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. 180

SOUTHERN CALIFORNIA EDISON COMPANY, ET AL. pursuant to 10CFR50.90, hereby submit Amendment Application No. 180. This amendment application consists of Proposed Change No. PCN-496 to Facility Operating License NPF-10. PCN-496 is a request to eliminate the requirements for hydrogen control systems from low power plant license condition 2.C(19)i and from Technical Specifications 3.3.11 and 3.6.7. This request is based on an exemption to 10CFR50.44, 10CFR50, Appendix A, General Design Criterion 41, and 10CFR50 Appendix E, Emergency Response Data System, Section VI.2.a.(i).(4).

Subscribed on this 10th day of September, 1998.

Respectfully Submitted,

SOUTHERN CALIFORNIA EDISON COMPANY

By: Dwight E. Nunn

Dwight E. Nunn
Vice President

State of California
County of San Diego
On 9/10/98 before me Mariane Sanchez
personally appeared Dwight E. Nunn, personally known to me ~~(or proved to me on the basis of satisfactory evidence)~~ to be the person~~(s)~~ whose name~~(s)~~ is~~/are~~ subscribed to the within instrument and acknowledged to me that he~~/she/they~~ executed the same in his~~/her/their~~ authorized capacity~~(ies)~~, and that by his~~/her/their~~ signature~~(s)~~ on the instrument the person~~(s)~~, or the entity upon behalf of which the person~~(s)~~ acted, executed the instrument.

WITNESS my hand and official seal.

Signature Mariane Sanchez

MARIANE SANCHEZ
COMM. # 1033763
Notary Public — California
ORANGE COUNTY
My Comm. Expires OCT 14, 1998

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. 166

SOUTHERN CALIFORNIA EDISON COMPANY, ET AL. pursuant to 10CFR50.90, hereby submit Amendment Application No. 166. This amendment application consists of Proposed Change No. PCN-496 to Facility Operating License NPF-15. PCN-496 is a request to eliminate the requirements for hydrogen control systems from low power plant license condition 2.C(17)d and from Technical Specifications 3.3.11 and 3.6.7. This request is based on an exemption to 10CFR50.44, 10CFR50, Appendix A, General Design Criterion 41, and 10CFR50 Appendix E, Emergency Response Data System, Section VI.2.a.(i).(4).

Subscribed on this 10th day of September, 1998.

Respectfully Submitted,

SOUTHERN CALIFORNIA EDISON COMPANY

By: Dwight E. Nunn

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On 9/10/98 before me, Mariane Sanchez
personally appeared Dwight E. Nunn, personally known to me ~~(or proved to me on the basis of satisfactory evidence)~~ to be the person~~(s)~~ whose name~~(s)~~ is~~/are~~ subscribed to the within instrument and acknowledged to me that he~~/she/they~~ executed the same in his~~/her/their~~ authorized capacity~~(ies)~~, and that by his~~/her/their~~ signature~~(s)~~ on the instrument the person~~(s)~~, or the entity upon behalf of which the person~~(s)~~ acted, executed the instrument.

WITNESS my hand and official seal.

Signature Mariane Sanchez

MARIANE SANCHEZ
COMM. # 1033763
Notary Public — California
ORANGE COUNTY
My Comm. Expires OCT 14, 1998

DESCRIPTION AND SUPPORTING DOCUMENTATION OF PROPOSED CHANGE NPF-10/15-496

This is a request to revise condition 2.C(19)i of low power operating license NPF-10 for San Onofre Nuclear Generating Station (SONGS) Unit 2, condition 2.C(17)d of low power operating license NPF-15 for SONGS Unit 3, Section 3.3.11, "Post Accident Monitoring Instrumentation," and Section 3.6.7, "Hydrogen Recombiners," of the Technical Specifications (TS) for SONGS Units 2 and 3 (SONGS 2 & 3). A technical briefing on this subject was given to Nuclear Regulatory Commission (NRC) staff in Rockville, Maryland on December 15, 1997 and discussed with the Subcommittee on probabilistic risk assessment (PRA) of the NRC Advisory Committee for Reactor Safeguards on February 20, 1998.

