONNEL.

COMPLETION OF UTILITY MODELING DATA AWAITS FINANCIAL DATA: FULL COSTS, O&M COSTS, CAPITAL COSTS, FIXED CHARGE RATES, ETC.

#### PLANNED ACTIVITIES

CONDUCT REVIEW OF INITIAL RESULTS FOR SAN GORGONIO SITE ON THE SCE SYSTEM IN LATE JULY OR EARLY AUGUST.

COMPILE EXTERNAL REVIEW COMMITTEE COMMENTS ON JBF AND AEROSPACE METHODOLOGY REPORTS. SUBMIT THESE FOR INCORPORATION.

COMPLETE SAN GORGONIO VALUE DETERMINATION.

BEGIN LUDINGTON VALUE DETERMINATION.

OUTPUT

THE DELIVERY DATES FOR REPORTS IS BEING RE-NEGOTIATED. DRAFT FOR SAN GORGONIO SITE SHOULD BE AVAILABLE IN AUGUST.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
1070K	331K	448K	234K

TABLE 8. SUBCONTRACTORS SCHEDULE OF STUDY SITES

AEROSPACE CORP.		JBF SCIENTIFIC, INC.	
<u>SITE</u>	<u>UTILITY</u>	<u>SITE</u>	<u>UTILITY</u>
SAN GORGONIO PASS, CA	SOUTHERN CALIFORNIA EDISON	SAN GORGONIO PASS, CA	SOUTHERN CALIFORNIA EDISON
LUDINGTON, MI	CONSUMERS POWER Co.	LUDINGTON, MI	CONSUMERS POWER Co.
MONTAUK POINT, NY KINGSLEY DAM, NE	LONG ISLAND LIGHTING Co. CENTRAL NEB. PUBLIC POWER	PT. ARENA, CA HOLYOKE, MA	PACIFIC GAS AND ELECTRIC CITY OF HOLYOKE GAS AND ELECTRIC Co.
COLD BAY, AK	ALASKA BUSSELL ELECTRIC	AMARILLO, TX	SOUTHWESTERN PUBLIC SER- VICE Co.
BOONE, NC	BLUE RIDGE ELECTRIC MEMBER- SHIP CORP.	CULEBRA, PR	PUERTO RICO WATER RESOURCES AUTHORITY
BOARDMAN, OR RUSSELL, KS HURON, SD	PORTLAND GENERAL ELECTRIC Co. CITY OF RUSSELL EAST RIVER POWER COOPERATIVE	CLAYTON, NM KAENA PT., HI BLOCK ISLAND, RI	TOWN OF CLAYTON HAWAIIAN ELECTRIC Co. BLOCK ISLAND POWER Co.

TABLE 9. SUBCONTRACTS

CONTRACTOR	WORK TITLE	PLANNED					ACTUAL		
		AMOUNT \$K	PR. COMPL. DATE	START DATE	END DATE	AMOUNT TO BE COSTED DURING FY80	AMOUNT \$K	START DATE	AMOUNT TO BE COSTED \$K
<u>3532.20 SELECTED UTILITIES VALUE ANALYSES</u>									
JBF CORP.	SITE VALUE ANALYSIS	370	--	11/79	11/80	296	355	12/79	300
AEROSPACE	SITE VALUE ANALYSIS	210	--	11/79	11/80	175	212	12/79	175
JBF CORP.	LADWP vs SCE ANALY.	20	4/80	6/80	6/80	--	--	--	--
JBF CORP.	SITE ANALYSIS EXT.	172	4/80	11/80	5/81	--	--	--	--
AEROSPACE CORP.	SITE ANALYSIS EXT.	150	4/80	11/80	5/81	--	--	--	--



### Selected Utilities Value Analysis (3532.20)

Task or Subtask Activities		Fy 80											Fy 81					
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Analysis of San Gorgonio Site																		
Analysis of Ludington Site																		
Analysis of Next 4 Sites by Each Subcontractor																		
Analysis of Last 3 Sites																		
Project Management																		
Subtask Management																		
Accrued Costs	b. Planned	5.9	11.8	69.4	129.1	189.8	249.4	318.1	389.9	448.3	507.7	568.6	628.0					
	c. Actual	9.2	16.6	20.4	71.1	173.5	249.9	302.0	354.7	383.0								
	d. Variance	(3.3)	(4.8)	49.0	58.0	16.3	(0.5)	16.1	35.2	65.3								

- △ Begin Milestone                      ○ Equipment Arrival                      □ Draft Final Report                      ◆ Workshop or Special Meeting
- ▼ Milestone Complete                      ● Progress Report                      ■ Final Report                      ▽ Present Status

- 1 Revised Completion Schedule
- 2 Revised Start Schedule

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ECONOMICS OF WECS TIED TO UTILITIES

DAVID PERCIVAL

OBJECTIVES

COMPARE EPRI UTILITY DATA TO DATA OBTAINED FROM UTILITIES IN 16 SITE VALUE STUDY.

DETERMINE THE SENSITIVITY OF WECS VALUE TO UTILITY OPERATIONAL AND ECONOMIC PARAMETERS.

ACCOMPLISHMENTS

CONTINUED CONTACT WITH EPRI REVEALS THAT DATA WILL PROBABLY NOT BE READY UNTIL AUGUST 1980. ALSO THE CONVERSION TO PROMOD WILL REQUIRE MORE EFFORT THAN PREVIOUSLY THOUGHT.

PLANNED ACTIVITIES

PERFORM CONVERSION OF REGIONAL UTILITY DATA AND BEGIN STUDY OF TWO REGIONS.

OUTPUT

DRAFT REPORT WILL BE DELAYED UNTIL NOVEMBER 1980.

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BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
55K	22K	38K	0

SUBCONTRACTS

NONE

### Economics of WECS Tied To Utilities (3532.30)

Task or Subtask Activities		Fy 80												Fy 81									
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar				
Select Region for Analysis Perform Analysis Utilizing PROMOD Subtask Management					▲	—	—	—	—	▼	▼	▲ <sup>1</sup>	▼	□	▼	◆	▼	▲ <sup>2</sup>	▼	■ <sup>2</sup>			
Accrued Costs	b. Planned	3.5	7.0	10.5	14.0	18.1	23.2	28.4	33.0	37.6	42.1	46.6	52.1										
	c. Actual	3.1	5.7	7.7	8.6	12.5	13.5	18.8	21.9	22.1													
	d. Variance	0.4	1.3	2.8	5.4	5.6	9.7	9.6	11.1	15.5													

- △ Begin Milestone                      ○ Equipment Arrival                      □ Draft Final Report                      ◆ Workshop or Special Meeting
- ▼ Milestone Complete                      ● Progress Report                      ■ Final Report                      ▼ Present Status

1 Revised Start Schedule  
2 Revised Completion Schedule

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A COMPREHENSIVE GUIDE: WECS CONNECTED TO ELECTRIC UTILITIES

ROGER TAYLOR

OBJECTIVES

PROVIDE A COMPREHENSIVE, CONSOLIDATED, READABLE SOURCE OF INFORMATION ON WECS AS IT RELATES TO ELECTRIC UTILITIES.

PROVIDE A KEY REFERENCE DOCUMENT TO UTILITIES, PUBLIC UTILITY COMMISSIONS, STATE ENERGY OFFICES, AND OTHERS ON PAST AND CURRENT DEVELOPMENTS IN THE FIELD OF WIND ENERGY.

ACCOMPLISHMENTS

NO ACCOMPLISHMENTS THIS QUARTER DUE TO UNAVAILABILITY OF STAFF. THIS SUBTASK HAS BEEN PUT ON INDEFINITE HOLD.

PLANNED ACTIVITIES

NONE

OUTPUT

DRAFT REPORT ORIGINALLY SCHEDULED DURING 4TH QUARTER FY80 WILL HAVE TO BE RESCHEDULED DUE TO DELAYS AND LACK OF STAFF.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	50K	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	79K	COMMITMENTS	0
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SUBCONTRACTS

NONE



## A Comprehensive Guide, WECS Connected to Electric Utilities (3532.60)

Task or Subtask Activities <sup>1</sup>		Fy 80												Fy 81						
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	
Data Collection on: Technical Characteristics Institutional Issues Economic Assessment Resources and Siting WECS Guide to Utilities Project Management Subtask Management																				
Accrued Costs	b. Planned	6.2	11.8	17.6	21.5	25.1	36.2	47.6	63.1	78.6	94.0	109.2	124.2							
	c. Actual	5.5	10.2	18.6	27.0	31.4	40.1	45.2	50.0	49.9*										
	d. Variance	0.7	1.6	(1.0)	(5.5)	(6.3)	(3.9)	2.4	13.1	28.7										

- △ Begin Milestone                      ○ Equipment Arrival                      □ Draft Final Report                      ◆ Workshop or Special Meeting
- ▼ Milestone Complete                      ● Progress Report                      ■ Final Report                      ▽ Present Status

<sup>1</sup> No Progress - See Report

\* Due to the fluctuating year to date overhead rates in the present accounting system.

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ECOLOGICAL, SOCIO-ENVIRONMENTAL ASSESSMENT OF WIND SYSTEMS

CARL STROJAN

OBJECTIVES

IDENTIFY AND QUANTIFY THE LIFE-CYCLE ENVIRONMENTAL EFFECTS OF BOTH SMALL AND LARGE WIND ENERGY SYSTEMS.

ASSESS COMPARATIVELY THE ENVIRONMENTAL EFFECTS OF SMALL AND LARGE WIND ENERGY SYSTEMS UNDER SELECTED DEPLOYMENT OPTIONS; E.G., COMMUNITY SCALE USE OF MANY SMALL WECS COMPARED WITH FEWER LARGE WECS.

ACCOMPLISHMENTS

BEGAN WORK ON A TECHNICAL SERVICES CONTRACT WITH FRANKLIN ASSOCIATES TO OBTAIN ESTIMATES OF AIR AND WATER POLLUTANTS EMITTED AND ENERGY CONSUMED DURING PRODUCTION OF RAW MATERIALS USED FOR WECS.

PLANNED ACTIVITIES

COMPLETE REVIEW OF DRAFT FINAL REPORT ON THE ENVIRONMENTAL EFFECTS OF SWECS BY WSB/DOE AND OUTSIDE REVIEWERS.\*

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\*THE FOLLOWING PERSONS WILL RECEIVE DRAFT FINAL REPORTS FOR REVIEW: ROBERT FERBER, UNIV. ILL-SRL; THOMAS SENIOR, UNIV. MICH; BEN BLANEY, EPA/CINCINNATI; DAVID BERG, EPA/WASHINGTON, D.C.; JOHN HOLDREN, UNIV. CALIF./BERKELEY; SHARRON ROGERS, BATTELLE-COLUMBUS; THEODORE KORNREICH, SAI, INC.; ROCKY FLATS WIND SYSTEMS GROUP; LARRY WENDELL, BATTELLE PNL.

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PREPARE DRAFT REPORT ON THE ENVIRONMENTAL ASPECTS OF MEDIUM AND LARGE SCALE MACHINE PRODUCTION FOR INCORPORATION INTO FY80 SUBTASK.

OUTPUT

PROGRESS REPORT PRESENTING A SYNTHESIS AND EVALUATION OF PREVIOUS WECS ENVIRONMENTAL RESEARCH; SERI'S SURVEY ON THE AESTHETICS OF SWECS; A DESCRIPTION OF GENERIC SWECS DESIGNS FOR WHICH ENVIRONMENTAL ANALYSES WILL BE PERFORMED; AND AN OUTLINE OF PLANNED TASK ACTIVITIES. (COMPLETED)

FINAL REPORT THAT PRESENTS AN ANALYSIS OF THE POTENTIAL HEALTH AND ECOLOGICAL EFFECTS OF SWECS FOR EACH LIFE-CYCLE PHASE (SYSTEM FABRICATION THROUGH DECOMMISSION) AND AN ASSESSMENT OF THE NET ENVIRONMENTAL EFFECTS OF SWECS. (IN PREPARATION AND REVIEW)

TECHNICAL PAPER WHICH PRESENTS THE RESULTS OF THE AESTHETICS SURVEY OF SWECS. (COMPLETED)

ENVIRONMENTAL, HEALTH, AND SAFETY IMPACT DATA FOR INPUT INTO PLANNING PERFORMED FOR DOE.

