UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

October 29, 2008

Mr. Dave Baxter
Vice President, Oconee Site
Duke Power Company LLC
7800 Rochester Highway
Seneca, SC 29672

SUBJECT: OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3, ISSUANCE OF AMENDMENTS REGARDING WATER HAMMER CONCERNS (TAC NOS. MD7000, MD7001, AND MD7002)

Dear Mr. Baxter:

The Nuclear Regulatory Commission has issued the enclosed Amendment Nos.363, 365, and 364 to Renewed Facility Operating Licenses DPR-38, DPR-47, and DPR-55, for the Oconee Nuclear Station, Units 1, 2, and 3, respectively. The amendments consist of changes to the Technical Specifications (TSs) in response to your application dated October 16, 2007, as supplemented by letters dated May 7, September 2, and October 23, 2008.

These amendments revise the Technical Specifications to accommodate plant modifications that address water hammer concerns described in Generic Letter 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Conditions," dated September 30, 1996.

A copy of the related Safety Evaluation is also enclosed. A Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

Leonard N. Olshan, Sr. Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-269, 50-270, and 50-287

Enclosures:
1. Amendment No.363 to DPR-38
2. Amendment No.365 to DPR-47
3. Amendment No.364 to DPR-55
4. Safety Evaluation

cc w/encls: Distribution via ListServe

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

DUKE ENERGY CAROLINAS, LLC

DOCKET NO. 50-269

OCONEE NUCLEAR STATION, UNIT 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No.363
Renewed License No. DPR-38

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment to the Oconee Nuclear Station, Unit 1 (the facility), Renewed Facility Operating License No. DPR-38 filed by the Duke Energy Carolinas, LLC (the licensee), dated October 16, 2007, as supplemented May 7, September 2, and October 23, 2008, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations as set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations set forth in 10 CFR Chapter I;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is hereby amended by page changes to the Technical Specifications as indicated in the attachment to this license amendment, and Paragraph 3.B of Renewed Facility Operating License No. DPR-38 is hereby amended to read as follows:

   B. Technical Specifications

      The Technical Specifications contained in Appendix A, as revised through Amendment No. 363, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance and shall be implemented within 30 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

For

Melanie C. Wong, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to Renewed Facility
Operating License No. DPR-38
and the Technical Specifications

Date of Issuance: October 29, 2008

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

DUKE ENERGY CAROLINAS, LLC

DOCKET NO. 50-270

OCONEE NUCLEAR STATION, UNIT 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No.365
Renewed License No. DPR-47

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment to the Oconee Nuclear Station, Unit 2 (the facility), Renewed Facility Operating License No. DPR-47 filed by the Duke Energy Carolinas, LLC (the licensee), dated October 16, 2007, as supplemented May 7, September 2, and October 23, 2008, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations as set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations set forth in 10 CFR Chapter I;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is hereby amended by page changes to the Technical Specifications as indicated in the attachment to this license amendment, and Paragraph 3.B of Renewed Facility Operating License No. DPR-47 is hereby amended to read as follows:

   B. Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No.365, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance and shall be implemented within 30 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

For

Melanie C. Wong, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to Renewed Facility Operating License No. DPR-47 and the Technical Specifications

Date of Issuance: October 29, 2008

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

DUKE ENERGY CAROLINAS, LLC

DOCKET NO. 50-287

OCONEE NUCLEAR STATION, UNIT 3

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No.364
Renewed License No. DPR-55

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment to the Oconee Nuclear Station, Unit 3 (the facility), Renewed Facility Operating License No. DPR-55 filed by the Duke Energy Carolinas, LLC (the licensee), dated October 16, 2007, as supplemented May 7, September 2, and October 23, 2008, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations as set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations set forth in 10 CFR Chapter I;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is hereby amended by page changes to the Technical Specifications as indicated in the attachment to this license amendment, and Paragraph 3.B of Renewed Facility Operating License No. DPR-55 is hereby amended to read as follows:

   B. Technical Specifications

      The Technical Specifications contained in Appendix A, as revised through Amendment No.364, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance and shall be implemented within 30 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

for

Melanie C. Wong, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to Renewed Facility
Operating License No. DPR-55
and the Technical Specifications

Date of Issuance: October 29, 2008

ATTACHMENT TO LICENSE AMENDMENT NO. 363

RENEWED FACILITY OPERATING LICENSE NO. DPR-38

DOCKET NO. 50-269

AND

TO LICENSE AMENDMENT NO.365

RENEWED FACILITY OPERATING LICENSE NO. DPR-47

DOCKET NO. 50-270

AND

TO LICENSE AMENDMENT NO.364

RENEWED FACILITY OPERATING LICENSE NO. DPR-55

DOCKET NO. 50-287

Replace the following pages of the Licenses and the Appendix A Technical Specifications (TSs) with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove Pages	Insert Pages
Licenses	Licenses
License No. DPR-38, page 3	License No. DPR-38, page 3
License No. DPR-47, page 3	License No. DPR-47, page 3
License No. DPR-55, page 3	License No. DPR-55, page 3
TSs	TSs
Table of Contents, page ii	Table of Contents, page ii
3.3.27-1	3.3.27-1
3.3.27-2	3.3.27-2
3.3.27-3	3.3.27-3
3.6.5-4	3.6.5-4
3.6.5-5	3.6.5-5
3.7.7-1	3.7.7-1
3.7.7-2	3.7.7-2
	3.7.7-3
Bases Table of Contents, page ii	Bases Table of Contents, page ii
B 3.3.27-1	B 3.3.27-1

B 3.3.27-2	B 3.3.27-2
B 3.3.27-3	B 3.3.27-3
B 3.3.27-4	B 3.3.27-4
B 3.3.27-5	B 3.3.27-5
B 3.3.27-6	B 3.3.27-6
B 3.6.5-2	B 3.6.5-2
B 3.6.5-3	B 3.6.5-3
B 3.6.5-4	B 3.6.5-4
B 3.6.5-8	B 3.6.5-8
B 3.6.5-9	B 3.6.5-9
B 3.6.5-10	B 3.6.5-10
B 3.6.5-11	B 3.6.5-11
B 3.7.7-1	B 3.7.7-1
B 3.7.7-2	B 3.7.7-2
B 3.7.7-3	B 3.7.7-3
B 3.7.7-4	B 3.7.7-4
B 3.7.7-5	B 3.7.7-5
B 3.7.7-6	B 3.7.7-6

Part 70; is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

A. Maximum Power Level

The licensee is authorized to operate the facility at steady state reactor core power levels not in excess of 2568 megawatts thermal.

B. Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 363 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

C. This license is subject to the following antitrust conditions:

Applicant makes the commitments contained herein, recognizing that bulk power supply arrangements between neighboring entities normally tend to serve the public interest. In addition, where there are net benefits to all participants, such arrangements also serve the best interests of each of the participants. Among the benefits of such transactions are increased electric system reliability, a reduction in the cost of electric power, and minimization of the environmental effects of the production and sale of electricity.

Any particular bulk power supply transaction may afford greater benefits to one participant than to another. The benefits realized by a small system may be proportionately greater than those realized by a larger system. The relative benefits to be derived by the parties from a proposed transaction, however, should not be controlling upon a decision with respect to the desirability of participating in the transaction. Accordingly, applicant will enter into proposed bulk power transactions of the types hereinafter described which, on balance, provide net benefits to applicant. There are net benefits in a transaction if applicant recovers the cost of the transaction (as defined in ¶1 (d) hereof) and there is no demonstrable net detriment to applicant arising from that transaction.

1 . As used herein:

(a) "Bulk Power" means electric power and any attendant energy, supplied or made available at transmission or sub-transmission voltage by one electric system to another.

(b) "Neighboring Entity" means a private or public corporation, a governmental agency or authority, a municipality, a cooperative, or a lawful association of any of the foregoing owning or operating, or

Part 70; is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

A. Maximum Power Level

The licensee is authorized to operate the facility at steady state reactor core power levels not in excess of 2568 megawatts thermal.

B. Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 365 are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

C. This license is subject to the following antitrust conditions:

Applicant makes the commitments contained herein, recognizing that bulk power supply arrangements between neighboring entities normally tend to serve the public interest. In addition, where there are net benefits to all participants, such arrangements also serve the best interests of each of the participants. Among the benefits of such transactions are increased electric system reliability, a reduction in the cost of electric power, and minimization of the environmental effects of the production and sale of electricity.

Any particular bulk power supply transaction may afford greater benefits to one participant than to another. The benefits realized by a small system may be proportionately greater than those realized by a larger system. The relative benefits to be derived by the parties from a proposed transaction, however, should not be controlling upon a decision with respect to the desirability of participating in the transaction. Accordingly, applicant will enter into proposed bulk power transactions of the types hereinafter described which, on balance, provide net benefits to applicant. There are net benefits in a transaction if applicant recovers the cost of the transaction (as defined in ¶1 (d) hereof) and there is no demonstrable net detriment to applicant arising from that transaction.

1. As used herein:

   (a) "Bulk Power" means electric power and any attendant energy, supplied or made available at transmission or sub-transmission voltage by one electric system to another.

   (b) "Neighboring Entity" means a private or public corporation, a governmental agency or authority, a municipality, a cooperative, or a lawful association of any of the foregoing owning or operating, or

Part 70; is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

A. Maximum Power Level

The licensee is authorized to operate the facility at steady state reactor core power levels not in excess of 2568 megawatts thermal.

B. Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 364 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

C. This license is subject to the following antitrust conditions:

Applicant makes the commitments contained herein, recognizing that bulk power supply arrangements between neighboring entities normally tend to serve the public interest. In addition, where there are net benefits to all participants, such arrangements also serve the best interests of each of the participants. Among the benefits of such transactions are increased electric system reliability, a reduction in the cost of electric power, and minimization of the environmental effects of the production and sale of electricity.

Any particular bulk power supply transaction may afford greater benefits to one participant than to another. The benefits realized by a small system may be proportionately greater than those realized by a larger system. The relative benefits to be derived by the parties from a proposed transaction, however, should not be controlling upon a decision with respect to the desirability of participating in the transaction. Accordingly, applicant will enter into proposed bulk power transactions of the types hereinafter described which, on balance, provide net benefits to applicant. There are net benefits in a transaction if applicant recovers the cost of the transaction (as defined in ¶1 (d) hereof) and there is no demonstrable net detriment to applicant arising from that transaction.

1. As used herein:

(a) "Bulk Power" means electric power and any attendant energy, supplied or made available at transmission or sub-transmission voltage by one electric system to another.

(b) "Neighboring Entity" means a private or public corporation, a governmental agency or authority, a municipality, a cooperative, or a lawful association of any of the foregoing owning or operating, or

3.3 INSTRUMENTATION

3.3.27 Low Pressure Service Water (LPSW) Reactor Building (RB) Waterhammer Prevention Circuitry

LCO 3.3.27 Three LPSW RB Waterhammer Prevention analog channels and two digital logic channels shall be OPERABLE.

---NOTES---
Applicable on each unit after completion of the LPSW RB Waterhammer Modification on the respective Unit.

APPLICABILITY: MODES 1, 2, 3, and 4

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required LPSW RB Waterhammer Prevention analog channel inoperable.	A.1 Restore required LPSW RB Waterhammer Prevention analog channel to OPERABLE status.	7 days
B. One required LPSW RB Waterhammer Prevention digital logic channel inoperable.	B.1 Restore required LPSW RB Waterhammer Prevention digital logic channel to OPERABLE status.	7 days

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Two or more required LPSW RB Waterhammer Prevention analog channels inoperable. <u>OR</u> Two required LPSW RB Waterhammer Prevention digital logic channels inoperable. <u>OR</u> Required Actions and associated Completion Times of Condition A or B not met.	C.1 Open two LPSW RB Waterhammer Prevention Pneumatic Discharge Isolation valves in the same header. <u>AND</u> C.2 Initiate actions to restore required LPSW RB Waterhammer Prevention analog or digital logic channels to OPERABLE status.	Immediately Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.27.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.27.2	Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.27.3	Perform CHANNEL CALIBRATION.	18 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.5.1	---------------------NOTE--------------------- Applicable for RB cooling system after the completion of the LPSW RB Waterhammer Modification on the respective Unit. -- Verify each reactor building spray and cooling manual and non-automatic power operated valve in the flow path that is not locked, sealed, or otherwise secured in position is in the correct position.	31 days
SR 3.6.5.2	Operate each required reactor building cooling train fan unit for $\geq$ 15 minutes.	31 days
SR 3.6.5.3	Verify each required reactor building spray pump's developed head at the flow test point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.6.5.4	Verify that the containment heat removal capability is sufficient to maintain post accident conditions within design limits.	18 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.5.5	---------------------NOTE-------------------------- Applicable for RB cooling system after the completion of the LPSW RB Waterhammer Modification on the respective Unit. -- Verify each automatic reactor building spray and cooling valve in each required flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	18 months
SR 3.6.5.6	Verify each required reactor building spray pump starts automatically on an actual or simulated actuation signal.	18 months
SR 3.6.5.7	Verify each required reactor building cooling train starts automatically on an actual or simulated actuation signal.	18 months
SR 3.6.5.8	Verify each spray nozzle is unobstructed.	10 years

3.7 PLANT SYSTEMS

3.7.7 Low Pressure Service Water (LPSW) System

LCO 3.7.7 For Unit 1 or Unit 2, three LPSW pumps and one flow path shall be OPERABLE.

