DUKE POWER COMPANY

OCONEE NUCLEAR STATION

ATTACHMENT 1

TECHNICAL SPECIFICATIONS

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3.16 CONTAINMENT HYDROGEN CONTROL SYSTEMS

Applicability

Applies to the Containment Hydrogen Recombiner System (including portable hydrogen recombiner unit and the Hydrogen Recombiner System flow path) and the Reactor Building Hydrogen Purge System whenever any Oconee unit is above cold shutdown conditions.

Objective

To define the conditions necessary to assure the availability of adequate containment hydrogen control capability.

Specification

3.16.1 The Containment Hydrogen Control Systems shall be operable as follows:

a. A portable hydrogen recombiner unit shall be operable and available for connection to the affected unit.

b. If no portable hydrogen recombiner unit is operable and available for connection to the affected unit, a portable hydrogen recombiner unit shall be restored to an operable status within 7 days.

c. If the conditions in 3.16.1.b can not be satisfied, the Reactor Building Hydrogen Purge System shall be verified operable within the next 48 hours.

d. With the Reactor Building Hydrogen Purge System operable, restore a hydrogen recombiner unit to operating status within 30 days or submit a report to the NRC within the next 30 days describing the circumstances resulting in inoperable equipment and plans for returning the equipment to service and for any interim surveillance testing of the purge system.

e. With a portable hydrogen recombiner unit operable, the Reactor Building Hydrogen Purge System is not required to be operable.

3.16.2 If the conditions under Technical Specification 3.16.1.c are not met, the Oconee Units shall be in hot shutdown within the next 12 hours and in cold shutdown in an additional 24 hours.

3.16.3 Components in the Containment Hydrogen Control Systems' flow path shall be operable on each Oconee unit with the following exceptions.

a. If the flow path is inoperable it shall be restored to operable status within 7 days.

b. If an inoperable flow path is not restored to operable status within 7 days, then the affected unit shall be at hot shutdown within the next 12 hours and at cold shutdown within an additional 24 hours. (1)

Bases

The Containment Hydrogen Control Systems are required at approximately 460 hours (19.2 days) following a LOCA to limit hydrogen concentration to 4.1 percent by volume.

The Containment Hydrogen Recombiner System is utilized as the primary method to maintain the post-accident containment atmosphere hydrogen concentration below its lower flammability limit of 4.1 percent by volume. The Containment Hydrogen Recombiner System includes a portable hydrogen recombiner which will be moved to the affected unit following a LOCA, anchored to its foundation, and connected to piping penetrations. Also included is a portable control panel, which will be locally mounted near the recombiner, anchored to its foundation and connected to its motor control center and the recombiner.

The Reactor Building Hydrogen Purge System is composed of a portable purging station and a portion of the Penetration Room Ventilation System. The purge system is operated as necessary (if the Containment Hydrogen Recombiner System is inoperable) to maintain the hydrogen concentration below the control limit.

The Containment Hydrogen Recombiner System is the preferable method of post- accident hydrogen control since it produces no radioactive gaseous release to the atmosphere. Therefore, the Containment Hydrogen Recombiner System will be utilized as the primary method to control the containment hydrogen concentration below 4.1 percent by volume.

Reference

FSAR, Section 15.16

(1) A one-time allowable outage time of fourteen (14) days is granted for installation of a modification to provide drainage for moisture which may accumulate in the Containment Hydrogen Recombiner System piping.

DUKE POWER COMPANY

OCONEE NUCLEAR STATION

ATTACHMENT 2

TECHNICAL SPECIFICATIONS
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3.16 CONTAINMENT HYDROGEN CONTROL SYSTEMS

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Applies to the Containment Hydrogen Recombiner System (including portable hydrogen recombiner unit and the Hydrogen Recombiner System flow path) and the Reactor Building Hydrogen Purge System whenever any Oconee unit is above cold shutdown conditions.

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3.16.1 The Containment Hydrogen Control Systems shall be operable as follows:

a. A portable hydrogen recombiner unit shall be operable and available for connection to the affected unit.

b. If no portable hydrogen recombiner unit is operable and available for connection to the affected unit, a portable hydrogen recombiner unit shall be restored to an operable status within 7 days.

c. If the conditions in 3.16.1.b can not be satisfied, the Reactor Building Hydrogen Purge System shall be verified operable within the next 48 hours.

d. With the Reactor Building Hydrogen Purge System operable, restore a hydrogen recombiner unit to operating status within 30 days or submit a report to the NRC within the next 30 days describing the circumstances resulting in inoperable equipment and plans for returning the equipment to service and for any interim surveillance testing of the purge system.

e. With a portable hydrogen recombiner unit operable, the Reactor Building Hydrogen Purge System is not required to be operable.

