MEMO TO Stan Nowicki

January 5, 1981
DATE PREPARED

Operating Reactors Branch No. 5

U. S. Nuclear Regulatory Commission

Enclosed is the following information which you requested from Mr. Jack Rainsberry of my organization:

1. Calculation of estimated time required to borate to cold shutdown conditions using only RWST water and the charging pumps.
2. Section 22 of the San Onofre Unit 1 Equipment Data Manual, "Compressed Air System Equipment."
3. Section 26 of the San Onofre Unit 1 System Description Manual, "Compressed Air System."

If you require any additional information please let me know.

cc: J. L. Rainsberry (w/enclosures)
NRC Files "
EDM Files "

From R. W. Krieger

ESTIMATE OF TIME REQUIRED TO BORATE TO COLD SHUTDOWN CONDITIONS USING RWST WATER AND CHARGING PUMPS

Assumptions:

1. RCS Volume = 6752 ft^3 at 575°F
2. Initial EOL Boron Concentration (B_c) = 0 ppm
3. Charging Pump Flowrate = 90 gpm
4. Cold Shutdown B_c = 480 ppm
5. RWST B_c = 3750 ppm at 80°F

Estimated Time

$$\frac{VdC}{dt} = W_{in} C_1 - W_{out} C$$

where

V = volume of RCS = 6752 ft^3
C = boron concentration = 480 ppm at cold shutdown
$W_{in} = W_{out} = W$ = charging and letdown rate = 90 gpm = .20052 ft^3/sec.
C_1 = RWST B_c = 3750 ppm

therefore

$$\frac{dC}{dt} = \frac{W}{V} (C_1 - C)$$

$$C = C_1 (1 - e^{\frac{-Wt}{V}})$$

solving for t

$$e^{\frac{-Wt}{V}} = 1 - \frac{C}{C_1}$$

$$t = \frac{V}{W} \ln \left(\frac{1}{1 - \frac{C}{C_1}}\right)$$

using values above

$$t = 4612 \text{ sec} \approx 77 \text{ min}$$

Conservatisms in Estimate

1. RCS volume includes pressurizer liquid volume and uncertainties
2. EOL Boron concentration is assumed
3. Charging pump flowrate is a nominal rate and not the maximum rate
4. Cold Shutdown B_c includes 100 ppm allowance for margin and uncertainties
5. RWST B_c is tech spec minimum concentration

SAN ONOFRE NUCLEAR GENERATING STATION
UNIT 1
EQUIPMENT DATA
22. COMPRESSED AIR SYSTEM EQUIPMENT

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SAN ONOFRE NUCLEAR GENERATING STATION
UNIT 1
EQUIPMENT DATA
22. COMPRESSED AIR SYSTEM EQUIPMENT

AIR RECEIVERS, C-4A, B, AND C

REFERENCES

Manufacturer, Advance Tank
Specification, BSO-403
Purchase Order, BSO-403
Quantity, Three

DATA

Shell, Material/Thickness	A455A / 5/16 in
Heads, Material/Thickness	A455A / 3/8 in
Overall Height	12 ft
Diameter O.D.	4 ft
Capacity	120 cu ft
Operating Pressure	110 psig
Operating Temperature	Ambient to 100 F
Design Pressure	125 psig
Design Temperature	200 F
Corrosion Allowance:	
Bottom	1/8 in
Remaining	1/16 in
Flange Rating/Facing (ASA Std.)	150 lb R.F.
Fittings Rating	3000 lbs
Earthquake Force	0.2 g
Applicable Codes and Spec	ASME Code & Stamped
Manhole Size	11 in x 15 in