For Unit 3, two LPSW pumps and one flow path shall be OPERABLE.

The LPSW Waterhammer Prevention System (WPS) shall be OPERABLE on Units where the LPSW RB Waterhammer modification is installed.

--NOTE--
With either Unit 1 or Unit 2 defueled and appropriate LPSW loads secured on the defueled Unit, such that one LPSW pump is capable of mitigating the consequences of a design basis accident on the remaining Unit, only two LPSW pumps for Unit 1 or Unit 2 are required.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required LPSW pump inoperable.	A.1 Restore required LPSW pump to OPERABLE status.	72 hours
B. LPSW WPS inoperable on Units with LPSW RB Waterhammer modification installed.	C.1 Restore the LPSW WPS to OPERABLE status.	7 days
C. Required Action and associated Completion Time of Condition A and B not met.	B.1 Be in MODE 3. <u>AND</u> B.2 Be in MODE 5.	12 hours 60 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.7.1	Verify LPSW leakage accumulator level is within Water levels between 20.5" to 41" for Units with LPSW RB Waterhammer modification installed. During LPSW testing, accumulator level > 41" is acceptable.	12 hours
SR 3.7.7.2	------------------------NOTE------------------------ Isolation of LPSW flow to individual components does not render the LPSW System inoperable. --- Verify each LPSW manual, and non-automatic power operated valve in the flow path servicing safety related equipment, that is not locked, sealed, or otherwise secured in position, is in the correct position.	31 days
SR 3.7.7.3	Verify each LPSW automatic valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	18 months
SR 3.7.7.4	Verify each LPSW pump starts automatically on an actual or simulated actuation signal.	18 months
SR 3.7.7.5	Verify LPSW leakage accumulator is able to provide makeup flow lost due to boundary valve leakage on Units with LPSW RB Waterhammer modification installed.	18 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.7.7.6	Verify LPSW WPS boundary valve leakage is ≤ 20 gpm for Units with LPSW RB Waterhammer modification installed.	18 months

B 3.3 INSTRUMENTATION

B 3.3.27 Low Pressure Service Water (LPSW) Reactor Building (RB) Waterhammer Prevention Circuitry

BASES

BACKGROUND

NRC Generic Letter 96-06 identified three issues of concern relative to effects of fluid in piping following postulated design basis events. One area of concern is the cooling water system piping serving the containment air coolers. The Low Pressure Service Water (LPSW) system provides cooling water to the safety related Reactor Building Cooling Units (RBCUs), non-safety related Reactor Building Auxiliary Cooling Units (RBACs) and non-safety related Reactor Coolant Pump Motor (RCPM) coolers. There is a possibility of waterhammer in the LPSW piping inside containment during either a Loss-of-Coolant Accident (LOCA) or a Main Steam Line Break (MSLB) concurrent with a loss of off-site power (LOOP) without means to prevent waterhammer.

The LPSW RB Waterhammer Prevention System (WPS) is composed of check valves, active pneumatic discharge isolation valves, and active controllable vacuum breaker valves. The LPSW RB Waterhammer Prevention Circuitry isolates LPSW to the RBCUs, RBACs and RCPM coolers any time the LPSW header pressure decreases significantly, such as during a LOOP event or LPSW pump failure during normal operations. The isolation function prevents and/or minimizes the potential waterhammers in the associated piping. The LPSW RB Waterhammer Prevention Circuitry will also re-establish flow to the containment air coolers following WPS actuation once the LPSW system has repressurized.

The RBCU fans and RBCU cooling water motor operated return valves are Engineered Safeguards (ES) features. On an ES actuation, these valves open. The LPSW RB Waterhammer Prevention Pneumatic Discharge Isolation Valves are designed to close on low LPSW supply header pressure and re-open when the LPSW supply header pressure is restored. The LPSW RB Waterhammer Prevention Controllable Vacuum Breaker Valves are designed to open on low LPSW pressure and re-close when LPSW pressure is restored.

The LPSW RB Waterhammer Prevention Pneumatic Discharge Isolation Valves fail open on loss of instrument air. During normal operation, a control solenoid valve in the instrument air supply to each

BASES

BACKGROUND (continued)

LPSW RB Waterhammer Prevention Pneumatic Discharge Isolation Valve is energized to vent air from the actuator to maintain the isolation valves in the open position. On loss of two of four of the analog input signals for the LPSW RB Waterhammer Prevention Isolation Circuitry, the 3-way control solenoid valve is de-energized to align the air accumulator with the pneumatic operator; thereby closing the LPSW RB Waterhammer Prevention Pneumatic Discharge Isolation Valve(s). LPSW RB Waterhammer Prevention Controllable Vacuum Breaker Valves are located downstream of the pneumatic discharge isolation valves. The LPSW RB Waterhammer Prevention Controllable Vacuum Breaker Valves are normally closed. They open simultaneously with the closing of the LPSW RB Waterhammer Prevention Pneumatic Discharge Isolation Valves in order to break vacuum in the return header by energizing the control solenoid valve.

The LPSW RB Waterhammer Prevention Circuitry contains four analog sensor channels and two digital actuation logic channels. Only three analog sensor channels are required to support OPERABILITY. Each analog sensor channel contains a safety grade pressure transmitter and current switch. The two digital actuation logic channels consist of safety grade relays in a two-out-of-two logic configuration. The actuation of the LPSW RB Waterhammer Prevention Circuitry requires two of the three required LPSW pressure signals supplied from the LPSW header pressure transmitters.

APPLICABLE SAFETY ANALYSES

In a LOOP event, the LPSW RB Waterhammer Prevention Circuitry isolates the cooling water flow to the RBCUs, RBACs and RCPM cooler on low LPSW supply header pressure prior to LPSW pump restart to prevent waterhammers. The LPSW RB Waterhammer Prevention Circuitry will also re-establish flow to the containment air coolers following WPS actuation once the LPSW system has repressurized. Isolating and re-establishing the LPSW flowpath ensures that Containment Integrity and Containment Heat Removal functions are maintained.

