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TECHNICAL AND ECONOMIC ASSESSMENT OF SOLAR HYBRID
REPOWERING

Final Report

September 1978

Work Performed Under Contract No. EG-77-C-03-1608

Public Service Company of New Mexico
Albuquerque, New Mexico

MASTER

U.S. Department of Energy

Solar Energy

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The technical and economic assessments described in this report are preliminary in nature and the scope of the study was limited to make early results available. This study is a point of departure for more comprehensive studies which will be sponsored by the Department of Energy. These additional studies will examine various combinations of economic parameters, utilities with a higher fraction of gas and oil generating capacity, the use of second generation solar central receiver technology which will allow repowering of reheat plants, and the market potential for repowering outside of the nine state area surveyed by Public Service of New Mexico.

Stearns-Roger

DRAWING LIST AND STATUS

ORDER NO. C-20266

CUSTOMER PUBLIC SERVICE COMPANY OF NEW MEXICO

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PAGE 1 OF 6

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ORDER NO C-20266

* New Drawings

PAGE 2 OF 6

FORM 02-237 REV. 10-75

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* New Drawings

PAGE 3 OF 6

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PAGE 4 OF 6

FORM 02-237 REV. 10-75

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PAGE 6 OF 6

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FLOW SHEET VALVE SYMBOLS

INSTRUMENTATION SYMBOLS

LINE SYMBOLS

PIPING AND EQUIPMENT SYMBOLS

OPERATOR SYMBOLS

INSTRUMENT AND EQUIPMENT ABBREVIATIONS

A ALARM POINT
AI ANALYZER INDICATOR
AM AMMUNICIATOR
AR ANALYZER RECORDER
AS AIR SUPPLY (INSTRUMENT AIR)
AT ANALYZER TRANSMITTER
ADV AUTOMATIC DRAIN VALVE
AOV AIR OPERATED VALVE
CCV CONDUCTIVITY CONTROL VALVE
CD SIGNAL CONVERTER OR PNEUMATIC RELAY
CE CONDUCTIVITY ELEMENT
CI CONDUCTIVITY INDICATOR
CHC CONDUCTIVITY HAND CONTROLLER
CR CONDUCTIVITY RECORDER
CT CONDUCTIVITY TRANSMITTER
DC DENSITY CONTROLLER
DPI DIFFERENTIAL PRESSURE INDICATOR
DPS DIFFERENTIAL PRESSURE SWITCH
DPT DIFFERENTIAL PRESSURE TRANSMITTER
DR DENSITY RECORDER
DT DENSITY TRANSMITTER
E ELECTRIC
EH ELECTRO-HYDRAULIC
EJ EXPANSION JOINT
E/P ELECTRIC TO PNEUMATIC CONVERTER
ER ELECTRIC RELAY
FD FLOW DRAINER
FC FLOW CONTROLLER
FCD FLOW CONTROL DRIVE
FCV FLOW CONTROL VALVE
FE FLOW ELEMENT
FG FLOW GLASS
FH FLEXIBLE HOSE
FHC FLOW HAND-AUTO CONTROLLER
FHS FIRE HOSE STATION
FI FLOW INDICATOR
FM FLOW METER
FO FLOW ORIFICE (RESTRICTION)
FOI FLOW INTEGRATOR
FR FLOW RECORDER
FRC FLOW RECORDER CONTROLLER
FS FLOW SWITCH
FT FLOW TRANSMITTER
FX FLOW TEST POINT (NO ELEMENT)
G OFAR
H HYDRAULIC
HCV HAND CONTROL VALVE
IL INDICATING LIGHT
IM INDICATOR
LC LEVEL CONTROLLER
LCD LEVEL CONTROL DRIVE
LCV LEVEL CONTROL VALVE
LG LEVEL GLASS
LHC LEVEL HAND CONTROLLER
LI LEVEL INDICATOR
LMS LIMIT SWITCH
LR LEVEL RECORDER
LRC LEVEL RECORDER CONTROLLER
LS LEVEL SWITCH
LT LEVEL TRANSMITTER
M MOTOR
MI MOTOR (POSITION) INDICATOR
MOD MODULE (MULTIPLE LIGHTED PS)
MOV MOTOR OPERATED VALVE
MT MOTION (POSITION) TRANSMITTER
P PNEUMATIC
PB PUSHBUTTON
PBIL PUSHBUTTON WITH INDICATING LIGHT
PC PRESSURE CONTROLLER
PCD PRESSURE CONTROL DRIVE
PCV PRESSURE CONTROL VALVE
P/E PNEUMATIC TO ELECTRIC CONVERTER
PF PERMANENT STRAINER
PHC PRESSURE HAND CONTROLLER
PHE pH ELEMENT
PHI pH INDICATOR
PHR pH RECORDER
PHT pH TRANSMITTER
PI PRESSURE INDICATOR
PR PRESSURE RECORDER
PRC PRESSURE RECORDER CONTROLLER
PS PRESSURE SWITCH
PT PRESSURE TRANSMITTER
PX PRESSURE TEST POINT
RE RESISTOR
RHO RESISTANCE
RD RUPTURE DISC.
S SOLENOID
SAS SERVICE AIR STATION
SC SAMPLE COOLER
SF SPRAY TYPE STRAINER
SI SPEED INDICATOR
SN SAMPLE NOZZLE
ST SPEED TRANSMITTER
SV SOLENOID VALVE
SW SWITCH (ELECTRICAL)
SWS SERVICE WATER STATION
SX SAMPLE TEST POINT
T TRAP
TC TEMPERATURE CONTROLLER
TCD TEMPERATURE CONTROL DRIVE
TCV TEMPERATURE CONTROL VALVE
TD TURBINE DRIVE
TDV TEST DEVICE
TE TEMPERATURE ELEMENT
TF TEMPORARY STRAINER
THC TEMPERATURE HAND CONTROLLER
TI TEMPERATURE INDICATOR
TR TEMPERATURE RECORDER
TRC TEMPERATURE RECORDER CONTROLLER
TS TEMPERATURE SWITCH
TT TEMPERATURE TEST POINT
TT TEMPERATURE TRANSMITTER
TW TEMPERATURE WELL
TV TELEVISION
TX TEST WELL
UVS FLAME SCANNER
V VALVE
VSC VARIABLE SPEED COUPLING
VSD VARIABLE SPEED DRIVE
ZI POSITION INDICATOR
ZSS ZERO SPEED SWITCH
ZT POSITION TRANSMITTER

PIPE LINE NUMBERING SYSTEM

SERVICE ABBREVIATIONS

AC ACID CLEANING
AD DRAINS TO ASH WATER SYSTEM
AS AUXILIARY STEAM
AW ASH WATER
BD BOILER BLOWDOWN
BF BOILER FEEDWATER
BO BLOWOUT
BW BEARING COOLING WATER
CA CONVEYING AIR
CD CO₂
CF CONDENSATE CYCLE FLUSH
CH CHEMICAL
CD CONDENSATE MAKE-UP
CO CONDENSATE
CW CIRCULATING WATER
DL DRAINS TO DAYLIGHT
DIL DIESEL OIL
DM DOMESTIC WATER
DR DRAINS TO CYCLE
DW DISMINERALIZED WATER
ED EQUIPMENT DRAIN
EW EQUIPMENT COOLING WATER
EX EXHAUSTION STEAM
FA FLY ASH
FD FLOOR DRAIN
FG FUEL GAS
FO FUEL OIL
FP FIRE PROTECTION WATER
FW FEED WATER
HW HEATER DRAINS
HC HEATING CONDENSATE
HS HEATING STEAM
HW HOT WATER - DOMESTIC
HY HYDROPHOR
IO IGNITION OIL
LO LUBE OIL
MM MISCELLANEOUS MATERIAL
MS MAIN STEAM
N NITROGEN
RA INSTRUMENT AIR
RB DRAINS TO NEUTRALIZING BASIN
PW POTABLE WATER
RD DRAINS TO HOLDING BASIN
RD ROOF DRAINS
RH REHEAT (HOT & COLD)
RW RAW WATER
SA SERVICE AIR
SB SOOT BLOWDOWN
SS SANITARY SEWER
ST STEAM (INCL. TRAPS)
SW SERVICE WATER
SP SPECIAL
TA TRANSFER AIR
TW TREATED WATER
VT VENTS (INCL. RELIEF VALVES)
WA WET ASH
WD DRAINS TO WASTE DISPOSAL SUMP
YO YARD DRAINS
YW CHILLED WATER

EQUIPMENT NUMBERING SYSTEM

ABBREVIATIONS

EJ EXPANSION JOINT
FH FLEXIBLE HOSE
MOV MOTOR OPERATED VALVE
RE PERMANENT STRAINER
SF SPRAY TYPE STRAINER
TF TEMPORARY STRAINER
I TRAP
V VALVE
ADV AIR OPERATED VALVE (NOT MODULATING)
Equipment numbering system above is for in-line piping components only. For equipment numbering system for pumps, tanks, etc., see P3 series drawings and project equipment nomenclature list.

