# UNITED STATES OF AMERICA

### NUCLEAR REGULATORY COMMISSION

Application of SOUTHERN CALIFORNIA EDISON COMPANY, <u>ET AL</u>. for a Class 103 License to Acquire, Possess, and Use a Utilization Facility as Part of Unit No. 2 of the San Onofre Nuclear Generating Station

Docket No. 50-361 Amendment Application No. 142

SOUTHERN CALIFORNIA EDISON COMPANY, <u>ET AL</u>. pursuant to 10 CFR 50.90, hereby submit Amendment Application No. 142.

This amendment application consists of Proposed Change Number NPF-10-437 to Facility Operating License No. NPF-10. Proposed Change Number NPF-10-437 is a request to add a Section <u>F.</u> to UFSAR Section 7.6.1.1.2, Design Basis Information, to allow all the sensors for the Shutdown Cooling valve open permissive interlocks to be of the same design and from the same manufacturer. Subscribed on this 7th day of July, 1994.

Respectfully submitted,

SOUTHERN CALIFORNIA EDISON COMPANY

Bv:

Richard M. Rosenblum Vice President

State of California County of Orange On 7/7/94 before me, BARBARA A. MC CARTHY/NOTARY PUBLIC personally appeared <u>RicHARD M. RoseNBLUM</u>, personally known to me to be the person whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his authorized capacity, and that by his signature on the instrument the person, or the entity upon behalf of which the person acted, executed the instrument.

WITNESS my hand and official seal.

signature Barbara a. m. Carthy



# UNITED STATES OF AMERICA

### NUCLEAR REGULATORY COMMISSION

Application of SOUTHERN CALIFORNIA EDISON COMPANY, <u>ET AL</u>. for a Class 103 License to Acquire, Possess, and Use a Utilization Facility as Part of Unit No. 3 of the San Onofre Nuclear Generating Station

Docket No. 50-362

Amendment Application No. 126

SOUTHERN CALIFORNIA EDISON COMPANY, <u>ET AL</u>. pursuant to 10 CFR 50.90, hereby submit Amendment Application No. 126.

This amendment application consists of Proposed Change Number NPF-15-437 to Facility Operating License No. NPF-15. Proposed Change Number NPF-15-437 is a request to add a Section <u>F</u>. to UFSAR Section 7.6.1.1.2, Design Basis Information, to allow all the sensors for the Shutdown Cooling valve open permissive interlocks to be of the same design and from the same manufacturer. Subscribed on this 7th day of July , 1994.

Respectfully submitted,

SOUTHERN CALIFORNIA EDISON COMPANY

By:

Richard M. Rosenblum Vice President

State of California County of Orange On <u>7/7/94</u> before me, <u>BARBARAA</u>, <u>MCCARTHY</u> NOTARY PUBLIC personally appeared <u>RicHARD</u> <u>M. ROSENBLUM</u>, personally known to me to be the person whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his authorized capacity, and that by his signature on the instrument the person, or the entity upon behalf of which the person acted, executed the instrument.

WITNESS my hand and official seal.

signature Barbara a. McCa. Thy



## DESCRIPTION AND SAFETY ANALYSIS OF PROPOSED CHANGE NPF-10/15-437

Proposed Change Number 437 (PCN-437) is a request to revise Updated Final Safety Analysis Report (UFSAR) Section 7.6.1.1.2, "Shutdown Cooling System Interlocks Design Basis Information," for San Onofre Units 2 and 3.

Existing UFSAR Section:

See Attachment "A"

Revised UFSAR Section:

See Attachment "B"

Pressurizer Pressure Transmitters Arrangement

See Attachment "C"

Pressurizer Pressure Indication Data

See Attachment "D"

ALTERNATIVES TABLE

See Attachment "E"

Figure, Titled: Shutdown Cooling Valve Arrangement

See Attachment "F"

## I. DESCRIPTION of CHANGE

Southern California Edison (Edison) proposes modifying the design of the Subcooled Margin Monitor (SMM) calculators in the Qualified Safety Parameter Display System (QSPDS) and the Shutdown Cooling System (SDCS) Open Permissive Interlocks (OPIs). The proposed design change will significantly increase the accuracy of the pressure sensing instrumentation under harsh environmental conditions, but it will eliminate the diversity of sensors for the SDCS-OPI.