EXISTING LICENSE CONDITIONS AND TECHNICAL SPECIFICATIONS

Unit 2: See Attachment A
Unit 3: See Attachment B

PROPOSED LICENSE CONDITIONS AND TECHNICAL SPECIFICATIONS

Unit 2: See Attachment C (pen and ink markup)
Unit 3: See Attachment D (pen and ink markup)

PROPOSED LICENSE CONDITIONS AND TECHNICAL SPECIFICATIONS

Unit 2: See Attachment E
Unit 3: See Attachment F

DESCRIPTION

This proposed change would (1) delete the specifications for hydrogen monitoring instrumentation from license condition 2.C(19)i of Unit 2, from license condition 2.C(17)d of Unit 3, and from Technical Specification (TS) Section 3.3.11 for SONGS 2 & 3; and (2) delete in its entirety the specifications for hydrogen recombiners in TS Section 3.6.7 for SONGS 2 & 3. Furthermore, after NRC approval of the requested TS changes, Southern California Edison will be authorized to abandon or remove the hydrogen control equipment without further approval.

BACKGROUND

The containment hydrogen control system was installed at SONGS 2 & 3 in accordance with the requirements of 10CFR50.44 and 10CFR50, Appendix A, General Design Criterion (GDC) 41 to control the hydrogen postulated to be released into the reactor containment following a design basis loss of coolant accident (LOCA). As prescribed by 10CFR50.44, hydrogen gas was postulated to be generated as a result of the following:

1. Metal-water reaction involving zirconium alloy fuel cladding and the reactor coolant;

2. Radiolytic decomposition of the post-LOCA emergency cooling solution (oxygen also evolves in this process); and

3. Corrosion of metals and paints by solutions used for emergency cooling or containment spray.

The containment hydrogen control system is designed to ensure that the hydrogen concentration is maintained below its flammability limit of 4 volume percent (4%) following a design basis LOCA. A description of the hydrogen control system design basis is provided in SONGS 2 & 3 Updated Final Safety Analysis Report (UFSAR), Section 6.2.5. The hydrogen control system consists of a hydrogen monitoring subsystem, hydrogen recombiners, and a hydrogen purge subsystem. These are briefly described below.

Hydrogen Monitoring Subsystem

The redundant hydrogen monitoring subsystem is a safety-related system that is designed to measure the hydrogen concentration inside the containment and to alert the operators in the control room of the need to activate the hydrogen recombiners or hydrogen purge system. Following an accident, when directed by the Emergency Operating Instructions (EOIs) to establish containment combustible gas control, the operators place the hydrogen monitoring system in operation and initiate its periodic calibration. (The hydrogen monitors become decalibrated due to temperature changes inside containment. The system is only partially compensated for temperature changes.) The containment hydrogen concentration is currently transmitted via the Emergency Response Data System. The hydrogen monitoring subsystem is currently required by license conditions 2.C(19)i for Unit 2 and 2.C(17)d for Unit 3.

Hydrogen Recombiners Subsystem

The hydrogen recombiner subsystem consists of two redundant recombiner trains which are permanently installed inside the containment. It is designed to maintain the hydrogen concentration below the lower flammability limit of 4%, consistent with the range of 4% to 6% as specified in the Regulatory Guide 1.7. Each recombiner train consists of controls located on a control board in the main control room, a power supply cabinet located in the electrical penetration area adjacent to the containment building, and a recombiner located on the operating deck of the containment. There are no moving parts inside the recombiner. Air flows by natural convection through the unit at a rate of 100 standard ft^3/min. Heating elements cause the hydrogen to chemically combine with atmospheric oxygen. As presently described in the SONGS 2 & 3 EOIs, the hydrogen recombiners are manually started by the control room operators before hydrogen concentration reaches 3.0% indicated (3.5% actual). Figure 6.2-63B in the SONGS 2 & 3 UFSAR shows that this is postulated to occur at approximately 9 days after a design basis LOCA.

Hydrogen Purge Subsystem

The hydrogen purge subsystem provides the capability for a controlled purge (filtered vent) of the containment atmosphere in order to maintain the hydrogen concentration below its flammability limit of 4% following a design basis LOCA. The hydrogen exhaust and supply trains consist of filters, fans, fan heaters, and associated piping, valves, ductwork, dampers, instruments, and controls. Supply and exhaust containment isolation valves are the only moving parts located inside the containment. The hydrogen purge subsystem is designed to purge the containment atmosphere at a rate of 50 standard ft^3/min.