GENERAL NOTES

FLOW DIAGRAM INDEX

REVISIONS										REFERENCE DRAWINGS										PRINT RECORD										ENG. RECORD										DRAWING STATUS									
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<div style="display: flex; justify-content: space-between;"> <div> <p>PIPING AND EQUIPMENT SYMBOLS AND NOMENCLATURE</p> <p>REEVES STATION UNIT NO. 2</p> <p>PUBLIC SERVICE COMPANY OF NEW MEXICO</p> <p>SOLAR HYBRID REPOWERING</p> <p>Stearns-Roger</p> </div> <div> <p>ALBUQUERQUE, N. M.</p> <p>C-20266</p> </div> </div>

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SOLAR RECEIVER FEEDWATER AND STEAM
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SOLAR HYBRID REPOWERING
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MISCELLANEOUS SYSTEMS
P & I DIAGRAMS
CONCEPTUAL DESIGN

REEVES STATION UNIT NO. 3
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR HYBRID REPOWERING

ALBUQUERQUE, N. M.
SCALE: NONE
Stearns-Roger
C-20266

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TOWER ELEVATION
SCALE: 1/2" = 30'-0"

PLAN @ EL. 423'-0"

PLAN @ EL. 258'-0"

PLAN @ EL. 18'-0"

REVISIONS					REFERENCE DRAWINGS					PRINT RECORD					ENG. RECORD					DRAWING STATUS				
NO.	DATE	BY	CHKD	APPD	NO.	DATE	BY	CHKD	APPD	NO.	DATE	BY	CHKD	APPD	NO.	DATE	BY	CHKD	APPD	NO.	DATE	BY	CHKD	APPD
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PLANS & ELEVATION
RECEIVER TOWER
CONCEPTUAL DESIGN

REEVES STATION UNIT NO. 2 ALBUQUERQUE, N. M.
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR HYBRID REPOWERING

1" = 10'-0" UN **Stearns-Roger** C-20256

DES. NO.
L-22929

SHEET NO.
P4-12

SECTIONS A-A
SCALE: 1/4" = 1'-0"
REF: SEE DWG. VI-8

REVISIONS					REFERENCE DRAWINGS					PRINT RECORD					ENG. RECORD		DRAWING STATUS	
REV.	DATE	BY	APP'D	DATE	NO.	DATE	BY	APP'D	DATE	BY	APP'D	DATE	BY	APP'D	DATE	BY	APP'D	

PLOT PLAN COLLECTOR FIELD CONCEPTUAL DESIGN		L-22929
REVERES STATION UNIT NO. 2 PUBLIC SERVICE COMPANY OF NEW MEXICO SOLAR HYBRID REPOWERING		YI-1
ALBUQUERQUE, N. M.		
1" = 100'		11-20265

NOTE:
FOR STORM DRAINAGE PROFILE, CROSS-
SECTIONS & DETAILS, SEE DMT. Y4-2.

[illegible]

NOTE:
FOR DITCH PROFILE, CROSS-SECTIONS
& DETAILS, SEE DWT. Y4-4.

[illegible]

VOL CONC. 3.0 CY
REINF WT. 4202#

VOL CONC. 5.91 CT
RBINF WT. 145 #

VOL CONC. 3.5 CY
BINP WT. 485 W

[illegible]

LEGEND

— EXISTING
 — NEW
 - - - FUTURE - UNIT 1

NOTES:

1. EXISTING SWITCHGEAR NOT SUITABLE FOR EXTENSION DUE TO THE 1200 AMPERE RATING OF BUS AND BREAKERS.

2. THIS DRAWING SUPERSEDES E2-1A AND E2-1B.

REVISIONS					REFERENCE DRAWINGS					PRINT RECORD					ENG. RECORD					DRAWING STATUS				
NO.	DATE	BY	CHKD	APPROV	NO.	DATE	USER	NO.	DATE	NO.	DATE	NO.	DATE	NO.	NO.	DATE	NO.	DATE	NO.	DATE	NO.	DATE	NO.	DATE
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ELECTRICAL ONE LINE DIAGRAM CONCEPTUAL DESIGN

REEVER STATION UNIT NO. 2
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR HYBRID REPOWERING

ALBUQUERQUE, N. M.
C-20266

Sheet No.
L-22929

Sheet No.
E2-1

Sheet No.
C-20266

Form 2200-31

NO.	REVISIONS					REFERENCE DRAWINGS						PRINT RECORD						ENG. RECORD		DRAWING STATUS		CONSTRUCTION	SHEET NO.	DWG. NO.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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SOLAR HYBRID REPOWERING
REEVES STATION, UNIT NO. 2

Stearns-Roger
INCORPORATED

ORDER NO.
C-20266

REV. 3

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LEFT BLANK

JOB NUMBER C-2026+
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 1

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
11	SOLAR COLLECTORS										
	111 ENGINEERING										
		111211 GENERAL									
			111211J								
				111211JC							
					111211J001 PRELIMINARY DESIGN OF COLLECTORS	.	50,000.	.	.	50,000.	
				111211JC		.	50,000.	.	.	50,000.	
						.	50,000.	.	.	50,000.	
				111211J		.	50,000.	.	.	50,000.	
						.	50,000.	.	.	50,000.	
				111211 GENERAL		.	50,000.	.	.	50,000.	
						.	50,000.	.	.	50,000.	
				111221 HELIOSTAT EQUIPMENT							
					111221J						
					111221JC						
					111221J001 PREPARE SPECS	.	.	.	.	.	.
					111221J002 EQUIPMENT SELECTION	.	.	.	.	.	.
					111221J003 PROCUREMENT	.	.	.	.	.	.
						.	.	.	.	.	.
				111221JC		.	.	.	.	.	.
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				111221 HELIOSTAT EQUIPMENT		.	.	.	.	.	.
						.	.	.	.	.	.
				111222 HELIOSTAT CONTROLS							
					111222J						
					111222JC						
					111222J001 PREPARE SPECS	.	.	.	.	.	.
					111222J002 EQUIPMENT SELECTION	.	.	.	.	.	.
					111222J003 PROCUREMENT	.	.	.	.	.	.

STEARNS-ROGER
DENVER. COLORADO

RUN DATE 14SEP78
PAGE 2

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----					-----ESTIMATE-----					REV	
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
11 SOLAR COLLECTORS											
111 ENGINEERING											
111222 HELIOSTAT CONTROLS											
111222J											
111222JC											
						.	.	.	.	.	.
					111222J	.	.	.	.	.	.
					111222 HELIOSTAT CONTROLS	.	.	.	.	.	.
					111223 HELIOSTAT FOUNDATIONS/PEDESTAL	.	.	.	.	.	.
					111223J	.	.	.	.	.	.
					111223JC	.	.	.	.	.	.
					111223J001 DETAIL DESIGN	.	.	.	.	.	.
					111223J002 PREPARE SPECS	.	.	.	.	.	.
					111223J003 PROCUREMENT	.	.	.	.	.	.
					111223JC	.	.	.	.	.	.
					111223J	.	.	.	.	.	.
					111223 HELIOSTAT FOUNDATIONS/PEDESTAL	.	.	.	.	.	.
					111 ENGINEERING	.	50,000.	.	.	50,000.	.
					112 CONSTRUCTION	.	.	.	.	.	.
					112221 HELIOSTAT EQUIPMENT	.	.	.	.	.	.
					112221D	.	.	.	.	.	.
					112221DC	.	.	38,817,000.	38,817,000.	38,817,000.	.
					112221D001 FABRICATION & INSTALLATION	.	.	38,817,000.	38,817,000.	38,817,000.	.

51

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

RUN DATE 14SEP78
PAGE 3

LEVEL & DESCRIPTION						ESTIMATE					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
					11 SOLAR COLLECTORS						
					112 CONSTRUCTION						
					112221 HELIOSTAT EQUIPMENT						
					112221D				.38,817,000.	38,817,000.	
					112221DC						
					112221D				.38,817,000.	38,817,000.	
					112221 HELIOSTAT EQUIPMENT				.38,817,000.	38,817,000.	
					112222 HELIOSTAT CONTROLS & POWER						
					112222F						
					112222FC						
					112222F001 ELECTRICAL	.	701,000.	1,161,200.	.	1,862,200.	
					112222FO	.	701,000.	1,161,200.	.	1,862,200.	
					112222F	.	701,000.	1,161,200.	.	1,862,200.	
					112222N						
					112222NO						
					112222N001 INSTRUMENTATION	.	.	.	.	.	
					112222NC	.	.	.	.	.	
					112222N	.	.	.	.	.	
					112222 HELIOSTAT CONTROLS & POWER	.	701,000.	1,161,200.	.	1,862,200.	