The RBCU Fans presently have a 3 minute delay to re-start following ES activation. LPSW flow will be restored to the RBCUs prior to the RBCU fan restart. This ensures the Containment Heat Removal function is unaffected.

The LPSW RB Waterhammer Prevention Circuitry satisfies Criterion 3 of 10 CFR 50.36 (Ref. 1).

BASES (continued)

LCO

Three LPSW RB Waterhammer Prevention analog channels and two digital logic channels shall be OPERABLE. Each analog sensor channel contains a safety related pressure transmitter and current switch. The two digital logic channels consist of safety related relays. The LPSW RB Waterhammer Prevention Circuitry design ensures that a single active failure will not prevent the circuitry and associated components from performing the intended safety functions.

There are four analog channels, but only three are required to support OPERABILITY. These three analog channels are configured in a two out of three control logic scheme that will isolate/reset the LPSW RB Waterhammer Prevention Circuitry. The LPSW RB Waterhammer Prevention Circuitry will close/open the four LPSW RB Pneumatic Discharge Isolation Valves when LPSW pressure is either low or returns to normal. Either digital logic channel will trip/restore the flow path.

The actuation logic used for the LPSW RB Waterhammer Prevention Circuitry is similar to other safety related circuitry currently being used. The LCO allowed required action and Completion Times are acceptable based on the number of channels normally available. Though one of the four analog channels can be out of service for an extended period, it is not a normal practice.

When one required analog channel is taken out of service, the two out of three analog control logic scheme is reduced to a two out of two analog control logic scheme. This control logic scheme will trip/reset the digital channels on decreasing/increasing supply header pressure.

Failure of an analog channel while in the two out of two control logic mode will reduce the control logic to a one out of two control logic scheme. This control logic is unacceptable because a failure will prevent the LPSW RB Waterhammer Prevention Circuitry from working as required.

The two digital channels are triggered by two of four analog channels consisting of a pressure transmitter/current switch. On decreasing/increasing supply header pressure, two of four analog channels will trip/reset the digital channels. If one of the two digital channels is inoperable or out of service, the system is no longer single failure proof.

The LCO is modified by a note. The note states that the LCO becomes applicable on each Unit after completion of the LPSW RB Waterhammer Modification.

BASES

APPLICABILITY

The LPSW RB Waterhammer Prevention Circuitry is required to be OPERABLE in MODES 1, 2, 3, and 4. This ensures LPSW is available to support the OPERABILITY of the equipment serviced by the LPSW system.

In MODES 5 and 6, the probability and consequences of the events that the LPSW System supports is reduced due to the pressure and temperature limitations of these MODES. As a result, the LPSW RB Waterhammer Prevention Circuitry is not required to be OPERABLE in MODES 5 and 6.

ACTIONS

A.1

If one required LPSW RB Waterhammer Prevention analog channel is inoperable, the LPSW RB Waterhammer Prevention Circuitry is no longer single failure proof and the control logic scheme is reduced to a two out of two configuration. Required Action A.1 requires the LPSW RB Waterhammer Prevention analog channels be restored to OPERABLE status within 7 days.

The 7 day Completion Time takes into account the allowed outage times of similar systems, reasonable time for repairs, and the low probability of an event occurring during this period.

B.1

If one required LPSW RB Waterhammer Prevention digital logic channel is inoperable, the LPSW RB Waterhammer Prevention Circuitry is not single failure proof. Required Action B.1 requires the digital channels be restored to OPERABLE status within 7 days.

The 7 day Completion Time takes into account the allowed outage times of similar systems, reasonable time for repairs, and the low probability of an event occurring during this period.

ACTIONS (continued)

C.1 and C.2

If two or more required LPSW RB Waterhammer Prevention analog channel(s) or two digital logic channel(s) are inoperable or the Required Actions and associated Completion Times of Condition A or B are not met, the WPS must be configured in order to assure the Containment Integrity and Heat removal functions are maintained. To achieve this status, actions to prevent automatic closing by manually opening (remote or local) two LPSW RB Waterhammer Prevention Pneumatic Discharge Isolation valves in the same header shall be completed immediately and actions to repair the inoperable equipment shall be taken immediately. LCO 3.7.7 will also apply when the LPSW RB Waterhammer Prevention Pneumatic Discharge Isolation valves in the same header are opened.

SURVEILLANCE REQUIREMENTS

SR 3.3.27.1

Performance of the CHANNEL CHECK every 12 hours ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that analog instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the two analog instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. CHANNEL CHECK will detect gross channel failure; therefore, it is key in verifying that the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined, based on a combination of the channel instrument uncertainties, including isolation, indication, and readability. If a channel is outside the criteria, it may be an indication that the transmitter or the signal processing equipment has drifted outside its limit.

The Frequency, equivalent to every shift, is based on operating experience that demonstrates channel failure is rare. Since the probability of two random failures in redundant channels in any 12 hour

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.27.1 (continued)

period is extremely low, the CHANNEL CHECK minimizes the chance of loss of protective function due to failure of redundant channels. The CHANNEL CHECK supplements less formal, but potentially more frequent, checks of channel operability during normal operational use of the displays associated with the LCO's required channels.

SR 3.3.27.2

A CHANNEL FUNCTIONAL TEST is performed on each channel to ensure the circuitry will perform its intended function. The Frequency of 92 days is based on engineering judgment and operating experience, with regard to channel OPERABILITY and drift, which demonstrates that failure of more than one channel in any 92 day interval is a rare event.

SR 3.3.27.3

A CHANNEL CALIBRATION is a complete check of the analog instrument channel, including the sensor. The test verifies that the channel responds to a measured parameter within the necessary range and accuracy. The CHANNEL CALIBRATION leaves the components adjusted to account for instrument drift to ensure that the circuitry remains operational between successive tests. The 18-month Frequency is justified by the assumption of an 18-month calibration interval in the setpoint analysis determination of instrument drift during that interval.

REFERENCES

1. 10 CFR 50.36.

BASES

BACKGROUND

Reactor Building Spray System (continued)

The Reactor Building Spray System provides a spray of relatively cold borated water into the upper regions of containment to reduce the containment pressure and temperature and to reduce the concentration of fission products in the containment atmosphere during an accident. In the recirculation mode of operation, heat is removed from the reactor building sump water by the decay heat removal coolers. Each train of the Reactor Building Spray System provides adequate spray coverage to meet the system design requirements for containment heat removal.

The Reactor Building Spray System is actuated automatically by a containment High-High pressure signal. An automatic actuation opens the Reactor Building Spray System pump discharge valves and starts the two Reactor Building Spray System pumps.

