ATTACHMENT 2

PROPOSED LICENSE CONDITION

(5) Each channel of the loose-part detection system shall be demonstrated OPERABLE in MODE 1 by performance of a:

a) CHANNEL CHECK at least once per 24 hours

b) CHANNEL TEST at least once per 31 days

The surveillance requirements for neutron noise monitor are covered by the Appendix A Technical Specification 4.1.1 for the Power Range Neutron Flux.

(6) With the neutron noise/loose-parts detection instrumentation inoperable for more than 7 days, licensee shall submit a Special Report to the Commission pursuant to Appendix A Technical Specification 6.9.2 within the next 3 days outlining the cause of the malfunction and the plans for restoring the system to operable status.

(7) In the case of a seismic event of 0.25g or greater as indicated on site sensors, a controlled shut down shall be initiated. Before operations are resumed, it will be demonstrated that no thermal shield damage has occurred due to the seismic event.

(8) The provisions of Appendix A Technical Specification 3.0.4 are not applicable to this license condition.

N. Inadequate Core Cooling Instrumentation System

Licensees shall implement all the requirements of item II.F.2, "Inadequate Core Cooling Instrumentation System" (Generic Letter 82-28) as soon as practicable but not later than startup for fuel cycle XII (approximately February 1993). Specific plans for implementation shall be submitted to NRC for approval by no later than December 1, 1990.

ATTACHMENT 3

RVLMS AND CET UPGRADE
DEFERRAL EVALUATION

Attachment 3

EVALUATION OF DEFERRAL OF INSTALLATION OF REACTOR VESSEL LEVEL MONITORING SYSTEM AND CORE EXIT THERMOCOUPLE UPGRADE

This attachment to Proposed Change No. 215 to Provisional Operating License No. DPR-13 provides a summary of considerations involved in implementation of the requirements of License Condition 3.N, and of Edison's evaluation of the proposed deferral of implementation from the Cycle 11 to the Cycle 12 refueling outage.

1.0 BACKGROUND

In a letter dated May 10, 1989 the NRC issued an order establishing the License Condition 3.N requirements to complete implementation of Item II.F.2 of Generic Letter 82-28, "Inadequate Core Cooling (ICC) Instrumentation System", no later than the startup for Fuel Cycle 11 and to submit specific plans for implementation to the NRC for approval no later than December 1, 1989. The Proposed Change would defer the requirement to complete implementation to not later than the startup for Fuel Cycle 12 and delay the date for submittal of plans to no later than December 1, 1990.

Deferral of the requirement from Cycle 11 to Cycle 12 is needed in order to permit the schedule for commencement of the Cycle 11 refueling to be advanced from September 1991 to July 30, 1990. This will permit the refueling to be combined with a thermal shield repair outage which must begin by that date.

For the reasons discussed below, Edison cannot comply with License Condition 3.N during the rescheduled Cycle 11 refueling outage. Unless the proposed change is approved, Edison cannot refuel during the thermal shield repair outage, and an additional outage for the purpose of refueling will occur in 1991. This additional outage can be avoided by deferral of the License Condition 3.N requirements from Cycle 11 to Cycle 12. The implementation delay resulting from this deferral is about 12 months.

2.0 IMPLEMENTATION SCHEDULE REVISION

Figure 2-1 following compares the previously planned operation and outage schedule for San Onofre Unit 1 with the current schedule which provides for Cycle 11 refueling during the mid-1990 extended outage to repair the thermal shield. The current schedule requires NRC approval of the proposed change because Edison cannot complete design development and procurement activities in time to permit installation of the Reactor Vessel Level Monitoring System during a mid-1990 Cycle 11 refueling outage.