This proposed design change will 1) replace all four wide-range pressurizer pressure transmitters with new model Rosemount 1154 Series H transmitters, 2) replace all four low-range pressurizer pressure transmitters with new model Rosemount 1154 Series H transmitters, and 3) connect the Channel 1 and 2 low-range pressurizer pressure channels to the respective QSPDS channels to provide inputs to the SMM calculators. Pressurizer pressure transmitters are shown on Attachment C.

The specific UFSAR change is to add a Section <u>F.</u> to UFSAR Section 7.6.1.1.2, Design Basis Information, as follows:

All the sensors for the Shutdown Cooling valve open permissive interlocks may be of the same design and/or manufacturer. To enable Operations to determine the appropriate shutdown cooling entry condition, Class 1E low-range pressurizer pressure indication is provided in the control room at the QSPDS.

## II. SYSTEM DESCRIPTIONS

Subcooled Margin, a Post Accident Monitoring Instrument (PAMI) parameter, is calculated by an algorithm in QSPDS which compares the saturation temperature at the Reactor Coolant System (RCS) pressure to the temperatures at three locations: 1) the RCS at T-hot Resistance Temperature Detectors (RTD's) and the T-cold RTD's, 2) the Core exit region (Core Exit thermocouples), and 3) the Reactor Vessel upper head (upper head thermocouple). The calculated values of the subcooled margin are compared to the alarm setpoint values within the QSPDS and the operator is alerted whenever the temperature and pressure have deviated from the permissible operating envelope and the plant is approaching saturation conditions. Presently, only the wide-range pressurizer pressure inputs from Channels 1 & 2 are used as the reference RCS pressure in the SMMs calculators in the respective QSPDS Channels.

The SDCS at both San Onofre Nuclear Generating Station (SONGS) Units 2 and 3 is isolated from the RCS by four normally closed isolation valves, each powered from a separate Class 1E electrical power source. The four valves are controlled by remote-manual operation only. There are four independent channels of Class 1E low-range (0-750 psia) RCS pressure sensors to provide pressure signals to the OPIs associated with these valves. The valves are arranged in two parallel flowpaths, each with two series isolation valves. Each valve has an OPI from its respective channel of a low-range RCS pressure bistable, set at approximately 376 psia. One valve in each flowpath is presently interlocked with a Foxboic transmitter (channels 1 and 3), and the other with a Rosemount 1153 transmitter (channels 2 and 4). Once the OPI is satisfied and the SDCS suction valves are opened, alarms are provided from all four channels to warn operators should RCS pressure increase above limits set for SDC operation. The SDCS valve arrangement is shown in Attachment F.

All RCS pressure transmitters are located inside containment. Class 1E control room indication of RCS pressure is provided by four qualified wide-range channels (0-3000 psia, Rosemount) and four qualified narrow-range channels (1500-2500 psia, Foxboro). As indicated above, wide-range channels 1 and 2 also provide inputs to the QSPDS for subcooled margin monitoring. The four qualified low-range channels used for the OPIs do not have Class 1E indication. Non-class 1E low-range indication from channels 1 and 2 is provided. All four low-range pressures are available via the non-1E plant computer. The various RCS pressure transmitters, their ranges, channel designations, and their principle functions are provided in Attachment C, Pressurizer Pressure Transmitters Arrangement. Pressurizer Pressure Indication Data is shown in Attachment D.

### III. BACKGROUND

# A. REGULATORY BACKGROUND

WASH-1400, (Reactor Safety Study and Assessment of Accident Risk in U.S. Commercial Nuclear Power Plants, NUREG-75/014) identified the inter-system Loss of Coolant Accident (LOCA) as a significant risk scenario, due to the potential for concurrent loss of core cooling and containment bypass. SDC systems were of particular concern in this regard because they involve large bore piping connections to the RCS, are located outside containment, and are designed to only a fraction of the RCS design pressure.

The NRC eliminated the SDCS inter-system LOCA scenario through criteria which were eventually incorporated into Branch Technical Positions RSB 5-1 and ICSB-3. These Branch Technical Positions require 1) independent and diverse interlocks to prevent opening of the redundant RCS-to-SDCS isolation valves when the RCS pressure exceeds SDCS design pressure, and 2) independent and diverse alarms to prevent increasing RCS pressure above SDCS design pressure when the valves are already open. With this diversity, there is no credible combination of operator error and common-mode failure that could result in the WASH-1400 inter-system LOCA scenario.