FINAL REPORT FOR FY80 EFFORT THAT PRESENTS A COMPARATIVE ENVIRONMENTAL ASSESSMENT OF SMALL AND LARGE WECS UNDER SELECTED DEPLOYMENT OPTIONS.

BUDGET SUMMARY

TOTAL BUDGET (FY80) \$98K	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES 72K	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES 59K	COMMITMENTS 1K
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TABLE 10. SUBCONTRACTS

CONTRACTOR	WORK TITLE	PLANNED				ACTUAL		
		AMOUNT \$K	PR. COMPL. DATE	START DATE	END DATE	AMOUNT \$K	START DATE	AMOUNT TO BE COSTED \$K
<u>3531.35 ECOLOGICAL/SOCIO-ENVIRONMENT ASSESSMENT</u>								
FRANKLIN ASSOC. (TECH. SERVICES)	POLLUTION ESTIMATES	10	4/80	5/80	8/80	10	3/80	10

### Wind Ecological/Socio-Environmental Assessment (3531.35/3531.39)

Task or Subtask Activities	Fy 80												Fy 81					
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
<b>3531.39</b> FY79 Activities Ecological Assessment of SWECS Technical Paper: SWECS Aesthetics Survey		●					□	■		▽								
<b>3531.35</b> Determine Format For Standardized Environmental Impact Data Collect And Synthesize Environ- mental Impact Data Perform Environmental Impact Assessment Subtask Management		△		△	▽	▽												
Accrued Costs		△	◆	◆			●	◆		▽	◆	□		◆	■			
b. Planned	8.4	17.7	28.1	30.7	34.2	37.9	40.6	50.1	59.1	71.1	82.6	100.4						
c. Actual	5.6	13.2	23.4	32.4	43.8	52.4	56.7	61.3	72.9									
d. Variance	2.8	4.5	4.7	(1.7)	(9.6)	(14.5)	(16.1)	(11.2)	(13.8)									

- △ Begin Milestone
- Equipment Arrival
- Draft Final Report
- ◆ Workshop or Special Meeting
- ▼ Milestone Complete
- Progress Report
- Final Report
- ▽ Present Status
- 1 Revised Completion Schedule

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TELEVISION INTERFERENCE AND WECS

NEIL KELLEY



OBJECTIVE

DETERMINE THE EXTENT AND CAUSES OF THE INTERFERENCE TO TELEVISION SIGNALS IN THE VICINITY OF OPERATIONAL WIND TURBINES AND IDENTIFY METHODS OF ALLEVIATING OR ELIMINATING THAT INTERFERENCE.

ACCOMPLISHMENTS

NEGOTIATIONS COMPLETED AND CONTRACT SIGNED FOR CONTINUING OF UNIVERSITY OF MICHIGAN TVI STUDIES (95K FOR A 12 MONTH EFFORT).

SUBCONTRACTING PROCUREMENT INITIATED FOR FEASIBILITY OF DEVELOPING AN ELECTRONIC ANTI-GHOSTING DEVICE FOR REDUCING TVI FROM WIND TURBINES BY POLYTECHNIC INSTITUTE OF NEW YORK.

TVI/COMMUNICATIONS QUESTIONS ARISING AT THE HAWAIIAN AND GOODNOE HILLS SITES RESOLVED BY UNIVERSITY OF MICHIGAN.

DRAFT OF TVI SITING HANDBOOK AND BLOCK ISLAND TVI REPORT IN FINAL STAGES OF REVIEW BY RON THOMAS, NASA/LERC; GRANT AYERS, BLUE RIDGE ELECTRIC MEMBERSHIP CORP.; DAN D. GIOVACCHINO, VALLEY FORGE SPACE TECHNOLOGY CENTER; JERRY FRICK, BONNEVILLE POWER; AND BOB McCONNELL, PETER SOUTH, NEIL KELLEY, CARL STROJAN, AND RON LARSON OF SERI.

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A FAST RESPONSE TEST OF THE ANTENNA INSTALLATIONS IN BOONE WAS ATTEMPTED BUT PROVED FAR FROM CONCLUSIVE DUE TO LOGISTICAL PROBLEMS AND UNEXPECTED HOMEOWNER VACATIONS.

#### PLANNED ACTIVITIES

MUTUALLY DEVELOP AN ANTENNA EVALUATION PROGRAM FOR THE BOONE INSTALLATIONS WHICH WILL MEET THE REQUIREMENTS OF ALL PARTIES INVOLVED: I.E., NASA, SERI, BREMCO, GE, AND THE UNIVERSITY OF MICHIGAN, AND RESCHEDULE ANOTHER FIELD MEASUREMENT PERIOD ACCORDINGLY.

RETURN REVIEWER COMMENTS TO UNIVERISTY OF MICHIGAN ON TVI HANDBOOK AND BLOCK ISLAND REPORT FOR INCORPORATION AND REVISION.

NEGOTIATE ANTI-GHOSTING DEVICE SUBCONTRACT WITH POLYTECHNIC INSTITUTE OF NEW YORK.

UNIVERSITY OF MICHIGAN TO BEGIN TO FOCUS ON TVI ASSOCIATED WITH SWECS AND VAWT.

#### OUTPUT

SYSTEMATIC TVI MEASUREMENTS AT LARGE WIND TURBINE SITES.

AN UPDATED TVI SITING HANDBOOK FOR LARGE WIND SYSTEMS.

A TVI SITING HANDBOOK FOR SMALL WIND SYSTEMS.

BLOCK ISLAND/BOONE AS EXPERIMENTAL LABS FOR TVI

SOURCE: T.B.A SENIOR, UNIVERSITY OF MICHIGAN

COMMENTS: ANY OPERATING WIND TURBINE CAN BE USED AS A TEST GROUND FOR TVI. HOWEVER, BLOCK ISLAND IS LESS SUITED THAN MOST DUE TO INACCESSIBLE SECTORS (PONDS, ETC.). FURTHERMORE, THE TV SIGNALS ARE PROBABLY STRONGER THAN AT THE CLAYTON SITE; ALSO CLAYTON IS A FAR MORE SUITABLE TEST GROUND DUE TO ACCESSIBILITY IN ALL DIRECTIONS AROUND THE TURBINE.

BOONE OFFERS THE OPPORTUNITY TO DEVELOP RETROFIT PROCEDURES TO COMPENSATE FOR TVI. SUCH DEVELOPMENT, HOWEVER, WOULD BE ACADEMIC ASSUMING THAT TVI SITING HANDBOOKS WOULD BE SUCCESSFUL. THEREFORE EXCEPT FOR RETROFIT ASPECTS, BOONE IS ALSO NOT THE MOST SUITABLE TEST GROUND FOR WIND TURBINE CAUSED TVI.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
170K	13K	53K	95K

TABLE 11. SUBCONTRACTS

CONTRACTOR	WORK TITLE	PLANNED				ACTUAL			
		AMOUNT \$K	PR. COMPL. DATE	START DATE	END DATE	AMOUNT TO BE COSTED DURING FY80	AMOUNT \$K	START DATE	AMOUNT TO BE COSTED \$K
<u>3532.50 TELEVISION INTERFERENCE AND WECS</u>									
UNIVERSITY OF MICHIGAN	TVI HANDBOOK	50	2/80	4/80	10/80	50	95	4/80	40
POLYTECHNIC INSTITUTE OF NEW YORK (PINY)	TVI GHOST SUPPRESSION	19	2/80	6/80	5/81	19	42	9/80	10

### Television Interference and WECS (3532.50)

Task or Subtask Activities	Fy 80												Fy 81					
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Complete TVI Site Survey at Block Island, RI	▼			□			■		■	▼								
TVI Site Survey at Boone, NC								△	▼	▽	●							
Small WECS TVI Test								△	▽	▽	▼							
Update TVI Handbook for Large WECS			□						■									
Develop TVI Handbook for Small WECS										△	▽	●		□			■	
TVI Suppression Study									△	▽	▽					□		
Project Management	△						◆			▽								
Subtask Management	△	◆		◆			◆			◆	▽			◆			◆	
Accrued Costs	b. Planned	2.1	4.2	8.5	14.0	16.8	20.2	22.8	37.4	52.8	67.4	82.5	97.2					
	c. Actual	1.6	2.5	3.9	5.4	7.7	7.8	9.0	10.3	12.7								
	d. Variance	0.5	1.7	4.6	8.6	9.1	12.4	13.8	27.1	40.1								

- |                      |                     |                      |                               |
|----------------------|---------------------|----------------------|-------------------------------|
| △ Begin Milestone    | ○ Equipment Arrival | □ Draft Final Report | ◆ Workshop or Special Meeting |
| ▼ Milestone Complete | ● Progress Report   | ■ Final Report       | ▽ Present Status              |

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NOISE MEASUREMENTS AT SELECTED WIND SYSTEM SITES

NEIL KELLEY

### OBJECTIVES

DOCUMENT AND QUANTIFY THE NOISE ASSOCIATED WITH THE OPERATION OF EXISTING LARGE WIND TURBINES AND IDENTIFY THE PRINCIPLE MECHANISMS THAT ARE RESPONSIBLE FOR THE GENERATION, PROPAGATION, AND ANY POTENTIAL IMPACTS BY UTILIZING FIELD MEASUREMENTS AND EXISTING ANALYTICAL TOOLS.

DEVELOP SUGGESTIONS FOR MINIMIZING THE NOISE GENERATED BY MOD-1 AND ITS IMPACT ON THE PUBLIC.

### ACCOMPLISHMENTS

PRESENTED SERI RESULTS ON MOD-1 NOISE SITUATION AT QUARTERLY REVIEW FOR WESD/DOE MAY 21.

COMPLETED SYSTEMATIC NOISE SURVEY OF MOD-1, INCORPORATING ACOUSTIC, METEOROLOGICAL, AND SEISMIC MEASUREMENTS, APRIL 6.

COMPLETED NOISE SURVEY OF MOD-0 IN BOTH UPWIND AND DOWNWIND CONFIGURATIONS, MAY 17.

COMPLETED ACOUSTIC MEASUREMENTS ASSOCIATED WITH LOAD BANK TESTS ON BOTH 23 AND 35 RPM OPERATION OF THE MOD-1, JUNE 13.

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PRESENTED RESULTS OF WIND TURBINE NOISE WORK TO WATER & POWER RESOURCE SERVICES PERSONNEL, JUNE 5.

SUGGESTED INSTALLING A SIMPLE AERODYNAMIC SPOILER DEVICE ON THE SOUTH LEG OF THE MOD-1 TOWER TO EVALUATE THE WORTH OF SUCH A DEVICE IN REDUCING THE IMPULSIVE SOUNDS GENERATED BY TURBINE OPERATION, MAY 14.

COMPLETED FIELD MEASUREMENTS OF NOISE BACKGROUND AT GOODNOE HILLS SITE, JUNE 20.

PRESENTED PRELIMINARY SERI RESULTS AND SUGGESTIONS ON MOD-1 NOISE AT FIRST QUARTERLY NOISE REVIEW AT NASA LEWIS, JUNE 26.

#### PLANNED ACTIVITIES

COMPLETE DATA REDUCTION AND ANALYSIS OF SERI MEASUREMENTS TAKEN IN THE FIELD AT THE MOD-0, MOD-1, AND MOD-2 SITES.

WORK WITH PENN. STATE TO COMPLETE THE SOUND PROPAGATION ANALYSES FOR THE INTENSIVE MOD-1 MEASUREMENTS PENDING RECEIPT OF TETHERSONDE DATA FROM PNL AND UNIVERSITY OF VIRGINIA.