3.0 EVALUATION OF ICC INSTRUMENTATION HARDWARE OPTIONS

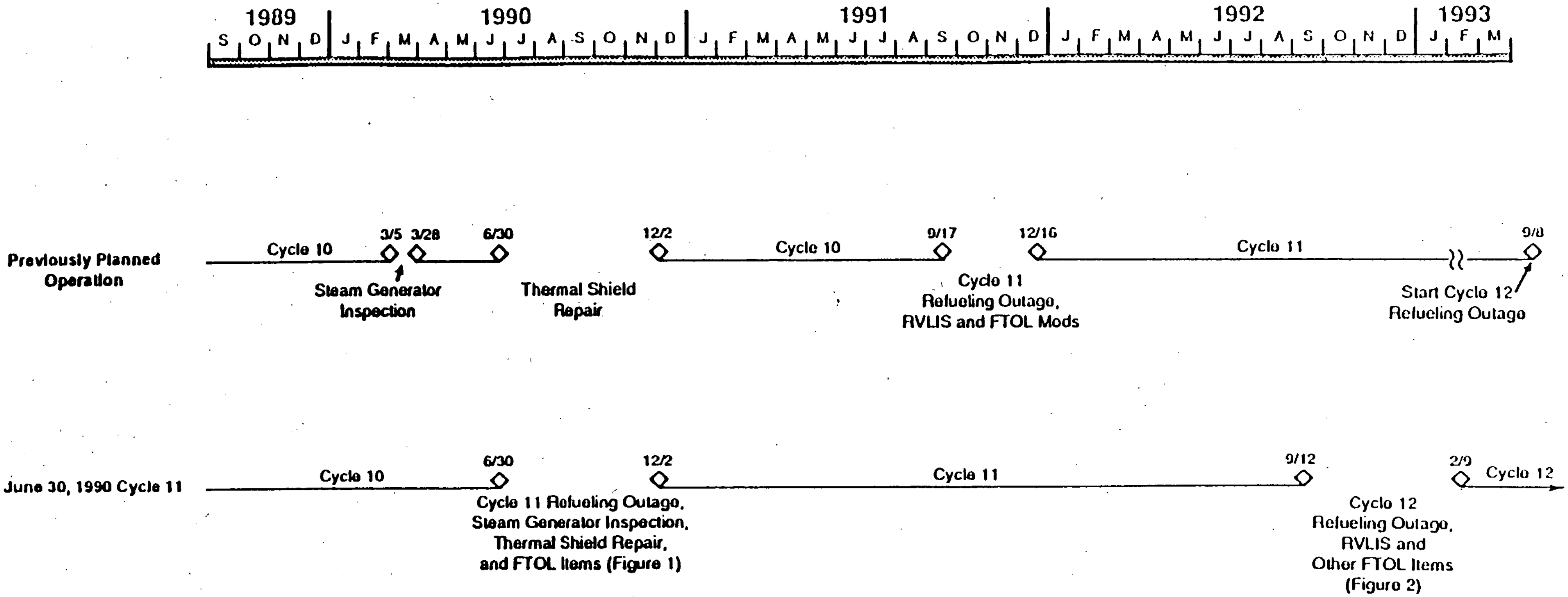
The ICC Instrumentation System consists of three components as follows:

1. Subcooled Margin Monitoring (SMM) System. A qualified SMM System is currently installed.

2. Core Exit Thermocouples (CETs). CETs are currently installed, however they require upgrade to fully meet post-accident qualification requirements.

3. Reactor Vessel Level Monitoring System (RVLMS). A RVLMS design suitable for use is not presently available and must be developed.

Figure 2-1
SONGS 1 Operation Schedule



Edison has evaluated RVLMS designs currently provided to the industry by Westinghouse and Combustion Engineering. Both designs must be modified to meet unique requirements for installation at San Onofre Unit 1, and a modified design must be tested to ensure it will meet performance requirements when installed. In consideration of the significant design and construction interfaces (Figure 3-1), Edison has also concluded that upgrade of the CETs should be conducted at the same time that the RVLMS is installed, based on design and ALARA benefits which would result from performing the modifications at the same time.

