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U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Gentlemen:

Subject: Docket Nos. 50-361 and 50-362
Reactor Coolant Pump Lube Oil Collection System
San Onofre Nuclear Generating Station
Units 2 and 3

This letter provides descriptions of an enhanced monitoring program and an engineering fire propagation evaluation for the reactor coolant pump (RCP) lube oil system at San Onofre Nuclear Generating Station Units 2 and 3 (SONGS 2 and 3).

During a recent Unit 3 shutdown, the cognizant engineer for the reactor coolant pumps (RCPs) noted that a small amount of oil had collected on a cool RCP support. The source of the oil was found to be a "wet" sightglass on the lower reservoir of a reactor coolant pump. The oil was not captured by the lube oil collection system because the sightglass extended beyond the edge of the drip pan. Action was taken to repair the drip and to modify the Unit 3 oil collection system such that it would capture any future leakage from this location. Additionally, the RCP lube oil collection system configuration was reviewed to determine if any other enhancements should be considered. Edison identified additional mechanical connections on the RCP lube oil system that were not previously considered to be leakage points in the original design. The RCP lube oil system, including threaded connections, will not catastrophically fail in a design basis earthquake. Furthermore, based on a review of maintenance orders dating back to commercial operation, these locations were determined to have no incidences of leakage. An Action Request and associated operability assessment were prepared to ensure the continued safe operation of SONGS 2 and 3.

The potential additional leakage locations were discussed with the Nuclear Regulatory Commission (NRC) in a telephone conference on October 25, 1996. As a result of that conversation, the NRC requested additional information. The requested information is enclosed and briefly discussed below.

Enclosure 1 provides a description of an enhanced RCP lube oil monitoring program which has been implemented to ensure that small amounts of leakage from the RCP lube oil system are detected. This monitoring program will

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remain in place until appropriate modifications can be made to the RCP lube oil collection system.

Enclosure 2 provides an analysis of a postulated fire originating from an RCP lube oil mechanical connection that was not previously considered a leak point. Results from this evaluation show that damage to safe shutdown equipment in the area would be very limited and that the majority of the equipment in the area would be unaffected. The conclusions of this analysis are consistent with the current evaluation in the Updated Fire Hazards Analysis (UFHA) and do not change the conclusions in the UFHA.

Edison will implement appropriate modifications to the RCP lube oil collection system during the next refueling outage for each unit.

If you have any questions on the enclosed information please let us know.

Sincerely,

A handwritten signature in cursive script, appearing to read "J. B. Rainey". The signature is written in dark ink and is positioned below the word "Sincerely,".

Enclosures

cc: L. J. Callan, Regional Administrator, NRC Region IV
J. E. Dyer, Director, Division of Reactor Projects, Region IV
K. E. Perkins, Jr., Director, Walnut Creek Field Office, NRC Region IV
J. A. Sloan, NRC Senior Resident Inspector, San Onofre Units 2 & 3
M. B. Fields, NRC Project Manager, San Onofre Units 2 and 3

Enclosure 1

Reactor Coolant Pump Motor Oil Enhanced Monitoring Plan

SONGS Units 2 and 3

Reactor Coolant Pump Motor Oil Enhanced Monitoring Plan

SONGS Units 2 and 3

The reactor coolant pump (RCP) motor lube oil system has two reservoirs, an upper reservoir and a lower reservoir. The upper reservoir and lower reservoir hold approximately 125 gallons and 26 gallons, respectively.

Both of these reservoirs have local and remote indication. The remote indication is monitored by the Plant Monitoring System Computer (PMS), which also has the capability of providing an alarm to the control room operators.

The oil level indicators, if trended over a period of time, are capable of detecting a 1% change in oil level. For the normal range of oil levels, a 1% change in level is approximately 0.5 gallons for the upper reservoir and 0.1 gallons for the lower reservoir.

An enhanced monitoring program has been implemented to ensure that small amounts of leakage from the RCP lube oil system are detected. An alarm setpoint will be set at approximately 5% (2.5 gals) below the nominal oil level for the upper reservoir and 10% (1 gal) below the nominal oil level for the lower reservoir. Operations can monitor the level indication, but will be alerted to a change in level by the PMS generated alarm. Due to equipment operation, the oil level signal has a +/- 2 % variation in the signal. The alarm setpoint was selected to provide maximum sensitivity to a level change but not cause unnecessary false alarms.