INVESTIGATE THE NOISE GENERATED BY A 25-KW SWECS INSTALLED AT ROCKY FLATS WHICH APPEARS TO BE VERY SIMILAR TO THAT GENERATED BY THE MOD-1 AND (IF POSSIBLE) TO REDUCE THE IMPULSE BY INSTALLING A TEMPORARY SPOILING DEVICE ON THE TOWER.



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DEPENDING ON THE OUTCOME OF THE SWECS TEST AND THE AVAILABILITY OF SUFFICIENT FUNDS, TO MEASURE THE MOD-1 NOISE OUTPUT WITH SOME FORM OF A SPOILER DEVICE INSTALLED DURING AUGUST.

HOLD THE SECOND QUARTERLY REVIEW AT SERI DURING LATE AUGUST OR EARLY SEPTEMBER. PRIMARY SUBJECT: TURBINE NOISE PROPAGATION.

#### PROBLEMS/VARIANCES

THE LARGE EXPENDITURE ASSOCIATED WITH THE ON-GOING INVESTIGATION OF THE MOD-1 NOISE SITUATION (>\$250K) HAS DEPLETED EVEN THE AUGMENTED TASK BUDGET OF \$440K AND THEREFORE NECESSITATES POSTPONING VAWT NOISE MEASUREMENTS AND THE NASA-REQUESTED SVT BACKGROUND SURVEY INTO FY81. FURTHER, IT NOW APPEARS UNLIKELY THAT THE TASK BUDGET WILL BE CAPABLE OF SUSTAINING ANOTHER FIELD TRIP TO THE MOD-1 DURING FY80 AND THAT TOO MUST BE POSTPONED.

#### OUTPUT

SUGGEST OPTIONS REGARDING MINIMIZING THE NOISE ASSOCIATED WITH THE OPERATION OF THE MOD-1 WTG AT BOONE, NC.

FINAL SUMMARY REPORT OF FY80 ACTIVITIES DETAILING THE RESULTS OF THE MOD-1 INVESTIGATION AND PERIPHERALLY-RELATED STUDIES, THE RESULTS OF A PRELIMINARY

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INVESTIGATION OF THE NOISE GENERATED BY THE MOD-0 IN THE UPWIND AND DOWNWIND CONFIGURATION, AND THE RESULTS OF THE NOISE BACKGROUND STUDY AT THE MOD-2 GOODNOE HILLS SITE.

BUDGET SUMMARY

TOTAL BUDGET (FY80) 440K	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES 285K	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES 282K	COMMITMENTS 53K
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TABLE 12. SUBCONTRACTS

CONTRACTOR	WORK TITLE	PLANNED					ACTUAL		
		AMOUNT \$K	PR. COMPL. DATE	START DATE	END DATE	AMOUNT TO BE COSTED DURING FY80	AMOUNT \$K	START DATE	AMOUNT TO BE COSTED \$K
<u>3532.55 NOISE MEASUREMENT AT SELECTED SITES</u>									
PNL	TETHER SONDE MEASUREMENTS	25	2/80	5/80	7/80	25	50	3/80	50
PENN STATE U.	STUDIES OF INFRASOUND	27	12/79	12/79	6/80	27	28	12/79	28
MIT	PROPAGATION WTG NOISE ESTIMATES	18	2/80	3/80	9/80	18	21	3/80	21

### Noise Measurements at Selected WECS Sites (3532.55)

Task or Subtask Activities	Fy 80												Fy 81				
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
<b>MOD-1 SPECIFIC</b>																	
Preliminary Noise Studies at MOD-1 Site (SERI)	△				▽												
Infrasound Propagation Studies Near MOD-1 Site (Penn State Univ)		△								▽							
Tethersonde Measurements Near MOD-1 Site (PNL)				△						▽							
Systematic Noise Survey Near MOD-1 (SERI, PNL, Penn State Univ)					△			▽									
Aerodynamic Noise Studies (MIT)				△						●	▽						▽
MOD-O Upwind/Downwind Noise Study (SERI)					△				▽								
MOD-1/0 Data Reduction & Interpretation (SERI)		△										▽	●		□		
MOD-1 Recommendations/Options (SERI)												▽	●		□		
<b>MOD-2 SPECIFIC</b>																	
MOD-2 Background Noise Study (SERI)								△		▽							
MOD-2 Noise Propagation Assessment (TBD)													△				▽
MOD-2 WTG Noise Study																△	
<b>WTG GENERIC</b>																	
WTG Noise Study (SERI)										△			●				●
Accrued Costs																	
b. Planned	5.9	9.9	17.8	36.7	45.1	63.6	198.3	243.1	282.2	318.5	347.2	375.9					
c. Actual	10.5	21.2	32.6	54.1	87.3	114.0	156.4	238.8	285.1								
d. Variance	(4.6)	(11.3)	(14.8)	(17.4)	(42.2)	(50.4)	(41.9)	(43)	(2.9)								

- △ Begin Milestone
- ▽ Milestone Complete
- Equipment Arrival
- Progress Report
- Draft Final Report
- Final Report
- ◆ Workshop or Special Meeting
- ▽ Present Status
- 1 Postponed due to lack of funds

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LAND USE ISSUES

ROBERT NOUN

OBJECTIVES

PROVIDE UTILITIES WITH AN ASSESSMENT OF THE SIMILARITIES AND DIFFERENCES BETWEEN WECS AND CONVENTIONAL POWER SYSTEMS IN TERMS OF SITING AND LICENSING REQUIREMENTS.

ACCOMPLISHMENTS

TASK ADVISORY COMMITTEE MET AT SERI ON APRIL 18 TO REVIEW TASK PLAN AND PROPOSED SUBCONTRACTOR STATEMENT OF WORK.

SUBCONTRACT AWARDED TO TSG, INC. (MIKE LOTKER) TO CONDUCT CASE STUDIES OF EXISTING OR PLANNED WECS/UTILITY INSTALLATIONS.

APPROVED CONSULTING AGREEMENT WITH DR. PAUL FRIESEMA, NORTHWESTERN UNIVERSITY.

COMPLETED ALL IN-HOUSE RESEARCH; BEGUN PREPARATION OF DRAFT FINAL REPORT.

SUBCONTRACTOR AND CONSULTANT BEGAN CASE STUDY SITE VISITS.

PLANNED ACTIVITIES

COMPLETE CASE STUDY VISITS.

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MEET WITH SUBCONTRACTOR AND CONSULTANT TO PLAN CONTENT OF CASE STUDIES IN DRAFT FINAL REPORT.

PREPARE DRAFT FINAL REPORT AND CIRCULATE FOR INTERNAL SERI AND TASK ADVISORY COMMITTEE REVIEW.

PREPARE FINAL REPORT TO COMPLETE TASK.

#### OUTPUT

A FINAL REPORT FOR USE BY DOE/WSB; UTILITIES, PUCS AND OTHERS CONTAINING:

- 0 A SUMMARY OF THE LAND AREA REQUIREMENTS, ENVIRONMENTAL IMPACTS, MULTIPLE LAND USE OPTIONS AND PUBLIC ATTITUDES AFFECTING WECS SITING BY UTILITIES;
- 0 AN OVERVIEW OF FEDERAL LAWS AND REGULATIONS THAT AFFECT WECS SITING BY UTILITIES;
- 0 AN OVERVIEW OF SELECTED STATE ENERGY FACILITY SITING LAWS THAT AFFECT WECS SITING WITHIN THE STATES;
- 0 SUMMARIES OF THE WECS/UTILITY CASE STUDIES;
- 0 INVENTORY OF FEDERAL LAWS AND REGULATIONS;
- 0 INVENTORY OF ENERGY FACILITY SITING LAWS OF THOSE STATES THAT HAVE INCLUDED WECS AS A RENEWABLE RESOURCE MEASURE UNDER THE RCS PROGRAM.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
135K	69K	64K	29K



TABLE 13. SUBCONTRACTS

CONTRACTOR	WORK TITLE	PLANNED					ACTUAL		
		AMOUNT \$K	PR. COMPL. DATE	START DATE	END DATE	AMOUNT TO BE COSTED DURING FY80	AMOUNT \$K	START DATE	AMOUNT TO BE COSTED \$K
<u>3531.30 LAND USE ISSUES</u>									
TSG (MIKE LOTKER)	WECS/UTILITY SITING ANALYSIS	25	3/80	5/80	9/80	25	25	5/80	25
UNIVERSITY OF DENVER LAW SCHOOL	LEGAL SUPPORT	10	1/80	1/80	10/80	10	10	1/80	10

### Land Use Issues (3531.30)

Task or Subtask Activities		Fy 80											Fy 81							
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	
Summarize Environmental Impacts Land Area Requirements, Regulations and Acquisitions Mechanisms Public Attitudes Multiple Land Use Options Land Use Constraints Subtask Management Advisory Committee Project Management		△		—		▼														
				△		—											▽		▼	
				△		—											▽		▼	
				△		—											▽		●	
				△		—											▽		◆	
				△		—											□		■	
Accrued Costs		b. Planned	6.5	12.3	17.3	24.4	30.5	38.1	45.7	55.9	64.2	84.6	98.4	115.2						
		c. Actual	6.5	11.5	15.3	22.0	30.3	33.2	41.2	58.5	69.1									
		d. Variance	0	0.8	2.0	2.4	0.2	4.9	4.5	(2.6)	(4.9)									

- △ Begin Milestone
  - Equipment Arrival
  - Draft Final Report
  - ◆ Workshop or Special Meeting
  - ▼ Milestone Complete
  - Progress Report
  - Final Report
  - ▽ Present Status
- 1 Meeting with Subcontractor and Consultant to Plan content of case studies in Final Report.  
 2 Circulation of Draft Final Report for review  
 3 Final Report

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STRATEGY ANALYSIS  
(WECS/PURPA ANALYSIS)

DAVID SCHALLER

OBJECTIVES

IDENTIFY THE IMPACT OF THE FEDERAL ENERGY REGULATORY COMMISSION'S RULES UNDER PURPA ON THE DEVELOPMENT OF WIND ENERGY.

DEVELOP A GUIDE AND INFORMATION SOURCE ON PURPA RULES FOR USE BY STATE UTILITY COMMISSIONS AND NONREGULATED UTILITIES.

ACCOMPLISHMENTS

REVISED SUBTASK WORK PLAN DEVELOPED AND APPROVED.

DRAFT REPORT.

OUTLINE COMPLETED AND ISSUE DEFINITION BEGUN, WITH FOCUS ON TECHNICAL AND INSTITUTIONAL QUESTIONS RAISED BY PURPA RULES.

PUC GUIDE EXPANDED AND TEXT PREPARATION BEGUN. CONTACTS WITH PUC STAFF ESTABLISHED AND GUIDE REVIEW SCHEDULES DEVELOPED.

PLANNED ACTIVITIES

CONTINUE INVESTIGATION OF PURPA RULE IMPACT ON PUBLIC UTILITY COMMISSIONS AND NONREGULATED UTILITIES.

DRAFT REPORT AND GUIDE DUE FOR INTERNAL/DOE REVIEW BY AUGUST 1, 1980.

OUTPUT

A REPORT TO WESD/DOE ANALYZING THE EXPECTED EFFECT OF PURPA RULES ON WIND ENERGY DEVELOPMENT.