JGB NUMBER C-20266

PUBLIC SERVICE COMPANY OF NEW MEXICO

SOLAR REPOWERING PROJECT

STEARNS-ROGER

DENVER COLORADO

RUN DATE 14SEP78

PAGE 4

4

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

LEVEL & DESCRIPTION					
1	2	3	4	5	BASE
1	2	3	4	5	BASE

11 SOLAR COLLECTORS

112 CONSTRUCTION

112223 HELIOSTAT FOUNDATIONS/PEDESTAL

112223A

112223A C

112223A001 HELIOSTAT FOUNDATION-EARTHWORK

112223A C

112223A

112223B

112223B C

112223B 001 HELIOSTAT FOUNDATION-CONCRETE

1122238 C

1122238

112223C

112223C C

112223C 001 HELIOSTAT FOUNDATION-STEEL

112223C 0

112223C

112223 FELIOSTAT FOUNDATIONS/PEDESTAL

112241 QUALITY ASSURANCE

112241H

112241H0

112241H001 QUALITY ASSURANCE

JOB NUMBER C-20266
 PUBLIC SERVICE COMPANY OF NEW MEXICO
 SOLAR REPOWERING PROJECT

STEARNS-ROGER
 DENVER COLORADO

RUN DATE 14SEP78
 PAGE 5

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
11	SOLAR COLLECTORS										
	112 CONSTRUCTION										
	112241 QUALITY ASSURANCE										
	112241H										
	112241H0										
	112241H										
	112241 QUALITY ASSURANCE										
53	112251 CHECKOUT										
	112251M										
	112251MC										
	112251M001 CHECKOUT						187,000.			187,000.	
	112251MC						187,000.			187,000.	
	112251M						187,000.			187,000.	
	112251 CHECKOUT						187,000.			187,000.	
	112 CONSTRUCTION						883,000.	1,161,200.	38,817,000.	40,866,200.	
11	SOLAR COLLECTORS						938,000.	1,161,200.	38,817,000.	40,916,200.	

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 6

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
12	RECEIVER										
	121	ENGINEERING									
		121211	GENERAL								
			121211J								
				121211JC							
					121211J001 PRELIMINARY DESIGN OF RECEIVER	.	1,759,000.	.	.	1,759,000.	
					121211J002 PRELIMINARY DESIGN OF TOWER	.	.	.	.	.	
				121211JC		.	1,759,000.	.	.	1,759,000.	
				121211J		.	1,759,000.	.	.	1,759,000.	
				121211	GENERAL	.	1,759,000.	.	.	1,759,000.	
				121221	ENGINEERING - RECEIVER						
				121221J	ENGINEERING - RECEIVER						
					121221JC						
					121221J001 PREPARE SPEC	.	.	.	.	.	
					121221J002 EQUIPMENT SELECTION	.	.	.	.	.	
					121221J003 PROCUREMENT	.	.	.	.	.	
				121221JC		.	.	.	.	.	
				121221J	ENGINEERING - RECEIVER	.	.	.	.	.	
				121221	ENGINEERING - RECEIVER	.	.	.	.	.	
				121224	ENGINEERING - TOWER						
				121224J	ENGINEERING - TOWER						
					121224JC						
					121224J001 DETAIL DESIGN	.	.	.	.	.	
					121224J002 PREPARE SPEC	.	.	.	.	.	
					121224J003 EQUIPMENT SELECTION	.	.	.	.	.	
					121224J004 PROCUREMENT	.	.	.	.	.	

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 8

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
12	RECEIVER										
	121	ENGINEERING									
		121226	ENGINEERING - AUX. EQUIP.								
		121226J	ENGINEERING - AUX. EQUIP.								
		121226	ENGINEERING - AUX. EQUIP.								
	121	ENGINEERING									
							1,759,000.			1,759,000.	
	122	CONSTRUCTION									
		122221	RECEIVER								
		122221C	RECEIVER - STRUCTURAL STEEL								
		122221C									
		122221C001	RECEIVER - STRUCTURAL STEEL								
		122221C									
		122221C	RECEIVER - STRUCTURAL STEEL								
		122221D	RECEIVER - EQUIPMENT								
		122221D									
		122221D001	RECEIVER - EQUIPMENT					16,960,000.		16,960,000.	
		122221D						16,960,000.		16,960,000.	
		122221D	RECEIVER - EQUIPMENT					16,960,000.		16,960,000.	
		122221E	RECEIVER - PIPING								
		122221E									
		122221E001	RECEIVER - PIPING								

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 9

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

LEVEL & DESCRIPTION						ESTIMATE					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
12 RECEIVER											
122 CONSTRUCTION											
122221 RECEIVER											
122221E RECEIVER - PIPING											
122221EC						.	.	.	.	.	.
122221E RECEIVER - PIPING						.	.	.	.	.	.
122221G RECEIVER - PAINTING											
122221GC						.	.	.	.	.	.
122221G001 RECEIVER - PAINTING						.	.	.	.	.	.
122221GC						.	.	.	.	.	.
122221G RECEIVER - PAINTING						.	.	.	.	.	.
122221 RECEIVER						.	.	.16,960,000.	.16,960,000.		
122224 TOWER											
122224A TOWER-EARTHWORK											
122224AC											
122224A001 TOWER - EARTHWORK						.	6,650.	.	.	6,650.	
122224AC						.	6,650.	.	.	6,650.	
122224A TOWER-EARTHWORK						.	6,650.	.	.	6,650.	
122224B TOWER-CONCRETE											
122224BC						.	824,800.	277,200.	.	1,102,000.	
122224B001 TOWER - CONCRETE						.	824,800.	277,200.	.	1,102,000.	
122224BC						.	824,800.	277,200.	.	1,102,000.	

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 10

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----					-----ESTIMATE-----					REV	
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
12	RECEIVER										
	122	CONSTRUCTION									
		122224	TOWER								
			122224B	TOWER-CONCRETE		.	824,800.	277,200.		1,102,000.	
			122224C	TOWER-STEEL							
				122224C							
				122224C001	TOWER - STEEL	.	24,000.	58,000.	48,400.	130,400.	
				122224C002	TOWER - ELEVATOR	.	.	.	400,000.	400,000.	
				122224C							
				122224C		.	24,000.	58,000.	448,400.	530,400.	
				122224C	TOWER-STEEL						
				122224C		.	24,000.	58,000.	448,400.	530,400.	
				122224E	TOWER-PIPING & PIPE RACK						
				122224E							
					122224E001 TOWER-MAIN STEAM PIPING	.	753,800.	767,400.	473,600.	1,994,800.	
					122224E002 TOWER-FEEDWATER PIPING	.	536,600.	98,200.	206,900.	841,700.	
					122224E003 TOWER-OTHER PIPING	.	153,000.	125,000.	95,000.	373,000.	
				122224E							
				122224E		.	1,443,400.	590,600.	775,500.	3,209,500.	
				122224E	TOWER-PIPING & PIPE RACK						
				122224E		.	1,443,400.	590,600.	775,500.	3,209,500.	
				122224F	TOWER-ELECTRICAL						
				122224F							
					122224F001 TOWER - ELECTRICAL	.	28,900.	52,300.	.	81,200.	
				122224F							
				122224F		.	28,900.	52,300.	.	81,200.	
				122224F	TOWER-ELECTRICAL						
				122224F		.	28,900.	52,300.	.	81,200.	
				122224G	TOWER-PAINTING						
				122224G							
					122224G001 TOWER - PAINTING	.	.	.	8,000.	8,000.	

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SCLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 11

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
12	RECEIVER										
	122	CONSTRUCTION									
		122224	TOWER								
			122224G TOWER-PAINTING						8,000.	8,000.	
			122224G C								
			122224G TOWER-PAINTING						8,000.	8,000.	
			122224	TOWER							
						2,327,750.	1,378,100.	1,231,900.		4,937,750.	
	122226	AUXILIARY EQUIPMENT - RECEIVER									
		122226D	AUX EQUIPMENT								
			122226D C								
			122226D001	AUXILIARY EQUIPMENT							
			122226D C								
			122226D	AUX EQUIPMENT							
			122226	AUXILIARY EQUIPMENT - RECEIVER							
			122241	QUALITY ASSURANCE - RECEIVER							
			122241H	QUALITY ASSURANCE - RECEIVER							
				122241HC							
				122241H001	QUALITY ASSURANCE - RECEIVER						
				122241HC							
				122241H	QUALITY ASSURANCE - RECEIVER						

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER, COLORADO

RUN DATE 14SEP78
PAGE 12

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
12 RECEIVER											
122 CONSTRUCTION											
122241 QUALITY ASSURANCE - RECEIVER						.	.	.	.	.	.
122251 CHECKOUT/ STARTUP - RECEIVER											
122251M CHECKOUT/ STARTUP - RECEIVER											
122251MO											
122251MOO1 CHECKOUT/STARTUP - RECEIVER						.	50,000.	.	.	50,000.	
122251MO						.	50,000.	.	.	50,000.	
122251M CHECKOUT/ STARTUP - RECEIVER						.	50,000.	.	.	50,000.	
122251 CHECKOUT/ STARTUP - RECEIVER						.	50,000.	.	.	50,000.	
122 CONSTRUCTION						.	2,377,750.	1,378,100.	18,191,900.	21,947,750.	
12 RECEIVER						.	4,136,750.	1,378,100.	18,191,900.	23,706,750.	

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14 SEP 78
PAGE 13

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
13	THERMAL STORAGE										
	131	ENGINEERING									
		131211	GENERAL								
			131211J								
				131211JC							
					131211J001 PRELIMINARY DESIGN OF SYSTEM	.	.	.	.	.	.
				131211JC		.	.	.	.	.	.
				131211J		.	.	.	.	.	.
		131211	GENERAL			.	.	.	.	.	.
	131221	THERMAL STORAGE EQUIPMENT									
		131221J									
			131221JC								
				131221J001 PREPARE SPECS		.	.	.	.	.	.
				131221J002 EQUIPMENT SELECTION		.	.	.	.	.	.
				131221J003 PROCUREMENT		.	.	.	.	.	.
				131221JC		.	.	.	.	.	.
				131221J		.	.	.	.	.	.
	131221	THERMAL STORAGE EQUIPMENT				.	.	.	.	.	.
	131	ENGINEERING				.	.	.	.	.	.