Reactor Building Cooling System

The Reactor Building Cooling System consists of three reactor building cooling trains. Each cooling train is equipped with cooling coils, and an axial vane flow fan driven by a two speed electric motor.

During normal unit operation, typically two reactor building cooling trains with two fans operating at low speed or high speed, serve to cool the containment atmosphere. Low speed cooling fan operation is available during periods of lower containment heat load. The third unit is usually on standby. Upon receipt of an emergency signal, the operating cooling fans running at low speed or high speed will automatically trip, then restart in low speed after a 3 minute delay, and any idle unit is energized in low speed after a 3 minute delay. The fans are operated at the lower speed during accident conditions to prevent motor overload from the higher density atmosphere.

For Unit(s) with the LPSW RB Waterhammer Prevention modification installed, the common LPSW return header will split into two new headers downstream of the Reactor Building Cooling Units (RBCUs). Each header will contain two pneumatic discharge isolation valves and will be capable of full LPSW flow. The headers will be rejoined downstream of the discharge isolation valves into a common return.

APPLICABLE SAFETY ANALYSES

The Reactor Building Spray System and Reactor Building Cooling System reduce the temperature and pressure following an accident. The limiting accidents considered are the loss of coolant accident (LOCA) and the steam line break. The postulated accidents are analyzed, with regard to containment ES systems, assuming the loss of one ES bus. This is the

BASES

APPLICABLE SAFETY ANALYSES (continued)	worst-case single active failure, resulting in one train of the Reactor Building Spray System and one train of the Reactor Building Cooling System being inoperable.

The analysis and evaluation show that, under the worst-case scenario (LOCA with worst-case single active failure), the highest peak containment pressure is 57.75 psig. The analysis shows that the peak containment temperature is 283.1°F. Both results are less than the design values. The analyses and evaluations assume a power level of 2619 MWt, one reactor building spray train and two reactor building cooling trains operating, and initial (pre-accident) conditions of 80°F and 15.9 psia. The analyses also assume a delayed initiation to provide conservative peak calculated containment pressure and temperature responses.

The Reactor Building Spray System total delay time of approximately 100 seconds includes Keowee Hydro Unit startup (for loss of offsite power), reactor building spray pump startup, and spray line filling (Ref. 2).

Reactor building cooling train performance for post accident conditions is given in Reference 2. The result of the analysis is that any combination of two trains can provide 100% of the required cooling capacity during the post accident condition. The train post accident cooling capacity under varying containment ambient conditions is also shown in Reference 2.

Reactor Building Cooling System total delay time of 3 minutes includes KHU startup (for loss of offsite power) and allows all ES equipment to start before the Reactor Building Cooling Unit on the associated train is started. This improves voltages at the 600V and 208V levels for starting loads (Ref. 2).

The Reactor Building Spray System and the Reactor Building Cooling System satisfy Criterion 3 of 10 CFR 50.36 (Ref. 3).

LCO

During an accident, a minimum of two reactor building cooling trains and one reactor building spray train are required to maintain the containment pressure and temperature following a LOCA. Additionally, one reactor building spray train is required to remove iodine from the containment atmosphere and maintain concentrations below those assumed in the safety analysis. To ensure that these requirements are met, two reactor building spray trains and three reactor building cooling trains must be OPERABLE in MODES 1 and 2. In MODES 3 or 4, one reactor building spray train and two reactor building cooling trains are required to be OPERABLE. The LCO is provided with a note that clarifies this requirement. Therefore, in the event of an accident, the minimum requirements are met, assuming the worst-case single active failure occurs.

BASES

LCO (continued)

Each reactor building spray train shall include a spray pump, spray headers, nozzles, valves, piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the BWST (via the LPI System) upon an Engineered Safeguards Protective System signal and manually transferring suction to the reactor building sump. The OPERABILITY of RBS train flow instrumentation is not required for OPERABILITY of the corresponding RBS train because system resistance hydraulically maintains adequate NPSH to the RBS pumps and manual throttling of RBS flow is not required. During an event, LPI train flow must be monitored and controlled to support the RBS train pumps to ensure that the NPSH requirements for the RBS pumps are not exceeded. If the flow instrumentation or the capability to control the flow in a LPI train is unavailable then the associated RBS train's OPERABILITY is affected until such time as the LPI train is restored or the associated LPI pump is placed in a secured state to prevent actuation during an event.

Each reactor building cooling train shall include cooling coils, fusible dropout plates or duct openings, an axial vane flow fan, instruments, valves, and controls to ensure an OPERABLE flow path. For Unit(s) with the LPSW RB Waterhammer modification installed, two headers of the LPSW RB Waterhammer Prevention Discharge Isolation Valves are required to support flowpath OPERABILITY or one header of LPSW RB Waterhammer Prevention Discharge Isolation Valves shall be manually opened (remote or local) to prevent automatic closure. Valve LPSW-108 shall be locked open to support system OPERABILITY.

APPLICABILITY

In MODES 1, 2, 3, and 4, an accident could cause a release of radioactive material to containment and an increase in containment pressure and temperature, requiring the operation of the reactor building spray trains and reactor building cooling trains.

In MODES 5 and 6, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODES. Thus, the Reactor Building Spray System and the Reactor Building Cooling System are not required to be OPERABLE in MODES 5 and 6.

ACTIONS

The Actions are modified by a Note indicating that the provisions of LCO 3.0.4 do not apply for Unit 2 only. As a result, this allows entry into a MODE or other specified condition in the Applicability with the LCO not met after performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering the MODE or other specified condition in the Applicability, and

BASES

ACTIONS

G.1 (continued)

conditions from full power conditions in an orderly manner and without challenging unit systems.

H.1

With two reactor building spray trains, two reactor building cooling trains or any combination of three or more reactor building spray and reactor building cooling trains inoperable in MODE 1 or 2, the unit is in a condition outside the accident analysis. Therefore, LCO 3.0.3 must be entered immediately.

With any combination of two or more required reactor building spray and reactor building cooling trains inoperable in MODE 3 or 4, the unit is in a condition outside the accident analysis. Therefore, LCO 3.0.3 must be entered immediately.

SURVEILLANCE REQUIREMENTS

SR 3.6.5.1

Verifying the correct alignment for manual and non-automatic power operated valves in the reactor building spray and cooling flow path provides assurance that the proper flow paths will exist for Reactor Building Spray and Cooling System operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these were verified to be in the correct position prior to locking, sealing, or securing. Similarly, this SR does not apply to automatic valves since automatic valves actuate to their required position upon an accident signal. This SR also does not apply to valves that cannot be inadvertently misaligned, such as check valves. This SR does not require any testing or valve manipulation. Rather, it involves verification, through a system walkdown, that those valves outside containment and capable of potentially being mispositioned are in the correct position.