A GUIDEBOOK FOR PUC'S AND NONREGULATED UTILITIES DETAILING THEIR RESPONSIBILITIES AND OPTIONS FOR REGULATORY COMPLIANCE WITH PURPA RULES, INCLUDING INFORMATION SOURCES AND TECHNICAL ASSISTANCE OPPORTUNITIES.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
60K	24K	45K	0

SUBCONTRACTS

NONE

Strategy Analysis (3531.20)

Task or Subtask Activities		Fy 80											Fy 81						
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Review PURPA Rulemaking							△	→	▽▽										
Identify PURPA Impacts									△	→	▽	▽							
Develop PURPA Implementation Manual										△	→	▽	▽						
Report to DOE/WESD										△	→	▽	□	→	■				
Publication of Manual											△	→	●	→	■				
Subtask Management					△	→	◆	→	▽	◆	→	▽							
Accrued Costs	b. Planned	0.0	0.0	0.0	1.1	7.7	14.5	21.3	33.3	45.3	52.1	57.5	57.7						
	c. Actual	0.0	0.2	0.6	0.6	1.5	4.8	8.4	18.3	23.9									
	d. Variance	0.0	(0.2)	(0.6)	0.5	6.2	9.7	12.9	15.0	21.4									

- △ Begin Milestone
- ▽ Milestone Complete
- Equipment Arrival
- Progress Report
- Draft Final Report
- Final Report
- ◆ Workshop or Special Meeting
- ▽ Present Status

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WIND SYSTEMS COORDINATION

IRWIN E. VAS

OBJECTIVES

PROVIDE TECHNICAL COORDINATION OF THE FEDERAL WIND ENERGY PROGRAM RESEARCH AND ANALYSIS EFFORTS, INTEGRATION OF THE RESEARCH RESULTS INTO A DECISION DATA BASE, AND INTEGRATION OF ACTIVITIES WITH DOE MANAGEMENT AND PRIME CONTRACTORS.

ACCOMPLISHMENTS

MET WITH STAFF OF SANDIA LABORATORIES (BRAASCH, KADLEC, KLIMAS, SULLIVAN) AND SOUTH (SERI) TO DISCUSS POSSIBLE ADVANCED CONCEPTS OF STUDIES TO BE ASSESSED.

AWARDED A CONTRACT XE-0-9261-1 TO COLORADO STATE UNIVERSITY ENTITLED "ENERGY FROM THE WIND--ANNOTATED BIBLIOGRAPHY" FOR \$16,836 FOR A TWO MONTH EFFORT.

AWARDED A CONTRACT TO PLANNING RESEARCH CORPORATION ENTITLED "WIND ENERGY SYSTEMS CORRELATION STUDY OF RESEARCH AND ANALYSIS" \$165,433 FOR AN 11 MONTH EFFORT.

COMPLETED TECHNICAL AND COST EVALUATION OF THE PROPOSAL SUBMITTED BY SAN BERNADINO COMMUNITY DEVELOPMENT CENTER.

MADE A PRESENTATION ON WIND ENERGY TO A GROUP OF APPROXIMATELY 15 PEOPLE SPONSORED BY THE INTERNATIONAL COMMUNICATIONS AGENCY.



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DISCUSSED THE SERI WIND ENERGY PROGRAM WITH SEVERAL PEOPLE:

DR. WOODY STODDARD - REGARDING LONG-TERM IMPLEMENTATION OF SMALL WIND MACHINES.

DR. WILLARD FRUIZE, MITRE CORPORATION - DISCUSSED MARKET STUDIES.

MR. G. THORARINSSON, MEMBER OF PARLIAMENT AND PROGRESSIVE PARTY TREASURER, ICELAND - DISCUSSED APPLICATIONS OF WIND IN ICELAND.

MR. WALTER SULLIVAN, SCIENCE EDITOR, NEW YORK TIMES - DISCUSSED THE SERI EFFORTS IN WIND.

MR. HAROLD TRUJILLO, ENERGY AND MINERALS DEPARTMENT STATE OF NEW MEXICO - INTERESTED IN WIND AND ITS RCS IMPLICATIONS.

MR. ROD KUCHARICH, COLORADO SPRINGS UTILITY - APPLICATION OF WIND MACHINES INTO THE UTILITY SYSTEM.

DR. REDDY, INDIAN INSTITUTE OF SCIENCE, BANGLERE - CONDITIONS FOR LOW-COST WIND MACHINES FOR UNDER-DEVELOPED COUNTRIES.

MARTEEN BURNS AND CHARLENE CONNELLY, NATURAL RESOURCE DEPARTMENT, BLACKFOOT INDIAN RESERVATION, MONTANA - APPLICATIONS OF WIND ENERGY ON THE RESERVATION.

MR. TOM ROBERTSON, CONSULTANT TO DOE ON GEOTHERMAL MATTERS - THE USE OF WIND ENERGY ON INDIAN RESERVATIONS.

MR. JIM MILLER, READERS DIGEST - WIND ENERGY APPLICATIONS.

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MR. HAROLD E. SEIELSTUD, DEPARTMENT OF ENGINEERING RESEARCH, PACIFIC GAS AND ELECTRIC COMPANY - USE AND APPLICATIONS OF LARGE WIND MACHINES BY A UTILITY.

DR. B. DANNER, EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH - USE AND APPLICATIONS OF WIND ENERGY.

DR. DON BOYER, HEAD MECHANICAL ENGINEERING DEPARTMENT AND PROFESSOR DAN SMITH, UNIVERSITY OF WYOMING - INTERESTED IN WIND MACHINE RELIABILITY.

DR. DICK NEILL, HAWAII NATURAL ELECTRIC INSTITUTE - INTERESTED IN MARKET DEVELOPMENT OF WIND IN HAWAII.

GUENTER KARWEINA, GERMANY - INTERESTED IN THE SERI WIND PROGRAM AND THE FEDERAL WIND ENERGY PROGRAM.

DR. ROBERT POE, SCIENTIFIC ADVISOR TO CONGRESSMAN GEORGE BROWN, CALIFORNIA - WIND ACTIVITIES AT SERI.

MET WITH THE CALIFORNIA ENERGY COMMISSION STAFF AND BILL REDDICK (WESD)--DISCUSSED WIND ENERGY PLANS.

MET WITH SOUTHERN CALIFORNIA EDISON STAFF, BOB SCHEAFFLER AND BILL REDDICK (WESD)--DISCUSSED SCE AND WESD PLANS FOR WIND.

#### PLANNED ACTIVITIES

CONTINUE PLANNING/LIAISON ACTIVITIES WITHIN THE FEDERAL WIND ENERGY PROGRAM.

INITIATE DEVELOPMENT OF DATA BASE IN THE CONTRACTED STUDY.

OUTPUT

REPORTS SUMMARIZING MEETINGS AND WORKSHOPS CONDUCTED IN SUPPORT OF THIS TASK.

UTILIZATION OF THE DATA BASE AND MODELS TO DETERMINE PROGRAM NEEDS AND TO SUPPORT PROGRAM PLANNING.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
430K	35K	76K	56K

TABLE 14. SUBCONTRACTS

CONTRACTOR	WORK TITLE	PLANNED				ACTUAL			
		AMOUNT \$K	PR. COMPL. DATE	START DATE	END DATE	AMOUNT TO BE COSTED DURING FY80	AMOUNT \$K	START DATE	AMOUNT TO BE COSTED \$K
<u>3532.10 WIND PROGRAM COORDINATION</u>									
PLANNING RESEARCH CORP.	COORDINATION	169	2/80	6/80	12/80	109	165	6/80	110
COLORADO STATE UNIVERSITY	WIND BIBLIGRAPHY	16	4/80	6/80	8/80	16	16	6/80	16
SAN BERNADINO CDC	WECS LABOR INVENTORY	51	6/80	8/80	2/81	17	--	--	--

### Wind Systems Coordination (353z.10)

Task or Subtask Activities		Fy 80												Fy 81					
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Coordination Meetings		△																	
Preliminary Data Base Format and Management System										△	▽							□	
Preliminary Analysis Utilizing Data Base										△	▽							□	
Project Management										△	▽	◆		◆					
Subtask Management		△	◆		◆			◆			▽	◆			◆				
Accrued Costs	b. Planned	4.2	7.8	12.7	17.6	22.6	38.1	47.4	61.6	75.8	90.0	131.9	171.2						
	c. Actual	5.6	8.2	12.7	16.6	19.7	21.8	26.3	32.3	35.5									
	d. Variance	(1.4)	(.4)	0.0	1.0	2.9	16.3	21.1	29.3	40.3									

- △ Begin Milestone
- Equipment Arrival
- Draft Final Report
- ◆ Workshop or Special Meeting
- ▽ Milestone Complete
- Progress Report
- Final Report
- ▽
- 1 Revised Contract Start Schedule

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WECS COST STUDY

JOE LAVENDER

OBJECTIVES

TO PROVIDE UP-TO-DATE AND WELL-DOCUMENTED INFORMATION CONCERNING COSTS, PERFORMANCE, AND OTHER CHARACTERISTICS OF SPECIFIC WIND ENERGY SYSTEMS TO DOE DECISION MAKERS.

SCOPE

ENGINEERING PERFORMANCE/DESIGN INFORMATION AND COST (CAPITAL COST, O&M, LIFE CYCLE COSTS) SHALL BE INCLUDED INITIALLY IN SPECIFIED DESIGNS. COST SENSITIVITY TABLES THAT ARE DEPENDENT UPON PRODUCTION QUANTITIES AND SITE LOCATION SHALL BE INCLUDED DURING FY80.

SPECIFIC WIND SYSTEMS THAT ARE INCLUDED IN THE TASK ARE:

o MILLVILLE	10 kW
o ENERGY DEVELOPMENT	40 kW
o DOE/SANDIA	100 kW
o MOD 2	2500 kW

ACCOMPLISHMENTS

COMPLETED COST SENSITIVITY ANALYSIS ON ALL FOUR SELECTED SYSTEMS.

ANALYZED MULTIPLE INSTALLATION OF 40-KW AND 100-KW SYSTEMS.

PERFORMED INVESTIGATION INTO SCHEDULE SENSITIVITIES OF THE FOUR SYSTEMS.

SERI LEGAL STAFF WAS CONSULTED AND DETERMINED THAT MANUFACTURERS COST DATA CAN BE PUBLISHED WITHOUT A RELEASE BASED UPON WORK BEING DONE.

COMPLETED INTERNAL SERI REVIEW OF VOLUME I "COST/PERFORMANCE."

PLANNED ACTIVITIES

MODIFY ROUGH DRAFT AND INITIATE EXTERNAL REVIEW OF VOLUME I (COST AND PERFORMANCE) BY AUGUST 1, 1980. EXTERNAL REVIEW WILL BE INITIATED JULY 18. REVIEW COMMITTEE LISTED BELOW.

DOE/WESD - BILL REDDICK

DOE - JACK CADOGAN

DOE - BILL WHITE

DOE - CHARLES SMITH

NASA - LEWIS - RON THOMAS



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ROCKY FLATS - TERRY HEALY  
SANDIA LABORATORIES - EMIL KADLEC  
ALCOA - DANIEL AI  
MELLVILLE - DEVON TASSEN  
ENERGY DEVELOPMENT CO. - DENNIS BAYLOR  
BOEING - JACK GRAVES  
HAMILTON STANDARD - ROBERT GREGOIRE  
KAMAN - BRUCE GOODALE  
WINDWORKS - HANS MEYER  
OKLAHOMA STATE UNIVERSITY - PETER MORETTI  
UNIVERSITY OF CALIFORNIA - MARSHALL MERRIAM  
AWEA - RICK KATZENBERG

COMPLETE COST AND PHYSICAL RELATIONSHIPS ON COMMERCIALY AVAILABLE SYSTEMS WILL  
BE DISTRIBUTED BY MEMO FOR EXTERNAL REVIEW.

OUTPUT

A TABULAR SECTION SUMMARIZING THE ANALYSIS OF THE SPECIFIED SYSTEMS.

CHARTS SHOWING THE RESULTS OF THE REGRESSION ANALYSIS.

A SECTION REVIEWING THE SOURCES OF THE INFORMATION AND JUSTIFYING COST AND  
PERFORMANCE INFORMATION THAT ARE EMPLOYED.

TABLES THAT WILL PROVIDE DETAILED COST AND PERFORMANCE INFORMATION WITH RESPECT TO "BASELINE" ASSUMPTIONS.