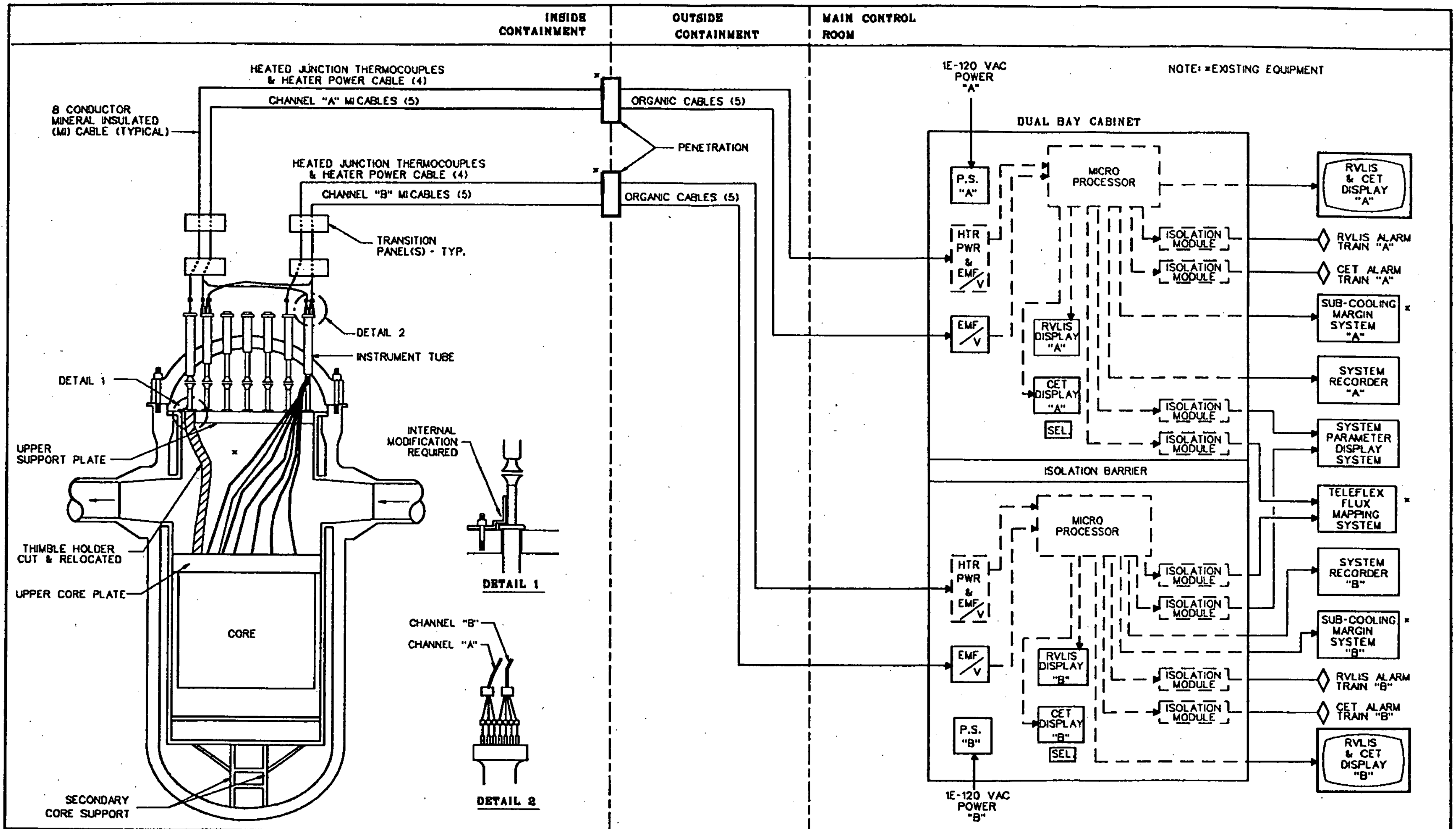
With respect to the standard Westinghouse RVLMS design specifically:

- The San Onofre Unit 1 reactor vessel has no bottom instrument taps, as required.
- Significant instrument errors may be introduced as a result of the required location of instrument taps on the Reactor Coolant System (RCS) cold legs.
- Post-LOCA injection through the cold legs has an unknown impact on instrument accuracy and response.
- There may be no capability to trend reactor vessel void content with the reactor coolant pumps operating.
- The location of pressure transmitters inside containment may introduce additional instrument errors.
- The modifications required for installation at San Onofre Unit 1 have not been installed at any other facility and would require testing.

With respect to the standard Combustion Engineering Heated Junction Thermocouple (HJTC) RVLMS design specifically:

- The San Onofre Unit 1 installation will require use of probes of a design not previously used or tested.
- Internal RCS hydraulic differential pressures may cause erroneous level indication due to flow through the probe holder assembly or trapped water volumes in the assembly.
- The new, smaller diameter probe required may not accurately provide required level information, and its ability to withstand incore forces during normal and accident conditions has not been fully analyzed.
- As with the Westinghouse design, the modifications required for installation at San Onofre Unit 1 have not been installed at any other facility and would require testing.

Edison must select between the Westinghouse and Combustion Engineering RVLMS standard designs and then proceed to develop and test the modifications required for installation in San Onofre Unit 1. Although this can be accomplished in time to support a September 1991 Cycle 11 refueling, the necessary work cannot be completed in time to support the rescheduled mid-1990 Cycle 11 refueling.