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 14

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

LEVEL & DESCRIPTION-----						ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
13	THERMAL STORAGE										
	132	CONSTRUCTION									
		132221	THERMAL STORAGE UNIT								
		132221A									
		132221AC									
			132221AC001 THERMAL STORAGE UNIT-EARTHWORK			.		.	.	.	.
		132221AC				.		.	.	.	.
		132221A				.		.	.	.	.
		132221B				.		.	.	.	.
		132221B0				.		.	.	.	.
			132221B001 THERMAL STORAGE UNIT-CONCRETE			.		.	.	.	.
		132221B0				.		.	.	.	.
		132221B				.		.	.	.	.
		132221C				.		.	.	.	.
		132221C0				.		.	.	.	.
			132221C001 THERMAL STORAGE UNIT-STEEL			.		.	.	.	.
		132221C0				.		.	.	.	.
		132221C				.		.	.	.	.
		132221D				.		.	.	.	.
		132221D0				.		.	.	.	.
			132221D001 THERMAL STORAGE UNIT-EQUIPMENT			.		.	.	.	.
		132221D0				.		.	.	.	.
		132221D				.		.	.	.	.

JGB NUMBER C-20266
 PUBLIC SERVICE COMPANY OF NEW MEXICO
 SOLAR REPOWERING PROJECT

STEARNS-ROGER
 DENVER COLORADO

RUN DATE 14SEP78
 PAGE 15

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----					-----ESTIMATE-----					REV	
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
13 THERMAL STORAGE											
132 CONSTRUCTION											
132221 THERMAL STORAGE UNIT											
132221E											
132221EC											
132221E001 THERMAL STORAGE UNIT-PIPING											
132221EC											
132221E											
132221F											
132221FC											
132221F001 THERMAL STORAGE UNIT-ELECTRICAL											
132221FC											
132221F											
132221G											
132221GC											
132221G001 THERMAL STORAGE UNIT-PAINTING											
132221GC											
132221G											
132221N											
132221NC											
132221N001 THERMAL STORAGE UNIT-INSTRUMENTS											
132221NC											
132221N											

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 16

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----					-----ESTIMATE-----					REV	
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
13	THERMAL STORAGE										
	132	CONSTRUCTION									
		132221	THERMAL STORAGE UNIT								
			132221P								
				132221PC							
					132221P001 THERMAL STORAGE UNIT-INSULATION	.	.	.	.	.	.
				132221PC							
			132221P								
		132221	THERMAL STORAGE UNIT								
		132241	QUALITY ASSURANCE								
			132241H								
				132241HC							
					132241H001 QUALITY ASSURANCE	.	.	.	.	.	.
				132241HC							
			132241H								
		132241	QUALITY ASSURANCE								
		132251	CHECKOUT								
			132251M								
				132251MC							
					132251M001 CHECKOUT	.	.	.	.	.	.
				132251MG							

JOB NUMBER C-20266
 PUBLIC SERVICE COMPANY OF NEW MEXICO
 SOLAR REPOWERING PROJECT

STEARNS-ROGER
 DENVER COLORADO

RUN DATE 14SEP78
 PAGE 17

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
13	THERMAL STORAGE										
	132	CONSTRUCTION									
		132251	CHECKOUT								
			132251M								
		132251	CHECKOUT								
		132	CONSTRUCTION								
13	THERMAL STORAGE										

JOB NUMBER C-20266

PUBLIC SERVICE COMPANY OF NEW MEXICO

SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78

PAGE 18

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
					14 CONTROLS & INSTRUMENTS						
					141 ENGINEERING						
					141211 GENERAL						
					141211J						
					141211JC						
					141211J001 PRELIM DESIGN OF CONTROL SYSTEMS	.	322,000.	.	.	322,000.	
					141211J002 PRELIM DESIGN OF INSTRUMENTATION	.	.	.	.	.	
					141211JC	.	322,000.	.	.	322,000.	
					141211J	.	322,000.	.	.	322,000.	
					141211 GENERAL	.	322,000.	.	.	322,000.	
					141222 INSTRUMENTATION						
					141222J INSTRUMENTATION						
					141222J1 INSTRUMENTATION						
					141222J101 CONTROL PANEL DES & PREPARE SPEC	.	.	.	.	.	
					141222J102 TURBINE CONTROL SYS DES & PREP S	.	.	.	.	.	
					141222J103 ANNUNCIATOR DES & PREPARE SPEC	.	.	.	.	.	
					141222J104 BOILER COMBUST CONT DES & PREP S	.	.	.	.	.	
					141222J105 OTHER INSTRUMENT DES & PREP SPEC	.	.	.	.	.	
					141222J106 INSTALLATION PROCUREMENT	.	.	.	.	.	
					141222J1 INSTRUMENTATION	.	.	.	.	.	
					141222J INSTRUMENTATION	.	.	.	.	.	
					141222 INSTRUMENTATION	.	.	.	.	.	
					141228 CONTROLS						
					141228J CONTROLS						
					141228J1 CONTROL SYSTEMS						
					141228J101 MASTR CONT COMPUTER DES & PREP S	.	.	.	.	.	

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 19

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
14	CONTROLS & INSTRUMENTS										
	141	ENGINEERING									
		141228	CONTROLS								
			141228J	CONTROL SYSTEMS							
				141228J1	CONTROL SYSTEMS						
					141228J102 DATA ACQUISITN SYST DES & PREP S	.	.	.	.	.	.
					141228J103 ANALOG SYSTEM DES & PREP SPEC	.	.	.	.	.	.
					141228J104 INTERFACE LOGIC SYS DES & PREP S	.	.	.	.	.	.
					141228J105 CONTROL SYSTEMS PROCUREMENT	.	.	.	.	.	.
					141228J1 CONTROL SYSTEMS	.	.	.	.	.	.
					141228J CONTROLS	.	.	.	.	.	.
					141228 CONTROLS	.	.	.	.	.	.
					141 ENGINEERING	.	322,000.	.	.	322,000.	.
					142 CONSTRUCTION						
					142222 INSTALLATION OF INSTRUMENTATION						
					142222N						
					142222NC						
					142222N001 INSTRUMENTATION INSTALL & HOOKUP	.	64,300.	1,137,900.	3,000.	1,205,200.	.
					142222NC	.	64,300.	1,137,900.	3,000.	1,205,200.	.
					142222N	.	64,300.	1,137,900.	3,000.	1,205,200.	.
					142222 INSTALLATION OF INSTRUMENTATION	.	64,300.	1,137,900.	3,000.	1,205,200.	.

JOB NUMBER C-20266
 PUBLIC SERVICE COMPANY OF NEW MEXICO
 SOLAR REPOWERING PROJECT

STEARNS-ROGER
 DENVER COLORADO

RUN DATE 14SEP78
 PAGE 20

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
14 CONTROLS & INSTRUMENTS											
142 CONSTRUCTION											
142228 INSTALLATION OF CONTROLS											
142228N											
142228ND											
142228ND001 CONTROL SYSTEMS INSTALLATION						.	23,700.	1,931,000.	2,500.	1,957,200.	
142228NC						.	23,700.	1,931,000.	2,500.	1,957,200.	
142228N						.	23,700.	1,931,000.	2,500.	1,957,200.	
142228 INSTALLATION OF CONTROLS						.	23,700.	1,931,000.	2,500.	1,957,200.	
142241 QUALITY ASSURANCE											
142241H											
142241HC											
142241H001 QUALITY ASSURANCE						.	.	.	.	.	
142241HC						.	.	.	.	.	
142241H						.	.	.	.	.	
142241 QUALITY ASSURANCE						.	.	.	.	.	
142251 CHECKOUT											
142251M											
142251MC											
142251M001 CHECKOUT						.	46,400.	.	.	46,400.	
142251MC						.	46,400.	.	.	46,400.	

JOB NUMBER C-20266
 PUBLIC SERVICE COMPANY OF NEW MEXICO
 SOLAR REPOWERING PROJECT

STEARNS-ROGER
 DENVER COLORADO

RUN DATE 14SEP78
 PAGE 21

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
14	CONTROLS & INSTRUMENTS										
	142	CONSTRUCTION									
		142251	CHECKOUT								
			142251M								
							46,400.			46,400.	
		142251	CHECKOUT				46,400.			46,400.	
		142	CONSTRUCTION				134,400.	3,068,900.	5,500.	3,208,800.	
14	CONTROLS & INSTRUMENTS						456,400.	3,068,900.	5,500.	3,530,800.	