DELIVERY: SPECIFIED/BID (SCFM)	300
DISCHARGE PRESSURE (PSIG)	100
ALTITUDE ABOVE SEA LEVEL (FEET)	20
AMBIENT TEMPERATURE (DESIGN)	40-100
RATED HORSEPOWER AT DRIVER SHAFT	72.5
MAX. ALLOWABLE DISCHARGE PRESSURE	100
AIR TEMP. LEAVING COMPRESSOR	430
VERTICAL OR HORIZONTAL.	Horizontal
NO. OF STAGES	One
NO. OF CYLINDERS: 1ST STAGE/2ND STAGE	One
BORE AND STROKE OF CYL: 1ST STG/2ND STG.	12 x 11
PISTON DISPLACEMENT: 1ST STAGE/2ND STAGE	464
VOLUMETRIC EFF: 1ST STAGE/2ND STAGE	75.5
SPEED: CRANKSHAFT (RPM)/PISTON(FT/MIN)	327 / 600
LUBRICATION: CYLINDER/CRANKCASE	None/Oil
MATERIAL: CYLINDER/CYLINDER LINER	Cast Iron
PISTON/PISTON RINGS	C.I. / Teflon
STUFFING BOX PACKING: CYLINDER/CRANKCASE	Teflon
LENGTH DISTANCE PIECE (IF ANY)	
CONNECTIONS: SIZE INLET/DISCHARGE	6/6
RATING INLET/DISCHARGE	150/150
FACING INLET/DISCHARGE	FF/FF
INTAKE FILTER-SILENCER: MFR/TYPE	Dollinger/Dry Type
SIZE/MODEL NO.	G-5
DRIVER: TYPE/RATED HORSEPOWER	Westinghouse / 75 HP
DRAWING REFERENCE	Open Dripproof 1750 rpm
DIRECT CONNECTED/V-BELT DRIVE	V-Belt
SHEAVE PITCH DIAMETER: DRIVER/COMPRESSOR	5.7 / 10.2
BELTS: NO. MAKE AND TYPE/SERVICE FACTOR	C-240
FLYWHEEL DIAMETER, IF ANY	60"
TOTAL WR^2 IN COMPRESSOR	
CYL. JACKET COOL. WTR: TEMP: INLET/OUTLET °F	Water, 95 normal / 135 F
FLOW/PRESS DROP	35 / 3 psig
MAX. ALLOW CYL. COOL WTR. PRESSURE PSIG max.	60 in
INTERCOOLER/AFTERCOOLER DWG. REFERENCE Materials	Tubes-Admiralty-Tube Sheets Muntz Mat
AIR TEMP. LEAVING AFTERCOOLER	110 F
Aftercooler-Water Temp. °F In/Out/GPM	95/135 / 5.0
Guard Required	Calif. Std.
TYPE OF CONTROL/CONTROL ELECT. POWER	Dual Control
PRESS. COMPR.: LOADED OR STARTS/UNLOADED OR STOPS	
TYPE STARTING UNLOADERS	Automatic
COMPRESSOR MANUFACTURER	Chicago Pneumatic
SIZE & TYPE	12 x 11 - TBO-B2
WEIGHT: COMPRESSOR ONLY/HEAVIEST PIECE	5500 shipping
PIPING LAYOUT/P & I.D. NO.	
(REQ'N NO.) (SPEC. NO./~~COST CODE~~	BSO-401

REV. 0 | DESCRIPTION | DATE | ENG | DR | CHK | SUPV | MATL | APPROVALS

BECHTEL CORPORATION

POWER DIVISION ENGINEERING

AIR COMPRESSOR DATA SHEET

AIR COMPRESSORS, K-1A, B, AND C

JOB No 3246

San Onofre Nuclear Generating Station, Unit 1

SHEET OF 22-2

REV.

M-312-E 6.28.56

A.C. INDUCTION MOTOR DATA SHEET

Customer: Southern California Edison Company

Project: San Onofre Nuclear Generating Station, Unit No. 1

AIR COMPRESSOR MOTORS

1.	Service	Comp. Drive
2.	No. of units:	3
3.	Type:	Squirrel Cage
4.	Mounting	Horizontal
5.	Characteristics	v Ph. Cy. 440-3-60
6.	Synchronous speed - rpm	1800
7.	Horsepower	75
8.	Frameno	444U
9.	Enclosure	Drip proof-Guarded
10.	Insulation Class	B
11.	Insulation treatment	Thermalastic
12.	Ambient temp. - C	40
13.	Stator temp. rise - C.	60
14.	Bearing type	Ball
15.	Rotation	Either
16.	Shaft (hollow-solid)	- -
17.	Thrust bearing load coupling - (self-release-non-reversing-solid-adjustable-flexible)	- -
18.	Full load amp.	89
19.	Starting current - amp.	540
20.	Starting torque - % F.L.	150
21.	Pull-out torque - % F.L.	200
22.	Eff 100% load % 75% load % 50% load %	90.5 90.0 88.5
23.	P.F. 100% load 75% load 50% load	89.0 86.0 80.0
24.	Space heaters - kv	.2kw @ 550 volts
25.	Rotation*	Either
26.	Conduit box location	F-1

* Rotation of motor when viewed from end of motor opposite shaft extension.