Two action points have been established for a decrease in oil level. The first action point is at the PMS alarm values; i.e., 5% (2.5 gals., upper reservoir) or 10% (1 gal., lower reservoir) below the nominal level. A second action point exists at 20% (10 gals., upper reservoir) or 30% (3 gals., lower reservoir) below the nominal value. At the first action point, a immediate containment entry will be initiated to inspect the affected RCP motor. It is anticipated that the entry will occur within 2 hours of reaching the action point. The containment entry will attempt to confirm oil leakage from the affected RCP motor and detect the presence of a fire or potential for a fire. If the monitored level indication gets below 20% (10 gals., upper reservoir) or 30% (3 gals., lower reservoir) of the nominal value, then an orderly shutdown of the affected unit will commence.

The nominal oil levels will be routinely evaluated to determine if an alarm setpoint will need to be adjusted lower as a result of long term oil level trends (consumption) in the motor. Setpoint changes will not be made unless approved by Station Engineering management.

This monitoring program will include the upper and lower reservoirs for Unit 2 and the upper reservoirs for Unit 3. The lower reservoirs on Unit 3 have been modified to contain any leakage from potential leakage points and will therefore not be included in the enhanced monitoring. Also, the new spare motor recently installed on 3P002 has all of the potential leakage points addressed properly and will not be included in the enhanced monitoring.

Enclosure 2

SONGS UNIT 2&3 RCP OIL COLLECTION FIRE HAZARDS EVALUATION

PURPOSE:

The purpose of this evaluation is to:

1. Evaluate the effect of a postulated fire from the worst case Reactor Coolant Pump (RCP) lube oil leak from connections not previously considered leak points.
2. Evaluate the equipment impacted by the postulated fire.
3. Evaluate the effects of the postulated fire on plant safe shutdown capability.

BACKGROUND:

During a containment walkdown in a recent unplanned outage on Unit 3, oil below an RCP lower oil reservoir sight glass was observed. The sight glass extended beyond the edge of the oil collection system drip pan, therefore the oil was not collected by the RCP lube oil collection system.

Action Request (AR) 960901231 was generated to document that sight glasses on the lower oil reservoir for three of the four Unit 3 RCPs were not protected by the respective oil collection systems. The oil collection system for the three RCPs were modified during the unplanned outage to ensure that any future oil leakage from the sight glasses would be captured within the system.

Subsequently, based on additional walkdowns conducted during the unplanned outage, another AR (961000042) was generated to identify other locations, of RCP oil piping that were not previously considered leak points, such as mechanical connections. Operability Assessments for each AR were performed and concluded that substantial leakage from the RCP oil systems was not expected, and that a small amount of leakage would not adversely impact the ability to safely shutdown the plant.

Although the operability assessments concluded that a fire would not adversely affect safe shutdown, the NRC has requested that SCE perform a fire hazard analysis to further substantiate the operability assessment conclusions. This assessment considers an oil quantity representing a worst case leakage potential from the locations described in the ARs. AR 961000042 concludes that the largest potential oil leakage would be associated with the lower sight glasses on the Unit 2 RCPs which have not yet had their oil collection systems modified.

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RCP OIL COLLECTION FIRE HAZARDS EVALUATION

SUMMARY:

A fire hazards analysis evaluation of a fire postulated from the worst case RCP lube oil leak location has determined that the ability to safely shut down the plant would not be impacted. The damage that would occur would have limited effect on equipment in the area and would be limited to a small area below the leak point. The remainder of the equipment in the area would be unaffected.

The worst case potential leak from a mechanical connection that was not previously considered a leak point is the lower reservoir sight glass. The evaluation considers the maximum amount of oil that can be lost from this location and the effect of a subsequent fire on all equipment. The ability of the fire to propagate outside the initial sphere of influence and ignite other combustible sources in the area and damage more safe shutdown equipment is also evaluated.