#### B. SONGS 2/3 COMMITMENTS

Edison committed, in FSAR Q&R 032.23 in 1980, to meet the SDCS-OPI interlock requirements by using diverse process pressure sensors: two Foxboro transmitters (force-balance bellows capsule) and two Rosemount transmitters (oil-filled capacitance cell).

In 1981, the NRC accepted the SONGS 2/3 SDCS-OPI design based on Safety Evaluation Report (NUREG-0712) Section 7.6.1, which states that 1) there is an independent pressure channel interlocked with each SDCS isolation valve, and 2) for each line, each valve is interlocked with a pressure sensor manufactured by different vendors.

# IV. DISCUSSION

The Subcooled Margin indication is an important tool in diagnosing RCS conditions and alerting the Operators to approaching RCS saturation conditions and inadequate core cooling. It is one of the post accident monitoring instruments identified in Regulatory Guide 1.97. Accurate pressurizer pressure measurements are required for the calculation of subcooled margin. Currently, only the wide-range pressurizer pressure channels are used as PCS pressure inputs over the whole range of RCS pressure.

### A. CURRENT ISSUES

Overall instrument loop uncertainties have recently been recalculated for harsh environmental conditions. The large uncertainty in wide-range RCS pressure contributes more than 70% of the Total Loop Uncertainties (TLUs) associated with the SMMs. The recently completed Combustion Engineering Owners Group (CEOG) Study [Task #782], for correction of Subcooled Margin accuracy problems, recommended replacement of the widerange transmitters with more accurate transmitters and addition of inputs from more accurate low-range transmitters. Inputs from the lowrange transmitters are necessary because uncertainty is a percentage of transmitter span, and at low pressures the wide-range percent-of-span uncertainty becomes inherently large compared to the pressure being measured.

Accurate RCS pressure indication is also required by the operators to determine that SDCS entry conditions are met. The calculated TLUs in a harsh environment for the existing instruments are +550/-516 psi for the wide-range Rosemount indication instruments, +280/-289 psi for the low-range Rosemount OPI indication instruments, and +41/-111 psi for the low-range Foxboro OPI indication instruments. If the actual instrumentation errors during an accident were as great as these worst case TLUs, the wide-range indicator channels could be unable to distinguish between 0 psig and 500 psia. This exceeds the 450 psia design of the SDCS, and also makes the wide-range channels unsuitable for selecting the appropriate post-LOCA long-term cooling mode. The adverse impacts of the TLUs of the low-range transmitters on the OPI setpoints include 1) opening the valves at RCS pressure greater than the SDC system design pressure or 2) extending the depressurization period to clear the interlocks at a lower than necessary RCS pressure.

The low-range transmitters are currently used for the SDCS-OPI. To maintain diversity in the SDCS-OPI function, each SDC flow path has one Foxboro and one Rosemount transmitter, as shown in Attachment F, Shutdown Cooling Valve Arrangement. The Foxboro transmitters are aligned to safety channels 1 and 3, and the Rosemount transmitters are aligned to channels 2 and 4. Because the QSPDS cabinets are aligned to channels 1 and 2, only transmitters that are aligned to channels 1 and 2 can be connected to QSPDS.

To achieve the desired accuracy for Subcooled Margin Monitoring and RCS pressure indication, it will be necessary to replace both the RCS widerange and the RCS low-range transmitters. The only transmitters available in the industry with acceptable TLUs are Rosemount 1154 Series H transmitters. Changing the low-range transmitters on Channels 1 and 2 to Rosemount 1154 Series H transmitters from the Rosemount 1153 transmitter would eliminate the current SDCS-OPI diversity in at least one SDCS line.

## B. JUSTIFICATION FOR CURRENT OPERATION

Continued plant operation with the current design is based on use of the Foxboro low-range transmitters which have the lowest post-accident TLU. Non-1E low-range pressurizer pressure indication is available in the control room for operator use to determine the shutdown cooling entry pressure. However, if there is a loss of non-1E bus voltage, credit is currently taken for reading loop output voltages taken from the 1E circuitry in the instrument racks behind the main control boards. If necessary, the interlocks with the Rosemount transmitters could be overridden without leaving the control room area.