22. COMPRESSED AIR SYSTEM EQUIPMENT

INSTRUMENT AIR DRYER, X-47

REFERENCES

Manufacturer, C. M. Kemps Mfg. Co.
Specification, BSO-402
Purchase Order, BSO-402
Quantity, One

DESCRIPTION

One (1) C. M. Kemp Mfg. Company Dual Tower, Desiccant Air Dryer, Oriad Model No. 100-E with NEMA-4 Electrical Construction

PERFORMANCE DATA

Capacity	254.5 scfm
Dryer Cycle	8 hours
Adsorption	4 hours
Reactivation	4 hours
Inlet Pressure	110 psig
Inlet Temperature	100 F
Final Dewpoint	Minus 20 F
Pressure Loss at Design Flow	1 psig
Reactivation Heat	3.5 KW
Reactivation Purge	4.5 scfm

PHYSICAL DATA

ASME Code Design	150 psig
Electrical Construction	NEMA 4
Control Circuit	115 Volt, 1 Phase, 60 Cycle
Power Circuit	440 Volt, 3 Phase, 60 Cycle
Method of Control	Full Automatic
Desiccant	120 lbs Silica Gel/Tower
Overall Dimensions	4 ft - 5 in by 2 ft - 8 in by 6 ft - 4 in
Weight	2300 lbs

22. COMPRESSED AIR SYSTEM EQUIPMENT

INSTRUMENT AIR FILTERS X-49A, B, AND C

REFERENCES

Manufacturer, Beach Sta-Dri Filter Co.
Specification, BSO-4001
Purchase Order, BSO-4001
Quantity, Three

PERFORMANCE DATA

Flow Rate	200 scfm
Design Pressure	100 psig
Allowable Air Pressure	150 psig
Cleaning Capacity	9 to 10 million cu ft of air (for a well maintained compressor)

PHYSICAL DATA

Model	600 AL
Connection, Inlet	2 inch - NPT
Outlet	2 inch - NPT
Weight	50 lbs (each)
Cylinder length	17 in
No. of Elements per Cylinder	2

MATERIALS

Top and Bottom Spacers	Aluminum
Gaskets	Neoprene
Cylinder	Aluminum
Castings, Top and Bottom	Aluminum