The impact of a postulated fire in this zone is minimized by the existing physical separation of the safe shutdown equipment as well as the fire protection and detection features that are provided in this zone. Therefore, compliance is maintained with 10 CFR 50.48 which requires that provisions be provided to "limit damage to structures, systems, or components important to safety so the capability to safely shutdown the plant is ensured".

This fire evaluation is a subset of the safe shutdown evaluation provided in the UFHA. The conclusions and results of this analysis are consistent with the current evaluation in the UFHA. This evaluation does not change the conclusion in the UFHA.

The conclusions of this evaluation are consistent with NSAC 178L, Revision 1 (January 1993). NSAC 178L documents fire events that have occurred in U.S. nuclear power plants during commercial operation between February 1965 and December 1988. During this time, 753 fires have occurred, 35 of which were in containment and 14 of the containment fires occurred on RCPs. This data base does not include the recent ANO-1 and Connecticut Yankee RCP fires. However, the conclusions of the NSAC report are consistent with the conclusions from the more recent fires, in that containment fires are not "risk-significant".

EVALUATION INPUT:

Description Of Fire Zone 2-CO-15-1B (Steam Generator E089) -

Major equipment in the room consists of Steam Generator E089, Pressurizer, and RCP's P001 and P003 (neither of which is required to operate for Safe Shutdown).

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RCP OIL COLLECTION FIRE HAZARDS EVALUATION

The fire zone boundaries are non rated heavy concrete with an approximate thickness of 48 inches. The ceiling of the fire zone, is open to containment.

A semi automatic deluge system protects each RCP at approximate elevations of 42' through 56'. Nozzles are directed at specific hazards (e.g. oil pumps, sight glasses, and bearings) and are expected to provide a substantial quantity of over spray throughout the entire RCP area.

Combustibles -

The following quantities of combustibles are within the fire zone of 2-CO-15-1B:

Oil & Grease	2866 lbs
Cable	481 lbs
Class A	0 lbs
Charcoal	0 lbs
Plastics	17 lbs
Miscellaneous	0 lbs

Combustibles in the fire zone are contained within the RCP motor or cable trays located at approximately 38' thru 58' elevation.

RCP oil information: Units 2 and 3 use a synthetic motor oil (Mobil SHC 626) having a flash point of 440 degrees F (MSDS), and an auto ignition temperature of 720 degrees F (see ISEG IN 94-58 Response). NFPA 321, Standard for Basic Classification of Flammable and Combustible liquids separates liquids into five classifications. SHC 626 is considered a class III B liquid which is the least hazardous of the five classifications (based on flash point).

Ignition Sources -

The ignition sources in the steam generator compartment are the RCS piping, steam generators and pressurizer. The RCP motor is not a credible ignition source since it is fully enclosed and above the elevation of the lower lube oil sight glass. The RCS cold leg piping is approximately 555 degrees F, while RCS hot leg piping is approximately 610 degrees F. Steam generator temperatures vary between that of the hot and cold leg piping (between 555 and 610 degrees F). The pressurizer is normally 653 degrees F.

The RCS piping, steam generators and pressurizer are protected with reflective metal (mirror), not fibrous blanket insulation, which cannot absorb significant amounts of oil. The temperatures on the external portions of the metal insulation are well below the flash point of the oil, and would not serve as an ignition source.

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RCP OIL COLLECTION FIRE HAZARDS EVALUATION

The construction of the insulation is such that the oil would tend to be diverted away from hot surfaces and would not be retained as in the case of blanket insulation which would tend to absorb the oil. The RCS insulation is not leak tight. Any oil managing to penetrate the circumference of the metal insulation would likely drain away from the hot piping - only a small quantity might remain.

HVAC Effects -

The containment normal ventilation consists of five normal cooling units which provide air cooled by chilled water to various parts of the containment. Steam generator E089 compartment, which contains RCP P001, can be cooled by three of the five normal cooling units, however, only two are usually in operation. The supply of cooled filtered air is delivered to about the 24' elevation of the E089 compartment. Transfer fans at this elevation provide assisted delivery to the lower areas of E089, P003 and P001. This cooled air flows vertically as it is heated by the various RCS components and piping within the E089 compartment. It flows past RCP's P001 and P003 at elevation 45' and then out the upper part of the E089 compartment into the upper containment dome area. Oil drops from RCP motor oil systems will fall by gravity and will not be affected by the vertical rise of air from the HVAC. This has been confirmed by observations during the unplanned outage where oil deposits were directly below the sight glass.