3.16.2 If the conditions under Technical Specification 3.16.1.c are not met, the Oconee Units shall be in hot shutdown within the next 12 hours and in cold shutdown in an additional 24 hours.

3.16.3 Components in the Containment Hydrogen Control Systems' flow path shall be operable on each Oconee unit with the following exceptions.

a. If the flow path is inoperable it shall be restored to operable status within 7 days.

b. If an inoperable flow path is not restored to operable status within 7 days, then the affected unit shall be at hot shutdown within the next 12 hours and at cold shutdown within an additional 24 hours. (1)

Bases

The Containment Hydrogen Control Systems are required at approximately 460 hours (19.2 days) following a LOCA to limit hydrogen concentration to 4.1 percent by volume.

The Containment Hydrogen Recombiner System is utilized as the primary method to maintain the post-accident containment atmosphere hydrogen concentration below its lower flammability limit of 4.1 percent by volume. The Containment Hydrogen Recombiner System includes a portable hydrogen recombiner which will be moved to the affected unit following a LOCA, anchored to its foundation, and connected to piping penetrations. Also included is a portable control panel, which will be locally mounted near the recombiner, anchored to its foundation and connected to its motor control center and the recombiner.

The Reactor Building Hydrogen Purge System is composed of a portable purging station and a portion of the Penetration Room Ventilation System. The purge system is operated as necessary (if the Containment Hydrogen Recombiner System is inoperable) to maintain the hydrogen concentration below the control limit.

The Containment Hydrogen Recombiner System is the preferable method of post- accident hydrogen control since it produces no radioactive gaseous release to the atmosphere. Therefore, the Containment Hydrogen Recombiner System will be utilized as the primary method to control the containment hydrogen concentration below 4.1 percent by volume.

Reference

FSAR, Section 15.16

(1) *A one-time allowable outage time of fourteen (14) days is granted for installation of a modification to provide drainage for moisture which may accumulate in the Containment Hydrogen Recombiner System piping.*

Attachment 3

TECHNICAL JUSTIFICATION

Background Information

The Containment Hydrogen Recombiner System (CHRS) is the primary method for controlling post accident hydrogen generation at Oconee Nuclear Station. The Reactor Building Hydrogen Purge System (RBHPS) is available as a backup to the CHRS. The CHRS consists of a portable hydrogen recombiner, control panel for the recombiner, and a portion of the Penetration Room Ventilation System (PRVS). When needed, the recombiner is moved to the affected unit, anchored to its foundation, and connected to the PRVS piping which runs to and from containment penetrations.

Section 15.16 of the Oconee FSAR describes post-accident hydrogen generation and the ability of the CHRS or RBHPS to maintain the containment hydrogen concentration below the flammability limit. Duke Power recently completed a reanalysis that defines CHRS and RBHPS requirements using Oconee-specific assumptions that are consistent with the methods described in 10 CFR 50.44 and Regulatory Guide 1.7. These new analyses will be incorporated into the Technical Specification Bases and the next update of the Oconee FSAR. These analyses conclude that operation of the CHRS or RBHPS within approximately 15 days of a design basis LOCA ensures that the containment hydrogen concentration will not exceed the lower flammability limit of 4 v/o.

The flow path from containment to the hydrogen recombiner consists of approximately 250 feet of three inch stainless steel piping. Similarly, the return flow path from the recombiner to containment is also approximately 250 feet in length. The routed piping contains several low points. Following an accident, the gas mixture flowing through this piping will include saturated steam. Recent calculations by Duke Power Engineering personnel have determined that steam condensation will create loop seals in the low points of the piping that will interrupt flow to the hydrogen recombiner. These loop seals may inhibit the ability of the recombiner to reduce the post-accident hydrogen concentration.