DELIVERY: SPECIFIED/BID (SCFM)	98.0
DISCHARGE PRESSURE (PSIG)	100, Adjustable to 60 & Set to 65
ALTITUDE ABOVE SEA LEVEL (FEET)	20
AMBIENT TEMPERATURE (DESIGN) 60° Design Point	40-100 Range
RATED HORSEPOWER AT DRIVER SHAFT	24 @ 75 psig
MAX. ALLOWABLE DISCHARGE PRESSURE	125
AIR TEMP. LEAVING COMPRESSOR	
VERTICAL OR HORIZONTAL.	Horizontal Tank Mounted
NO. OF STAGES	2
NO. OF CYLINDERS: 1ST STAGE/2ND STAGE	2/1
BORE AND STROKE OF CYL: 1ST STG/2ND STG.	6-0 / 2-3/4 / 3-1/2 / 2-3/4
PISTON DISPLACEMENT: 1ST STAGE/2ND STAGE	23.3
VOLUMETRIC EFF: 1ST STAGE/2ND STAGE	73% @ 60 psig 72% @ 100 psig
SPEED: CRANKSHAFT (RPM)/PISTON(FT/MIN)	1470/860
LUBRICATION: CYLINDER/CRANKCASE	Oil/Oil
MATERIAL: CYLINDER/CYLINDER LINER	Cast Iron
PISTON/PISTON RINGS	Aluminum (LP) / CI (HP)
STUFFING BOX PACKING: CYLINDER/CRANKCASE	
LENGTH DISTANCE PIECE (IF ANY)	
CONNECTIONS: SIZE INLET/DISCHARGE	3"/3"
RATING INLET/DISCHARGE	NPTI
FACING INLET/DISCHARGE	
INTAKE FILTER-SILENCER: MFR/TYPE	
SIZE/MODEL NO.	
DRIVER: TYPE/RATED HORSEPOWER Non Overloading	Westinghouse
DRAWING REFERENCE	
DIRECT CONNECTED/V-BELT DRIVE	Multi V-Belt Drive
SHEAVE PITCH DIAMETER: DRIVER/COMPRESSOR	
BELTS: NO. MAKE AND TYPE/SERVICE FACTOR	
FLYWHEEL DIAMETER, IF ANY	
TOTAL WR^2 IN COMPRESSOR	
CYL. JACKET COOL. WTR: TEMP: INLET/OUTLET	
FLOW/PRESS DROP	
MAX. ALLOW CYL. COOL WTR. PRESSURE	
INTERCOOLER/AFTERCOOLER DWG. REFERENCE	
AIR TEMP. LEAVING AFTERCOOLER	
TYPE OF CONTROL/CONTROL ELECT. POWER	Dual Control
PRESS. COMPR.: LOADED OR STARTS/UNLOADED OR STOPS	
TYPE STARTING UNLOADERS	
Specification	BSO-4023
Purchase Order	BSO-4023
COMPRESSOR MANUFACTURER	Worthington
SIZE & TYPE 6-0/6-0/3-1/2 x 2-3/4 25BN-24	
WEIGHT: COMPRESSOR ONLY/HEAVIEST PIECE	2170
PIPING LAYOUT/P & I.D. NO.	
(REQ'N NO.) (SPEC. NO./COST CODE	

REV. | DESCRIPTION | DATE | APPROVALS | MATL | SUPV | CHK | DR | ENG

0

BECHTEL CORPORATION

POWER DIVISION ENGINEERING

AIR COMPRESSOR DATA SHEET

AUXILIARY AIR COMPRESSOR, K-12

JOB No 3246

San Onofre Nuclear Generating Station, Unit 1

SHEET OF

REV. 22-6

M-312-E 6-28-56

A.C. INDUCTION MOTOR DATA SHEET

Customer: Southern California Edison Company

Project: San Onofre Nuclear Generating Station, Unit No. 1

Date: February 21, 1967

AUXILIARY AIR COMPRESSOR MOTOR

1.	Service	Auxiliary Air Compressor
2.	No. of units:	One
3.	Type:	Induction
4.	Mounting	Horizontal
5.	Characteristics	3/60/440
6.	Synchronous speed - rpm	1800
7.	Horsepower	25
8.	Frameno	324U
9.	Enclosure	Drip-Proof
10.	Insulation Class	B
11.	Insulation treatment	Lifeguard
12.	Ambient temp. - C	40
13.	Stator temp. rise - C.	60
14.	Bearing type	Std. (Not less than 100,000 hours life)
15.	Rotation	Clockwise
16.	Shaft (hollow-solid)	Solid
17.	Thrust bearing load coupling - (self-release-non-reversing-solid-adjustable-flexible)	
18.	Full load amp.	
19.	Starting current - amp.	
20.	Starting torque - % F.L.	
21.	Pull-out torque - % F.L.	
22.	Eff 100% load % 75% load % 50% load %	
23.	P.F. 100% load 75% load 50% load	
24.	Space heaters - kv	-------
25.	Rotation*	
26.	Conduit box	NEMA 4 W/unthreaded 1/4" Drain Hole one size larger than standard.

* Rotation of motor when viewed from end of motor opposite shaft extension.

SAN ONOFRE NUCLEAR GENERATING STATION
UNIT 1
SYSTEM DESCRIPTION
26. COMPRESSED AIR SYSTEM

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SAN ONOFRE NUCLEAR GENERATING STATION
UNIT 1
SYSTEM DESCRIPTION
26. COMPRESSED AIR SYSTEM

FUNCTION

The compressed air system provides a continuous supply of pressurized air for instruments, controls, and other service requirements.