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 22

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----					-----ESTIMATE-----					REV	
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
15 BALANCE OF PLANT											
151 ENGINEERING BALANCE OF PLANT											
151212 SYSTEM ENGINEERING											
151212J SYSTEM ENGINEERING											
151212J1 SYSTEM REQUIRMENTS											
151212J101 PREPARE FUNCT. DESIGN REQUIREMEN						.	224,000.	.	.	224,000.	.
151212J102 PREP SYSTEM DESIGN SPECS						.	.	.	.	.	.
151212J1 SYSTEM REQUIRMENTS											
						.	224,000.	.	.	224,000.	.
151212J2 SYSTEM DESIGN											
151212J202 PREPARE INTEGRATED PLANT LAYCUT						.	.	.	.	.	.
151212J203 PREPARE INTERFACE CONTROL DRWG.						.	.	.	.	.	.
151212J204 PERIODIC REVIEW/UPDATE						.	.	.	.	.	.
151212J205 PREPARE OVERALL SYST. FLOW DIAGR						.	.	.	.	.	.
151212J2 SYSTEM DESIGN											
						.	.	.	.	.	.
151212J3 SYSTEM ANALYSIS											
151212J301 PERFORM SS AND TRANS. ANALYSIS						.	.	.	.	.	.
151212J3 SYSTEM ANALYSIS											
						.	.	.	.	.	.
151212J4 SAFETY ANALYSIS											
151212J401 PERFORM RELIABILIBY STUDIES						.	.	.	.	.	.
151212J402 PERFORM TRANSIENT ANALYSIS						.	.	.	.	.	.
151212J4 SAFETY ANALYSIS											
						.	.	.	.	.	.
151212J5 PLANS											
151212J501 PREPARE DESIGN PLANS						.	.	.	.	.	.
151212J502 PREPARE Q.A. PLANS						.	.	.	.	.	.
151212J503 PREPARE PROCURE & CONSTR PLANS						.	.	.	.	.	.
151212J504 PREPARE PLANT CHECKCUT PLAN						.	.	.	.	.	.
151212J505 DATA ACQUISITION PLAN						.	.	.	.	.	.
151212J506 PREPARE OPERATIONS TEST PLAN						.	.	.	.	.	.
151212J5 PLANS											
						.	.	.	.	.	.

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14 SEP 78
PAGE 23

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
15 BALANCE OF PLANT											
151 ENGINEERING BALANCE OF PLANT											
151212 SYSTEM ENGINEERING											
151212J SYSTEM ENGINEERING						.	224,000.	.	.	224,000.	
151213 SYSTEM ENGINEERING						.	224,000.	.	.	224,000.	
151213 SITE ENGINEERING											
151213J SITE ENGINEERING											
151213JC											
151213J001 PERMITS AND APPROVALS						.	.	.	.	.	.
151213J002 PREPARE SITE PREP PLAN						.	.	.	.	.	.
151213J003 PREPARE FACILITY PLAN						.	.	.	.	.	.
151213J004 PREPARE PUBLIC AWARENESS PLAN						.	.	.	.	.	.
151213J005 PERIODIC REVIEW & UPDATE OF PLAN						.	.	.	.	.	.
151213J006 PREPARE SITE SPECS						.	.	.	.	.	.
151213J007 PREPARE FACILITY SPECS						.	.	.	.	.	.
151213J008 FACILITY DESIGN						.	.	.	.	.	.
151213J009 PREP TEST PLAN TO ACQUIRE SITE DA						.	.	.	.	.	.
151213J010 PERFORM TESTS						.	.	.	.	.	.
151213J011 ANALYZE & REPORT DATA						.	.	.	.	.	.
151213J012 ESTAB/MAINTAIN SITE DATA BANK						.	.	.	.	.	.
151213J013 SITE DATA DISSEMINATION						.	.	.	.	.	.
151213J014 SITE DATA PREPARATION						.	.	.	.	.	.
151213J015 PERFORM ENVIRONMENTAL ASSESSMENT						.	.	.	.	.	.
151213J016 PREPARE IMPACT STATEMENT						.	.	.	.	.	.
151213JC						.	.	.	.	.	.
151213J SITE ENGINEERING						.	.	.	.	.	.
151213 SITE ENGINEERING						.	.	.	.	.	.

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SCLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14 SEP 78
PAGE 24

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
15					BALANCE OF PLANT						
	151				ENGINEERING BALANCE OF PLANT	.	224,000.	.	.	224,000.	
	152				CONSTRUCTION BALANCE OF PLANT						
		152229			DEMOLITION						
			152229T								
				152229TC		.	3,100.	.	.	3,100.	
					152229T001 DEMOLITION	.	3,100.	.	.	3,100.	
				152229TC		.	3,100.	.	.	3,100.	
						.	3,100.	.	.	3,100.	
				152229T		.	3,100.	.	.	3,100.	
						.	3,100.	.	.	3,100.	
				152229	DEMOLITION	.	3,100.	.	.	3,100.	
						.	3,100.	.	.	3,100.	
				152230	MOD TO EXIST STRUCTURES & EQUIPMENT						
					152230F						
					152230FC						
					152230F001 MODIFICATIONS-ELECTRICAL	.	14,300.	48,900.	.	63,200.	
					152230F002 MOD-RELOCATE TRANSMISSION LINES	.	100,000.	50,000.	.	150,000.	
						.	114,300.	98,900.	.	213,200.	
					152230FC	.	114,300.	98,900.	.	213,200.	
						.	114,300.	98,900.	.	213,200.	
					152230F	.	114,300.	98,900.	.	213,200.	
						.	114,300.	98,900.	.	213,200.	
					152230 MOD TO EXIST STRUCTURES & EQUIPMENT	.	114,300.	98,900.	.	213,200.	
						.	114,300.	98,900.	.	213,200.	
					152231 NEW WORK						
					152231A						
					152231AC						
					152231A001 EARTHWORK-SITE GRADING	.	.	1,251,000.	.	1,251,000.	

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 25

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
15 BALANCE OF PLANT											
152 CONSTRUCTION BALANCE OF PLANT											
152231 NEW WORK											
152231A											
152231AC											
152231A002 EARTHWORK-UNDERGROUND DIVERSION						.	.	.	322,000.	322,000.	
152231A003 EARTHWORK-ROADWAYS & FENCE						.	.	.	325,900.	325,900.	
152231AC						.	.	.	1,898,900.	1,898,900.	
152231A						.	.	.	1,898,900.	1,898,900.	
152231B											
152231B0											
152231B001 CONCRETE						.	26,200.	21,100.	2,160,100.	2,207,400.	
152231B0						.	26,200.	21,100.	2,160,100.	2,207,400.	
152231B						.	26,200.	21,100.	2,160,100.	2,207,400.	
152231C											
152231C0											
152231C001 BUILDINGS						.	110,000.	160,000.	129,400.	399,400.	
152231C002 WAREHOUSE						.	4,000.	4,500.	48,000.	56,500.	
152231C0						.	114,000.	164,500.	177,400.	455,900.	
152231C						.	114,000.	164,500.	177,400.	455,900.	
152231D											
152231D0											
152231D001 EQUIPMENT						.	35,700.	293,000.	9,300.	338,000.	
152231D0						.	35,700.	293,000.	9,300.	338,000.	

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 26

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
15	BALANCE OF PLANT										
	152	CONSTRUCTION	BALANCE OF PLANT								
		152231	NEW WORK								
			152231D				35,700.	293,000.	9,300.	338,000.	
			152231E								
			152231EC								
				152231E001	PIPING		521,600.	154,700.	36,400.	712,700.	
				152231EC			521,600.	154,700.	36,400.	712,700.	
				152231E			521,600.	154,700.	36,400.	712,700.	
				152231F							
				152231FC							
					152231F001 ELECTRICAL		56,200.	359,600.		415,800.	
				152231FG			56,200.	359,600.		415,800.	
				152231F			56,200.	359,600.		415,800.	
				152231G							
				152231GC							
					152231G001 PAINTING				66,000.	66,000.	
				152231GC					66,000.	66,000.	
				152231G					66,000.	66,000.	
				152231	NEW WORK		753,700.	592,900.	4,348,100.	6,094,700.	

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14 SEP 78
PAGE 27

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
15					BALANCE OF PLANT						
	152				CONSTRUCTION BALANCE OF PLANT						
		152251			CHECKOUT						
			152251M								
				152251MC							
					152251M001 CHECKOUT	.	12,300.	.	.	12,300.	
				152251MC		.	12,300.	.	.	12,300.	
				152251M		.	12,300.	.	.	12,300.	
				152251	CHECKOUT	.	12,300.	.	.	12,300.	
				152	CONSTRUCTION BALANCE OF PLANT	.	883,400.	1,091,800.	4,348,100.	6,323,300.	
15					BALANCE OF PLANT	.	1,107,400.	1,091,800.	4,348,100.	6,547,300.	

