SOUTHERN CALIFORNIA
EDISON
An *EDISON INTERNATIONAL*℠ Company

Dwight E. Nunn
Vice President

May 31, 2001

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

Subject: **Docket Nos. 50-361 and 50-362**
Proposed Change Number NPF-10/15-514
Increase in Reactor Power to 3438 MWt
San Onofre Nuclear Generating Station, Units 2 and 3

References:

1. SCE to NRC letter dated April 3, 2001, Subject: Proposed Change Number NPF-10/15-514 Increase in Reactor Power to 3438 MWt, San Onofre Nuclear Generating Station Units 2 and 3

2. SCE to NRC letter dated May 11, 2001, Subject: Proposed Change Number NPF-10/15-514 Increase in Reactor Power to 3438 MWt, San Onofre Nuclear Generating Station Units 2 and 3

Gentlemen:

This letter provides responses to NRC requests for additional information (RAIs) concerning the Southern California Edison (SCE) request to increase the reactor power to 3438 MWt at San Onofre Units 2 and 3, Amendment Applications 207 and 192, Proposed Change Number 514 (Reference 1). The enclosure to this letter includes a revised response to supersede the Enclosure 2 response which was provided in Reference 2.

If you have any further questions regarding these amendment applications, please contact me or Mr. Jack L. Rainsberry (949) 368-7420.

Sincerely,

P. O. Box 128
San Clemente, CA 92674-0128
949-368-1480
Fax 949-368-1490

A001

Enclosure

cc: E. W. Merschoff, Regional Administrator, NRC Region IV
C. C. Osterholtz, NRC Senior Resident Inspector, San Onofre Units 2 and 3
J. E. Donoghue, NRC Project Manager, San Onofre Units 2 and 3
S. Y. Hsu, Department of Health Services, Radiologic Health Branch

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Application of SOUTHERN CALIFORNIA EDISON COMPANY, ET AL. 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. 192

SOUTHERN CALIFORNIA EDISON COMPANY, ET AL. pursuant to 10 CFR 50.90, hereby submit information in support of Amendment Application No. 192. This information consists of responses to NRC requests for additional information on Proposed Change No. NPF-15-514 to Facility Operating License NPF-15. Proposed Change No. NPF-15-514 is a request to revise the Facility Operating License by increasing the licensed power for operation.

Subscribed on this 31st day of May, 2001.

Respectfully submitted,
SOUTHERN CALIFORNIA EDISON COMPANY

By: [signature]
Dwight E. Nunn
Vice President

State of California
County of San Diego
On 5/31/01 before me, Frances Thurber, personally appeared Dwight E. Nunn, 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 [signature]

FRANCES M. THURBER
Commission # 1295266
Notary Public - California
San Diego County
My Comm. Expires Mar 23, 2005

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Application of SOUTHERN CALIFORNIA EDISON COMPANY, ET AL. 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. 207

SOUTHERN CALIFORNIA EDISON COMPANY, ET AL. pursuant to 10 CFR 50.90, hereby submit information in support of Amendment Application No. 207. This information consists of responses to NRC requests for additional information on Proposed Change No. NPF-10-514 to Facility Operating License NPF-10. Proposed Change No. NPF-10-514 is a request to revise the Facility Operating License by increasing the licensed power for operation.

Subscribed on this 31st day of May, 2001.

Respectfully submitted,
SOUTHERN CALIFORNIA EDISON COMPANY

By: [signature]
Dwight E. Nunn
Vice President

State of California
County of San Diego
On 5/31/01 before me, Frances Thurber, personally appeared Dwight E. Nunn, 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 Frances Thurber

FRANCES M. THURBER
Commission # 1295266
Notary Public - California
San Diego County
My Comm. Expires Mar 23, 2005

Enclosure

Item One: What decay heat generation rates are used in the Large Break Loss Of Coolant Accident (LOCA) Long Term Cooling analysis?

Response: The decay heat generation rates used in the Long Term Cooling Model are based on the 1973 version of ANS Standard 5.1 including the recommended uncertainty factors given therein (1.2 up to 1000 seconds and 1.1 thereafter). Additional detail on the use of the decay heat model is provided in Reference 1.1 Appendix E

Reference:

1.1) CENPD-254-P-A, "Post - LOCA Long Term Cooling Evaluation Model," June 1980

Item Two: Please provide the following information:

1) The Secondary Calorimetric Power calculation equation used in Plant Monitoring System.