DRAWING REFERENCES

568780 Compressed Air, P & ID

DESIGN CRITERIA

SYSTEM

The system supplies oil-free, dry, compressed air at 85 to 100 psig, at a flow rate of 100 scfm and a maximum dew point of minus 20 F for pneumatic instrument operation and control. The system also supplies compressed air to service outlets throughout the Station for operation of pneumatic tools or other requirements.

COMPONENTS

Air Compressors K-1A,B,C

Design capacity, each	300 scfm
Design discharge pressure	100 psig

Aftercoolers E-26A,B,C

Air inlet temperature	450 F
Air outlet temperature	110 F
Cooling water flow	5 gpm
Cooling water inlet temperature	95 F
Cooling water outlet temperature	135 F

Air Receivers C-4A,B,C

Volume, each	120 Cu Ft
Design pressure	125 psig
Design temperature	120 F

Instrument Air Dryer X-47

Type	Desiccant
Capacity, minimum	250 scfm
Air outlet dewpoint	minus 20 F
Pressure drop	1 psi
Internal reactivation heater cap., each	3.5 kw
Reactivation purge flow	4.5 scfm

DESIGN CRITERIA (Continued)

Instrument Air Filters X-49A,B,C

Capacity, each at 8 psi pressure drop	200 scfm
Design pressure	100 psig

NORMAL OPERATION

During normal operation, one of the three single-stage, non lubricated, air compressors operates continuously to supply the Station instrument and service air requirements. The cylinder unloading mechanism is operated automatically to match the system demand. Whenever the air compressor is operating (assume K-1A), the solenoid valve (SV-62) is energized to load from closing of its respective motor start. Energizing SV-62 discharges system pressure as long as the system pressure remains between 90 and 100 psig (the force exerted by the air pressure is greater than the spring pressure at the unloader and the compressor cylinder inlet valves are kept open). Air drawn into the cylinder is discharged through the inlet valves without being compressed and the compressor idles (unloaded). When system pressure drops below 90 psig, the force exerted by the air pressure is less than the spring pressure at the unloader and the cylinder inlet valves close. The compressor is then loaded.

The two remaining air compressors are manually positioned in automatic standby from the control room and will start in sequence upon the decrease of supply air header pressure. Pressure Switch PS-57 starts Compressor K-1B at 75 psig and Pressure Switch PS-58 starts compressor K-1C when system pressure drops to 70 psig. The unloader valve operation for these compressors is identical to compressor K-1A, described above. Operation of the standby air compressors is annunciated in the control room. The standby air compressors must be stopped manually. When the system demand has returned to normal, air is admitted to the suction of a compressor through a filter-silencer. The filter-silencer reduces noise and filters out dirt particles from the air stream prior to entering the cylinder.

Discharged air flows through an aftercooler where the temperature is reduced to 110 F before it enters the air receivers. Cooling water flow (Turbine Cycle Cooling Water System) to the aftercoolers is continuous, having been established at initial startup. Aftercooler air inlet temperature alarms are provided by TS-15, TS-16 and TS-17 which annunciate high temperature in the control room and trip the respective compressor motors.

The air receivers are reservoirs and serve as surge chambers for the compressors to minimize system pressure fluctuations. The air receivers are equipped with relief valves (RV-23, RV-24 and RV-25) and local pressure indicators. Each receiver and its respective air compressor is isolated as a unit for maintenance. A check valve is provided at each air receiver outlet to prevent loss of compressed air through a stopped compressor with broken discharge valves.

26. COMPRESSED AIR SYSTEM

NORMAL OPERATION (Continued)

A common air supply header receives air flow from the three receivers and supplies the instrument air header and the service air header on demand.

The instrument air header supplies instrumentation and pneumatic controllers throughout the Station which require compressed air of high purity and low dew point. Since some controllers require 3-15 psi instrument air pressure for operation, and others 3-27 psi, Station control valve operation requires that instrument air header pressure be maintained above 40 psig.