On February 1, 1996, at 1:30 pm, Oconee Nuclear Station declared the CHRS and RBHPS inoperable due to the potential for flow blockage from condensation. If the affected flow

paths are not restored to an operable status within 7 days, Technical Specification 3.16.3.b requires that the affected unit shall be at hot shutdown within the next 12 hours and at cold shutdown within an additional 24 hours. The condensation phenomenon is common to all three Oconee units. The NRC was notified of this condition via a 10 CFR 50.72 notification at approximately 4:30 pm on February 1, 1996.

A long term solution to this problem will likely involve the installation of heat tracing and insulation on the hydrogen recombiner suction and discharge piping. However, this modification cannot be implemented within the 7 days required by the Oconee Technical Specifications.

Duke Power is requesting a one-time emergency Technical Specification change to extend the action statement time for Technical Specification 3.16.3 from 7 days to 14 days. This extension will allow enough time for a temporary modification to be implemented on all three units. Attachment 6 provides details concerning this temporary modification.

Justification

The fact that hydrogen generation following a design basis accident is not a significant safety concern has been recognized for several years. In 1993, the NRC hosted a workshop on the elimination of requirements marginal to safety. One of the items recognized at this workshop as having a small safety benefit is the requirement for hydrogen recombiners.

The hydrogen generation which occurs following a design basis LOCA is a slow process driven by sump radiolysis and metal corrosion. Calculations by Duke Power indicate that, assuming no credit for the CHRS or RBHPS, the lower flammability limit of 4 v/o is not exceeded until approximately 15 days following a design basis LOCA. Furthermore, assuming no credit for the CHRS or RBHPS, the concentration thirty days following a design basis LOCA is approximately 5.5 v/o.

Studies of containment structural capacity and the effects of hydrogen combustion performed for the IPE studies have shown that much higher hydrogen concentrations are required

to threaten the integrity of large dry containments like the Oconee containment. Concentrations in excess of 12.0 v/o would be required to present a challenge to the integrity of the Oconee containment. Concentrations of this magnitude are only expected during core damage accidents like those studied in PRAs. The hydrogen burn which occurred at TMI-2 is generally regarded to have been initiated at a hydrogen concentration of 8.5 v/o with no impact on containment integrity.

Until the completion of ongoing installation and testing of the modification, the CHRS will continue to be inoperable. Even though the work is being performed on an expedited basis, it is likely that it will not be completed within the allowed time frame of 7 days. Allowing continued power operation of the Oconee units on a one-time basis for a maximum of 7 days beyond the currently allowed outage time for the CHRS for a total of 14 days maximum rather than requiring shutdown of the units is in the interest of nuclear safety for the following reasons:

1. The inherent risks associated with the operational transients of unit shutdown and startup will be avoided.

2. The probability of a design basis LOCA that would require operation of the CHRS occurring during the additional 7 days is extremely small.

3. The CHRS does not perform any required core cooling function, therefore there will be no increase in the core melt frequency.

4. The hydrogen concentration in a large, dry containment, such as Oconee, increases at a very slow rate following the design basis LOCA with calculations by Duke Power indicating the flammability limit of 4 v/o is not exceeded until 15 days post LOCA. It is very likely that contingencies could be developed and implemented to complete any remaining modification work to place the CHRS in service.

The risk associated with continued operation of the Oconee units until the temporary modification is completed is considered very small. Thus, it is concluded that this

amendment request will avoid the inherent risk associated with shutting down three nuclear units without a commensurate benefit in plant safety.

Attachment 4

NO SIGNIFICANT HAZARDS CONSIDERATION EVALUATION

Pursuant to 10 CFR 50.91, Duke Power Company (Duke) has made the determination that this amendment request involves a No Significant Hazards Consideration by applying the standards established by the NRC regulations in 10 CFR 50.92. This ensures that operation of the facility in accordance with the proposed amendment would not:

(1) Involve a significant increase in the probability or consequences of an accident previously evaluated:

No. The Containment Hydrogen Control System is not an accident initiator. The Containment Hydrogen Control System functions following a loss of coolant accident (LOCA) to control combustible gas concentration accumulating inside containment. This one-time, seven day extension of the allowable outage time for the Containment Hydrogen Control System flow path does not increase the probability of a LOCA or any other previously evaluated accident.