Location of SSD (including spurious operation) Equipment -

Within Fire Zone 2-CO-15-1B are components/ circuits of systems that are credited for safe shutdown: Hot leg loop 2 temperature indication, cold leg 1A temperature indication, source range flux monitors, QSPDS E089 T-cold indication, hot leg loop 1 temperature indication, SU channel 2 neutron flux indication, NSSS aux relay cabinet, controlled bleed off relief isolation, pressurizer proportional heaters, pressurizer backup heaters (1E and non-1E), reactor coolant pumps, normal pressurizer spray valve and controllers, RCP seal cooling, CCW return isolation valves, pressurizer, and a steam generator.

EVALUATION BASIS:

1. A fire was postulated in fire zone 2-CO-15-1B because it contains more safe shutdown components (e.g. the pressurizer) than the other steam generator room. Therefore, more equipment maybe impacted. Additional fires were not postulated in other fire zones, consistent with assumptions made in the SONGS UFHA and Appendix R analyses.
2. This assessment is based on locations of equipment and raceways identified as the best available based on the Unit 3 walkdown, photos and available design drawings pertaining

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RCP OIL COLLECTION FIRE HAZARDS EVALUATION

to both Units.

3. The lower lube oil reservoir contains approximately 30 gallons of oil. Due to the sight glass location, no more than approximately 15 gallons are expected to leak out of the system. All threaded mechanical connections are coated with Permatex or an equivalent material. This is designed to assure a proper fit and lock-in the threaded connections to prevent leaks. A review of Maintenance Orders dating back to 1984 indicates no incidents of leakage from threaded connections for the devices described above. These types of connections may potentially exhibit leakage. However, the leakage would be minor, intermittent drops, and not a continuous stream. Any weepage would not result in significant accumulation or pooling of lube oil.
4. Seismic evaluation of RCP Lube Oil System concluded that the RCP lube oil system, including the threaded connections, will not catastrophically fail in a design basis earthquake (DBE).
5. An enhanced RCP lube oil monitoring program has been implemented to ensure that small amounts of leakage from the RCP lube oil system are detected and corrective action taken. Use of a 15 gallon oil leak for the purpose of this analysis is therefore very conservative, as operator response and subsequent corrective actions should minimize the actual amount of leakage postulated. The 15 gallon amount assumes no operator action is taken.
6. Safe Shutdown equipment is a special category of plant equipment that has been designated as needed to shutdown the plant should a fire occur in any fire area. Equipment designated as safe shutdown equipment may or may not be safety related. Both safety related and safe shutdown equipment are contained in fire zone 2-CO-15-1B and may be affected by a fire in the zone. The impact from a fire on the safety related equipment is inconsequential provided that safe shutdown equipment remains available to safely shut down the plant. The impact from a fire on safe shutdown equipment is provided in the following evaluation.

EVALUATION:

A three dimensional drawing showing the location of the postulated leak and the surrounding equipment is provided in Attachment 1.

Fire Location -

The postulated fire is expected to occur directly below the leak location. The ventilation system air flow patterns within the steam generator compartment are

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RCP OIL COLLECTION FIRE HAZARDS EVALUATION

relatively still in the area of the lower lube oil reservoir sight glass. Turbulent air flow is expected below the RCP casing. Above the RCP casing the increased flow area reduces the air velocity around the postulated leak location. Therefore, oil leakage from the lower reservoir sight glass would fall straight down, directly on the reactor coolant pump casing (cold leg piping).

As described previously, the temperatures of the RCS piping in the steam generator compartment are greater than the flash point of the lube oil. As a result, oil which migrates through the insulation to the cold leg pipe surface may vaporize. If significant quantities of oil were to collect beneath the insulation, near the hot pipe surface, the location of the fire would be the pump casing beneath the RCP motor at approximately elevation 32'.