To maintain acceptable purity and low dew point, an instrument air dryer (X-47) is provided. The air dryer is a dual tower dessicant-type unit with fully automatic controls. Instrument air enters one of the desiccant towers through four-way Solendid Valve SV-105 and is discharged through four-way Solendid Valve SV-106. After a pre-set time (four (4) hours), a timer switch located on the unit automatically positions SV-105 and SV-106 for direct flow to the second tower. The first tower is then automatically regenerated by heating the silica gel dessicant with an internal 3.5-kw electric heater. A reactivation purge flow of 4.5 scfm is automatically supplied during reactivation which requires four (4) hours.

Local pressure gauges, mounted on each tower, provide visual indication of pressure drop through the dryer. Relief Valves RV-44 and RV-45 are provided, one on each tower, to prevent over-pressure by air heat-up as a result of being dried.

Instrument air filters are provided after the instrument air dryer to remove impurities. Normally, all three filters are in parallel service. The air leaving the filters is split into two instrument air headers which form a loop to supply all areas of the Station. Branch lines are taken off the instrument air header loop. Each branch line contains a restricting orifice which limits flow through the line to 150 cfm in the event of a line rupture downstream from the orifice.

Compressed air leak-off from penumatic instruments and valves inside the Sphere is collected in a common header. Normally, the leak-off flows through CV-40 and CV-10 to the vent stack (Air Conditioning System). When the Sphere high radiation alarm is actuated in the control room, three-way valve CV-40 actuated by SV-19, is automatically positioned to divert leak-off flow to the Sphere atmosphere, and CV-10 actuated by SV-28 is closed. The same control valve action is initiated when high pressure exists in the Sphere exhaust duct (PS-23) or is initiated manually from the control room.

Service air is supplied to the various Station service air outlets directly from the air receivers through Control Valve CV-41 and a service air header loop. Control Valve CV-41 is actuated by Pressure Controller PC-1 to cut off service air use if the compressed air system supply pressure drops to 70 psig. This is to assure that instrument air supply which has priority.

26. COMPRESSED AIR SYSTEM

STARTUP OPERATION

The three manual valves on the air receiver discharge lines to the air header are opened before starting a compressor. The flow path is established through the instrument air dryer and the three instrument air filters in parallel.

Normally, Compressor K-1A is started manually from the control room by positioning the control switch in START. Pressure Switch PS-56 will start the compressor due to low compressed air header pressure. System pressure will begin to increase through Receiver C-4A and Receivers C-4B and C-4C will be pressurized through orfices in the check valves on the air outlet piping from each receiver. Control Valve CV-41 on the service air header will remain closed until the air receiver (C-4A) pressure exceeds 70 psig. When system pressure is 100 psig, Compressor K-1A will unload as described in Normal Operation.

Cooling water supply is automatically established to the three air compressor cooling water jackets through Solenoid Valves SV-59, SV-60 and SV-61, when the respective compressor motors are energized. Cooling water is supplied from the Turbine Plant Cooling Water System.

ABNORMAL OPERATION

When the compressed air load exceeds 300 cfm, which is the capacity of one compressor (assume K-1A), system pressure will drop. When system pressure drops to 75 psig, a pressure switch (PS-57) closes, starting the second compressor (K-1B) automatically and a pressure switch (PS-53) positions Solenoid Valve SV-63 to the LOADED position. If system pressure continues to drop, Compressor K-1C is started automatically at 70 psig by PS-58. At 70 psig, service air flow is stopped by CV-41, and the three compressors (900 cfm) are utilized for instrument air supply exclusively.

All three compressors will continue to operate after system pressure has been returned to 100 psig. When system demand returns to normal, two compressors (K-1B and K-1C) can be turned off and re-positioned manually to automatic standby.

Any of the three compressors can be selected as the operating compressor from the control room with the remaining compressors on automatic standby. Sequence of operation may be varied by adjusting the pressure switch settings.

Abnormal operating conditions are annunciated in the control room by Flow Switch FS-5 for high instrument air flow to the Sphere, from Pressure Switch PS-15 for low instrument air header pressure, and from Pressure Switch PS-16 for low service air header pressure.