In the event of a design basis LOCA and failure of the hydrogen recombiners or increasing hydrogen concentration, the hydrogen purge subsystem may be utilized to control the hydrogen concentration inside containment. This is manually performed by the control room operators as directed by the EOIs. Since the purging of any amount of post-LOCA containment atmosphere is undesirable, the operation of the hydrogen purge subsystem would be initiated only when it has been determined that the hydrogen concentration level inside the containment is reaching about 3.5%. The Functional Recovery EOI for Containment Combustible Gas Control contains the following caution: "When the hydrogen purge unit is operated following a LOCA, then loss of Train B power will prevent closing the Containment Isolation Valve HV-9917, and dose rates may prevent closing valves manually, resulting in loss of containment integrity."

Valve HV-9917 is the inside-containment six inch hydrogen purge exhaust motor-operated valve. The EOI directs that the hydrogen purge supply flow path of outside makeup air not be used following a LOCA because the containment would be pressurized and the supply flow path is not monitored. Thus, operability of only the hydrogen purge exhaust valves would be of concern during purging. If the air-operated outside-containment hydrogen purge exhaust containment isolation valve failed to seat and valve HV-9917 lost power to its motor operator while open, a loss of containment integrity could ensue due to high dose rates preventing operation of manual isolation valves in series with the containment isolation valves.

Hydrogen Mixing

Hydrogen mixing within the containment is accomplished by the Containment Spray System (CSS), the Containment Emergency Fan Coolers (CEFCs), the Containment Dome Air Circulators (CDACs), and the internal structure design, which permits convective mixing and prevents hydrogen entrapment. These systems and the internal structures of the containment such as intermediate floors and other internal structures are designed to maintain a well-mixed containment atmosphere, and to prevent hydrogen pocketing.

The equipment for hydrogen mixing is not part of the hydrogen control system. The equipment for hydrogen mixing starts on automatic signals following a LOCA to remove heat and fission products from the containment atmosphere, as well as to minimize localized hydrogen buildup inside containment. This license amendment request proposes no changes to the hydrogen mixing equipment.

DISCUSSION OF CHANGE

Impact of Hydrogen Control on Defense-in-Depth Design

As explained below, the SONGS 2 & 3 defense-in-depth accident control design is unaffected by the proposed change due to (1) existing margin in the containment design, and (2) the minimal impact of the hydrogen control system on the ability of the containment to withstand challenges due to hydrogen production following a design basis LOCA. Furthermore, (3) due to its limited capacity, the hydrogen control system has no value in defense against containment failure resulting from hydrogen buildup inside the containment following severe accidents.

1. Impact of Hydrogen Control on Containment Safety Margin

SONGS 2 & 3 employs a large, dry containment design with a design pressure of 60 psig. This type of PWR containment is believed to be the least susceptible to damage from a hydrogen burn. The hydrogen burn during the 1979 Three Mile Island 2 (TMI-2) accident with a hydrogen concentration of about 8.1% resulted in a containment peak pressure of about 28 psig, well below the containment design pressure of 60 psig (NSAC-22, 1981). The SONGS 2 & 3 containment with a similar design has sufficient safety margin against hydrogen burn following design basis and severe accidents without use of the hydrogen control system.

Without operation of the hydrogen control system, the hydrogen concentration would realistically remain below the flammability limit of 4% (see Section 2, below), and hence the containment integrity would not be challenged, for at least 30 days following a design basis LOCA. The containment peak pressure will remain below the SONGS 2 & 3 containment design pressure of 60 psig during this time (see Figure 6.2-5 in SONGS 2 & 3 UFSAR). A time period of 30 days would be sufficient for determining whether action would be required.

