

NRC DISTRIBUTION FOR PART 50 DOCKET MATERIAL

TO: Mr. Robert W. Reid		FROM: Sacramento Municipal Utility Dist. Sacramento, California J. J. Mattimoe		DATE OF DOCUMENT 5/16/77
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DESCRIPTION Ltr. trans the following: DO NOT REMOVE (1-P) ACKNOWLEDGED PLANT NAME: Rancho Seco Unit No. 1 RJL	ENCLOSURE Response to NRC request for information regarding emergency diesel generator alarm and control circuitry - Dated March 28, 1977. (8-P) (40 cys encl rec'd)
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SAFETY	FOR ACTION/INFORMATION	ENVIRO
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SACRAMENTO MUNICIPAL UTILITY DISTRICT □ 6201 S Street, Box 15830, Sacramento, California 95813; (916) 452-3211

REGULATORY DOCKET FILE COPY

May 16, 1977

Director of Nuclear Reactor Regulation
Attention: Mr. Robert W. Reid, Chief
Operating Reactors, Branch 4
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555



Docket No. 50-312
Rancho Seco Nuclear Generating
Station, Unit No. 1

Dear Mr. Reid:

Please refer to your letter of March 28, 1977 wherein you requested that the District investigate the Rancho Seco Unit No. 1 nuclear generating plant regarding the alarm circuitry and diesel generator control circuitry to determine how each condition that renders a diesel generator unable to respond to an automatic start is alarmed in the Control Room.

Enclosed with this letter are 40 copies of our response to the information request items on Page 2 of your letter.

Sincerely yours,

J. J. Mattimoe
Assistant General Manager
and Chief Engineer

Enclosures

77/390506

SACRAMENTO MUNICIPAL UTILITY DISTRICT

RANCHO SECO NUCLEAR GENERATING
STATION, UNIT NO. 1

RESPONSE TO:

NUCLEAR REGULATORY COMMISSION
REQUEST FOR INFORMATION
REGARDING EMERGENCY DIESEL
GENERATOR ALARM AND CONTROL CIRCUITRY
DATED MARCH 28, 1977

May 16, 1977

NRC REQUEST FOR INFORMATION

I. NRC Question (a):

All conditions that render the diesel generator incapable of responding to an automatic emergency start signal as discussed above.

Response:

- A. Physical parameters, the loss or degradation of which would prevent an automatic safety features initiated diesel engine start.
 - 1. Loss of or low DC voltage for the engine automatic start-up control circuit.
 - 2. Loss of or low starting air pressure.
 - 3. Loss of fuel oil from day tank.
 - 4. Loss of combustion air caused by the discharge of the CO₂ fire protection system. (NOTE: A safety features actuation signal blocks the automatic CO₂ discharge system.)
- B. Protective devices, the operation of which would prevent an automatic safety features initiated diesel engine start.
 - 1. Mechanical overspeed trip mechanism.
 - 2. Generator differential and field ground protective auxiliary relay.
 - 3. Failure to start trip relay circuit. (NOTE: This protection would only effect second and subsequent attempts of an automatic start. An initial start has to be attempted and have failed before this circuit is activated to block subsequent automatic starts until the circuit is manually reset.)
- C. Conditions which would prevent a buildup of generator voltage:
 - 1. Loss of or low DC supply voltage to the generator excitation system control circuits.
 - 2. Mechanical overspeed trip mechanism tripped.
 - 3. Generator differential and field ground protective auxiliary relay tripped.
- D. Control switches, the position of which would impair the ability of the engine speed governor and generator voltage regulation systems to automatically regulate the generator output frequency and voltage within the specified limits under loading conditions.

NOTE:

The position of these switches will not effect the automatic starting system for the diesel engine.

1. Electric governor speed droop control switch.
 2. Automatic voltage regulator control switch.
- E. The "Local-Remote" control switch, the position of which would block a manually initiated automatic start from the main control room.

NOTE:

The position of this switch would not block an automatic safety features initiated start of the diesel engine nor would it effect the normal operation of the engine speed governor or generator voltage regulator.

II. NRC Question (b):

The wording on the annunciator window in the control room that is alarmed for each of the conditions identified in (a).

Response:

All of the conditions listed above in the response to Question (a) are annunciated in the main control room on one or more annunciator windows. The window engraving and alarm condition association is as follows:

NOTE

The "A" and "B" diesel generator unit alarms are on separate annunciator windows. The engraving for the Unit "B" alarms are in parenthesis.

Electrical system annunciator window engraving:

"DSL GEN A TROUBLE"
("DSL GEN B TROUBLE")

The following abnormal conditions are connected to initiate illumination of this window:

<u>Item</u>	<u>Condition</u>
A1	Loss of DC power to engine control circuits
A2	Low starting air pressure
A3	Low fuel oil level in day tank
B1	Mechanical overspeed device tripped
B2	Generator differential and field ground protective auxiliary relay tripped
B3	Failure to start lockout relay circuit
C1	Loss of DC power to excitation system control circuits
C2	Mechanical overspeed device tripped
C3	Generator differential and field ground protective auxiliary relay tripped
D1	Governor speed droop control switch in the "Droop" position
D2	Automatic voltage regulator control switch in the "Manual" position

Electrical system annunciator window engraving:

"DSL GEN A AVR ON MAN OR L/R ON LOC"
("DSL GEN B AVR ON MAN OR L/R ON LOC")

The following abnormal conditions are connected to initiate illumination of this window:

<u>Item</u>	<u>Condition</u>
D2	Automatic voltage regulatory control switch in the manual position
E	Local-Remote control switch in the local position

Fire protection annunciator window engraving:

"ZONE 40 AUX BLDG GRADE N DSL RM"
("ZONE 41 AUX BLDG GRADE S DSL RM") - Item A4, discharge of the CO₂ system into the diesel generator room will initiate illumination of this window.