SR 3.6.5.1 is modified by a note that states the SR is applicable for Reactor Building Cooling system following completion of the LPSW RB Waterhammer Modification on the respective Unit.

SR 3.6.5.2

Operating each required reactor building cooling train fan unit for $\geq$ 15 minutes ensures that all trains are OPERABLE and that all associated controls are functioning properly. It also ensures that blockage, fan or motor failure, or excessive vibration can be detected for corrective action.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.6.5.2 (continued)

The 31 day Frequency was developed considering the known reliability of the fan units and controls, the three train redundancy available, and the low probability of a significant degradation of the reactor building cooling trains occurring between surveillances and has been shown to be acceptable through operating experience.

SR 3.6.5.3

Verifying that each required Reactor Building Spray pump's developed head at the flow test point is greater than or equal to the required developed head ensures that spray pump performance has not degraded during the cycle. Flow and differential pressure are normal tests of centrifugal pump performance required by Section XI of the ASME Code (Ref. 4). Since the Reactor Building Spray System pumps cannot be tested with flow through the spray headers, they are tested on recirculation flow. This test confirms one point on the pump design curve and is indicative of overall performance. Such inservice tests confirm component OPERABILITY, trend performance, and may detect incipient failures by indicating abnormal performance. The Frequency of this SR is in accordance with the Inservice Testing Program.

SR 3.6.5.4

Verifying the containment heat removal capability provides assurance that the containment heat removal systems are capable of maintaining containment temperature below design limits following an accident. This test verifies the heat removal capability of the Low Pressure Injection (LPI) Coolers and Reactor Building Cooling Units. The 18 month Frequency was developed considering the known reliability of the low pressure service water, reactor building spray and reactor building cooling systems and other testing performed at shorter intervals that is intended to identify the possible loss of heat removal capability.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.5.5 and 3.6.5.6

These SRs require verification that each automatic reactor building spray and cooling valve actuates to its correct position and that each reactor building spray pump starts upon receipt of an actual or simulated actuation signal. The test will be considered satisfactory if visual observation and control board indication verifies that all components have responded to the actuation signal properly; the appropriate pump breakers have closed, and all valves have completed their travel. This SR is not required for valves that are locked, sealed, or otherwise secured in position under administrative controls. The 18 month Frequency is based on the need to perform these Surveillances under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillances were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillances when performed at the 18 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

SR 3.6.5.5 is modified by a note that states the SR is applicable for Reactor Building Cooling system following completion of the LPSW RB Waterhammer Modification on the respective Unit.

SR 3.6.5.7

This SR requires verification that each required reactor building cooling train actuates upon receipt of an actual or simulated actuation signal. The test will be considered satisfactory if control board indication verifies that all components have responded to the actuation signal properly, the appropriate valves have completed their travel, and fans are running at half speed. The 18 month Frequency is based on engineering judgment and has been shown to be acceptable through operating experience. See SR 3.6.5.5 and SR 3.6.5.6, above, for further discussion of the basis for the 18 month Frequency.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.6.5.8

With the reactor building spray header isolated and drained of any solution, station compressed air is introduced into the spray headers to verify the availability of the headers and spray nozzles. Performance of this Surveillance demonstrates that each spray nozzle is unobstructed and provides assurance that spray coverage of the containment during an accident is not degraded. Due to the passive nature of the design of the nozzles, a test at 10 year intervals is considered adequate to detect obstruction of the spray nozzles.

REFERENCES

1. UFSAR, Section 3.1.
2. UFSAR, Section 6.2.
3. 10 CFR 50.36.
4. ASME, Boiler and Pressure Vessel Code, Section XI.

B 3.7 PLANT SYSTEMS

B 3.7.7 Low Pressure Service Water (LPSW) System

BASES

BACKGROUND

The LPSW System provides a heat sink for the removal of process and operating heat from safety related components during a transient or accident. During normal operation and normal shutdown, the LPSW System also provides this function for various safety related and nonsafety related components.

The LPSW system for Unit 1 and Unit 2 is shared and consists of three LPSW pumps which can supply multiple combinations of path ways to supply required components. The LPSW system for Unit 3 consists of two LPSW pumps which can supply multiple combinations of path ways to supply required components. Although multiple combinations of path ways exist, only one flow path is necessary, since no single failure of an active component can prevent the LPSW system from supplying necessary components. The pumps and valves are remote manually aligned, except in the unlikely event of a loss of coolant accident (LOCA) or other accidents. The pumps are automatically started upon receipt of an Engineered Safeguards actuation signal, and automatic valves are aligned to their post accident positions. The LPSW System also provides cooling directly to the Reactor Building Cooling Units (RBCU) and Low Pressure Injection coolers, turbine driven EFW pump, HPI pump motor coolers, and the motor driven EFW pumps.

GL 96-06 required consideration of waterhammer inside containment during a LOCA or MSLB combined with a loss of offsite power (LOOP) event. As a result, the LPSW Reactor Building (RB) Waterhammer Prevention System (WPS) was added to maintain LPSW piping water solid inside containment during any event that causes a loss of LPSW system pressure. The WPS is fully automatic. Other functions of the WPS are addressed by LCO 3.3.27 and LCO 3.6.5.

Additional information about the design and operation of the LPSW System, along with a list of the components served, is presented in the UFSAR, Section 9.2.2 (Ref. 1).

APPLICABLE SAFETY ANALYSES

The primary safety function of the LPSW System is, in conjunction with a 100% capacity reactor building cooling system, (a combination of the reactor building spray and reactor building air coolers) to remove core decay heat following a design basis LOCA, as discussed in the UFSAR,

BASES

APPLICABLE SAFETY ANALYSES (continued)

Section 6.3 (Ref. 2). This provides for a gradual reduction in the temperature of the fluid, as it is supplied to the Reactor Coolant System (RCS) by the High Pressure and Low Pressure Injection pumps.

The LPSW System is designed to perform its function with a single active failure of any component, assuming loss of offsite power.

The LPSW System also cools the unit from Decay Heat Removal (DHR) System entry conditions, to MODE 5 during normal and post accident operation. The time required for this evolution is a function of the number of DHR System trains that are operating. One LPSW pump per unit and a flowpath is sufficient to remove decay heat during subsequent operations in MODES 5 and 6. This assumes a maximum LPSW System temperature of 90°F occurring simultaneously with maximum heat loads on the system.