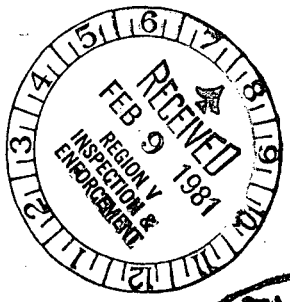
Southern California Edison Company

P. O. BOX 800
2244 WALNUT GROVE AVENUE
ROSEMEAD, CALIFORNIA 91770

J. G. HAYNES
MANAGER OF NUCLEAR OPERATIONS

TELEPHONE
(213) 572-1742

February 2, 1981



U. S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Region V
1990 North California Boulevard
Suite 202, Walnut Creek Plaza
Walnut Creek, California 94596

Attention: Mr. R. H. Engelken, Director

DOCKET NO. 50-206
SAN ONOFRE - UNIT 1

Dear Sir:

This letter constitutes a revision to a reportable occurrence involving loss of power to all station auxiliaries, previously reported to you in LER 80-038 dated December 9, 1980.

It was noted that during this incident, 4Kv breaker 11C02, source breaker to 4Kv bus 1C, did not open on loss of voltage as required. Subsequent investigation revealed that the No. 1 D.C. bus control power switch to the station undervoltage scheme for the 1C bus was open. This switch is required to be in the closed position for complete operation of the station undervoltage scheme during a Loss of Power (LOP) or Safety Injection Signal/Loss of Power (SIS/LOP) event.

The primary function of the aforementioned undervoltage scheme is to strip 4Kv bus 1C of remaining loads during a LOP or SIS/LOP event. This circuit is energized to perform this function. However, with the D.C. control power swtich open, the undervoltage scheme will remain deenergized. In this condition, the potential exists for applying load blocks larger than the diesel generator is designed to accept.

The subject D.C. control power switch is physically located in 4Kv breaker cubicle 11C01. It is identified as the control power to the station undervoltage scheme and is located within six inches from a similar D.C. switch that supplies control power to breaker 11C01. When "racking out" a 4Kv breaker, it is normal practice to open the D.C. control power switch to that breaker. Breaker 11C01 is the tie breaker between 4Kv buses 1-C & 1-A and would be racked out for clearances on these buses or for breaker servicing.

A002
S.1

81-30

A review of our records indicate that the control power switch to the undervoltage scheme was verified to be closed at the end of our last refueling outage. At that time sequencer testing including SIS/LOP was completed satisfactorily. From that time until this outage, there were no clearances issued which would have required opening of the D.C. control power switch to breaker 11C01 or the No. 1 D.C. bus control power switch to the undervoltage scheme. However, during the current refueling outage there were at least two times when the D.C. control power switch to breaker 11C01 was opened. It is believed that on one of these occasions the D.C. control power switch to the station undervoltage scheme was inadvertently opened due to its close proximity to the D.C. control power switch to breaker 11C01.

The first of the two occasions noted above occurred on April 16, 1980, one week after reactor shutdown. Prior to the first occasion the SIS/LOP signal had been locked out and the reactor was in the cold shutdown condition. In this mode the normal loading on 4KV bus 1C would not be greater than the maximum load block that the diesel generator is designed to accept. Due to equipment testing however, there may have been brief periods when the loading on 4Kv bus 1C was greater than the design load block.

With the SIS/LOP signal locked out, an LOP event would automatically start the Diesel Generators but loading would be accomplished manually as specified in Emergency Operating Instruction, SOI-3-5.30, Loss of Offsite Power. This procedure lists the automatic equipment trips associated with the station undervoltage scheme and requires verification that breaker 11C02 is open prior to manual loading. In the unlikely event the diesel generator had not been able to accept the loading which may have been on 4Kv bus 1C and tripped, the operator would have detected the failure of the automatic trip functions and taken immediate remedial action.

Based on the above information, it is our conclusion that the station undervoltage transfer scheme was disabled inadvertently during the current refueling outage but that this disabling would have no adverse effect on plant safety during this time. Testing of the sequencer is required prior to return to service and discovery of the open switch would have been assured at that time. There was no effect on public health and safety as a result of this event.

To preclude recurrence of this incident, the station will develop and implement administrative controls on safety-related D.C. control circuits prior to our return to service from the current refueling outage.