75

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
16	ELECTRIC POWER GENERATION SYSTEM										
	161 EPGS ENGINEERING										
	161214 EPGS - PRELIM SYSTEM DESIGN										
	161214J EPGS - PRELIM SYSTEM DESIGN										
	161214JC										
					161214JOC1 PREPARE DESIGN REQUIREMENTS	.	321,000.	.	.	321,000.	.
					161214JOC2 PREP PRELIM DESIGN OF EXIST SYS	.	.	.	.	.	.
	161214JC					.	321,000.	.	.	321,000.	.
	161214J EPGS - PRELIM SYSTEM DESIGN					.	321,000.	.	.	321,000.	.
	161214 EPGS - PRELIM SYSTEM DESIGN					.	321,000.	.	.	321,000.	.
	161215 EPGS - SYST. DESIGN & MODIFICAT.										
	161215J EPGS - SYST. DESIGN & MODIFICAT.										
	161215JC										
					161215J001 MODIFICATION-DETAIL DESIGN	.	.	.	.	.	.
					161215J002 MODIFICATION-PREPARE SPECS	.	.	.	.	.	.
					161215J003 MODIFICATION-EQUIPMENT SELECTION	.	.	.	.	.	.
					161215J004 MODIFICATION-PROCUREMENT	.	.	.	.	.	.
	161215JC					.	.	.	.	.	.
	161215J EPGS - SYST. DESIGN & MODIFICAT.					.	.	.	.	.	.
	161215 EPGS - SYST. DESIGN & MODIFICAT.					.	.	.	.	.	.
	161216 EPGS - COMPONENT DESIGN										
	161216J EPGS - COMPONENT DESIGN										
	161216JC										
					161216J001 MECHANICAL DESIGN	.	.	.	.	.	.
					161216J002 ELECTRICAL DESIGN	.	.	.	.	.	.
					161216J003 CIVIL/STRUCTURAL DESIGN	.	.	.	.	.	.

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 29

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
16	ELECTRIC POWER GENERATION SYSTEM										
161	EPGS ENGINEERING										
161216	EPGS - COMPONENT DESIGN										
161216J	EPGS - COMPONENT DESIGN										
161216JC											
161216J004	PIPING/INSTRUMENT DESIGN					.		.	.	.	.
161216J005	CONTROL SYSTEM DESIGN					.		.	.	.	.
161216J006	PROCUREMENT					.		.	.	.	.
161216JC						.		.	.	.	.
161216J	EPGS - COMPONENT DESIGN					.		.	.	.	.
161216	EPGS - COMPONENT DESIGN					.		.	.	.	.
161	EPGS ENGINEERING					.	321,000.	.	.	321,000.	
162	EPGS CONSTRUCTION										
162229	DEMOLITION										
162229T	DEMOLITION										
162229T0											
162229T001	DEMOLITION					.	11,200.	300.	.	11,500.	
162229TC						.	11,200.	300.	.	11,500.	
162229T	DEMOLITION					.	11,200.	300.	.	11,500.	
162229	DEMOLITION					.	11,200.	300.	.	11,500.	

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 30

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
16	ELECTRIC POWER GENERATION SYSTEM										
	162	EPGS CONSTRUCTION									
		162230	MOD TO EXISTING STRUCTURES & EQUIP								
			162230A MODIFICATIONS - EARTHWORK								
			162230A C								
			162230A001 MODIFICATIONS-EARTHWORK			.	.	.	.	.	.
			162230A C			.	.	.	.	.	.
			162230A MODIFICATIONS - EARTHWORK			.	.	.	.	.	.
			162230B MODIFICATIONS - CONCRETE			.	.	.	.	.	.
			162230B C			.	.	.	.	.	.
			162230B001 MODIFICATIONS-CONCRETE			.	.	.	.	.	.
			162230B C			.	.	.	.	.	.
			162230B MODIFICATIONS - CONCRETE			.	.	.	.	.	.
			162230C MODIFICATIONS - BLDGS & STRUCT.			.	.	.	.	.	.
			162230C C			.	.	.	.	.	.
			162230C001 MODIFICATIONS-BLDS & STRUCTURES			.	.	.	.	.	.
			162230C C			.	.	.	.	.	.
			162230C MODIFICATIONS - BLDGS & STRUCT.			.	.	.	.	.	.
			162230D MODIFICATIONS - PROCESS EQUIPM.			.	.	.	310,000.	310,000.	.
			162230D C			.	.	.	310,000.	310,000.	.
			162230D001 MODIFICATIONS-PROCESS EQUIPMENT			.	.	.	310,000.	310,000.	.
			162230D C			.	.	.	310,000.	310,000.	.
			162230D MODIFICATIONS - PROCESS EQUIPM.			.	.	.	310,000.	310,000.	.

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14 SEP 78
PAGE 31

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
16	ELECTRIC POWER GENERATION SYSTEM										
	162	EPGS CONSTRUCTION									
		162230	MOD TO EXISTING STRUCTURES & EQUIP								
		162230E	MODIFICATIONS - PIPING								
		162230EC									
		162230EC001	MODIFICATIONS-PIPING			.	.	.	.	.	.
		162230EC				.	.	.	.	.	.
		162230E	MODIFICATIONS - PIPING			.	.	.	.	.	.
		162230E				.	.	.	.	.	.
		162230F	MODIFICATIONS - ELECTRICAL								
		162230FC									
		162230FC001	MODIFICATIONS-ELECTRICAL			.	.	.	.	.	.
		162230FC				.	.	.	.	.	.
		162230F	MODIFICATIONS - ELECTRICAL			.	.	.	.	.	.
		162230F				.	.	.	.	.	.
		162230G	MODIFICATIONS - PAINTING								
		162230GC									
		162230GC001	MODIFICATIONS-PAINTING			.	.	.	.	.	.
		162230GC				.	.	.	.	.	.
		162230G	MODIFICATIONS - PAINTING			.	.	.	.	.	.
		162230G				.	.	.	.	.	.
		162230L	MODIFICATIONS - PLANT ITEMS								
		162230LC									
		162230LC001	MODIFICATIONS-PLANT ITEMS			.	.	.	.	.	.
		162230LC				.	.	.	.	.	.
		162230L	MODIFICATIONS - PLANT ITEMS			.	.	.	.	.	.

JOB NUMBER C-20266
 PUBLIC SERVICE COMPANY OF NEW MEXICO
 SOLAR REPOWERING PROJECT

STEARNS-ROGER
 DENVER COLORADO

RUN DATE 14SEP78
 PAGE 32

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
16	ELECTRIC POWER GENERATION SYSTEM										
	162 EPGS CONSTRUCTION										
	162230 MOD TO EXISTING STRUCTURES & EQUIP										
	162230N MODIFICATIONS - INSTRUMENTATION										
	162230NC										
	162230N001 MODIFICATIONS-INSTRUMENTATION					.	.	.	.	.	.
	162230MC					.	.	.	.	.	.
	162230N MODIFICATIONS - INSTRUMENTATION					.	.	.	.	.	.
	162230P MODIFICATIONS - INSULATION										
	162230P0										
	162230P001 MODIFICATIONS-INSULATION					.	.	.	.	.	.
	162230P0					.	.	.	.	.	.
	162230P MODIFICATIONS - INSULATION					.	.	.	.	.	.
	162230 MOD TO EXISTING STRUCTURES & EQUIP					.	.	.	310,000.	310,000.	
	162231 NEW WORK										
	162231A NEW WORK - EARTHWORK										
	162231AC										
	162231A001 NEW WORK-EARTHWORK					.	.	.	.	.	.
	162231AC					.	.	.	.	.	.
	162231A NEW WORK - EARTHWORK					.	.	.	.	.	.
	162231B NEW WORK - CONCRETE										
	162231B0										
	162231B001 NEW WORK-CONCRETE					.	.	.	.	.	.

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 33

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
16	ELECTRIC POWER GENERATION SYSTEM										
	162	EPGS CONSTRUCTION									
		162231	NEW WORK								
		162231B	NEW WORK - CONCRETE								
			162231B C			.	.	.	.	.	.
		162231B	NEW WORK - CONCRETE			.	.	.	.	.	.
		162231C	NEW WORK - BLDG & STRUCT.			.	.	.	.	.	.
			162231C C			.	.	.	.	.	.
			162231C001 NEW WORK-BLDGS AND STRUCTURES			.	.	.	.	.	.
			162231C C			.	.	.	.	.	.
		162231C	NEW WORK - BLDG & STRUCT.			.	.	.	.	.	.
		162231D	NEW WORK - PROCESS EQUIPM.			.	.	.	.	.	.
			162231D C			.	.	.	.	.	.
			162231D001 NEW WORK-EQUIPMENT			.	51,100.	596,300.	13,400.	1,060,800.	.
			162231D C			.	51,100.	596,300.	13,400.	1,060,800.	.
		162231D	NEW WORK - PROCESS EQUIPM.			.	51,100.	596,300.	13,400.	1,060,800.	.
		162231E	NEW WORK - PIPING			.	.	.	.	.	.
			162231E C			.	.	.	.	.	.
			162231E001 NEW WORK-MAIN STEAM PIPING			.	172,400.	205,300.	100,000.	477,700.	.
			162231E002 NEW WORK-FEEDWATER PIPING			.	265,000.	92,000.	80,100.	437,100.	.
			162231E003 NEW WORK-OTHER PIPING			.	208,900.	65,500.	29,000.	303,400.	.
			162231E C			.	646,300.	362,800.	209,100.	1,218,200.	.
		162231E	NEW WORK - PIPING			.	646,300.	362,800.	209,100.	1,218,200.	.