Oil which does not collect on the RCP casing would fall to the containment floor or be directed by transfer fans to the steam generator compartment wall. There are no ignition sources near the floor or walls. The sloping of the floor in the steam generator compartment will prevent migration to areas outside the compartment.

SSD Equipment In The Vicinity Of A Potential Fire -

It is postulated that 15 gallons leaks from the sight glass. However it is more likely that the quantity of oil involved in the fire would be much less due to various obstructions (e.g., pipe supports and other structural elements) in which small amounts of oil may fall on and divert away from the hot ignition sources. Additionally, a significant amount of the 15 gallons would drain from the mirror insulation and downward onto the containment floor prior to ignition and would not be involved in the fire, because of the loose fitting design of the reflective insulation.

The event report for the ANO fire indicates that the flame height for their RCP oil fire was approximately 2 feet. The flame height for the ANO fire is bounding for the fire at SONGS because the ANO fire was initiated from insulation that concentrated quantities of oil. The postulated fire at SONGS would be a thin oil film that would not substantiate more flame height. As discussed above, Steam Generator E089 compartment rises to approximately 95' elevation and opens directly to the remaining portion of containment. A hot gas layer is therefore not expected to develop at higher elevations. Additionally, the fire is not close to the fire zone walls and radiated heat is not expected to intensify the fire. Based on these factors, equipment expected to be damaged as a result of a fire will be located directly in the fire plume.

The closest safe shutdown components to the proposed fire location

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RCP OIL COLLECTION FIRE HAZARDS EVALUATION

(approximately the 32' elevation) and the distance from the proposed fire are:

Component	Distance (Approximately) Horizontal/Vertical
2TE 0111Y1/2TE 0911Y1 (Cold leg temperature)	9'/same
2PV 0100A/2PY 0100A (Spray Valve)	5'+/ 1'below
2TV 9144 (RCP CCW cooling Isol)	5'+/same
Cable tray CAXKA7 -1E PZR Backup htrs. -non 1E PZR heaters	4'/6'
Cable tray CAXKA9 -PZR Backup htrs. -non 1E PZR heaters	12'/6'

Because the mirror insulation is installed at the proposed fire location, if a fire were to occur, oil, possibly flaming would be expected to drop off the pump casing onto the RCS piping below and then on to the floor. There are no exposed, significant quantities of combustibles below the CAXKA7 and CAXKA9 cable trays. The fire is not expected to propagate on to other combustibles below the cable trays identified.

Based on the height of the fire, and the horizontal and vertical distance of cable trays CAXKA7 and CAXKA9 from the ignition source, the fire is not expected to ignite cables therein. However, if the cables were to ignite, the fire would not propagate the full length of the trays into the adjacent fire zone. This is due to the IEEE 383 qualified cable insulation, and the ignition source is localized to the pump casing and will not sustain extended combustion.

A horizontal tray (CAXWB3) is located approximately 15' vertically and 5' horizontally from CAXKA9. Because of the IEEE 383 approved cable insulation, the separation, and the fire suppression system installed protecting the cables, a fire is not expected to propagate to the CAXWB3.

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RCP OIL COLLECTION FIRE HAZARDS EVALUATION

Conduits containing SSD equipment are not expected to be directly exposed to the fire plume. Conduits on elevations 15' to 45' are routed adjacent to the walls at significant distances away from the postulated fire location. Above the 45' elevation two SSD conduits are routed at least 13' above the ignition location. Circuits within these conduits are not expected to be directly exposed to a fire, based on the size and location of the proposed fire.

There are four channels of pressurizer pressure and two channels of pressurizer level instrumentation within the fire zone. Only one channel of pressurizer pressure and level instrumentation is required for safe shutdown.

Pressurizer pressure and level transmitters are mounted on the outside of the E089 steam generator compartment on the P001 side of the steam generator. These transmitters are separated by a minimum distance of 17 feet. A deviation to the separation requirements of Appendix R was approved in the SER dated June 29, 1988. The basis for this deviation was that "the existing spatial separation between redundant systems is sufficient to assure that...at least one shutdown division remains free of fire damage."