SAN ONOFRE NUCLEAR GENERATING STATION - UNIT 1 FIGURE 3-1

REACTOR VESSEL LEVEL INSTRUMENTATION & CORE EXIT THERMOCOUPLE SYSTEM

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Additional information related to the considerations above is provided below.

3.1 Westinghouse RVLMS

The standard RVLMS installation requires connection of pressure transmitter taps on the reactor vessel top and bottom and on the RCS hot legs. Pressure data are then used to determine reactor vessel water level when the reactor coolant pumps are not operating and void content when they are operating. Since access to the bottom of the San Onofre Unit 1 reactor vessel is not practical, the lower pressure tap must be relocated to the RCS cold legs and the hot leg tap must be deleted. This modification raises the following concerns which require resolution:

Instrument Error

The use of the RCS cold leg introduces a measurement error due to the subcooled water in the downcomer which has been conservatively estimated by Westinghouse to be approximately 20% of the span. For very small LOCAs where only the charging pumps are used for inventory make-up, this error may be shown to be unacceptable.

Safety Injection Flow

For larger breaks where safety injection is used, flow through the cold leg piping may result in differential pressures which cause unacceptable level measurement errors.

Trending of Reactor Vessel Void Content

Relocation of the lower reactor vessel tap to the RCS cold legs compresses the level measurement range. As a result, void content information will be more sensitive to reactor coolant pump operation and the ability of the modified system to detect the approach to ICC under these conditions may be inadequate.

Westinghouse data indicates that the effective instrument span is a function of the number of operating reactor coolant pumps. With all 3 pumps operating, the instrument span could be reduced by as much as a factor of 20, and this would require compensation by signal processing equipment. The compensation would introduce additional system errors.

Edison's review of the standard Westinghouse RVLMS design (NUREG/CR-2628) has identified that a running reactor coolant pump in the RCS loop with the hot leg tap would cause the instrument signal derived between the hot leg and reactor vessel head to indicate off-scale in the zero direction. The modified design for use at San Onofre Unit 1 would use RCS cold leg taps in the A and C loops. Although the exact response of the RVLMS to operating reactor coolant pumps in the A or C loops would have to be determined, it is expected that similar results could occur.

At San Onofre Unit 1, either the B loop reactor coolant pump or both A and C reactor coolant pumps must operate in order to induce adequate spray flow by pump operation. Accordingly, if operation of both A and C pumps were required in a particular situation, RVLMS might not be able to provide useful data.

The problem associated with span reduction and increased measurement errors resulting from reactor coolant pump operation is expected to be exacerbated by the effect of concurrent two-phase flow. In addition, 30 Hz pump discharge pulsations and other process instrumentation and background noise conditions must be considered.

Pressure Transmitters Inside Containment

The RVLMS permits the installation of pressure transmitters either inside or outside containment. Edison's review of operating experience indicates that installations outside containment do not perform as well as when the pressure transmitters are installed inside containment. However, Westinghouse has estimated that post-accident environmental conditions inside containment may introduce errors of as much as 25% of span.

The Need for Additional Development and Testing

Edison concludes that the modifications required to the standard Westinghouse RVLMS design for installation at San Onofre Unit 1 will require additional evaluation and testing in order to provide adequate assurance that the system will perform its required function.

3.2 Combustion Engineering RVLMS

The HJTC RVLMS involves the placement into the reactor vessel of specially designed probes, consisting of a number of thermocouple pairs and heater elements uniformly distributed throughout the length of the probe. A heater element is located close to one thermocouple in each pair. Since water is a better conductor of heat energy than steam, the differential temperature between the thermocouple pairs in the water region is less than in the steam region. The approximate reactor vessel water level can be determined on the basis of where these differential temperatures change.

As with the Westinghouse design, a number of concerns must be resolved in the Combustion Engineering RVLMS prior to installation at San Onofre Unit 1. These concerns are summarized as follows:

Probe Development

Limitations in the number of reactor vessel head penetrations and thimbles available make it necessary to develop new incore thimbles and probes. The installation will require removal of two incore probes with the HJTC taking their places. This requires resolution of concerns described below.

Performance of the New Probes

The standard HJTC probe assembly has a separator tube approximately 2 inches in diameter surrounding the individual HJTCs. This separator tube is inserted in a guide tube that is approximately 4 inches in diameter. The existing guide tube at San Onofre Unit 1 that must accept the modified HJTC probe is approximately 0.675 inches in diameter, and preliminary information on the modified probe is that it will have to be approximately 0.5 inches in diameter. The installation would use a "grommet-like" device on the probe to support and center it within the guide tube, leaving an annular space around the probe of only about 0.08 inches.