Beyond 30 days, hydrogen would accumulate inside the containment and could reach the flammability limit. However, containment failure due to hydrogen combustion is unlikely, based on the results of the SONGS 2 & 3 Individual Plant Examination (IPE) study. The SONGS 2 & 3 IPE concluded that for the worst case accident sequence with respect to hydrogen combustion, it is unlikely that enough hydrogen would accumulate to produce a hydrogen burn that could challenge the containment ultimate pressure capacity. The IPE further states that none of the accident sequences addressed in the SONGS 2 & 3 IPE could realistically threaten containment due to hydrogen combustion.

Both the nuclear industry and the NRC conducted numerous analyses and tests following the TMI-2 accident to determine the containment capability of pressurized water reactor plants with large, dry containments. For example, NUREG/CR-5662 (1991) reports the computed containment peak pressure due to global hydrogen burn based on a 75% fuel cladding metal-water reaction (MWR) (which can be expected to occur during severe accidents) for a group of pressurized water reactor plants with large, dry containments, similar to the SONGS 2 & 3 containments. The reported containment peak pressure values are all within the plants' estimated containment capacities. Therefore, the NRC-sponsored study concludes that it seems unlikely that containment integrity would be threatened by a hydrogen burn from a 75% MWR in the containments examined. The 75% MWR estimate was intended to be representative of a range of core melt accidents. It should be noted that the TMI-2 accident involved about 45% MWR which resulted in a hydrogen concentration of about 8.1% (NUREG/CR-4330, Volume 3, 1987). The NRC concluded that the large, dry containments could withstand the containment pressure following severe accidents and there was no need to backfit these containments with "glow plug" igniters or to inert the containment atmospheres.

A detailed plant-specific containment integrity analysis for SONGS 2 & 3 indicates that the containment leak pressure is about 99 psig at a 95% confidence level, and the containment rupture pressure is approximately 139 psig at a 95% confidence level (SONGS 2 & 3 Individual Plant Examination, 1992). Hence, a safety margin exists for containment integrity at higher hydrogen concentration levels beyond 30 days following a design basis LOCA, without the use of a hydrogen control system.

With respect to equipment survivability, NUREG/CR-5662 states:

> "Equipment survivability depends on the specific plant design and on the containment environment during a specific accident. The large-scale Nevada test site experiments demonstrated that various types of plant equipment are capable of operating successfully when subjected to the severe thermal environments associated with large-volume hydrogen burns.
>
> "The recent analytical and experimental study performed at Sandia National Laboratories showed that the simulated equipment can withstand a LOCA and single burn resulting from a 75% MWR in a large, dry containment. However, the multiple burn due to the operation of ignition systems could pose a serious threat to safety-related equipment located in the source compartment."

It should be noted that the SONGS 2 & 3 containments do not have "glow plug" igniters. This reduces the potential for multiple burns. During the TMI-2 accident, containment was not breached and damage inside containment was essentially limited to plastics and other low melting point materials such as telephone cases and the crane operator's seat (NUREG/CR-4330, Volume 3, 1987).

Summary

Analysis indicates that for pressurized water reactor plants with large, dry containments, a safety margin remains for containment rupture from hydrogen burn or detonation at higher hydrogen concentration levels during severe accidents or beyond 30 days following a design basis LOCA, without using any hydrogen control system. Additionally, the NRC has determined that pressurized water reactor plants with large, dry containments can withstand the containment pressure following severe accidents and there was no need to backfit these containments with "glow plug" igniters or to inert the containment atmospheres.

2. Impact of Hydrogen Control on Design Basis Accidents

The containment hydrogen control system is provided in accordance with the requirements of 10CFR50.44 and 10CFR50, Appendix A, GDC 41 to control the concentration of hydrogen which may be released into the reactor containment following postulated design basis accidents. The containment hydrogen control system is designed to ensure that the hydrogen concentration is maintained below the flammability limit of 4% following a design basis LOCA. Additionally, the SONGS 2 & 3 safety-related containment systems (CSS, CEFCs, and CDACs) and the internal containment structural design provide excellent hydrogen mixing capability inside the containment that would prevent hydrogen pocketing following a postulated design basis LOCA.