The pressurizer instrumentation inside the steam generator compartment is the transmitter tubing. The tubing runs from the transmitters at elevation 36', through and along the south wall of the compartment, and up to the associated pressurizer instrument taps. The pressurizer pressure taps are at approximately elevation 78'; the pressurizer level instrument taps are at approximately elevation 47'.

As described above, the ignition point is at approximately elevation 32' on the pump casing. From this point, the horizontal separation between the tubing routed on the steam generator compartment wall is greater than 13'. The vertical separation of the wall-mounted tubing and the P001 pump casing is a minimum of approximately 4', and increases as the tubing ascends the wall. The horizontal separation between the ignition point and the pressurizer level instrument taps, (where the tubing connects to the bottom of the pressurizer) is at least 5'; the vertical separation is greater than 16'. Additionally, the level instrument tubing is routed about 18" below the pressurizer, on the inside of I-beam supports which provide radiant energy shielding.

The majority of the fire hazards in this zone are a result of the RCP oil which, except for the 15 gallons, will be collected within the oil collection system. Any fire directly exposing or originating at the RCP will actuate the thermal detectors which will trip the semi automatic deluge valve. Although the system is semi-

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RCP OIL COLLECTION FIRE HAZARDS EVALUATION

automatic and suppression will not commence immediately, current compensatory measures being taken by station operators require a containment entry should more than approximately one gallon of oil be lost from the lower reservoir. It is anticipated that this action will identify the leakage before a fire would occur based on the inherent capability of the mirror insulation to separate the oil from the hot surfaces. Should a fire occur, however, it is expected that action will already be underway to investigate the abnormal condition, significantly reducing the time to identify fire conditions or required to initiate fire water flow to the containment building.

The fire source will be limited by the configuration of the mirror insulation, which will route significant quantities of oil to the floor, and is not expected to reach beyond a height of approximately 24". Likewise, the fire will not propagate beyond the edge of the insulation on the pump casing. Therefore, the zone of influence of the fire will not adversely affect the pressurizer instrument tubing.

Affects On Safe Shutdown Capability -

For the purposes of this evaluation the components defined above are conservatively postulated to be damaged by fire. Although based on expected fire size, it is doubtful that this equipment will be impacted. The consequences provide assurance that a fire at this location will not adversely impact the ability to safely shutdown. The consequences of losing the components are as follows:

Equipment	SSD Impact
2TE-0911Y1 (QSPDS E-089 T cold)	None - Redundant component available in opposite S/G Room
2TE 0111Y1 (cold leg 1A temp indication)	None - Component not required for SSD in this fire area.
2PV-0100A (PZR Spray Valve)	None - Operator action taken to trip RCPs
2TV9144 (RCP seal cooling CCW return Isol vlv)	None - Operator action taken to trip RCPs
1E PRZ Htrs.	None - Components are not credited in this

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RCP OIL COLLECTION FIRE HAZARDS EVALUATION

	fire area (Charging system remains available)
Non-1E PRZ Htrs	None - Components fail to their desired position (off)

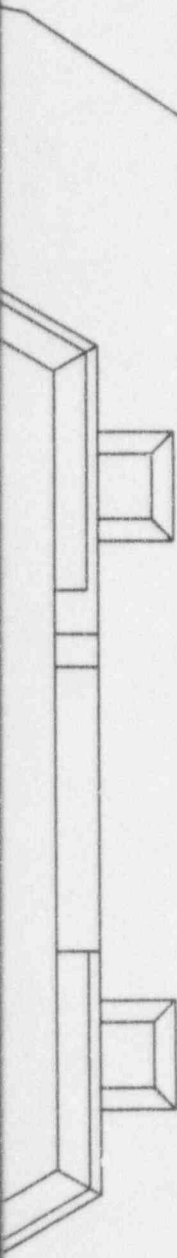
CONCLUSION:

Measures are in place to minimize the potential for RCP lube oil leakage, and a fire which could result from the leakage. Also, measures are in place to enhance the ability to identify and mitigate oil leakage.