The LPSW System satisfies Criterion 3 of 10 CFR 50.36 (Ref. 2).

LCO

For the LPSW system shared by Units 1 and 2, three LPSW pumps are required to be OPERABLE to provide the required redundancy to ensure that the system functions to remove post accident heat loads, assuming the worst case single active failure occurs coincident with the loss of offsite power. The LCO is modified by a Note which requires only two LPSW pumps to be OPERABLE for Units 1 or 2 if either Unit is defueled and one LPSW pump is capable of mitigating the DBA on the fueled Unit. The Units 1 and 2 LPSW System requires only two pumps to meet the single failure criterion provided that one of the units has been defueled and the following LPSW System loads on the defueled unit are isolated: Reactor Building Cooling Units (RBCU), Reactor Building Auxiliary Coolers, Component Cooling, Main Turbine Oil Tank, Reactor Coolant (RC) Pumps, and Low Pressure Injection (LPI) Coolers.

For the LPSW system for Unit 3, two LPSW pumps are required to be OPERABLE to provide the required redundancy to ensure that the system functions to remove post accident heat loads, assuming the worst case single active failure occurs coincident with the loss of offsite power.

An LPSW flow path is considered OPERABLE when the associated piping, valves, heat exchangers, and instrumentation and controls required to perform the safety related function are OPERABLE. Any combination of pathways to supply the required components is acceptable, provided there is no single active failure which can prevent supplying necessary loads and applicable design criteria (e.g., seismic qualification) are satisfied.

BASES

LCO (continued)

The LPSW WPS is considered OPERABLE when the associated leakage accumulator, relief valves, seat leakage limits for check valves and pneumatic discharge isolation valves, closure capability of pneumatic discharge isolation valves, and opening capability of the controllable vacuum breaker valves are OPERABLE.

APPLICABILITY

In MODES 1, 2, 3, and 4, the LPSW System is a normally operating system that is required to support the OPERABILITY of the equipment serviced by the LPSW System. Therefore, the LPSW System is required to be OPERABLE in these MODES.

In MODES 5 and 6, the OPERABILITY requirements of the LPSW System are determined by the systems it supports.

ACTIONS

A.1

If one required LPSW pump is inoperable, action must be taken to restore the required LPSW pump to OPERABLE status within 72 hours. In this Condition, the remaining OPERABLE LPSW pump(s) are adequate to perform the heat removal function. However, the overall reliability is reduced because a single failure in the OPERABLE LPSW pump(s) could result in loss of LPSW system function. The 72 hour Completion Time is based on the redundant capabilities afforded by the OPERABLE pump, and the low probability of a DBA occurring during this period.

B.1

If the LPSW WPS is inoperable, action shall be taken to restore the required LPSW WPS components to OPERABLE status within 7 days for Units with the LPSW RB Waterhammer modification installed.

The 7 day Completion Time is based on similar systems and is considered reasonable based on engineering judgment and the low probability of a DBA occurring during the period of maintenance.

C.1 and C.2

If the LPSW pump or WPS cannot be restored to OPERABLE status within the associated Completion Time, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit

BASES

ACTIONS

C.1 and C.2 (continued)

must be placed in at least MODE 3 within 12 hours, and in MODE 5 within 60 hours.

The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems. The extended interval to reach MODE 5 provides additional time to restore the required LPSW pump and is reasonable considering that the potential for an accident or transient is reduced in MODE 3.

SURVEILLANCE REQUIREMENTS

SR 3.7.7.1

For Units with LPSW RB Waterhammer Prevention System installed, verifying the correct level in the leakage accumulator will provide assurance that in the event of boundary valve leakage during a LOOP event, there is sufficient water to keep the LPSW piping filled. The required water level is between half full and full, which corresponds to a level indication of 20.5" to 41". Any level glass reading is bounded by 20.5" to 41" level indication, therefore any level glass reading is considered acceptable. During LPSW testing, accumulator level > 41" is acceptable because the LPSW system is vented and the tank is being continuously filled; therefore, the accumulator is still capable of performing its safety function.

The 12 hour Frequency is based on engineering judgment and considered sufficient to ensure the appropriate amount of water is available in the accumulator.

SR 3.7.7.2

Verifying the correct alignment for manual, and power operated valves in the LPSW System flow path provides assurance that the proper flow paths exist for LPSW System operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since they are verified to be in the correct position prior to locking, sealing, or securing. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of potentially being mispositioned are in the correct position. This SR also does not apply to valves that cannot be inadvertently misaligned, such as check valves.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.7.2 (continued)

The 31 day Frequency is based on engineering judgment, is consistent with the procedural controls governing valve operation, and ensures correct valve positions.

This SR is modified by a Note indicating that the isolation of components or systems supported by the LPSW System does not affect the OPERABILITY of the LPSW System.

SR 3.7.7.3

The SR verifies proper automatic operation of the LPSW System valves. The LPSW System is a normally operating system that cannot be fully actuated as part of the normal testing. This SR is not required for valves that are locked, sealed, or otherwise secured in position under administrative controls. The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency. Therefore, the Frequency is acceptable from a reliability standpoint.

SR 3.7.7.4

The SR verifies proper automatic operation of the LPSW System pumps on an actual or simulated actuation signal. The LPSW System is a normally operating system that cannot be fully actuated as part of normal testing during normal operation. The 18 month Frequency is consistent with the Inservice Testing Program. Operating experience has shown that these components usually pass the Surveillance when performed at an 18 month Frequency. Therefore, the Frequency is acceptable from a reliability standpoint.

SR 3.7.7.5

For Units with LPSW RB Waterhammer Prevention System installed, the SR verifies proper operation of the LPSW RB Waterhammer Prevention System leakage accumulator. Verifying adequate flow from the accumulator will provide assurance that in the event of boundary valve leakage during a LOOP event, there is sufficient water to keep LPSW piping filled.

The 18 month Frequency is based on engineering judgment and operating experience.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.7.6

For Units with LPSW RB Waterhammer Prevention System installed, the SR verifies that LPSW WPS boundary valve leakage is ≤ 20 gpm. Verifying boundary valve leakage is within limits will ensure that in the event of a LOOP, a waterhammer will not occur, because the LPSW leakage accumulator will be able to maintain the LPSW piping water solid.

The LPSW Leakage Accumulator is designed to allow up to 25 gpm of aggregate leakage for one minute. The boundary valve leakage is limited to 20 gpm in order to allow five (5) gpm of miscellaneous leakage.