#### C. PROPOSED DESIGN CHANGE

Edison proposes:

1) to replace all four wide-range pressurizer transmitters (model 1153) with new model Rosemount 1154 Series H transmitters. Based on preliminary TLU calculations, this will improve the TLU under the worst case accident harsh environment from the current +550/- 516 psi value to a significantly lower value of +141/-109 psi,

2) to replace all four low-range transmitters (two Foxboro N-E11GM and two Rosemount transmitters) with new model Rosemount transmitters. Based on preliminary TLU calculations, this will improve the TLU under worst case accident conditions from the current TLU of +41/-111 psi for the Foxboro transmitters and +280/-289 psi for the existing Rosemount transmitters to a new TLU of +32/-30 psi. This change will also improve the SDC-OPI accuracy.

3) to connect the Channel 1 and 2 low-range pressurizer pressure signals to the respective QSPDS channels. This will substantially reduce the overall uncertainties of the SMMs and allow the 20°F subcooling requirements in the Emergency Operating Instructions (EOI's) to be maintained. Additionally, this change will provide Class 1E indication of Channel 1 and 2 low-range RCS pressure in the control room. Existing channel independence and electrical separation will be maintained.

This proposed design change will achieve the following:

- 1) Improve the SMM accuracy at all RCS pressure ranges.
- Provide Class 1E control room indication for all RCS pressure ranges.
- 3) Improve the accuracy of the OPIs.

The proposed Rosemount model 1154 Series H pressure and differential pressure transmitters use the same capacitance cell technology as the

existing Rosemount model 1153 transmitters. The capacitance cell technology has a proven record based on more than 16,000 model 1153 and 1154 transmitters which have been installed in nuclear power plant applications worldwid: since 1980.

In July of 1989, Rosemount resolved the fill oil loss problem which occurred in some model 1153 and 1154 transmitters. Rosemount improved the statistical quality control process, and the allowable tolerances on the flange and G-ring of the capacitance cell were also reduced. This resulted in reduction of the stack-up force on the capacitance cell which was the primary cause of the loss of fill oil.

The new model 1154 Series H transmitters utilize the same proven electronic circuitry with some MIL standard components for better operation under high radiation and temperature environments. Improved potting is provided around the cell for additional protection to the capacitance cell from thermal shock under LOCA conditions.

Because the 1154 model transmitter is identical to the 1153 model transmitter with some improvements in the manufacturing process, the excellent operating history of the model 1153 transmitter can be credited to the 1154 model transmitter.

The ALTERNATIVES TABLE in Attachment E summarizes the alternatives for replacing some or all 4 of the low-range RCS pressure transmitters and their relative merits. The first alternative was selected because it solves the TLU concerns for both the SMM and the OPIs. Although the second alternative was \$100,000 less expensive than the first alternative, the second alternative did not resolve the TLU concerns on all channels for the SMM and the OPIs. The third alternative did resolve the TLU concerns for the SMM. However, alternative 3 cost an additional \$500,000 and did not resolve the TLU concerns for the OPIs.

### D. JUSTIFICATION TO CHANGE CURRENT DIVERSITY CRITERIA

The proposed modification eliminates the diversity in the SDCS-OPI interlocks, since the operating principle and manufacturer will no longer be different. However, Edison believes that the intent of the RSB 5-1 and ICSB-3 diversity criteria wisstill be satisfied by Class IE control room indication, based on the solowing:

- Based on the history of the 1153 model transmitter, common-mode failure of all channels of qualified RCS pressure instruments has never been observed during hundreds of reactor-years of normal operation in the United States.
- 2. The different ranges of RCS pressure instruments provide protection against common-mode failures post-accident. In the range of 1500-2500 psia the diverse Foxboro narrow-range and Rosemount wide-range channels will continue to overlap. An undetected common-mode failure in this range is therefore not

credible. In the range of 0-750 psia the narrow-range and widerange Rosemount channels will overlap. Although these two ranges use transmitters of the same design principle and manufacturer, the sensing elements are different. Undetected common-mode failure of the four channels in each of these two ranges is therefore considered extremely unlikely.

- 3. NRC resolution of the Anticipated Transient Without Scram (ATWS) diversity (ATWS Rule 10 CFR 50.62 calls for diversity from the reactor protection system from the sensor output only) and the more recent Rosemount transmitter oil fill issue (per NRC Bulletin No. 90-01: Loss of Fill Oil in Transmitters Manufactured by Rosemount) indicates that different operating principles and/or manufacturer for the pressure sensors are no longer essential to satisfy diversity criteria.
- 4. Edison is providing additional Class 1E indication of low-range RCS pressure previously not available in the control room. Although not addressed by RSB 5-1 or ICSB-3, valid indication of RCS pressure to the operators is considered the first line of defense against inadvertently overpressurizing the SDCS.