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 34

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
					16 ELECTRIC POWER GENERATION SYSTEM						
					162 EPGS CONSTRUCTION						
					162231 NEW WORK						
					162231F NEW WORK - ELECTRICAL						
					162231F0						
					162231F001 NEW WORK-ELECTRICAL	.	56,200.	359,600.	.	415,800.	
					162231FG	.	56,200.	359,600.	.	415,800.	
					162231F NEW WORK - ELECTRICAL	.	56,200.	359,600.	.	415,800.	
					162231G NEW WORK - PAINTING						
					162231G0	.	.	.	1,000.	1,000.	
					162231G001 NEW WORK-PAINTING	.	.	.	1,000.	1,000.	
					162231G0	.	.	.	1,000.	1,000.	
					162231G NEW WORK - PAINTING	.	.	.	1,000.	1,000.	
					162231L NEW WORK - PLANT ITEMS						
					162231LC	.	.	.	.	.	
					162231L001 NEW WORK-PLANT ITEMS	.	.	.	.	.	
					162231LC	.	.	.	.	.	
					162231L NEW WORK - PLANT ITEMS	.	.	.	.	.	
					162231N NEW WORK - INSTRUMENTATION						
					162231NC	.	.	.	.	.	
					162231N001 NEW WORK-INSTRUMENTATION	.	.	.	.	.	
					162231NC	.	.	.	.	.	
					162231N NEW WORK - INSTRUMENTATION	.	.	.	.	.	

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SCLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 35

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
16	ELECTRIC POWER GENERATION SYSTEM										
162	EPGS CONSTRUCTION										
162231	NEW WORK										
162231P	NEW WORK - INSULATION										
162231PC											
162231P001	NEW WORK-INSULATION					.	.	.	.	.	.
162231PC						.	.	.	.	.	.
162231P	NEW WORK - INSULATION					.	.	.	.	.	.
162231	NEW WORK					.	753,600.	1,718,700.	223,500.	2,695,800.	
162241	QUALITY ASSURANCE										
162241H	QUALITY ASSURANCE										
162241H0						.	.	.	.	.	.
162241H001	QUALITY ASSURANCE					.	.	.	.	.	.
162241H0						.	.	.	.	.	.
162241H	QUALITY ASSURANCE					.	.	.	.	.	.
162241	QUALITY ASSURANCE					.	.	.	.	.	.
162251	CHECKOUT										
162251M	CHECKOUT/STARTUP										
162251MC						.	12,300.	.	.	12,300.	
162251M001	CHECKOUT					.	12,300.	.	.	12,300.	
162251MC						.	12,300.	.	.	12,300.	

JOB NUMBER C-20266
 PUBLIC SERVICE COMPANY OF NEW MEXICO
 SOLAR REPOWERING PROJECT

STEARNS-ROGER
 DENVER COLORADO

RUN DATE 14SEP78
 PAGE 36

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
16	ELECTRIC POWER GENERATION SYSTEM										
	162	EPGS CONSTRUCTION									
		162251	CHECKOUT								
			162251M	CHECKOUT/STARTUP		.	12,300.	.	.	12,300.	
			162251	CHECKOUT		.	12,300.	.	.	12,300.	
			162	EPGS CONSTRUCTION		.	777,100.	1,719,000.	533,500.	3,029,600.	
16	ELECTRIC POWER GENERATION SYSTEM					.	1,098,100.	1,719,000.	533,500.	3,350,600.	

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 37

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
17					DISTRIBUTABLES						
	173										
		173700			INDIRECT EXPENSES						
			173700H		FIELD EXPENSE						
				173700H0							
					173700H001 FIELD EXPENSE	.	829,500.	.	.	829,500.	
					173700H002 ALL RISK INS, PR TAX, BOND	.	618,200.	.	.	618,200.	
				173700H0		.	1,447,700.	.	.	1,447,700.	
				173700H	FIELD EXPENSE	.	1,447,700.	.	.	1,447,700.	
		173700K			CONSTRUCTION SUPPLIES						
			173700KC								
				173700KC01	CONSTRUCTION SUPPLIES	.	.	200,000.	.	200,000.	
				173700KC		.	.	200,000.	.	200,000.	
				173700K	CONSTRUCTION SUPPLIES	.	.	200,000.	.	200,000.	
				173700Q	SALES TAX / GRT						
			173700QC								
				173700QC01	SALES TAX / GRT	.	.	.	.	.	
				173700QC		.	.	.	.	.	
				173700Q	SALES TAX / GRT	.	.	.	.	.	
				173700S	TEMPORARY FACILITIES						
			173700SC			.	108,800.	163,500.	.	272,300.	
				173700SC01	TEMPORARY FACILITIES	.	108,800.	163,500.	.	272,300.	
				173700SC		.	108,800.	163,500.	.	272,300.	

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14 SEP78
PAGE 38

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
17 DISTRIBUTABLES											
173											
					173700 INDIRECT EXPENSES						
					173700S TEMPORARY FACILITIES		108,800.	163,500.		272,300.	
					173700 INDIRECT EXPENSES		1,556,500.	363,500.		1,920,000.	
					173900 ESCALATION, CONTING, CONTR FEE						
					173900Y						
					173900YC						
					173900Y001 ESCALATION	.	.	.	.	.	.
					173900Y002 CONTINGENCY	.	.	.	.	.	.
					173900Y003 CONSTRUCT. CONTRACTORS FEE/G & A	.	.	.	.	.	.
					173900YC	.	.	.	.	.	.
					173900Y	.	.	.	.	.	.
					173900 ESCALATION, CONTING, CONTR FEE	.	.	.	.	.	.
					173		1,556,500.	363,500.		1,920,000.	
					176 MANAGEMENT						
					176771 ADMINISTRATION						
					176771J						
					176771JC						
					176771J001 PROJECT MANAGEMENT	.	.	.	.	.	.
					176771J002 COST / SCHEDULE CONTROL	.	.	.	.	.	.
					176771J003 ENGINEERING CHANGE CONTROL	.	.	.	.	.	.
					176771JC	.	.	.	.	.	.

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 39

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
17	DISTRIBUTABLES										
	176	MANAGEMENT									
		176771	ADMINISTRATION								
			176771J								
			176771	ADMINISTRATION							
			176772	PLANNING							
				176772J							
				176772JC							
					176772J001 WBS EXTENSION REVIEW & UPGRADE						
				176772JC							
				176772J							
				176772	PLANNING						
				176773	REPORTING						
					176773J						
					176773JC						
					176773J001 TECHNICAL REPORTS						
					176773JC02 FINANCIAL REPORTS						
					176773J003 TOPICAL REPORTS						
					176773JC						
					176773J						
					176773	REPORTING					

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SCLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 40

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
17 DISTRIBUTABLES											
176 MANAGEMENT											
176774 OVERALL QUALITY CONTROL											
176774J											
176774JC											
176774JOC1 DESIGN REVIEW						.	.	.	.	.	.
176774JOC2 MEETINGS AND REVIEWS						.	.	.	.	.	.
176774JC											
176774J						.	.	.	.	.	.
176774 OVERALL QUALITY CONTROL											
176775 OTHER EXPENSES						.	.	.	.	.	.
176775J											
176775JC											
176775J001 TRAVEL						.	.	.	.	.	.
176775J002 COMMUNICATIONS						.	.	.	.	.	.
176775J003 REPRODUCTIONS						.	.	.	.	.	.
176775J004 COMPUTER						.	.	.	.	.	.
176775J005 POSTAGE						.	.	.	.	.	.
176775J005 OTHER EXPENSES						.	.	.	.	.	.
176775JC											
176775J						.	.	.	.	.	.
176775 OTHER EXPENSES											
176976 FEES						.	.	.	.	.	.
176976Y											
176976YC											
176976Y001 PARTICIPANTS' FEES / G&A						.	.	.	.	.	.

JOB NUMBER C-20266
 PUBLIC SERVICE COMPANY OF NEW MEXICO
 SOLAR REPOWERING PROJECT

STEARNS-ROGER
 DENVER COLORADO

RUN DATE 14SEP78
 PAGE 41

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
17 DISTRIBUTABLES											
		176 MANAGEMENT									
		176976 FEES									
		176976Y									
		176976YC									
		176976Y002 ENGINEERING FEE / G&A				.	.	.	.	.	.
		176976Y003 CONSULTANTS' FEES / G&A				.	.	.	.	.	.
		176976YC				.	.	.	.	.	.
		176976Y				.	.	.	.	.	.
68		176976 FEES				.	.	.	.	.	.
		176 MANAGEMENT				.	.	.	.	.	.
17 DISTRIBUTABLES						.	1,556,500.	363,500.	.	1,920,000.	

JGB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEAENS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 42

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
18	PLANT OPERATION & MAINTENANCE										
	184										
		184081	OPERATING CREW								
			1840810								
				1840810C							
					1840810001 DEFINE REQUIREMENTS	.	.	.	.	.	.
					1840810002 OPERATING CREW COST ESTIMATES	.	.	.	.	.	.
					1840810003 CREW SELECTION	.	.	.	.	.	.
					1840810004 CREW TRAINING MANUALS	.	.	.	.	.	.
					1840810005 CREW TRAINING	.	.	.	.	.	.
				1840810C		.	.	.	.	.	.
				1840810		.	.	.	.	.	.
				184081	OPERATING CREW	.	.	.	.	.	.
				184082	MANUALS	.	.	.	.	.	.
					1840820	.	.	.	.	.	.
					1840820C	.	.	.	.	.	.
					1840820001 OPERATING PLAN & MANUAL	.	.	.	.	.	.
					1840820002 MAINTENANCE PLAN & MANUAL	.	.	.	.	.	.
				1840820C		.	.	.	.	.	.
				1840820		.	.	.	.	.	.
				184082	MANUALS	.	.	.	.	.	.
				184083	OPERATION	.	.	.	.	.	.
					1840830	.	.	.	.	.	.
					1840830C	.	.	.	.	.	.
					1840830001 TOTAL PLANT CHECKOUT & STARTUP	.	.	.	.	.	.
					1840830002 OPERATIONS-TEST AND POWER	.	.	.	.	.	.