PROVIDE TABLES SHOWING THE SENSITIVITY OF THE RESULTS OF THE ANALYSIS TO SIGNIFICANT BUT REALISTIC CHANGES IN THE "BASELINE" ASSUMPTIONS.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
50K	47K	31K	5K

# WECS Cost Study

## Information Flow Chart

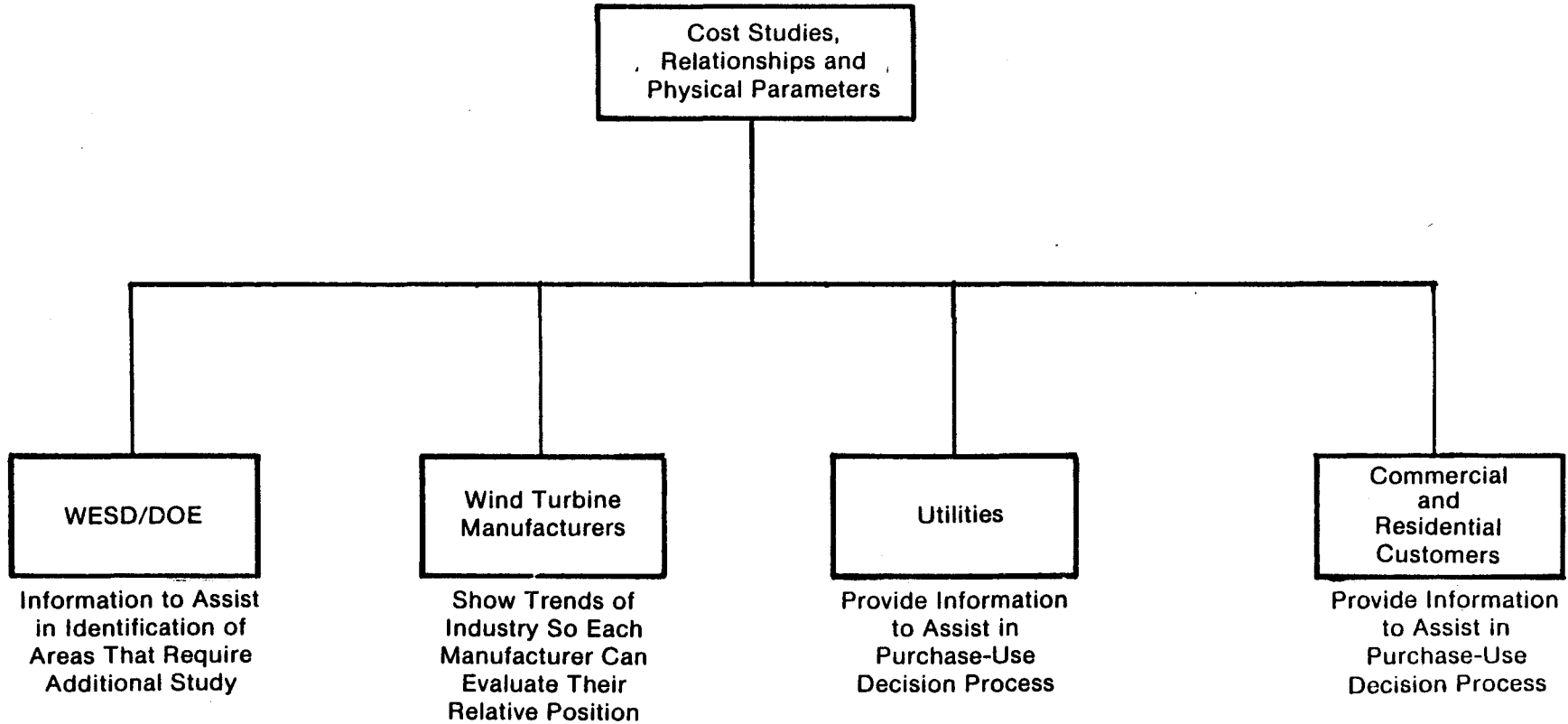


TABLE 15. SUBCONTRACTS

CONTRACTOR	WORK TITLE	PLANNED					ACTUAL		
		AMOUNT \$K	PR- COMPL. DATE	START DATE	END DATE	AMOUNT TO BE COSTED DURING FY80	AMOUNT \$K	START DATE	AMOUNT TO BE COSTED \$K
<u>3532.45 WECS COST STUDY</u>									
TBD (SOLE SOURCE)	O&M GENERIC STUDY	4	6/80	8/80	9/80	4			

### WECS Cost Study (3532.45)

Task or Subtask Activities		FY 80												FY 81					
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Information Collection and Normalization		△					▽												
WECS Cost Configuration Study					△				▽										
Life Cycle Cost Base Analysis							△					▽							
Prepare Data Tables											△			▽					
Update Data with Externalities														△					
Update Data With New Information With Actuals															△			▽	
Subtask Management		△			◆			◆			▽	●	◆		◆				
Accrued Costs	b. Planned	2.2	4.2	9.9	14.8	16.6	19.4	22.5	25.7	30.5	35.1	38.4	42.0						
	c. Actual	0.7	4.7	7.4	11.4	13.4	16.6	24.7	40.5	46.7									
	d. Variance	1.5	(0.5)	2.5	3.4	3.2	2.8	(2.2)	(14.8)	(16.2)									

- △ Begin Milestone
- ▽ Milestone Complete
- Equipment Arrival
- Progress Report
- Draft Final Report
- Final Report
- ◆ Workshop or Special Meeting
- ▽ Present Status

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PROGRAM REVIEW AND PLANNING

IRWIN E. VAS

OBJECTIVES

PROVIDE THE PLANNING AND ADMINISTRATION FOR THE SERI WIND ENERGY SYSTEMS PROGRAM.

ACCOMPLISHMENTS

PRESENTED THE DRAFT QUARTERLY REPORT ON MAY 21, 1980 TO WESD/DOE FOR THE SECOND QUARTER. COMPLETED AND SUBMITTED TO WESD/DOE THE FINAL VERSION OF THE FIRST AND SECOND QUARTERLY REPORTS FOR THE SERI WIND ENERGY SYSTEMS PROGRAM.

PROVIDED WESD/DOE DETAILS RELATING TO THE "SOLAR ENERGY OBJECTIVES".

SUBMITTED TO WESD/DOE THE UPDATED LISTING OF SMALL/MINORITY SUBCONTRACTORS FOR FY79 AND FY80 AND THEIR FUNDING LEVELS.

COMPLETED THE REPROGRAMMING OF SERI SUBTASK EFFORTS WITH BUDGET CHANGES REFLECTING THE ACTIVITIES OF THE FIRST TWO QUARTERS AND PROPOSED ACTIVITIES OF THE SECOND TWO QUARTERS FOR FY80.

DEVELOPED THE WIND ENERGY PROGRAM INSTITUTE PLAN FOR FY81 AND SUBMITTED IT TO SERI MANAGEMENT.

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DEVELOPED A STRAWMAN FOR A WECS/UTILITY WORKSHOP AND SUBMITTED IT FOR INTERNAL REVIEW AS WELL AS DOE REVIEW.

RESPONSIBLE AS TECHNICAL CHAIRMAN FOR THE AIAA (AMERICAN INSTITUTE OF AERONAUTICS AND ASTONAUTICS)/SERI WIND ENERGY CONFERENCE HELD IN BOULDER, CO, APRIL 9-10, 1980.

MADE A PRESENTATION TO DR. MAURICE KAATZ, DOE ON THE CURRENT STATUS AND FUTURE PLANS OF THE SERI WIND PROGRAM.

PROVIDE DRAFT RESPONSES FOR DENIS HAYES' OR KEN TOURYAN'S SIGNATURE TO THE FOLLOWING:

DR. TAMURA ON HIS INNOVATIVE CONCEPT;

DR. THOMANN ON HIS WECS--ECONOMICS PAPER;

DR. PLUNKETT, MERDI, REGARDING WIND STUDIES AT SERI.

PROFESSOR ROBERTS, AUSTRALIA; REGARDING A POSSIBLE SABBATICAL VISIT TO SERI TO WORK IN WIND.

PROFESSOR SASTRY, INDIAN INSTITUTE OF SCIENCE, REGARDING THE USE OF WIND ENERGY FOR AGRICULTURAL PURPOSES.

MET AND DISCUSSED SERI WIND EFFORTS WITH THE FOLLOWING:

PROFESSOR ARNOLD COURT, BOARD OF GOVERNORS, DESERT STUDY CENTER, CALIFORNIA STATE UNIVERSITY--POSSIBLE FORECAST VERIFICATIONS OF WECS IN THE DESERT.



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DR. CARLOS SANCHEZ, TARIFE (SPAIN)--POSSIBLE SUPPORT FROM SERI IN THE SPANISH WIND EFFORTS.

INGA EMMELING, UNIVERSITY OF LUND, SWEDEN--ENVIRONMENTAL NOISE, TELEVISION INTERFERENCE, AND PLANNING EFFORTS.

RICK NELSON AND TIM MILLER, ACCUREX CORPORATION--ADVANCED CONCEPTS.

PROFESSOR JUYA SRIVASTAVA, DEPARTMENT OF MATHEMATICS AND STATISTICS, COLORADO STATE UNIVERSITY--APPLICATIONS OF STATISTICS TO WIND ENERGY.

DR. WALTER LAITY, ENERGY SYSTEMS ENGINEERING, BATTELLE PNL--STORAGE OPTIONS FOR SMALL WIND MACHINES.

MET AND DISCUSSED WIND ENERGY EFFORTS WITH DOE CONTRACTOR PERSONNEL.

REDDICK (WESD) AND REEVE (SERI)--ON THE MARKET CHARACTERIZATION SUBTASK AND PROBLEMS RELATING TO THE SUBTASK.

DIVONE, REDDICK, ANCONA AND ASPLIDEN (WESD); MAYFIELD (RAYTHEON) REEVE (SERI)--ON MARKET CHARACTERIZATION SUBTASK (MAY 8).

DODGE, STEWARD (ROCKWELL INTERNATIONAL, RF); WEIS (SERI)--ON THE RI/RF EXHIBIT AND BUDGET.

DIVONE, REDDICK, ANCONA, DYES, GREENE, ASPLIDEN--DISCUSSED PROPOSED FY81 SUBTASKS (MAY 22)

WILLIAMS, PORPOTAGE (ROCKWELL INTERNATIONAL, RF) AND DEUTSCH, HILL, HEIFERLING, LUMUMBA (SERI)--THE RI AND SERI MARKET STUDIES.

SUPPORTED THE FOLLOWING WORKSHOP/MEETINGS AT SERI:

UTILITY/MARKET/LEGAL WORKSHOPS, 20 ATTENDEES APRIL 15-16, 1980.

LEGAL STUDIES WORKSHOP, 10 ATTENDEES, APRIL 18, 1980.

WIND ENERGY INNOVATIVE SYSTEMS ADVISORY COMMITTEE.

SEMINAR BY JIM LERNER, CALIFORNIA ENERGY COMMISSION, 20 ATTENDEES--CURRENT STUDIES AND GOALS OF CEC.

PLANNED ACTIVITIES

CONTINUE REVIEW, PLANNING, AND REPORTING ACTIVITIES AS REQUIRED.

COMPLETE FY81 DRAFT PROGRAM DEVELOPMENT PLAN.

COMPLETE REVISED INSTITUTIONAL PLAN.

OUTPUT

QUARTERLY REVIEWS FOR PRESENTATION TO WESD/DOE.

MONTHLY PROGRAM STATUS REPORTS FOR SERI.

PROGRAM DEVELOPMENT PLAN FOR FY81.

PROGRAM MANAGEMENT FOR WES PROGRAM.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
175K	78K	84K	11K

SUBCONTRACTS

NONE

**Program Review and Planning (3531.10)**

Task or Subtask Activities		Fy 80											Fy 81						
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Planning/Administration (Task Management)	Program Development Plan				◆			◆											
	Arrange Consultant Agreements			□	▽	■							□						
	Develop Institutional Plan	△												▽					
Accrued Costs	b. Planned	4.9	10.9	16.9	24.5	35.0	52.7	60.4	72.1	83.8	97.8	109.0	114.9						
	c. Actual	3.5	10.3	16.3	22.3	31.4	45.0	56.4	70.3	78.2									
	d. Variance	1.4	0.6	0.6	2.2	3.6	7.7	4.0	1.8	5.6									

- △ Begin Milestone
- Equipment Arrival
- Draft Final Report
- ◆ Workshop or Special Meeting
- ▼ Milestone Complete
- Progress Report
- Final Report
- ▽ Present Status

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WIND ENERGY INNOVATIVE SYSTEMS

IRWIN E. VAS

OBJECTIVE

DETERMINE TECHNICAL AND ECONOMIC FEASIBILITY OF INNOVATIVE WIND ENERGY SYSTEMS.