The standard probe also has numerous holes throughout its length to form the collapsed water level within the guide tube and to provide for drainage without allowing excessive flow through the separator tube. The ability of the smaller sizes and clearances available in the modified design to effectively provide a collapsed water level within the guide tube will have to be demonstrated, and the size, number and position of the holes will have to be determined. An insufficient number and/or size of holes could cause inadequate drainage, while an excessive number and/or size could allow excessive flows. In either case, erroneous water level indication would result.

Also, the modified RVLMS design for installation in San Onofre Unit 1 consists of six HJTCs, versus eight in the standard design. This reduces the level measurement resolution, and an effort is underway to make further modifications that would restore the number of HJTCs to eight.

Incore Forces

The mechanical strength of the existing San Onofre Unit 1 guide tube has been analyzed to withstand the forces within the reactor vessel during normal operating and design basis events. The effect of adding holes to the tubes has not yet been fully evaluated.

The Need for Additional Development and Testing

As with the Westinghouse RVLMS design, the modifications required in the Combustion Engineering design must receive additional evaluation and testing in order to provide adequate assurance that the system will perform its required function.

3.3 CET Upgrade

In addition to the installation of the RVLMS, in order to fully implement the requirements of Generic Letter 82-28 it is necessary to upgrade the CETs. It is intended to include this work with an overall upgrade of the ICC Instrumentation System and displays. As indicated in Figure 3-1, this upgrade will integrate the electronics of the RVLMS and the CETs in a complex manner. The design of this integrated system is such that significant engineering and ALARA benefits result from combining the RVLMS and CET work such that it is performed at the same time.

San Onofre Unit 1 has 35 CETs, of which 7 are currently inoperable. Upgrade of the CETs will address cable qualification, separation and data display so as to fully satisfy the requirements of NUREG-0737. Replacement of instrument cabling, connectors, containment penetrations and displays will be performed, and the incore orientation and cable routing will be such that CET information will be available from each quadrant and separated into two independent trains.

A single, micro-processor based instrumentation system will be used to display CET and RVLMS information. In addition, Edison is evaluating including the SMM and Safety Parameter Display System functions in the same ICC Instrumentation System display, similar to the San Onofre Units 2 and 3 Critical Function Monitoring System.

The integration of the CET upgrade with the RVLMS installation will provide significant engineering benefits and minimize worker exposure associated with work required inside containment. Accordingly, Edison proposes to delay the CET upgrade from Cycle 11 to Cycle 12 and to perform it at the same time as the RVLMS installation.

4.0 RISK ASSESSMENT OF SCHEDULE DEFERRAL

Edison has estimated the risk associated with a 12-month deferral in the installation of RVLMS and upgrade of the CETs. A small-break LOCA event is the most appropriate for consideration in this context.

A fault tree model was constructed of all systems needed to respond to a small-break LOCA, including safety injection, charging, recirculation, component cooling water, salt water cooling, auxiliary feedwater and AC/DC power. The model reflects the Cycle 10 plant configuration and incorporates all proceduralized operator actions.

Use of the model in a Probabilistic Risk Assessment (PRA) for small-break LOCAs occurring with a frequency of 2.9E-3/year yields a frequency of core damage of approximately 7.32E-5/year. The PRA was conducted on a conservative basis, with no credit taken for recovery of failed equipment.

In order to reflect the benefits of installation of the RVLMS and upgrade of the CETs, it was assumed that operator error probabilities associated with safety injection, charging and recirculation, which could in any way be impacted by information from the RVLMS and the CETs, would be reduced by half. The PRA was again performed yielding a reduced core damage frequency of 7.09E-5/year. This represents a reduction in core damage frequency of 2.25E-6/year, or 3%.

Accordingly, Edison concludes that the 12-month delay in completing ICC Instrumentation System implementation does not involve a significant reduction in a margin of safety.

5.1 ICC INSTRUMENTATION SYSTEM DESIGN AND OPERATIONAL ASSESSMENT

The purpose of this section is to describe the San Onofre Unit 1 design and operational ICC response capability during the Cycle 11 deferral period. This provides a qualitative description of how the unit is designed with regard to ICC instrumentation and how the operator will use available instrumentation to respond to ICC events.

5.1 Cycle XI ICC Instrumentation System Configuration

The primary instrumentation systems utilized to detect and monitor an ICC condition are the SMM Systems and the CETS. Other instrumentation that initiates safety systems, monitors the operation of safety systems, and indicates the need for operator action, is also available to the operators. The following discussion presents a detailed description of the design and operating characteristics of the SMM System and the CETS.