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 43

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
18 PLANT OPERATION & MAINTENANCE											
	184										
		184083	OPERATION								
		1840830									
			18408300								
			1840830003	OPERATIONAL ANALYSIS & REPORTING		.	.	.	.	.	.
			18408300			.	.	.	.	.	.
			1840830			.	.	.	.	.	.
		184083	OPERATION			.	.	.	.	.	.
		184084	SPARE PARTS			.	.	.	.	.	.
		184084U				.	.	.	.	.	.
			184084UC			.	.	.	.	.	.
			184084U001	SPARE PARTS		.	.	.	.	.	.
			184084UC			.	.	.	.	.	.
			184084U			.	.	.	.	.	.
		184084	SPARE PARTS			.	.	.	.	.	.
		184085	SPECIAL EQUIPMENT			.	.	.	.	.	.
		1840850				.	.	.	.	.	.
			1840850001	HELIOSTAT WASH TRUCK		.	.	.	.	.	.
			18408500			.	.	.	.	.	.

JGB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAR REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 44

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----					
1	2	3	4	5	BASE

18 PLANT OPERATION & MAINTENANCE

184

184085 SPECIAL EQUIPMENT
1840850

184085 SPECIAL EQUIPMENT

184

18 PLANT OPERATION & MAINTENANCE

-----ESTIMATE-----					REV
HOURS	LABOR	MATERIAL	OTHER	TOTAL	#

.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.

JOB NUMBER C-20266
PUBLIC SERVICE COMPANY OF NEW MEXICO
SOLAF REPOWERING PROJECT

STEARNS-ROGER
DENVER COLORADO

RUN DATE 14SEP78
PAGE 45

WORK BREAKDOWN STRUCTURE ESTIMATE REPORT

-----LEVEL & DESCRIPTION-----						-----ESTIMATE-----					REV
1	2	3	4	5	BASE	HOURS	LABOR	MATERIAL	OTHER	TOTAL	#
**** GRAND TOTAL ****											
						9,293,150.	8,782,500.	61,896,000.	79,971,650.		

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ATTACHMENT 2

PUBLIC SERVICE OF NEW MEXICO ESTIMATE

Number of (Separate Installations)	1-Site	2-Sites	4-Sites	12 Sites	36 Sites
	1981	1982	1983	1984	1985
ITEM	4300 Heliostat	15,000	38,000	113,000	330,000
Heliostat, Electronics and Cabling	13.13	10.45	9.17	6.84	6.21
Installation, c/o, Computer, Software and Engineering Support	1.91	1.90	1.81	1.57	1.19
TOTAL	15.04	12.35	10.35	8.41	7.40
Foundation and Field Wiring	1.54	1.49	1.45	1.41	1.36
GRAND TOTALS	16.58	13.84	11.80	9.82	8.76

17.100

PNM
ESTIMATE

REFER TO
AUG 21 1978
NOTED

MARTIN MARIETTA
ESTIMATE

C-20266-113

Bill-Information
you requested
by phone
8/16/78

ATTACHMENT 2a

GENERAL PRICING GROUND RULES

1. All values are in 1978 dollars and assumes recurring costs only.
2. \$/ft² are based on a 430 ft² heliostat.
3. Heliostat is composed of: mirror module (including glass), structure, drive, drive motors, encoders, cabling, electronics and miscellaneous hardware.
4. The field installation includes any on-site assembly, installation, c/o of the heliostat, and integrations with the control computer, adaptation of existing software to the particular site and full-field demonstration. Special tooling unique to a site is not included in this cost.
5. Field wiring and foundation assumes a location similar to Barstow in terms of terrain and soil characteristics.

Rocketdyne Division
6633 Canoga Avenue
Canoga Park, CA 91304
Telex: 698478

Rockwell
International

REFER TO NOTED

Gen. Files

ANSID

23 August 1978

In reply refer to 78RC65190

Stearns-Roger Engineering Company
4500 Cherry Creek Drive
P. O. Box 5888
Denver, Colorado 80217

Attention: Mr. W. R. Lang

Subject: Receiver Subsystem for 25 MWe Solar Repowering

Reference: (a) Your letter C-20266-53, dated 31 July 1978
(b) MDC G 7375 P "10 MWe Thermal Central Receiver
Power Plant - Plant Integration and Solar
Facilities Subsystems"
McDonnell Douglas Astronautics Company,
May 1978

Gentlemen:

In response to your request contained in Reference (a), Rocketdyne is pleased to submit for your budgetary planning purposes a rough-order-of-magnitude estimate of the costs necessary to design, fabricate, and install a receiver limit that would provide for a nominal 25 MWe repowering power level. The ROM price for such an activity would be \$20 million. The basis for this estimate is the firm proposal information developed during the 10 MWe Barstow Pilot Plant bidding activity. That information was treated and adjusted as follows:

- (1) Receiver size for the 25 MWe repowering application was 69 ft. high by 39 ft. in diameter as compared with the Barstow Pilot Plant, which is 50 ft. high by 23 ft. in diameter. The heat flux profiles on both receivers are similar in distribution and magnitude. Identical tubing and fabrication techniques will be used.
- (2) Design activity in support of the Design Integrator was reduced from the Barstow Plant as follows:

System Integration	50%
Collector	50%
Master Control	50%
Plant Support Services	80%

- (3) Receiver design labor entailing all detailing and supporting analysis was reduced as follows:

Configuration Design and Analysis	50%
Detailed Design and Analysis	40%

The rationale associated with these assumptions pertains to the fact that all techniques and basic configurations are established; however, all details of drawing for fabrication must be redone.

- (4) Program Management activities which include QA Planning and Documentation, Interface Documentation, Support to Meetings, Reports, Field Representative at the Design Integrator's site, Project Engineering, and Program Manager and Controller were reduced between 30 and 100% with an overall net reduction of 53%.
- (5) Receiver absorber material costs were adjusted as follows:
- Headers - Directly with Receiver Circumference (1.7)
 - Tooling - Directly with Receiver Surface Area (2.34)
 - Tubing and Appendages - Directly with Receiver Surface Area
 - Special X-Ray Equipment - No Change
- (6) Receiver material costs for items other than the raw material used for absorber fabrication were scaled with the 0.6 power of the receiver surface area (i.e. thermal power level) or 1.67.
- (7) Receiver fabrication labor was initially scaled with the 0.6 power of the surface area to account for the split in setup time and actual fabrication time to perform the various welding operations which comprise the vast majority of the labor. That result was subsequently reduced by 10% to account for a learning curve developed during the Barstow Pilot Plant activity.

- (8) Travel and Consultant costs were left unchanged.
- (9) Field support activity during activation was reduced by 70%.
- (10) A three-year period of performance (similar to Barstow) is anticipated with go-ahead occurring in September 1979. Since this is one year subsequent to that for the Barstow Pilot Plant, a 6% escalation factor was applied.
- (11) A cost reimbursement contracting arrangement was assumed with a 10% fee.

If any further information of a technical or programmatic nature is required, please contact Mr. J. M. Friefeld on (213) 884-2871. Questions of a contractual nature should be directed to Mr. A. H. DeCanniere on (213) 884-2322. We are looking forward to further activities on this program, as well as a successful joint effort on the Barstow Pilot Plant.

Very truly yours,

ROCKWELL INTERNATIONAL CORPORATION
Rocketdyne Division

D. C. Lefler
Director
Contracts and Pricing

AHD:im

8-1644-A

C-20266-120

5301 Bolsa Avenue, Huntington Beach, CA 92647 (714) 896-3311

AUG 18 1978

A3-130-EP-JOP-240

Stearns-Roger Incorporated
6924 South Yosemite Street
P. O. Box 5888
Denver, Colorado 80217

Attention: Mr. W. R. Lang

Reference: Stearns-Roger letter dated July 31, 1978;
Subject: Solar Hybrid Repowering Project
Public Service Company of New Mexico

REFER TO	NOTED
W4-1000	
Aug 18 1978	
Gen. Files	
ANS'D	

Dear Mr. Lang:

In response to the request of referenced letter, MDAC has prepared a budgetary estimate for the quantity of 4,289 heliostats. The following summary includes the major guidelines and assumptions used in the development of the estimate.

1. The configuration will be identical to 10 MWe Pilot Plant heliostats.
2. The scope of Collector Subsystem activities would be limited to the tasks defined in the referenced letter.
3. Authority-to-Proceed would occur on/or before 1 March 1980, in order to take advantage of the 10 MWe Pilot Plant activities without a gap in the production line.
4. Costs are presented in FY '78 dollars.

Since the size of the 10 MWe Pilot Plant heliostat has not been finalized, the prices are presented as a range associated with areas of 404 and 528 square feet.

The price range is between \$24.50 per square foot and \$20.00 per square foot.

If more detailed information is required, do not hesitate to contact the undersigned.

J. O. Pfeffer
Branch Manager - Contracts
Energy Programs

MCDONNELL DOUGLAS

CORPORATION