The hydrogen control system design basis is provided in SONGS 2 & 3 UFSAR, Section 6.2.5. UFSAR Figure 6.2-63 shows predicted hydrogen concentration volumes versus days after the occurrence of a design basis LOCA for various sources of hydrogen, as well as the total hydrogen volume. The figure also shows the rate of hydrogen removal by the hydrogen recombiners or the hydrogen purge system when initiated manually by the control room operators. The air flow volume of each hydrogen recombiner train is 100 standard ft^3/min. The hydrogen recombiners are manually started by the control room operators before hydrogen concentration reaches 3.5%, which occurs approximately 9 days after a design basis LOCA. The operating range of the hydrogen recombiners is between 1% and 3.5%. The control room operators would shut off the hydrogen recombiners when the hydrogen concentration reaches about 3.5%, as directed by the EOIs, to prevent hydrogen ignition by the heater elements. The hydrogen purge system is designed to purge the containment atmosphere at a rate of 50 standard ft^3/min. In the event of a design basis LOCA together with failure of the hydrogen recombiners, upon hydrogen concentration reaching 3.5%, the EOIs permit use of the hydrogen purge system to control hydrogen concentration. The hydrogen purge system is manually initiated by the control room operators in accordance with the EOIs.

UFSAR Figure 6.2-63B shows hydrogen concentrations of approximately 1.7% after the first day and 3.5 % at about 9 days after a postulated design basis LOCA. Using the current assumptions, the hydrogen concentration would reach the flammability limit of 4% at about 13.5 days and 5.3% at about 30 days following a design basis LOCA, given that neither the hydrogen recombiners nor the hydrogen purge system is started by the control room operators.

Hydrogen production calculations in the UFSAR for a design basis LOCA are based on a number of conservative assumptions; for example, the design basis analysis considers a factor of five increase for hydrogen generation by the metal-water reaction (i.e., affecting the Zirconium-Water Reaction curve in Figure 6.2-63A) over the maximum amount calculated in accordance with 10CFR50.46 (UFSAR Section 6.2.5.3.A.2). The UFSAR also assumes that 1% of the fission product solids in the core mix with the LOCA water, causing radiolytic hydrogen production (i.e., affecting the Radiolysis curve in Figure 6.2-63A). Assuming 1% fission product solids in LOCA water is more appropriate for severe accidents than for design basis accidents.

Also, the UFSAR over predicts the hydrogen concentration level resulting from the radiolysis by 20% as stated in the UFSAR source document (Standard Review Plan Section 6.2.5, Appendix A, p. 6.2.5-13, 1981). Another conservative assumption in the UFSAR analysis is the use of 0.5 molecule/100 ev for the hydrogen yield during radiolysis. The published data from ORNL (ORNL-NSIC-23, 1968) support a net yield of 0.3 molecule/100 ev for hydrogen under conditions similar to those of the containment sump (UFSAR, Section 6.2.5.3.A.1).

The zirconium-water generation curve is flat at a constant hydrogen volume of about 1%, and is the dominant hydrogen production method in the short term (i.e., the first five days post-LOCA), whereas, the radiolysis curve steadily increases from zero to about 3% over a period of 30 days post-LOCA. Radiolysis is therefore the dominant hydrogen production method in the long term (i.e., more than five days post-LOCA).

In order to gain an understanding of hydrogen production under more realistic conditions than those assumed in the UFSAR, Southern California Edison (SCE) utilized the hydrogen generation rates described in UFSAR Sections 6.2.5.3.A.1 (radiolysis) and 6.2.5.3.A.2 (Zr-water reaction) with the following modifications:

1. for the amount of hydrogen generated by radiolysis in the sump, SCE removed the 20% conservatism specified in Standard Review Plan Section 6.2.5 in the isotope energy production rates;

2. for the amount of hydrogen generated by radiolysis in the sump, SCE modified the hydrogen yield of the reaction from the 0.5 molecule/100 ev in UFSAR Section 6.2.5.3.A.1 to the value of 0.3 molecule/100 ev in ORNL-NSIC-23 to obtain a hydrogen yield more closely corresponding to the yield under conditions expected in the sump; and,

3. for the amount of hydrogen generated by the Zr-water reaction prescribed by 10CFR50.44(d)(1), SCE used the 0.23 mil cladding penetration depth criterion rather than the factor of five increase used in UFSAR Section 6.2.5.3.A.2;

Hydrogen generation from all other sources was taken directly from UFSAR section 6.2.5.3 with no change.