2) Current Nominal Hot Full Power operating parameters for the Equation.

3) The Secondary Calorimetric Power uncertainty components for existing and uprated conditions presented in physical units at the current Hot Full Power conditions.

Response:

For San Onofre Nuclear Generating Station Units 2 and 3 (SONGS 2 and 3) the Secondary Calorimetric Power Calculation (BSCAL) is performed within the Core Operating Limits Supervisory System (COLSS), section 7.7.1.5 of Reference 2.1. The BSCAL uncertainty analysis utilizes a computer code (COLSSIM, Reference 2.2) that stochastically applies the uncertainties listed below, performs the appropriate heat balance, and provides the result as a power uncertainty. The BSCAL equations used in COLSS presented below are consistent with the use of the uncertainties. To provide a cohesive description of the detailed BSCAL equations simplifications were made, including the use of one feedwater and steam generator train versus two in the plant, combining heat loss terms into one constant, and providing enthalpy values versus polynomial functions. The use of the values and equations will result in a reasonable estimate of the impact of the change in uncertainties and not the exact results of the COLSSIM code.

Secondary Calorimetric Power Calculation Equation

The following equations represent the Secondary Calorimetric Power calculation based on the Feedwater or Steam Venturi indications:

$$BSCAL = (2 \times SGPow - 5.94E7) \times 8.645E\text{-}9 \qquad \text{(Equation 1)}$$

Where:

BSCAL	= Secondary Calorimetric Power, % of rated power
SGPow	= Power from each steam generator, BTU/hr
5.94E7	= Value accounts for both energy losses and credits from the Nuclear Steam Supply System (NSSS) (e.g. charging, letdown, pressurizer losses, pressurizer heaters, Reactor Coolant Pump (RCP) heat, and NSSS heat losses) BTU/hr
8.645E-9	= Conversion factor, % of rated power/BTU/hr
2	= # of Steam Generator loops

Note that normally SGPow is slightly different for each Steam Generator (SG) due to separate measurements and flow trains. In order to simplify numeric complexity, but not impact the error calculations, only one set of measurements is presented. SGPow is expressed in Equation 2

$$SGPow = [M_S \times (H_{S/G\,L} \times (1-\chi) + H_{S/G\,S} \times \chi) + M_B \times H_{S/G\,L} - M_F \times H_{FW}] \times 1000 \text{ (Equation 2)}$$

Where:

M_S	= steam mass flow rate, Klbm/hr
M_F	= feedwater mass flow rate, Klbm/hr
M_B	= blowdown mass flow rate, Klbm/hr
$H_{S/G\,L}$	= enthalpy of saturated liquid (based on SG pressure), BTU/lbm
$H_{S/G\,S}$	= enthalpy of saturated vapor (based on SG pressure), BTU/lbm
χ	= quality at the outlet of SG, fraction
H_{FW}	= feedwater enthalpy (based on Feedwater temperature and pressure), BTU/lbm
1000	= conversion factor, lbm/Klbm

BSCAL may be calculated based on signals from either the Feedwater Flow venturi or the Steam Flow venturi. The Feedwater Flow venturi was used in the original implementation of BSCAL. The BSCAL calculation based on the Steam Flow venturi was adopted due to the much smoother indication and slow rate of change in physical properties.

When the BSCAL calculation is based on Feedwater Venturi indication, the steam flow is derived from the feedwater flow and blowdown flow as shown in Equation 3. Only feedwater and blowdown flow uncertainties impact the BSCAL calculation power uncertainty.

$$M_S = M_F - M_B \qquad \text{(Equation 3)}$$

When the BSCAL calculation is based on Steam Venturi indication, the feedwater flow is derived from the steam flow and blowdown flow as shown in Equation 4. Only steam flow and blowdown flow uncertainties impact the BSCAL calculation power uncertainty.

$$M_F = M_S + M_B \qquad \text{(Equation 4)}$$

State Parameters Values

Table 2-1 provides typical operating values for the state parameters that result in the current 100% Secondary Calorimetric Power Calculation.