Based on the above, Edison believes that there is no significant hazard associated with the proposed change to the SONGS 2/3 SDCS-OPI diversity commitment.

### V. SAFETY ANALYSIS

The proposed change described above shall be deemed to involve a significant hazards consideration if there is a positive finding in any one of the following areas:

 Will operation of the facility in accordance with this proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

### Response: No

Accurate measurement of subcooled margin will be achieved over the whole range of Reactor Coolant System (RCS) pressures. Additional Class 1E indication of RCS pressure with a different range than previously available in the control room is being provided. Although not addressed by NRC Branch Technical Position RSB 5-1, valid indication of RCS pressure to the operators is considered the first and most important line of defense against inadvertently overpressurizing the Shutdown Cooling System (SDCS).

A common-mode failure of all channels of qualified RCS pressure instruments has never been observed during hundreds of reactor-years of normal operation in the United States. The proposed Rosemount model 1154 Series H pressure and differential pressure transmitters use the same capacitance cell technology as the existing Rosemount model 1153 transmitters. The capacitance cell technology has a proven record based on more than 16,000 model 1153 transmitters which have been installed in nuclear power plant applications worldwide since 1980.

The new model 1154 Series H transmitters utilize the same proven electronic circuitry. Some of the existing components have been replaced with MIL standard components for better operation under high radiation and temperature environments. Improved potting is provided around the ceil for additional protection to the capacitance cell from thermal shock under Loss of Coolant Accident (LOCA) conditions. Therefore, no new failure mcchanisms are postulated by replacing the existing 1153 transmitters with the new 1154 Series H transmitters

The different ranges of RCS pressure instruments do provide protection against common-mode failures post-accident. In the range of 1500-2500 psia the diverse Foxboro narrow-range and Rosemount wide-range channels will continue to overlap. An undetected common-mode failure in this range is therefore not credible. In the range of 0-750 psia the narrow-range and widerange Rosemount channels will overlap. Although these two ranges use transmitters of the same design principle and manufacturer, the sensing elements are different. Undetected common-mode failure of the four channels in each of these two ranges is therefore considered extremely unlikely.

Therefore, elimination of the diversity previously provided by having pressure sensors supplied from different vendors does not involve a significant increase in the probability or consequences of an accident previously evaluated.

 Will operation of the facility in accordance with this proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

#### Response: No

This proposed change replaces existing pressure sensors with newer sensors that are more accurate and reliable. The design function of the system and the design function of the pressure sensors and the associated interlocks are not being changed.

The different ranges of RCS pressure instruments do provide protection against common-mode failures post-accident. In the range of 1500-2500 psia the diverse Foxboro narrow-range and Rosemount wide-range channels will continue to overlap. An undetected common-mode failure in this range is therefore not credible. In the range of 0-750 psia the narrow-range and widerange Rosemount channels will overlap. Although these two ranges use transmitters of the same design principle and manufacturer, the sensing elements are different. Undetected common-mode failure of the four channels in each of these two ranges is therefore considered extremely unlikely.

Therefore, elimination of the diversity provided by having pressure sensors supplied from different vendors will not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Will operation of the facility in accordance with this proposed change involve a significant reduction in a margin of safety?

#### Response: No

A common-mode failure of all channels of qualified RCS pressure instruments has never been observed during hundreds of reactor-years of normal operation in the United States.

The new model 1154 Series H transmitters utilize the same proven electronic circuitry. Some of the existing components have been replaced with MIL standard components for better operation under high radiation and temperature environments. Improved potting is provided around the cell for additional protection to the capacitance cell from thermal shock under LOCA conditions. No new failure mechanisms are postulated by replacing the existing 1153 transmitters with the new 1154 Series H transmitters

Therefore, elimination of the diversity provided by having pressure sensors supplied from different vendors in accordance with this proposed change will not involve a significant reduction in a margin of safety.

## Safety and Significant Hazards Determination

Based on the above Safety Analysis, it is concluded that: (1) the proposed change does not constitute a significant hazards consideration as defined by 10 CFR 50.92; and (2) there is reasonable assurance that the health and safety of the public will not be endangered by the proposed change; and (3) this action will not result in a condition which significantly alters the impact of the Station on the environment as described in the NRC Final Environmental Statement.