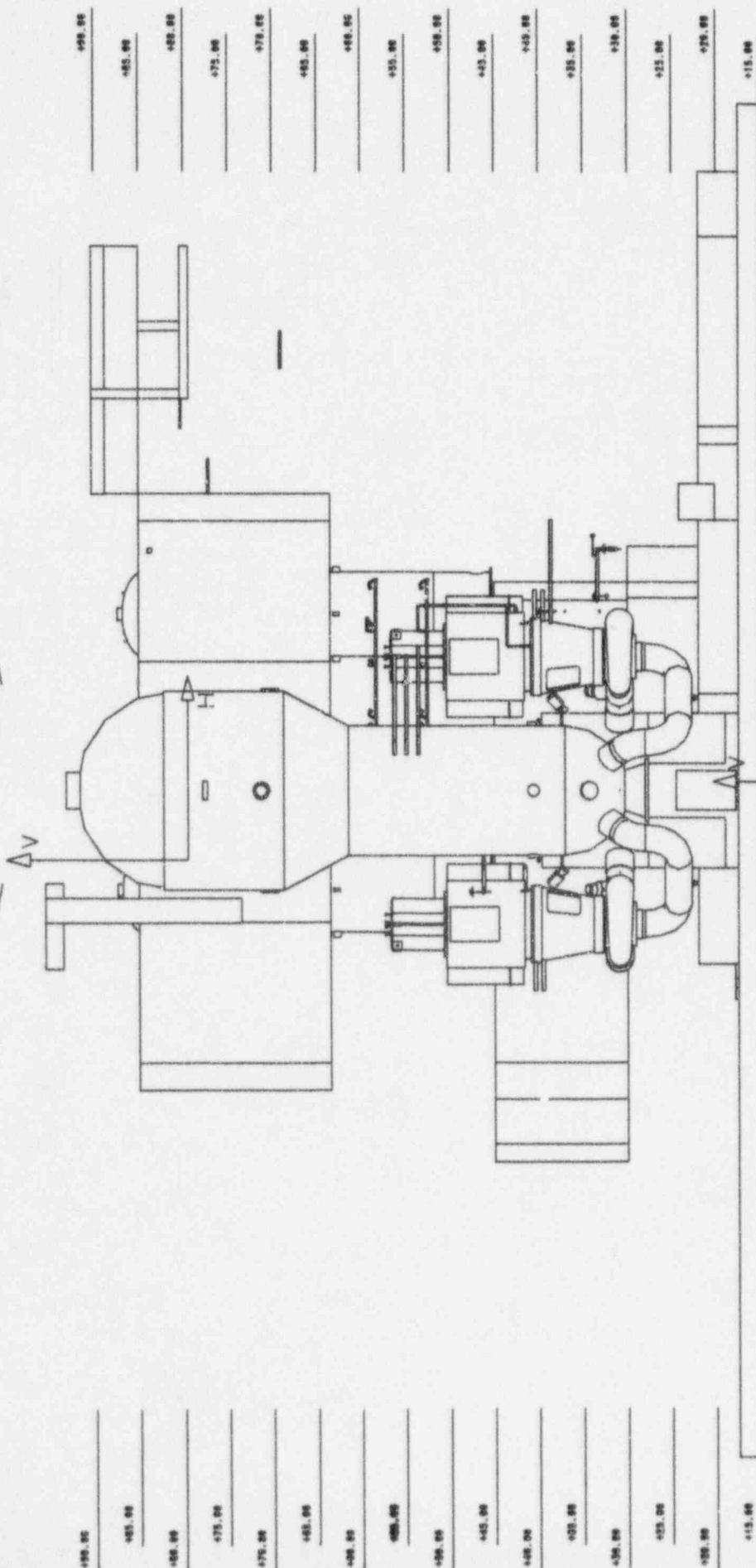
Safe shutdown capability, in the unlikely event of a fire, has been assessed. Safe shutdown components were identified to either meet separation criteria, or to have redundant components available. The assessment confirmed that, in the unlikely event a lube oil fire occurs in the containment building, damage will be limited and the ability to achieve and maintain safe shutdown is preserved.

ATTACHMENT:

CATIA 3-D drawings indicating locations of proposed leakage points (2LE0157), fire protection systems, safe shutdown components, HVAC flow rates, and general configurations of the RCP's, Steam Generators, and associated piping.



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