Table 2-1 State Parameter Values			
Parameter	Unit	Value	Comment
M_F	Klbm/hr	7532	Feedwater Mass Flow Rate
M_B	Klbm/hr	74.1	Blowdown Mass Flow Rate
M_S	Klbm/hr	7457.9	Steam Mass Flow Rate
$H_{S/G\ S}$	BTU/lbm	1199.33	Vapor Enthalpy, based on Steam Generator saturated pressure, P_{SG}
$H_{S/G\ L}$	BTU/lbm	510.161	Liquid Enthalpy, based on Steam Generator saturated pressure, P_{SG}
H_{FW}	BTU/lbm	419.321	Feedwater Enthalpy, based on Feedwater temperature and pressure, T_{FW} and P_{FW}
χ	Fraction	0.998	Steam Quality at Steam Generator outlet
P_{SG}	psia	802	Steam Generator saturation pressure, used to determine $H_{S/G\ S}$ and $H_{S/G\ L}$
T_{FW}	°F	440	Feedwater temperature, used to determine H_{FW}
P_{FW}	psia	815	Feedwater pressure, used to determine H_{FW}
Inserting the above numerical values into Equations 1 through 4 results in FWBSCAL to be approximately 100% of rated power of 3390 MWth.			

Uncertainty Components

Table 2-2 provides the secondary Calorimetric Power Error uncertainty components for the state parameters listed above. The uncertainty components are listed at the current 100% hot full power conditions for both the existing plant (using Venturis) and Power Uprate Cross Flow UFM.

Table 2-2 San Onofre Units 2 and 3 Secondary Calorimetric Power Uncertainty Components For Existing Plant and Power Uprate				
	Existing Plant with Flow Venturis		Power Uprate with Crossflow Ultrasonic Flow Measurement (UFM)	
Uncertainty Component	Value	Distribution	Value	Distribution
Feedwater Flow	± 149.1[1] klbm/hr	2σ normal	± 37.66 klbm/hr	2σ normal
Feedwater Temperature	± 8.5 F	2σ normal	± 1.8 F	2σ normal
Steam Flow	± 152.1 klbm/hr	2σ normal	± 39.5[2] klbm/hr	2σ normal
Blowdown Flow	37.05 klbm/hr	Uniform	± 7.41 klbm/hr	2σ normal
Repeatability/ Calibration	- -	- -	± 15.1klbm/hr [4]	2σ normal
Steam Generator Pressure	± 16.0 psi	2σ normal	± 16.0 psi [3]	2σ normal
Feed Water Pressure [5]	± 23.0 psi	2σ normal	± 23.0 psi [3]	2σ normal
Steam Quality	0.002	Uniform	0.002 [3]	Uniform

(1) The Feedwater Venturi uncertainty expressed herein only applies at or near the state parameters given in the table 2-1.

(2) The Steam Flow uncertainty is based on the Feedwater Uncertainty and the blowdown flow uncertainty.

(3) Unaffected by Crossflow instrumentation or power uprate.

(4) This value is stochastically simulated with the feedwater flow uncertainty into the feedwater flow calculation (reference 2.3).

(5) The actual code input is steam header pressure which is converted internally to feedwater pressure for use in the calculation.

References

2.1) SONGS Updated Final Safety Evaluation Report (UFSAR) Section 7.7.1.5

2.2) Topical Report CEN-356(V)-P-A, Revision 01-P-A, "Modified Statistical Combination of Uncertainties," May 1988.

2.3) "Improved Flow Measurement Accuracy Using Crossflow Ultrasonic Flow Measurement Technology," CENPSD-397-P, Revision 01, January 2000.

The NRC staff requests a description of the programs and procedures that will control calibration of the Crossflow system and the pressure and temperature instrumentation whose measurement uncertainties affect the power calorimetric uncertainties determined in the Westinghouse calculation, as referenced in Section 2.2.3 of your April 3, 2001 submittal. In this description, please include the procedures for:

1. **Maintaining calibration,**
2. **Controlling software and hardware configuration,**
3. **Performing corrective actions,**
4. **Reporting deficiencies to the manufacturer, and**
5. **Receiving and addressing manufacturer deficiency reports.**

Response:

Reactor Power is determined by a calorimetric heat balance on the secondary plant. A calorimetric heat balance uses inputs of steam flow, feedwater flow, feedwater temperature, feedwater pressure, blowdown flow, and steam pressure to determine the power transferred through the steam generators to the secondary plant. The Westinghouse calculation of feedwater flow uncertainty, as referenced in Section 2.2.3 of our April 3, 2001 submittal (Reference 3.1), uses feedwater flow, temperature, and pressure as inputs.