Under these more realistic assumptions, the hydrogen concentration will be less than 4% at 30 days post-LOCA without operation of any hydrogen control system.

As a sensitivity analysis, for a higher radiolytic hydrogen yield in the sump of 0.4 molecule/100 ev (i.e., mid-way between the values based on ORNL data and the UFSAR), the evaluation shows that the hydrogen concentration will still not exceed 4% at 30 days post-LOCA without operation of any hydrogen control system.

Therefore, realistically, the hydrogen concentration would not reach the flammability limit of 4%, and hence there would be no challenge to containment integrity, for at least 30 days post-LOCA, even without operation of the hydrogen recombiners or the hydrogen purge system. The containment peak pressure will remain below the SONGS 2 & 3 containment design pressure of 60 psig during this time (see Figure 6.2-5 in SONGS 2 & 3 UFSAR). A time period of 30 days would be sufficient for determining whether action would be required.

Beyond 30 days, hydrogen would accumulate inside the containment and could reach the flammability limit. However, containment failure due to hydrogen combustion is unlikely, based on the results of the SONGS 2 & 3 Individual Plant Examination (IPE) study. The SONGS 2 & 3 IPE concluded that for the worst case accident sequence with respect to hydrogen combustion, it is unlikely that enough hydrogen would accumulate to produce a hydrogen burn that could challenge the containment ultimate pressure capacity. The IPE further states that none of the accident sequences addressed in the SONGS 2 & 3 IPE could realistically threaten containment due to hydrogen combustion.

There is also no potential for containment integrity to be challenged due to hydrogen pocketing, based on SONGS 2 & 3 containment internal structural design (generous vent paths) and availability of safety-related containment systems that provide sufficient hydrogen mixing (CSS, CEFCs, and CDACs). The results of a study for several PWR plants with large dry containments indicated that, depending on the containment volume and fan capacity, a mixing of the total containment air volume by fans alone would take only 10 to 30 minutes for the PWRs examined (NUREG-CR-5662, Section 2.3). The time required to process one containment volume for SONGS was shown to be 25 minutes.

Summary

The hydrogen control system is designed to maintain the hydrogen concentration below its flammability limit during design basis accidents. However, without operation of the hydrogen control system, the hydrogen concentration would realistically be expected to remain below the lower flammability limit of 4%, and hence the containment integrity would not be challenged, for at least 30 days following a design basis accident. Beyond 30 days, hydrogen concentration may reach the flammability limit. However, containment failure due to hydrogen combustion is unlikely based on the results of the SONGS 2 & 3 IPE study.

3. Impact of Hydrogen Control on Severe Accidents

For severe accidents, i.e., those beyond the design basis, containment hydrogen concentrations in the range of 10% over short periods of time are possible, as demonstrated at the TMI-2 accident in 1979. The hydrogen control system is designed to maintain the hydrogen concentration level below the flammability limit of 4% during design basis accidents that result in small amounts of hydrogen proceed slowly over long periods of time--i.e., many days. For severe accidents during which containment hydrogen concentration will rapidly rise to above the 4% level, the present hydrogen control system is undersized, and hence would provide no benefit to hydrogen concentration control and containment performance. An NRC-sponsored study (NUREG/CR-5567, 1990) corroborates this point by stating that the hydrogen control systems are designed to accommodate hydrogen accumulation for design basis events (oxidation of 5% Zircalloy surrounding the active fuel). These systems are not designed for the hydrogen generation that might accompany a core meltdown. Consequently, the hydrogen control system was determined to be ineffective in mitigating hydrogen in the SONGS 2 & 3 IPE study. Subsequent to the TMI-2 accident, improvements in equipment, operator training, and procedures make it extremely unlikely that a severe core damaging event comparable to TMI-2 would occur at SONGS 2 & 3. Nevertheless, the SONGS 2 & 3 IPE worst case scenario was based on a hypothetical hydrogen concentration of 11.5%, compared to an actual hydrogen concentration of about 8.1% during the TMI-2 hydrogen burn.