ACCOMPLISHMENTS

REVIEWED CURRENT R&D PROJECTS ON A CONTINUING BASIS.

REVIEWED EIGHT UNSOLICITED PROPOSALS, RETURNED COMMENTS TO PROPOSERS, AND RECOMMENDED FUNDING BE CONSIDERED ON TWO OF THESE PROPOSALS BY OTHER WIND SYSTEMS TASKS.

REVIEWED FOUR DRAFT FINAL REPORTS (GRUMMAN AEROSPACE: TORNADO-TYPE WIND ENERGY SYSTEM, JBF SCIENTIFIC: VORTEX GENERIC ASSESSMENT, MARKS POLARIZED: AEROSOL CHARGED EFD GENERATOR, AND WEST VIRGINIA UNIVERSITY: CIRCULATION CONTROLLED (VAWT) AND RETURNED COMMENTS TO THE PRINCIPAL INVESTIGATORS. THE REPORTS BY MARKS AND JBF WERE ACCEPTED AS FINAL REPORTS AND THE PROCEDURES FOR CONTRACT CLOSE OUT WERE INITIATED.

COMPLETED A CONTRACT MODIFICATION TO THE AEROVIRONMENT SUBCONTRACT X4-9-8085-1, DYNAMIC INDUCER, FOR \$11K TO COVER INCREASED G&A RATES.

RECEIVED 35 ABSTRACTS IN RESPONSE TO A CALL FOR PAPERS FOR THE SECOND WIND ENERGY INNOVATIVE SYSTEMS CONFERENCE AND INITIATED REVIEWS.

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COMPLETED TECHNICAL AND COST EVALUATIONS AND RANK ORDERED THE PROPOSALS RECEIVED IN RESPONSE TO THE TETHERED AND INNOVATIVE LOI'S. RECOMMENDATIONS WERE MADE FOR FUNDING THREE OF THE TETHERED (OUT OF 21) AND TWO OF THE INNOVATIVE (OUT OF 27) PROPOSALS.

COMPLETED NO-COST EXTENSIONS FOR UNIVERSITY OF DAYTON (FROM MARCH 30, 1980 TO AUGUST 30, 1980), SOUTH DAKOTA SCHOOL OF MINES (FROM MARCH 12, 1980 TO AUGUST 31, 1980) MARKS POLARIZED CORP. (FROM APRIL 30, 1980 TO JULY 31, 1980), AND GRUMMAN AEROSPACE CORP. (FROM FEBRUARY 15, 1980 TO SEPTEMBER 15, 1980).

RECEIVED THE DRAFT FINAL REPORTS FOR THE POLYTECHNIC INSTITUTE OF NEW YORK FY78 FUNDED EFFORT ON VORTEX AUGMENTED WES [E(49-18)-2358], THE GRUMMAN AEROSPACE CORP. FY78 FUNDED EFFORT ON THE TORNADO-TYPE WES (EX-76-C-01-2555), AND THE GRUMMAN AEROSPACE CORP. FY79 FUNDED EFFORT ON THE DIFFUSER AUGMENTED WES (XH-9-8073-1) AND INITIATED REVIEWS OF EACH.

COMPLETED ASSEMBLY AND CHECK OUT OF WUTA ATMOSPHERIC TEST EQUIPMENT. HOWEVER, LIGHTNING STRIKE ON POWER LINES HAS DAMAGED INSTRUMENTATION AND THE COMPUTER (WIND TURBINE WAS PROTECTED AND IN THE "TOWER DOWN" POSITION). REPAIRS ARE ESTIMATED TO RUN \$3K AND ONE MONTH.

COMPLETED ALL TASKS FOR THE MARKS POLARIZED EFFORT AND THE DRAFT FINAL REPORT IS IN PREPARATION.

COMPLETED TESTING OF UTRC WIND TUNNEL MODELS AND INITIATED DATA REDUCTION.

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THE WIND TUNNEL TEST ON AEROVIRONMENT DYNAMIC INDUCER HAS TO BE DELAYED ONE TO TWO MONTHS DUE TO INSTRUMENTATION PROBLEMS.

PAPER ENTITLED "A REVIEW OF THE SERI WIND ENERGY INNOVATIVE SYSTEMS PROGRAM" HAS BEEN ACCEPTED FOR PRESENTATION AT THE 3RD INTERNATIONAL SYMPOSIUM ON WIND ENERGY, COPENHEGAN, DENMARK.

#### PLANNED ACTIVITIES

AWARD SUBCONTRACTS IN RESPONSE TO THE TETHERED AND INNOVATIVE ASSESSMENT LOI'S.

ESTABLISH SECOND WEIS CONFERENCE AGENDA AND SELECT PAPERS TO BE PRESENTED.

REVIEW UNSOLICITED PROPOSALS.

COMPLETE CONTRACT MODIFICATION TO THE WASHINGTON UNIVERSITY TECHNOLOGY ASSOCIATES SUBCONTRACT, XH-9-8085-3, TO ALLOW FOR INCREASED INSTRUMENTATION AND TESTING OF FIELD TEST WIND TURBINE.

COMPLETE REVIEW OF THE PINY AND TWO GRUMMAN DRAFT FINAL REPORTS AND RETURN COMMENTS TO THE PRINCIPAL INVESTIGATORS.

AWARD FOLLOW-ON FUNDING TO WEST VIRGINIA UNIVERSITY FOR TESTING OF CIRCULATION CONTROLLED AIR FOILS AND AIR SUPPLY SYSTEMS.



OUTPUT

DEVELOPMENT OF ADVANCED WIND SYSTEMS THAT HAVE THE POTENTIAL OF BEING COST COMPETITIVE WITH CONVENTIONAL SYSTEMS.

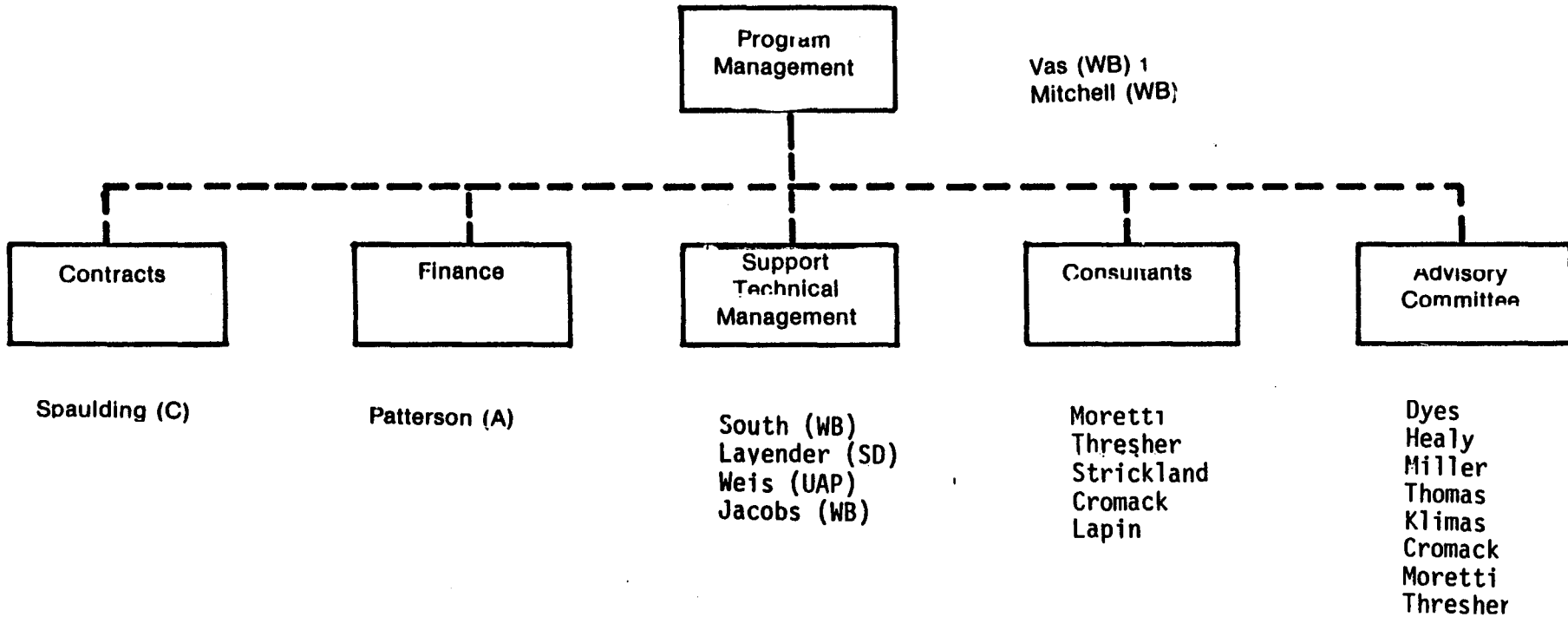
TECHNICAL REPORTS ON THE INNOVATIVE R&D STUDIES.

TECHNICAL AND PROGRAMMATIC SUPPORT OF THE FEDERAL WIND ENERGY PROGRAM.

SUBTASK BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
1437K	493K	479K	82K

### WEIS Program Management Chart



Office/Branch abbreviations are defined below:

- C - CONTRACTS
- A - ACCOUNTING
- SD - SYSTEMS DEVELOPMENT BRANCH
- WB - WIND ENERGY BRANCH
- UAP - UTILITY APPLICATIONS AND POLICY BRANCH

TABLE 16. R&D SUBCONTRACTED PROJECTS, FY79 AND FY80

TITLE/SUBCONTRACTOR	TERMINATION DATE	FUNDING STATUS	
		FUNDING FY79	PROJECTED FUNDING FY80
INN. - W. VA. UNIV.	DECEMBER, 31, 1979	0	51,000
DAWT - GRUMMAN	FEBRUARY 15, 1980 (NER)*	89,293	120,000
TORNADO - GRUMMAN	AUGUST 30, 1979 (NER)*	N/A	70,000
EFD - MARKS	JULY 31, 1980	64,007	N/A
EFD - U. DAYTON	AUGUST 30, 1980	117,523	120,000
HUM. AIR - S. DAKOTA	AUGUST 31, 1980	68,975	N/A
VORTEX - PINY	AUGUST 31, 1979	N/A	N/A
DYN. IND. - AEROV.	OCTOBER 15, 1980	132,835	N/A
OSCILL. VANE - UTRC	OCTOBER 15, 1980	119,900	N/A
CYCLIC PITCH - WUTA	OCTOBER 15, 1980	106,318	N/A

\*NER - NO-COST EXTENTION REQUESTED.