The CROSSFLOW System is being purchased and installed to meet the requirements of the CROSSFLOW Topical Report (Reference 3.2). These requirements and standards meet or exceed the existing instrumentation used to perform the calorimetrics heat balance. The instrument calibration, software control, and hardware configuration will be performed to the same standards as the existing instrumentation and are subject to the requirements of 10CFR50.59. In addition, specific technical and contractual requirements have been imposed on the supplier, such as deviation from the specification, material substitution, and design document submittal.

The San Onofre Nuclear Generating Station Action Request System will be used to control corrective action activities for instrumentation used in the calorimetric heat balance (see item 3 below). This system provides a method to request engineering assistance and corrective action maintenance orders. Deficiencies will be reported to the manufacturer if an engineering evaluation, through an Action Request, determines that vendor notification is appropriate. Southern California Edison, as part of its business practices, evaluates manufacturer deficiency reports. Appropriate corrective actions are taken and, if necessary, an Action Request is generated for equipment installed in the plant.

References:

3.1) SCE to NRC letter dated April 3, 2001, Subject: Proposed Change Number NPF-10/15-514 Increase in Reactor Power to 3438 MWt, San Onofre Nuclear Generating Station Units 2 and 3

3.2) Westinghouse/ABB-CE Topical Report CENPD-397-P-A, Revision 1, Improved Flow Measurement Accuracy Using CROSSFLOW UFM Technology, dated May 2000.

1. Maintaining calibration

SO23-V-2.10, Feedwater Ultrasonic Flow Measurement and Main Steam Flow Calibration: The temporary CROSSFLOW ultrasonic flow measurement system, presently used at SONGS, is installed and operated by this procedure. New operating instructions are being developed as part of the design change that will direct the performance of the internal calibration check at intervals specified by the vendor. The calibration procedures for the permanently installed CROSSFLOW ultrasonic flow and temperature systems are under development as part of the design change and will be based on the vendor's manuals and experience at SONGS. The vendor has calibrated the timers and amplifiers for the existing temporary units although the units could also be calibrated by another qualified calibration facility. The vendor or another qualified calibration facility will calibrate the timers and amplifiers in the permanent installation based on the vendor's recommendations.

Calibration of the feedwater pressure transmitters, which will be used as an input to the ultrasonic temperature system, is performed by SO123-II-9.14, Electronic Differential Pressure and Pressure Transmitter Calibration. This procedure provides instructions for the calibration of Foxboro/Weed electronic differential pressure and pressure transmitters, Series 611, 613, 821, E10, and other similar transmitters.

The temporary and the new permanent CROSSFLOW systems have an internal calibration check to assure proper operation.

Calibration of other instrument sensors used in the calorimetric calculation are performed according to the procedures in Table 3-1.

Table 3-1 Calibration Procedures for Secondary Calorimetric Process Instruments	
Process Parameter	Sensor Calibration Procedure
Feedwater Flow	SO123-II-8.10, 'Deitrich Model 1151DP and Rosemount Differential/Absolute/Gage Pressure Transmitter, Models 1151, 1152, 1153, 1154, and 3051 Calibration'
Feedwater Temperature	SO123-II-9.208, 'Thermocouple Functional Verification and Integrity Check'
Steam Flow	SO123-II-8.10, 'Deitrich Model 1151DP and Rosemount Differential/Absolute/Gage Pressure Transmitter, Models 1151, 1152, 1153, 1154, and 3051 Calibration'
Blowdown Flow	SO123-II-9.14, 'Electronic Differential Pressure and Pressure Transmitter Calibration'
Steam Generator Pressure	SO123-II-9.14, 'Electronic Differential Pressure and Pressure Transmitter Calibration'
Steam Header Pressure	SO123-II-9.14, 'Electronic Differential Pressure and Pressure Transmitter Calibration'
Feedwater Pressure	Derived in COLSS from Steam Header Pressure (see above)

SO123-II-8.10.1, Instrumentation and Control Loop Verification: This procedure is used to calibrate each loop. If the output of the loop is found to be acceptable, no further calibration of individual loop components is performed. If the loop output is not acceptable, individual components are calibrated according to plant equipment specific procedures.