5.1.1 SMM System

The SMM System provides continuous, on-line indication of the margin to saturation of the reactor coolant utilizing RCS temperature elements, pressure transmitters, electronic signal processing equipment, and indicators. The SMM system consists of two redundant, safety-related monitoring channels that were installed as a result of NRC Short-Term Lessons Learned (NUREG-0578) requirements.

The SMM System utilizes redundant gas discharge analog bar information displays (one per channel), located in the main control room, to provide continuous indication of the following parameters:

A, B, C Hot Leg Temperatures	(range: 100° - 700° F)
Saturation Temperature (T_{sat})	(range: 100° - 700° F)
Limiting RCS Temperature (T_{hot})	(range: 100° - 700° F)
Margin to Saturation (T_{sat}-T_{hot})	(range: -50° - $+150^\circ$ F)

The system provides the control room personnel with an immediate assessment of the approach to, or the occurrence of, saturated RCS conditions.

5.1.2 CETs

The CETs monitor the temperature of the reactor coolant as it leaves the fuel assemblies. The adequacy of core cooling is inferred from the core exit temperatures. The present CET system includes 35 thermocouples whose leads exit the reactor vessel closure head via five instrumentation ports. Each port houses seven thermocouples. The individual thermocouples are Type K, ungrounded, 1/8 inch in diameter. The CET display is via the Teleflex system located in the control room.

The present in-containment signal transmission cabling and connectors are not qualified to meet current post-accident equipment qualification requirements. As noted in Section 3.0, this equipment will be replaced with qualified equipment. The cables are presently terminated in Thermo Electric, Type KK, connectors at the end of the pressure tube.

The in-vessel portion of the CET is considered qualified and inherently capable of performing its function during accident and post-accident environmental conditions by virtue of its design, materials of construction, and operating experience. In addition, the current Regulatory Guide 1.97 (Revision 3) requirements, accept installed Type K thermocouples as qualified.

As noted in Section 3.0, the upgraded CET configuration will include a complete replacement of the instrument cabling, connectors, containment penetrations and displays. The new configuration will provide eight CETs per train dedicated to SMM input and control room display of core exit temperature. The incore orientation and cable routing will be such that information will be available for core conditions in each quadrant and separated to provide independent trains. The upgraded configuration will meet all of the design criteria of Generic Letter 82-28 regarding qualification, separation, display, power supply, quality assurance and redundancy.

5.2 Cycle II ICC Instrumentation Operational Assessment

An assessment has been made of the operator's use of available instrumentation during post-accident response scenarios. Also discussed below is the implementation of a new loss-of-recirculation procedure.

5.2.1 EOI Use of ICC Instrumentation

San Onofre Unit 1 has RCS temperature indication, subcooled margin monitoring and CET monitoring capability. All of this ICC instrumentation provides the operator with information to detect and respond to the approach to, and onset of, ICC. As shown in Figure 5-1, this instrumentation is used at various decision points, to direct the operator to the proper response procedure.

The first indication used is the CETs. If five CETs are not greater than 1200°F, and subcooling margin is verified to be greater than 40°F, then the core cooling critical safety function is satisfied. If CETs indicate conditions greater than 1200°F, or subcooling is less than 40°F with the hot leg RTDs greater than 680°F, the operator is directed immediately to Emergency Operating Instruction (EOI) SO1-1.2-1, "Response to Inadequate Core Cooling."

SO1-1.2-1 provides the operator response to an inadequate core cooling condition to minimize possible core damage by systematically attempting to establish alternate means of core cooling. The operator performs this by carefully verifying the operability of injection system components, transfer to recirculation or other potentially available means of reestablishing core cooling.

The last instrumentation check is to refine the operator response, and it directs the operator to either SO1-1.2-2, "Response to Degraded Core Cooling," or SO1-1.2-3, "Response to Saturated Core Cooling Conditions." In this manner, the CET ICC instrumentation is used to "finely" tune the operators' response.

The purpose of SO1-1.2-2 is to ensure adequate core cooling and prevent reactor fuel damage resulting form inadequate cooling. The operator is directed into this symptom directed instruction from abnormal core exit thermocouple readings of between 680°F and 1200°F. In this instruction, the operator will ensure provision is made for core cooling water from the safety injection system and the charging pumps. The purpose of SO1-1.2-3 is to restore subcooled margin to the RCS. The operator is directed into this symptom-directed instruction by abnormal readings from the two subcooled margin indicators located on the auxiliary feedwater panel. In this instruction, an attempt is made to re-establish at least a 40°F subcooling margin by operating, or verifying proper operation of, the safety injection system.