TABLE 17. PRINCIPAL SUBCONTRACTORS FOR FY80 R&D PROJECTS

PROJECT TITLE	SUBCONTRACTOR	PROJECT CODE	CONTRACT No.	PRINCIPAL INVESTIGATOR
INNOVATIVE WIND TURBINE	WEST VIRGINIA UNIVERSITY	WVU	EY-76-C-05-5135	R. E. WALTERS
DIFFUSER AUGMENTED WIND TURBINES (DAWT)	GRUMMAN AEROSPACE	G-D	XH-9-8073-1	K. M. FOREMAN
TORNADO-TYPE WIND ENERGY SYSTEMS PHASE II (TORNADO)	GRUMMAN AEROSPACE	G-T	EX-76-C-01-2555	J. T. YEN
TESTS AND DEVICES FOR WIND/ELECTRIC POWER CHARGED AEROSOL GENERATORS (EFD)	MARKS POLARIZED	MP	XH-9-8128-1	A. M. MARKS
ELECTROFLUID DYNAMIC WIND GENERATOR PROGRAM (EFD)	UNIVERSITY OF DAYTON	UDE	XH-9-8074-1	J. E. MINARDI
ENERGY FROM HUMID AIR (HUMID AIR)	SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY	SD	DE-AC01-79ET23052	T. K. OLIVER
VORTEX AUGMENTORS FOR WIND ENERGY CONVERSION (VORTEX)	POLYTECHNIC INSTITUTE OF NEW YORK	PINY	E(49-18)2358	P. M. SFORZA
ADVANCED AND INNOVATIVE WIND ENERGY CONCEPT DEVELOPMENT-DYNAMIC INDUCER (DYNAMIC INDUCER)	AEROVIRONMENT	ADI	XH-9-8085-1	P. B. S. LISSAMAN
OSCILLATING VANE CONCEPT (OSCILLATING VANE)	UNITED TECHNOLOGIES RESEARCH CENTER	UTRC	XH-9-8085-2	R. L. BIELAWA
THE YAWING OF WIND TURBINES WITH BLADE CYCLIC PITCH (CYCLIC PITCH)	WASHINGTON UNIVERSITY TECHNOLOGY ASSOC.	WUCP	XH-9-8085-3	K. H. HOHENEMSER

TABLE 18. SUBCONTRACTS

CONTRACTOR	WORK TITLE	PLANNED					ACTUAL		
		AMOUNT \$K	PR. COMPL. DATE	START DATE	END DATE	AMOUNT TO BE COSTED DURING FY80	AMOUNT \$K	START DATE	AMOUNT TO BE COSTED \$K
<u>3533-35 WEIS</u>									
WEST VIRGINIA UNIV.	INNOVATIVE WECS	51	1/80	7/80	2/81	30			
GRUMMAN	DAWT	120	9/80	5/80	4/81	0			
DAYTON UNIV.	EFD STUDIES	120	9/80	10/80	10/81	0			
GRUMMAN	TORNADO	70	9/80	10/80	3/81	10			
TBD (COMPETITIVE)	ASSESSMENT OF SPECIFIC WEIS	191	2/80	9/80	8/81	15			

**WEIS (3533.35)**

Task or Subtask Activities		Fy 80											Fy 81										
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar				
Subtask Management WEIS Conference Project Management Award Renewal Contracts Award Solicited Contracts		△	◆		◆			◆							◆				◆				
		△			△						▽		◆	□		■				◆			
		△			◆		◆		◆		▽									◆			
			△								▽	▽									▽		
Accrued Costs	b. Planned	63.0	124.8	186.2	242.2	299.8	355.2	402.4	440.3	479.1	543.8	618.9	728.3										
	c. Actual	50.2	109.5	181.2	237.5	288.8	340.8	404.4	458.5	493.4													
	d. Variance	12.8	15.3	5.0	5.0	11.0	14.4	(2.0)	(18.2)	(14.3)													

- △ Begin Milestone
- ▽ Milestone Complete
- Equipment Arrival
- Progress Report
- Draft Final Report
- Final Report
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- ▽ Present Status

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ENGINEERING ANALYSIS AND COST ESTIMATING OF INNOVATIVE WECS

PETER SOUTH

OBJECTIVES

ESTABLISH COSTING METHODOLOGIES SUITABLE FOR INNOVATIVE WECS (IWECS) IN THEIR CONCEPTUAL, DEVELOPMENTAL, AND PRODUCTION PHASES TO ESTIMATE THEIR COST OF ENERGY.

PROVIDE AERODYNAMIC AND ENGINEERING ANALYSES OF IWECS TO ASCERTAIN THEIR PERFORMANCE, STRUCTURAL, AND MATERIAL CHARACTERISTICS.

ACCOMPLISHMENTS

PREPARED SUBCONTRACT TO DEVELOP SAMICS PROGRAM FOR PRODUCTION COSTING OF WECS. INTERNAL AND EXTERNAL TECHNICAL REVIEWS WERE COMPLETED. DOE SUBCONTRACT REVIEW IS IN PROGRESS.

CONTINUED WRITING MANUAL DESCRIBING ESSENTIAL CHARACTERISTICS OF IWECS AND THEIR SUBSYSTEMS.

BEGAN STUDY TO DEVELOP COST ESTIMATES FOR MADARAS SYSTEM FOUNDATION.

PRELIMINARY REVIEW OF RESULTS FROM THE SUBCONTRACT ISSUED TO A CONSULTANT (ROBERT ALLEN) TO ANALYZE THE PRODUCTION COSTS OF A MADARAS WIND SYSTEM.

BEGAN DEVELOPMENT OF PERFORMANCE ESTIMATING METHODOLOGY.



SUBTASK PROGRESS IMPROVED DUE TO ADDITION OF REQUIRED PERSONNEL.

PLANNED ACTIVITIES

CONTINUE AERODYNAMIC ANALYSES OF DAWT AND TORNADO WHILE INITIATING OTHER ANALYSES (E.G., CIRCULATION CONTROLLED VAWT, VORTEX AUGMENTOR CONCEPT).

MODIFY SAMICS\* PROGRAM FOR IWECS PRODUCTION COSTING.

WRITE, ACQUIRE REVIEW FOR, AND SEND RFP'S FOR IWECS DEVELOPMENT COSTING.

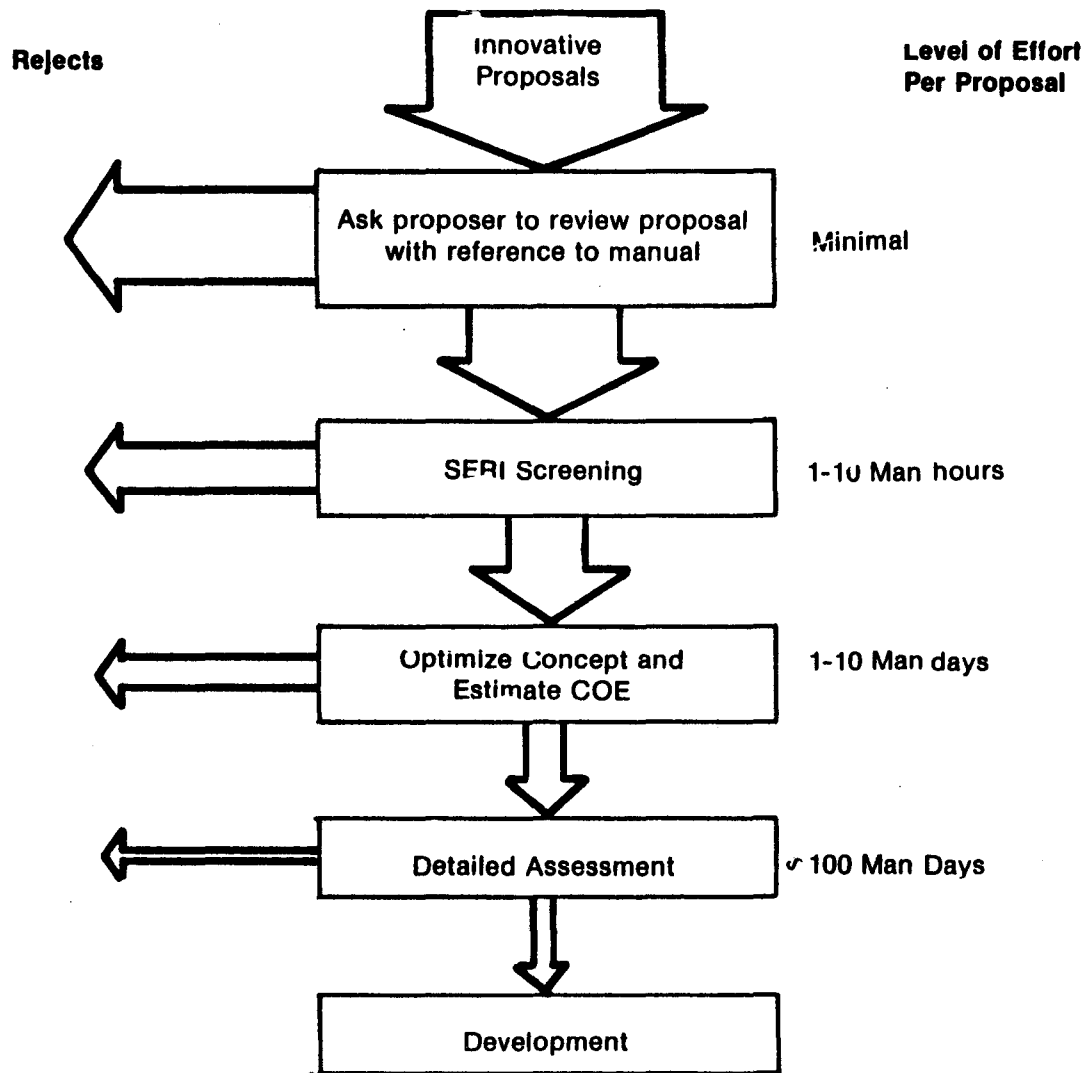
CONTINUE WORK ON REPORT DESCRIBING FUNDAMENTAL AERODYNAMIC CHARACTERISTICS OF GENERIC IWECS.

OUTPUT

REPORTS DESCRIBING COSTING TECHNIQUES SUITABLE FOR IWECS TO EVALUATE POTENTIAL AND COST EFFECTIVENESS, DEVELOPMENT COSTS, AND PRODUCTION COSTS.

REPORTS ON AERODYNAMIC CHARACTERISTICS OF IWECS.

\*SOLAR ARRAY MANUFACTURING INDUSTRY COSTING.



## COSTING METHODOLOGIES

### DEVELOPMENT AND PRE-PRODUCTION COSTING

ESTABLISH COST DATA BASE FOR FIRST UNIT AND PRE-PRODUCTION UNIT COSTS.

FIND GENERAL COST ESTIMATING RELATIONSHIPS OR ALGORITHMS IN THE DATA BASE.

DETERMINE GENERAL COST TRENDS FOR PRE-PRODUCTION UNITS.

DEVELOP DETAILED ANALYSIS METHODOLOGIES FOR DEVELOPMENT AND PRE-PRODUCTION COSTING, UTILIZING THE COST DATA BASE.

### PRODUCTION COSTING

THE IWECS WILL BE CONSIDERED A COMBINATION OF A LIMITED VARIETY OF SUBSYSTEMS. THE ESSENTIAL CHARACTERISTICS OF THESE SUBSYSTEMS WILL BE STUDIED AND CATALOGUED. THE CLASSES OF SUBSYSTEMS LIKELY TO BE COST-EFFECTIVE WILL BE DETERMINED FROM THIS STUDY, ALLOWING THE ASSESSMENT OF THE POTENTIAL OF MOST INNOVATIVE PROPOSALS TO BE MADE.

THE INNOVATIVE PROPOSAL WILL BE PROCESSED IN A SERIES OF STEPS, EACH STEP REQUIRING ROUGHLY AN ORDER OF MAGNITUDE MORE EFFORT THAN THE PRECEDING ONE. AT EACH LEVEL THE PROPOSALS PROVEN NOT TO BE COST-EFFECTIVE WILL BE DISCARDED.

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THE FIRST STEP WILL BE TO SEND THE INNOVATOR A MANUAL THAT DESCRIBES THE COST EFFECTIVENESS OF VARIOUS TYPES OF SUBSYSTEM AND REQUEST THAT HE ILLUSTRATE WHERE HIS DEVICE IS MORE COST-EFFECTIVE THAN OTHERS.

IN THE SECOND STEP, A SIMILAR EVALUATION WILL TAKE PLACE WITHIN SERI.

THIRDLY, THE PROPOSED CONFIGURATION WILL BE OPTIMIZED USING GENERAL PERFORMANCE AND COST CRITERIA. THE OPTIMIZED CONFIGURATIONS WILL BE COSTED USING DATA PRODUCED BY THE SAMICS PROGRAM AND COE DETERMINED.

A DETAILED ANALYSIS THAT WILL BE REQUIRED FOR ALL THE PROPOSALS THAT CANNOT BE SHOWN TO BE NONCOST-EFFECTIVE.