Should you have any questions regarding this incident, please call me.

Sincerely,

M. Haynes

Enclosure: LER 80-038 Rev. 1

cc: L. F. Miller (NRC Resident Inspector - San Onofre Unit 1)
Director, Office of Management Information & Program Control
Director, Nuclear Safety Analysis Center

NRC FORM 366 (7-77)

U. S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT

CONTROL BLOCK: | | | | | | | (1) (PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

Line	Field	Entry
01	LICENSEE CODE (2)	C A S O S 1
	LICENSE NUMBER (3)	0 0 - 0 0 0 0 0 - 0 0
	LICENSE TYPE (4)	4 1 1 1 1
	CAT (5)	
CON'T 01	REPORT SOURCE (6)	L
	DOCKET NUMBER (7)	0 5 0 0 0 2 0 6
	EVENT DATE (8)	1 1 2 2 8 0
	REPORT DATE (9)	0 2 0 2 8 1

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)

02 With the RCS drained to mid loop and transferring a 4KV bus power supply from
03 aux. transformer C to aux. transformer A&B, AC power to all station auxiliaries
04 was lost for 15 seconds due to brkr misalignment. It was also noted that source brkr
05 to 4Kv bus 1C did not open on loss of voltage due to an open D.C. switch supplying
06 power to the station undervoltage scheme. There was no effect upon public health and
07 safety nor was there any impact on plant safety. Both emergency diesel generators
08 started automatically and were available for loading if needed.

Line 09	Entry
SYSTEM CODE (11)	E B
CAUSE CODE (12)	A
CAUSE SUBCODE (13)	A
COMPONENT CODE (14)	C K T B R K
COMP. SUBCODE (15)	A
VALVE SUBCODE (16)	Z

LER/RO REPORT NUMBER (17)	Entry
EVENT YEAR	8 0
	—
SEQUENTIAL REPORT NO.	0 3 8
	/
OCCURRENCE CODE	0 3
REPORT TYPE	L
	—
REVISION NO.	1

Field	Entry
ACTION TAKEN (18)	H
FUTURE ACTION (19)	Z
EFFECT ON PLANT (20)	Z
SHUTDOWN METHOD (21)	Z
HOURS (22)	0 0 0 0
ATTACHMENT SUBMITTED (23)	Y
NPRD-4 FORM SUB. (24)	Y
PRIME COMP. SUPPLIER (25)	Z
COMPONENT MANUFACTURER (26)	Z 9 9 9

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)

10 A licensed operator intending to open auxiliary transformer C bus supply breakers
11 inadvertently opened the 4KV bus tie breakers. The D.C. power supply switch to station
12 undervoltage scheme was inadvertently opened by personnel racking out a nearby brkr.
13 Administrative controls on safety related D.C. circuits will be implemented to
14 preclude recurrence.

Line	Field	Entry
15	FACILITY STATUS (28)	H
	% POWER (29)	0 0 0
	OTHER STATUS (30)	N.A.
	METHOD OF DISCOVERY (31)	A
	DISCOVERY DESCRIPTION (32)	Operator Observation
16	ACTIVITY RELEASED (33)	Z
	CONTENT OF RELEASE (34)	Z
	AMOUNT OF ACTIVITY (35)	N.A.
	LOCATION OF RELEASE (36)	N.A.
17	PERSONNEL EXPOSURES NUMBER (37)	0 0 0
	TYPE (38)	Z
	DESCRIPTION (39)	N.A.
18	PERSONNEL INJURIES NUMBER (40)	0 0 0
	DESCRIPTION (41)	N.A.
19	LOSS OF OR DAMAGE TO FACILITY TYPE (42)	Z
	DESCRIPTION (43)	N.A.
20	PUBLICITY ISSUED (44)	N
	DESCRIPTION (45)	N.A.
	NRC USE ONLY	

SCEC 50-206, SAN ONOFRE #1
MISCELLANEOUS APPLICANT CORRESPONDENCE
January 01, 1981 thru. April 30, 1981

NAME OF PREPARER J. M. Curran PHONE: (714) 492-7700

GPO 917-926