The hydrogen recombiners are ineffective at processing hydrogen at the higher rates expected to be generated during severe core damage accidents. The SONGS 2 & 3 hydrogen recombiners have a 100 standard ft^3/min capacity each, and would be placed in operation when the hydrogen concentration is in the range of 1% to 3.5%. The EOIs instruct the control room operators to turn off the hydrogen recombiners when the hydrogen concentration reaches about 3.5% to prevent hydrogen ignition. For hydrogen concentrations close to the flammability limit of 4%, the EOIs recommend not using the hydrogen recombiners.

The hydrogen purge subsystem is also unlikely to be used after a severe core damage accident due to the concern about the capability of the hydrogen purge exhaust inside-containment isolation valve to secure the path after venting, given a high containment pressure situation. This potential inability to secure the purge pathway due to loss of Train B electrical power could result in an open release path to the environment, a situation the EOIs caution against. Moreover, the hydrogen purge system has a limited capacity of 50 ft^3/min.

The usefulness of the hydrogen monitoring subsystem is also limited during severe accidents. The maximum range of the hydrogen monitoring system is 10%, whereas in severe core damage accidents the hydrogen concentration is likely to exceed 10%. An alternate method for determining hydrogen concentration, should it become necessary, is containment atmosphere samples taken from the Post Accident Sampling System, as recommended by the Combustion Engineering Owners Group Accident Management Guidelines planned for adoption at SONGS 2 & 3.

Summary

The usefulness of the hydrogen control system is limited to design basis accidents. The system is undersized for severe accidents, and hence provides no benefit for these accidents.

Conclusion

The proposed change does not affect the SONGS 2 & 3 defense-in-depth design due to (1) existing margin in the containment design, and (2) the minimal impact of the hydrogen control system on the ability of the containment to withstand challenges due to hydrogen production following a design basis LOCA. Furthermore, (3) due to its limited capacity, the hydrogen control system provides no benefit for severe accidents.

Risk Reduction Due To Instruction Simplification

In a postulated LOCA, the SONGS 2 & 3 EOIs direct the control room operators to monitor and control the hydrogen concentration inside the containment after they have carried out the steps to maintain and control the higher priority critical safety functions such as reactivity, RCS inventory, RCS pressure, and core heat removal. The key operator actions in controlling the hydrogen concentration are to place the hydrogen recombiners or hydrogen purge system in operation. These two actions involve many procedural steps and require coordination between the control room operators and other work groups, such as Instrumentation and Control (to perform periodic hydrogen monitor calibrations), Chemistry, and Health Physics (before placing the hydrogen purge in operation).

These hydrogen control activities could potentially distract operators during the extremely busy period following an accident, and could therefore have a negative impact on the higher priority critical operator actions. As discussed previously, these hydrogen control activities are of minimal to no benefit in mitigating accidents.

Removal of the existing requirement for a hydrogen control system would eliminate the EOI steps for hydrogen control and hence simplify the EOIs. This would have a positive impact on public health risk by reducing the probability of operator error during potential accidents and hence reduce the core damage frequency. As proposed in this change request, these changes will allow the operators to address all hydrogen control issues as part of the proposed Accident Management Guidelines, which cover operator actions at long time frames following accidents.

Removal of the existing requirement for a hydrogen control system would also eliminate the EOI steps to initiate a hydrogen purge of the containment. This would result in a lower probability of a failed-open containment purge valve. Consequently, the offsite doses would be reduced due to the reduction of the probability of a failed-open containment purge valve.

Summary of Risk Reduction Due To Instruction Simplification

The changes described in this change request result in a "risk positive" change. Removal of the existing requirement for a hydrogen control system, and, as such, the consideration of hydrogen generation within the SONGS 2 & 3 design basis, will eliminate the EOI steps for hydrogen control and hence simplify the EOIs, resulting in lower operator error probabilities. Elimination of the EOI steps to initiate the containment hydrogen purge will result in a lower probability of a failed-open containment purge valve, resulting in lower large early release probabilities.

Disposition of Equipment

After NRC approval of the requested Technical Specification change, SCE will be authorized to abandon or remove the hydrogen control equipment without further approval. SCE will be released from its post-TMI action plan commitments regarding the hydrogen control equipment. As such the consideration of hydrogen generation will no longer be included in the design basis of SONGS 2 & 3.