FINALLY, THE PROPOSALS WILL GO THROUGH A DEVELOPMENT AND PROOF-OF-CONCEPT PHASE.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
367K	87K	113K	8K

TABLE 19. SUBCONTRACTS

CONTRACTOR	WORK TITLE	PLANNED				ACTUAL		
		AMOUNT \$K	PR. COMPL. DATE	START DATE	END DATE	AMOUNT TO BE COSTED DURING FY80	AMOUNT \$K	START DATE
<u>3533.40 ENGINEERING ANALYSIS AND COST ESTIMATING OF IWECS</u>								
TBD	DEVELOPMENT & PRE-PRODUCTION COSTING METHODOLOGY	123		2/81	8/81	0		
TBD (SOLE SOURCE) GACI - FEDERAL, INC.	PRODUCTION COSTING METHOD- OLOGY	85	2/80	7/80	2/81	40		

**Cost Estimating and Engineering Analysis of Wels (3533.40)**

Task or Subtask Activities		Fy 80											Fy 81					
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Development Cost Methodology Engineering Evaluation (innovative manual)		△								▽								
Production Cost Methodology Subtask Management		△	◆		△						▽		□					
Accrued Costs	b. Planned	5.2	7.5	14.1	23.8	33.5	46.4	60.1	85.4	112.6	137.9	166.9	210.4					
	c. Actual	6.0	10.0	15.8	25.2	28.6	41.2	54.4	75.3	87.1								
	d. Variance	(0.8)	(2.5)	(1.7)	(1.4)	4.9	5.2	5.7	10.1	25.5								

- △ Begin Milestone
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TECHNICAL INFORMATION DISSEMINATION

PATRICIA WEIS

OBJECTIVE

ENHANCE MARKET DEVELOPMENT FOR WECS BY CONVERTING THE TECHNICAL RESULTS OF THE FEDERAL R&D PROGRAM INTO TOOLS FOR WIDER AUDIENCES, ESPECIALLY DEVELOPERS, INFLUENCERS, AND USERS.

ACCOMPLISHMENTS

CAPITAL FORMATION FOR SMALL MANUFACTURERS OF WECS

- o UC 60, 59A, c DISTRIBUTION
- o COPIES TO RSEC'S
- o ANNOUNCED IN WINDLETTER

PROCEEDINGS - PANEL ON INFORMATION DISSEMINATION FOR WIND ENERGY

- o UC-60 DISTRIBUTION
- o SENT TO ALL PARTICIPANTS

UPDATE - WIND ENERGY INFORMATION DIRECTORY

- o AT PRINTER
- o 10,000 EXPECTED LATE JULY



EXHIBITS ON SMALL WIND

- o UNAUTHORIZED MODIFICATIONS MADE TO EXHIBITS BY ROCKWELL
- o LESS THAN PREDICTED EXPOSURE OF EXHIBITS TO PUBLIC

COMPLETED DISTRIBUTION OF POSTER THE DOE WIND ENERGY PROGRAM

- o 10,000 DISTRIBUTED - NO SUPPLY LEFT AT SERI
- o REPRINT OR REVISION SHOULD BE CONSIDERED
- o WINDPOWER MAP CONTRAVERSIAL

PLANNED ACTIVITIES (4TH QUARTER)

THE DOE LARGE WIND TURBINE DEVELOPMENT PROGRAM

- o TECHNICAL HISTORY AND OVERVIEW
- o 50 PAGES TYPESET WITH 60 ILLUSTRATIONS

THE DOE LARGE WIND TURBINE PROGRAM

- o EXECUTIVE SUMMARY OF #1
- o 8 PAGES TYPESET

THE MOD-2 WIND TURBINE PROJECT

- o TECHNICAL OVERVIEW
- o 25 PAGES TYPESET, 20 ILLUSTRATIONS

WINDPOWER - MOD-2

- o PAMPHLET FOR DEDICATIONS ETC.

SITING COURSE FOR SWECS DISTRIBUTORS

- o FINAL DRAFT BEING PREPARED
- o INPUT FROM WIND INDUSTRY
- o 5 HOUR SLIDE SHOW WITH WORKBOOK

A/V MATERIALS KIT

- o SLIDE SHOW FOR GENERAL PUBLIC
- o TO BE USED BY LABS ETC. FOR PRESENTATIONS

PRELIMINARY REVIEW - COMMUNITY APPLICATIONS OF WECS

DEVELOP POSTER EXHIBITS AND PAMPHLET FOR FAIRS

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- o CONTRACT LET TO AWEA FOR 3 POSTERS AND A PAMPHLET
- o SCHEDULED DELIVERY 3 MONTHS

BEGIN INTERPRETIVE EXHIBITS AT NASA WIND TURBINES

- o BOONE, NC
- o BLOCK ISLAND, RI

OUTPUT

SITING COURSE FOR SMALL WECS - SLIDE SHOW WITH BATTELLE

COMMUNITY APPLICATIONS OF WECS - HANDBOOK

CAPITAL FORMATION FOR SWECS MANUFACTURERS - A GUIDE TO METHODS AND SOURCES -  
AWEA PROCEEDINGS - PANEL ON INFORMATION DISSEMINATION FOR WIND ENERGY

THE DOE LARGE WIND TURBINE DEVELOPMENT PROGRAM - TECHNICAL BRIEF

THE DOE LARGE WIND TURBINE PROGRAM - TECHNICAL SUMMARY

THE MOD-2 DEVELOPMENT PROJECT - TECHNICAL BRIEF

WINDPOWER - MOD-2 - PAMPHLET

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WIND: AN ENERGY ALTERNATIVE - 16-MM MOVIE

WIND ENERGY THEATER - VIDEOTAPE

AIV MATERIALS KIT - SLIDE SHOW

EXHIBITS WITH ROCKWELL

POSTER EXHIBITS - AWEA .

INTERPRETIVE EXHIBITS WITH NASA

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
373K	183K .	240K	55K

TABLE 20. SUBCONTRACTS

CONTRACTOR	WORK TITLE	PLANNED				ACTUAL			
		AMOUNT \$K	PR-COMPL. DATE	START DATE	END DATE	AMOUNT TO BE COSTED DURING FY80	AMOUNT #K	START DATE	AMOUNT TO BE COSTED \$K
AWEA	CAPITAL FORMATION	20	--	9/79	4/80	20	20	9/79	20
RSSG	COMMUNITY GUIDE	25	--	10/79	2/80	25	28	10/79	28
ROCKWELL INTERNATIONAL	EXHIBITS ON WIND	50	--	5/80	11/80	35	50	5/80	35

### Technical Information Dissemination

Task or Subtask Activities		Fy 80											Fy 81							
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	
Siting Course Large Wind Turbines Community Guide AV Materials Kit Handbook on Capital Film Version of Multimedia DOE-ACTS Exhibits & Educational Materials Update & Reprint Directory					△				□		▽		■		▽					
				△				□		■		▽								
		△			□				□		▽		■		▽					▽ <sup>1</sup>
				△				□		■		▽								
		△			■			□		■		▽								
				△	□		■		▽											
								△		■		▽		●		●		●		▽
Accrued Costs		b. Planned	27.4	54.4	80.5	116.5	133.7	154.5	194.1	231.1	264.5	318.7	331.8	349.2						
		c. Actual			93			117.6			183.0									
		d. Variance			(12.5)			36.9			81.5									

- △ Begin Milestone
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<sup>1</sup> Revised Completion Schedule

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SMALL WIND TURBINE PRODUCTION EVALUATION  
AND COST ANALYSIS

CARL NORDQUEST

### OBJECTIVE

THE OBJECTIVE OF THIS TASK IS TO DEVELOP TECHNICAL AND COST EVALUATIONS OF SMALL WIND ENERGY CONVERSION SYSTEMS (WIND TURBINES OF LESS THAN 100-KW RATING) TO IDENTIFY THE BENEFITS OF AUTOMATION FOR REDUCING PRICES AND TO UNDERSTANDING THE TECHNICAL REQUIREMENTS FOR LOW-COST HIGH VOLUME PRODUCTION. THIS TASK HAS A FURTHER OBJECTIVE OF PROVIDING AN ANALYTICAL FOUNDATION FOR THE EVALUATION OF FUTURE WIND TURBINE DESIGNS.

### APPROACH

THE SCOPE OF WORK IS DIVIDED INTO THREE PRINCIPAL TASKS: A PRODUCTION REDESIGN OF THE WIND TURBINE, A PRODUCTION ANALYSIS, AND A COST ANALYSIS OF THE WIND TURBINE. A CONTRACT WILL BE GIVEN TO A FIRM WITH PROVEN MASS PRODUCTION AND AUTOMATION EXPERIENCES TO PERFORM THE TASKS. OVER 100 FIRMS RESPONDED TO THE CBD. HOWEVER ONLY SIX RESPONDED TO THE RFP SINCE THE SELECTION CRITERIA SPECIFIED THAT THE BIDDER HAVE EXTENSIVE ACTUAL AUTOMATION EXPERIENCE.

THE PRODUCTION REDESIGN AND PRODUCTION ANALYSIS ARE DONE CONCURRENTLY UTILIZING THE ENTIRE TASK GROUP. EVERY PART AND ASSEMBLY MUST BE ANALYZED FOR AUTOMATION POTENTIAL.



ACCOMPLISHMENTS

SELECTED WINDWORKS SWECS AS MACHINE FOR STUDY.

AWARDED SUBCONTRACT TO GENERAL MOTORS TO DO PRODUCTION EVALUATION AND COST ANALYSIS ON WINDWORKS MACHINE AT THREE LEVELS OF PRODUCTION.

TOURED WINDWORKS FACTORY TO WITNESS PRESENT PRODUCTION METHODS.

PLANNED ACTIVITIES

G.M. WILL INITIATE WORK ON THEIR SUBCONTRACT JULY 15, 1980.

OUTPUT

- 0 EVALUATION OF PRODUCTION SUITABILITY OF SELECTED 8-10 kW WIND TURBINE AND DESIGN MODIFICATION WHERE APPROPRIATE TO MAKE IT ADAPTABLE TO PRODUCTION BY AUTOMATED METHODS.
- 0 DETAILED COST ESTIMATES ON NONRECURRING AND RECURRING COST ELEMENTS FOR THREE PRODUCTION SENARIOS. THE WORK INCLUDES FACTORY PLANS, ASSEMBLY FLOW SHEETS, MATERIAL PROCUREMENT PLAN, CAPITAL EQUIPMENT/FACILITIES LIST, PLANT LAYOUT, WORK STATION DESCRIPTIONS, AND MANPOWER/MATERIAL FOR EACH STATION.

- O IN-DEPTH COST AND SENSITIVITY ANALYSIS ON UNIT HARDWARE COSTS CONSIDERING CHARGES IN PRODUCTION QUANTITY/RATE; TOOLING CONCEPTS; ADDITIONAL AUTOMATION; TOLERANCES AND RELIABILITY.
- O A REPORT ON ALL OF THE ABOVE SHOULD BE READY FOR PRINTING SIX MONTHS AFTER THE CONTRACT DATE.
- O PLANT FACILITIES, SWECS COST AND TOOLING REQUIRED WILL BE FURNISHED FOR THREE PRODUCTION LEVELS: 1000-10,000/YR, 100,000/YR, AND 250,000/YR.

BUDGET SUMMARY

TOTAL BUDGET (FY80)	1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	PLANNED 1ST, 2ND, AND 3RD QUARTERS EXPENDITURES	COMMITMENTS
279K	54K	187K	0

**SWECS Analysis and Costing 5636.20 (FY80 and FY81 Follow On)**

Subtask Activities		FY80						FY 81								
		July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep
	Tear Down SWECS Selected & Analyze	▽△	→	▽												
	Redesign for 3 Production Levels	▽	△	→	▽											
	Layout 3 Plant Fac. with Tools & Flow	▽	△	→	→	→	→	▽								
	Develop Factory and Sales Cost (3 levels)			△	→	→	→	→	→	▽						
	Subtask Management & Meetings	▽	△		◆			◆			◆	■				
Accrued Costs	b. Planned	187														
	c. Actual	54														
	d. Variance	133														

- △ Begin Milestone
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National Renewable  
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