A saturated core cooling condition can occur from a spectrum of initiating events. Therefore, the operator is returned to the applicable procedure after re-establishing the required subcooled margin. It should be noted that for some accidents (primarily steam generator tube rupture) a loss of subcooling is expected and procedurally created. Therefore, the operator is cautioned prior to implementation of this instruction to assure that restoration of subcooling is desired.

CRITICAL SAFETY FUNCTION STATUS TREES

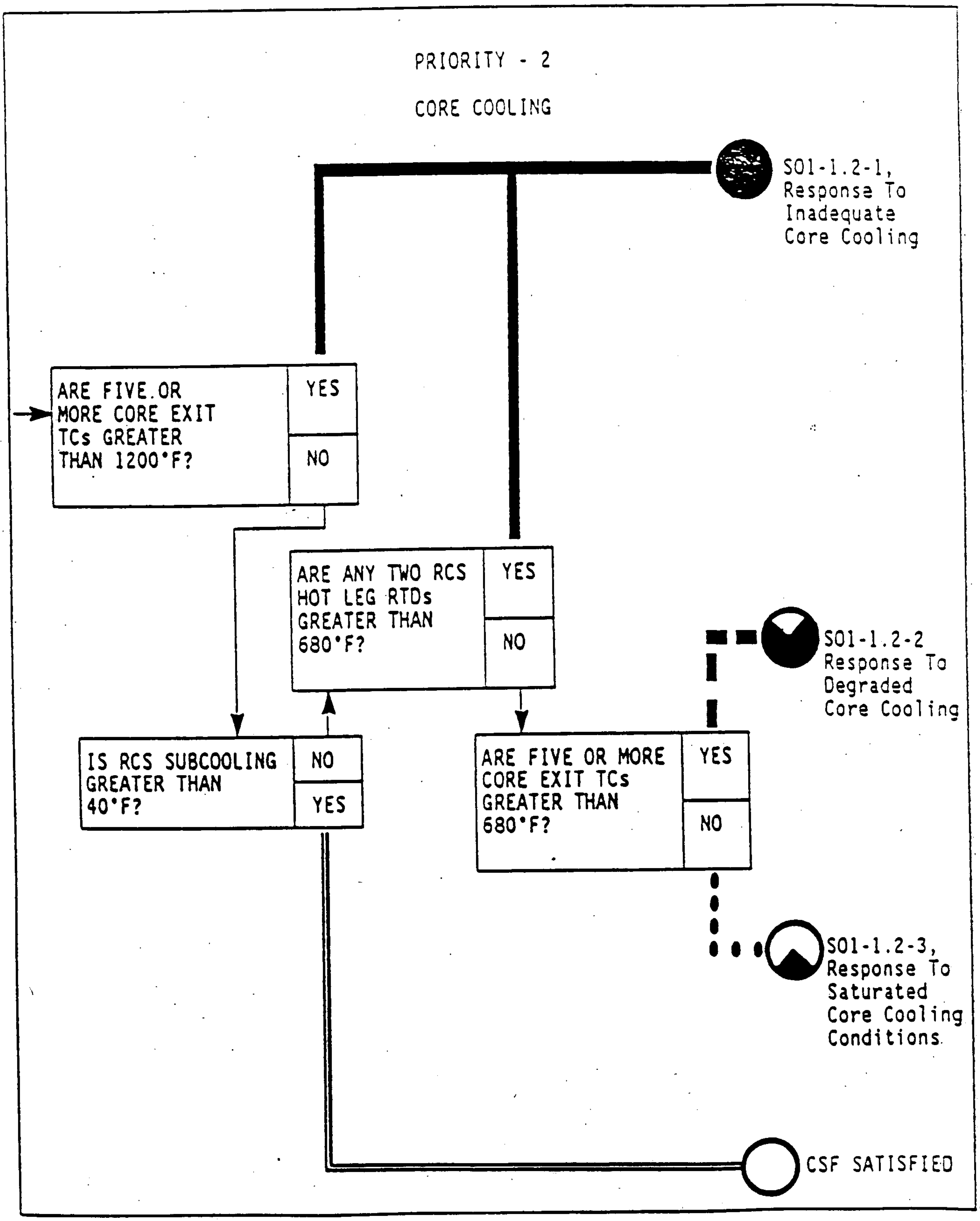

FIGURE 5-1

5.2.2 Loss of Recirculation EOI

SCE's letter of June 20, 1986 indicated an EOI for loss of recirculation would be developed. The intent of this procedure was to provide the operators with sufficient information to enable the potential alternative and recovery actions to be taken. These actions include: refill of the refueling water storage tank (RWST), use of excess spent fuel pool water and subsequent use of the, then submerged, residual heat removal system. These alternate actions are pursued in parallel with a continuing effort to recover one or both of the recirculation system trains. The EOI and the risk of loss of recirculation are discussed briefly below.

The San Onofre Unit 1 post-LOCA plant recovery sequence relies on the continuing operation of the two-train recirculation system up to 120 days. This system performs recirculation cooling of the containment atmosphere, via sprays, and the core, via recirculation injection. This recirculation path requires the long-term operation of the two recirculation pumps, both of which are submerged and inaccessible during the post-LOCA recovery period.

The PRA performed in support of SCE's June 20, 1986 submittal quantitatively confirmed the qualitative assessment presented above. The PRA concluded that failure of the recirculation pumps, post-LOCA, is a dominate contributor to core-melt frequency. Accordingly, Edison committed in the June 20, 1986 letter to generate an EOI to address the possible recovery actions in the event a loss of recirculation occurs.

Provided as Appendix A is SO1-1.0-25, "Loss of Recirculation Flow." The entry conditions are loss of one or both recirculation pumps, or loss of one or both pump discharge motor operated valves. Upon entry into this procedure, the operator performs the following sequential actions, depending on whether one or both of the recirculation trains are inoperable:

- Verification of recirculation train status.
- Refill of RWST, if Health Physics permits.
- Verification of recirculation train electrical status.