2. Controlling software and hardware configuration

SO123-XXIV-10.1, Preparation, Review, Approval, Issuance, Implementation, and Closure of Engineering Change Packages (ECPs) and Engineering Changes Notices (ECNs): This procedure will be used for all future design changes and provides a detailed description of the process and controls for design activities. It identifies the sequential stages of the design process from the initial assignment of a design task through final drawing revision.

SO123-XXIV-5.1, Engineering & Technical Services Software Quality Assurance: This procedure establishes the program for acquiring, developing, qualifying, maintaining, and controlling Engineering & Technical Services (E&TS) computer software used for Quality Affecting activities. The procedure was written in accordance with licensing commitments which require that newly acquired or revised Quality Affecting Software be properly designed, configured, verified, and documented prior to use. This procedure shall be followed for software on new plant computer systems in support of design change activities.

SO123-V-4.71 Software Development and Maintenance: This procedure establishes a program for acquiring, developing, maintaining, and controlling computer software and associated responsibilities used to support Quality Affecting activities. (Note: the CROSSFLOW software is being purchased as "quality affecting" software.) This procedure shall be followed for modifications to software on existing plant computer systems.

3. Performing corrective actions

SO123-CA-1, Corrective Action Program: This Order describes the Corrective Action Program used by the Nuclear Organization to identify, evaluate, and resolve conditions adverse to quality. The overall program structure, responsibilities, and requirements are specified to implement regulatory and nuclear organization management requirements.

SO123-XV-50, Corrective Action Process: This procedure defines the Corrective Action Process for identifying, evaluating, and resolving conditions adverse to quality, including problems contrary to nuclear safety, public safety, and regulatory compliance. This procedure also defines requirements and guidance for root cause evaluations, corrective action assignments, apparent cause evaluations, common cause evaluations, corrective action follow-up activities, and trending activities.

SO123-XX-1 ISS 2, Action Request/Maintenance Order Initiation and Processing: This procedure provides a single system for reporting of conditions adverse to quality, events, proposed improvements (equipment and non-equipment related), and for resultant actions. It delineates responsibilities for the management and oversight of the Action Request process and defines the process for ensuring timely corrective actions are taken commensurate with the safety significance of the reported condition.

SO123-XX-50.39, Cause Evaluation Standards and Methods: This procedure defines the standards and methods for conducting root cause, apparent cause, and common cause evaluations.

4. Reporting deficiencies to the manufacturer

SO123-XX-1 ISS 2, Action Request/Maintenance Order Initiation and Processing: This procedure provides a single system for reporting of conditions adverse to quality, events, proposed improvements (equipment and non-equipment related), and for resultant actions. It delineates responsibilities for the management and oversight of the Action Request process and defines the process for ensuring timely corrective actions are taken commensurate with the safety significance of the reported condition. Action Requests provide a mechanism to direct reporting deficiencies to the manufacturer, including any potential 10 CFR 21 issues.

5. Receiving and addressing manufacturer deficiency reports

SO123-XX-1 ISS 2, Action Request/Maintenance Order Initiation and Processing: This procedure provides a single system for reporting of conditions adverse to quality, events, proposed improvements (equipment and non-equipment related), and for resultant actions. It delineates responsibilities for the

management and oversight of the Action Request process and defines the process for ensuring timely corrective actions are taken commensurate with the safety significance of the reported condition. Action Requests provide a mechanism to address actions resulting from receipt of manufacturer deficiency reports.

SO123-V-4.71 Software Development and Maintenance: This procedure establishes a program for acquiring, developing, maintaining, and controlling computer software and associated responsibilities used to support Quality Affecting activities. (Note: the CROSSFLOW software is being purchased as "quality affecting" software.) This procedure shall be followed for modifications to software on existing plant computer systems. This procedure is applicable to software modifications which result from a manufacturer's deficiency report.