Electrical system annunciator window engraving:

"125 V DC BUS FAILURE"

Low voltage on either of the "A" or "B" safety features batteries will initiate illumination of this window.

Electrical system annunciator window engraving:

"125V BUS A TROUBLE"
("125V BUS B TROUBLE")

A trip of the DC control power supply circuit breaker for the emergency diesel generator control circuits will initiate illumination of this window.

III. NRC Question (c):

Any other alarm signals that also cause the same annunciator to alarm.

Response:

The above stated annunciator windows will alarm for the following additional conditions:

For the annunciator window which reads "DSL GEN A TROUBLE" ("DSL GEN B TROUBLE"), the following additional items activate this window:

1. High crank case pressure
2. Air intake vacuum high
3. Water temperature high
4. Water temperature cold
5. Standby oil pressure low
6. Lube oil level low
7. Lube oil temperature high
8. Lube oil temperature low
9. Lube oil filter differential pressure high
10. Lube oil bypass filter relief valve open
11. Fuel oil differential pressure high
12. Fuel oil filter bypass open
13. Fuel oil tank level high
14. Turbo charger exhaust temperature high
15. Air motor start attempt failure
16. Fuel oil storage tank level low
17. Engine bearing temperature high
18. Engine room temperature high
19. Lube oil bypass pressure low
20. Combustion air pressure low
21. Jacket water flow low
22. Lube oil pressure low

23. Engine fuel pump failure
24. Motor driven fuel pump failure
25. Fuel pump pressure low
26. Governor speed low
27. Generator overvoltage
28. Generator undervoltage
29. Generator field ground alarm
30. Generator high stator temperature
31. Generator high bearing temperature
32. Generator Exciter low voltage Rectifier No. 1 failure
33. Generator low voltage Rectifier No. 2 failure
34. Generator circuit breaker protective relay trip

For the annunciator window which reads "DSL GEN A AVR ON MAN OR L/R ON LOC" or ("DSL GEN B AVR ON MAN OR L/R ON LOC"), there are no additional alarm signals connected to activate this window.

For the annunciator window which reads "ZONE 40 AUX BLDG GRADE N DSL RM" or ("ZONE 41 AUX BLDG GRADE S DSL RM"), the following additional items activate this window:

1. CO₂ system trouble
2. Discharge of fire water system

For the annunciator window which reads "125V DC BUS FAILURE," low battery voltage alarm relays from the remaining five 125-volt batteries in the plant are connected to activate this window.

For the annunciator window which reads "125V BUS A TROUBLE" or (125V BUS B TROUBLE"), a trip of any other feeder breakers connected to this bus will activate this window.

IV. NRC Question (d):

Any condition that renders the diesel generator incapable of responding to an automatic emergency start signal which is not alarmed in the control room.

Response:

Within the scope of this review we consider that all of the conditions listed above in the response to NRC Question (a) includes all of the operational type conditions which would render the diesel generator incapable of responding to an automatic start signal (or responding to step load requirements in regard to frequency and voltage regulation). All of the above stated conditions are presently alarmed in the control room in the manner described above.

The scope of this review covered the following systems:

1. The electrical control circuitry for the automatic starting sequence of the engine.
2. The electrical control circuitry provided for manual maintenance starting, operating and testing of the diesel generator units.
3. The electrical control circuitry for the generator excitation and voltage regulation systems.
4. The protective shutdown circuits for the engine and generator.
5. The speed governor electrical control system.
6. The alarm system for the emergency engine generators.

In making this review, the following initial condition assumptions were made:

1. All supporting systems and equipment, valves, governor adjustments, voltage regulator adjustments, etc., are properly aligned.
2. There are no abnormal or defective mechanical or electrical components or systems the failure or abnormal operation of which could not be detected without actually attempting to start or operate the emergency generating units.
3. The diesel generator unit had performed satisfactorily on its last automatic start test and no work had been done on the units since the performance of the test.

V. NRC Question (e):

Any proposed modifications resulting from this evaluation.

Response:

We propose to make the following modifications to the diesel generator annunciator system:

1. The annunciator windows that are presently engraved "DSL GEN A AVR ON MAN OR L/R ON LOC" or ("DSL GEN B ON MAN OR L/R ON LOC") will be reengraved to read as follows:

"DSL GEN A AUTO START INOPERABLE"
("DSL GEN B AUTO START INOPERABLE")
2. The diesel generator annunciator circuitry will be rewired so that the following conditions will cause activation of the reengraved windows:

- A. Loss of DC power to the engine or generator control circuits.
- B. Low starting air pressure.
- C. Low fuel oil level in the day tank.
- D. Mechanical overspeed trip device in the tripped position.
- E. Generator differential and field ground protective auxiliary relay tripped.
- F. Fail to start relay circuit tripped.
- G. Electric governor speed droop control switch in the droop position.
- H. Automatic voltage regulator control switch in the manual position.
- I. Local-Remote control switch in the local position.
- *J. Engine lube oil level low.

*A low (or loss of) engine lube oil condition would not block an automatic start of the engine; however, because the condition could result in failure of the engine shortly after starting, we consider it highly desirable to add this alarm to this group.