The hydrogen generation which occurs following a design basis LOCA is a slow process driven by sump radiolysis and metal corrosion. Calculations have shown that many days are required to reach the regulatory limit of 4 v/o. A hydrogen concentration slightly above 4 v/o is generally accepted as the lower flammability limit. Furthermore, assuming no credit for the CHRS or RBHPS, the concentration thirty days following a design basis LOCA, is approximately 5.5 v/o. Studies of containment structural capacity and the effects of hydrogen combustion have shown that concentrations much higher than 4 v/o are required to threaten the integrity of a large dry containment like the Oconee containment. Concentrations in excess of 12 v/o would be required to present a challenge to the integrity of the Oconee containment. Concentrations of this magnitude are only expected during core damage accidents like those studied in probabilistic risk analyses. Therefore, this proposed change does not increase the consequences of an accident previously evaluated.

(2) Create the possibility of a new or different kind of accident from any kind of accident previously evaluated:

No. As stated previously, the Containment Hydrogen Control System is not an accident initiator. Rather it provides mitigation functions post-accident.

Increasing the allowable outage extension time does not introduce any new credible failure modes. Therefore, this proposed change does not create the possibility of a new or different kind of accident from any kind of accident previously evaluated.

(3) Involve a significant reduction in a margin of safety.

No. The margin of safety is not significantly reduced by a one-time fourteen (14) day allowable outage time for the Containment Hydrogen Control System flow path. As stated above, hydrogen generation following a design basis LOCA is a slow process which will not reach concentrations which would be required to threaten containment integrity within thirty days. For large, dry containments, the fact that hydrogen generation following a design basis event is not a significant safety concern has been recognized for several years. In 1993, the NRC hosted a workshop on the elimination of requirements marginal to safety. One of the items discussed was the requirements for hydrogen recombiners. Since it has been recognized that the requirements concerning the hydrogen recombiner are incidental to safety, this one-time increase in the allowed outage time does not represent a significant reduction in the margin of safety.

Duke has concluded, based on the above, that there are no significant hazards considerations involved in this amendment request.

Attachment 5

ENVIRONMENTAL IMPACT ANALYSIS

Pursuant to 10 CFR 51.22 (b), an evaluation of the proposed amendment has been performed to determine whether or not it meets the criteria for categorical exclusion set forth in 10 CFR 51.22 (c) 9 of the regulations. The proposed amendment does not involve:

1) A significant hazards consideration.

   This conclusion is supported by the No Significant Hazards Consideration evaluation that is contained in Attachment 4.

2) A significant change in the types or significant increase in the amounts of any effluents that may be released offsite.

   The proposed amendment will not significantly change the types or amounts of any effluents that may be released offsite.

3) A significant increase in the individual or cumulative occupational radiation exposure.

   The proposed will not significantly increase the individual or cumulative occupational radiation exposure.

In summary, the proposed amendment request meets the criteria set forth in 10 CFR 51.22 (c) 9 of the regulations for categorical exclusion from an environmental impact statement.

As an intermediate solution to the CHRS inoperability problem, Oconee is implementing a temporary modification that will drain condensate out of the CHRS suction and discharge piping and route it back into containment. The modification involves attaching high temperature, high pressure, reinforced hoses to drain valves that are already installed on the low points of the piping. The hoses will be routed to a collection tank. Small transfer pumps will route the collection tank condensate back to containment via a connection to the Low Pressure Injection (LPI) system.

Engineering evaluations have been performed to ensure that the intent of the appropriate piping codes is met. For example, the temporary modification is qualified to withstand the safe shutdown earthquake without a loss of function. Components included in this modification are seismically mounted and qualified. The connection hoses are inherently flexible and capable of withstanding a seismic event. Additionally, the enviromental qualification aspects of this modification have been evaluated and found to meet the appropriate criteria. Before being declared operable, the system will be pressure tested to ensure that it will maintain its integrity.

This modification has been designed such that it is not vulnerable to a single failure. As with the Hydrogen Recombiner, power to the transfer pumps is initially load shed. However, adequate time is available to restore power to the Hydrogen Recombiner and transfer pumps before they are required to be placed in service.

Based on the slow rate of hydrogen generation, adequate time is available for operator actions to place the system in service. Additionally, dose calculations have determined that the necessary equipment can be accessed without undue radiation exposure to the operators.

The modification is connected to the existing Containment Hydrogen Control System via valves on the supply and return flow path. These connections are located beyond containment isolation valves which receive a close command upon Engineered Safeguards actuation. The containment penetrations and their isolation valves are unaffected by this modification.

Duke Power has completed a 10 CFR 50.59 evaluation and has concluded that the temporary modification does not involve an unreviewed safety question.