- Increase of containment cooling.
- Reinitiation of injection, if RWST refill is accomplished.
- Use of the, now submerged, RHR system.

These actions are in parallel with a continuing effort to restore the normal recirculation flow path.

As seen in the procedure, the operator is provided with extensive guidance to ascertain the resultant containment sump levels and boron concentrations. Information on prerequisite actions to open or operate potentially non-qualified valves, is also provided.

All of these actions and guidance are intended to provide the operator with a previously evaluated sequence of preferred options following a loss of recirculation flow due to recirculation pump or pump discharge failure. The result is that Edison has addressed a significant portion of the identified post-LOCA risk with a recovery procedure designed to avert a core-damage scenario.

5.3 Conclusion

The San Onofre Unit 1 Cycle II ICC configuration includes adequate design and operational characteristics to equip the operators to respond to ICC conditions. These characteristics include RCS temperature and RCS subcooled margin information and pre-defined actions, including actions on loss of recirculation, to be taken by the operator based on that information. In this manner, San Onofre Unit 1 operation during the Cycle 11 deferral period is acceptable.

NRC1031B

APPENDIX A

EOI SO1-1.0-25

LOSS OF RECIRCULATION FLOW

LOSS OF RECIRCULATION FLOW

NOTE: The following steps are always applicable:

CONTAINMENT SPRAY	IF	Containment pressure >10 PSIG and charging pump suction aligned to RWST	THEN:	Ensure containment spray initiated.
	IF	Containment pressure >10 PSIG and charging pump suction aligned to SFP	THEN:	Establish containment spray via hose manifold connection per step 6 of Attachment 1.
	IF	Containment pressure <5 PSIG AND STABLE OR DECREASING	THEN:	Reset containment spray signal and secure spray flow.

RWST/SFP ALIGNMENT CRITERIA	IF	Charging pump suction is aligned to the RWST __AND__ RWST level $\leq 7\%$	THEN:	Trip all charging and refueling water pumps and go to step 15.
	IF	Charging pump suction is aligned to the SFP __AND__ 1) RWST level $\geq$ 90%, __OR__ 2) SFP is approaching 28 feet (130,000 gallons supplied)	THEN:	Return suction to RWST: 1) Ensure MOV 883 OPEN. 2) Ensure SFP 301 CLOSED.

LOSS OF RECIRCULATION	IF	During performance of steps 1 through 9, both trains of recirculation fail	THEN:	Go to step 10.
	IF	During performance of steps 10 through 30, at least one train of recirculation is restored.	THEN:	Implement the remaining steps of this procedure as needed and return to step 1.