NO SIGNIFICANT HAZARDS CONSIDERATIONS

The Commission has provided standards for determining whether a significant hazards consideration exists as stated in 10CFR50.92. A proposed amendment to an operating license for a facility involves no significant hazards consideration if operation of the facility in accordance with a proposed amendment would not: (1) involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety. A discussion of these standards as they relate to this change request follows.

1. 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

   The containment hydrogen control system is currently classified as an engineered safety feature that serves as the combustible gas control system in the containment. The hydrogen control system is composed of a hydrogen monitoring subsystem, a hydrogen recombiner subsystem, and a hydrogen purge subsystem. Hydrogen control subsystem components are not considered to be accident initiators. Therefore, this change does not increase the probability of an accident previously evaluated.

   The hydrogen control system is provided to ensure that the hydrogen concentration is maintained below the flammability limit of 4% so that containment integrity is not challenged following a design basis Loss Of Coolant Accident (LOCA). Existing analysis show that the hydrogen concentration will not reach the flammability limit of 4% for at least 13.5 days after a design basis LOCA. The time available will be extended to over 30 days using more realistic hydrogen generation rates. The containment peak pressure will remain below the San Onofre Nuclear Generating Station Units 2 and 3 (SONGS 2 & 3) containment design pressure of 60 psig during this time. Beyond 30 days, hydrogen concentration may reach the flammability limit. However, containment failure due to hydrogen combustion is unlikely based on the results of the SONGS 2 & 3 IPE study. The detailed SONGS 2 & 3-specific containment integrity analysis indicates that containment rupture pressure is approximately 139 psig with 95% confidence. Therefore, this change does not increase the consequences of accidents previously evaluated.

Removal of the existing requirements for hydrogen control will eliminate the Emergency Operating Instruction (EOI) steps for hydrogen control and hence simplify the EOIs. This would have a positive impact on public health risk by reducing the probability of operator error during potential accidents and hence reduce the core damage frequency. As proposed in this change request, these changes will allow the operators to address all hydrogen control issues as part of the proposed Accident Management Guidelines which cover operator actions at long time frames following accidents.

Removal of the existing requirements for hydrogen control will eliminate the EOI steps to initiate the containment hydrogen purge. This will result in a lower probability of a failed open containment purge valve. Consequently, the offsite doses would be reduced due to the reduction of the probability of a failed-open containment purge valve. The changes described in this request result in a "risk positive" change.

Therefore, this change does not involve a significant increase in the probability or consequences of any accident previously evaluated.

2. 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 does not change the design or configuration of the plant beyond the hydrogen control system. Hydrogen generation following a design basis LOCA has been evaluated in accordance with regulatory requirements. Deletion of the hydrogen control system from the Technical Specifications does not alter the hydrogen generation processes post-LOCA. The consideration of hydrogen generation will no longer be included in the design basis of SONGS 2 & 3. Therefore, this change does not create the possibility of a new or different kind of accident from any 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

The changes described in this change request result in a "risk positive" change. Removal of the existing requirement for a hydrogen control system will, by eliminating the EOI steps for hydrogen control, result in lower operator error probabilities. Elimination of the EOI steps to initiate the containment hydrogen purge will result in a lower probability of a failed-open containment purge valve, resulting in lower large early release probabilities.

Therefore, this change involves an increase in safety, not a reduction in a margin of safety.

Based on the negative responses to these three criteria, Southern California Edison has concluded that the proposed change involves no significant hazards consideration.

ENVIRONMENTAL CONSIDERATION

Southern California Edison has determined that the proposed Technical Specification (TS) change does not result in any increase in the amount or type of effluent that may be released offsite, and results in no increase in individual or cumulative occupational radiation exposure. By eliminating the use of the hydrogen purge system and the associated probability for a failed open containment isolation valve, the proposed change will reduce the potential for an uncontrolled release, and will reduce the potential dose to a worker attempting to manually stop an uncontrolled release. As described above, the proposed TS amendment involves no significant hazards consideration and, as such, meets the eligibility criteria for categorical exclusion set forth in 10CFR51.22(c)(9).