The 18 month Frequency is based on engineering judgment and operating experience.

REFERENCES

1. UFSAR, Section 9.2.2.
2. UFSAR, Section 6.3.
3. 10 CFR 50.36.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO

AMENDMENT NO.363 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-38

AMENDMENT NO.365 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-47

AND

AMENDMENT NO.364 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-55

DUKE ENERGY CAROLINAS, LLC

OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3

DOCKET NOS. 50-269, 50-270, AND 50-287

1.0 INTRODUCTION

By application dated October 16, 2007 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML072920449), as supplemented by letters dated May 7, 2008 (ADAMS Accession No. ML081330241), September 2, 2008 (ADAMS Accession No. ML082520014), and October 23, 2008 (ADAMS Accession No. ML08320311) Duke Energy Carolinas, LLC (Duke, the licensee), requested changes to the Technical Specifications (TSs) for the Oconee Nuclear Station, Units 1, 2, and 3 (Oconee). The supplements dated May 7, September 2 and October 23, 2008, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the NRC staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on November 20, 2007 (72 FR 65364).

The proposed changes would revise the TSs to accommodate plant modifications that address water hammer concerns described in Generic Letter (GL) 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Conditions," dated September 30, 1996.

GL 96-06 required utilities to evaluate the potential for waterhammer in cooling water systems serving containment following a loss of offsite power (LOOP) concurrent with a loss-of-coolant accident (LOCA) or a main steam line break (MSLB). Analysis and system testing in response to GL 96-06 concluded that waterhammers could occur in the low pressure service water (LPSW) system piping during all LOOP events at Oconee. The operability evaluations in response to GL 96-06 concluded that LPSW piping will not fail for the current configuration; however, piping code allowable stresses are exceeded. The Oconee LPSW systems are currently operable, but degraded/nonconforming (OBD/NCI). The proposed installation of an LPSW water hammer prevention system (WPS) is intended to eliminate waterhammer during a LOOP event.

2.0 REGULATORY EVALUATION

The NRC staff considered the following regulatory bases and guidance in its review of the proposed TS changes:

- Title 10, Part 50, "Domestic Licensing of Production and Utilization Facilities," of the *Code of Federal Regulations* (10 CFR Part 50) establishes the fundamental regulatory requirements. Specifically, Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50 provides, in part, the necessary design, fabrication, construction, testing, and performance requirements for structures, systems, and components important to safety.

- Section 50.36(d)(2)(ii)(C) requires that a TS limiting condition for operation (LCO) of a nuclear reactor must be established for a structure, system, and component that is part of the primary success path and which functions or actuates to mitigate a design-basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

- Section CFR 50.36(d)(3) states that, "Surveillance requirements are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met."

- General Design Criterion (GDC) 1, "Quality standards and records," specifies that "Structures, systems, and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance to safety functions to be performed."

- GDC 2, "Design bases for protection against natural phenomena," specifies that "Structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes...without loss of capability to perform their safety functions."

- GDC 4, "Environmental and dynamic effects design basis," specifies "Structures, systems, and components important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents"

- GDC 13, "Instrumentation and Control," requires that "instrumentation shall be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to assure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated systems. Appropriate controls shall be provided to maintain these variables and systems within prescribed operating ranges."

- GDC 38, "Containment heat removal," specifies "A system to remove heat from the reactor containment shall be provided. The system safety function shall be to reduce rapidly, consistent with the functioning of other associated systems, the containment pressure and temperature following any loss-of-coolant accident and maintain them at acceptably low levels."

- GDC 44, "Cooling water," specifies "A system to transfer heat from structures, systems, and components important to safety, to an ultimate heat sink shall be provided. The system safety function shall be to transfer the combined heat load of these structures, systems, and components under normal operating and accident conditions."

- GDC 45, ""Inspection of cooling water system," specifies "The cooling water system shall be designed to permit appropriate periodic inspection of important components, such as heat exchangers and piping, to assure the integrity and capability of the system."

- GDC 46, "Testing of cooling water system," specifies "The cooling water system shall be designed to permit appropriate periodic pressure and functional testing to assure (1) the structural and leaktight integrity of its components, (2) the operability and the performance of the active components of the system...including operation of applicable portions of the protection system and the transfer between normal and emergency power sources."

3.0 TECHNICAL EVALUATION

Each Unit's reactor building cooling system includes:

- Three reactor building cooling units (RBCUs). These three cooling units are engineered safety systems and provide post-accident RB cooling.

- Four reactor building auxiliary cooling units. These four cooling units are used for building cooling in normal plant operation and do not perform a safety function.

During normal plant operation, the RBCUs may operate in the high- or low-speed mode. These units circulate RB air over the LPSW supplied cooling coils and distribute the cool air throughout the lower portion of the RB.

On engineered safeguards (ES) actuation, the RB cooling system mode of operation changes automatically. An ES signal causes all LPSW motor-operated valves at the discharge of the three RBCUs to go full open to maximize LPSW flow through the RBCUs. Additionally, the operating RBCUs will automatically trip and after a 3-minute delay, all three RBCUs begin to operate in low speed.

In response to GL 96-06, an analysis and system testing were performed and concluded that waterhammer could occur in the LPSW system piping during a LOOP event. Operability evaluations in response to GL 96-06 were performed and concluded that the LPSW piping will not fail; however, piping code allowable stresses will be exceeded. These analyses and testing led to declaring the Oconee LPSW systems to be OBD/NCI.

The licensee proposed to eliminate the waterhammer during a LOOP event by installing an LPSW WPS. The safety-related, Siesmic Category I LPSW WPS consists of a number of components, which include check valves in the LPSW system supply header and an accumulator to make up for leakage. The check valves will prevent draining of the LPSW line to the RBCUs during the time the LPSW system is not operating after a LOOP event.

The accumulator, which has a capacity of 76 gallons, will provide make up for leakage during the time the LPSW system is not operating after a LOOP event. The modifications will be designed, procured, and installed in accordance with the licensee's Quality Assurance (QA) Program defined in Chapter 3 of the Oconee Updated Final Safety Analysis Report.

The licensee's analysis allows for up to 25 gallons per minute (gpm) leakage. This leakage is made up of two parts: (1) 20 gpm total boundary valve leakage, and (2) 5 gpm miscellaneous, unspecified leakage (e.g., flange leakage). The accumulator is sized to provide 25 gpm for one minute.

The TSs will be modified to include operability requirements for the accumulator and surveillance requirements for the accumulator and boundary valve leakage. A 7-day completion time will be established when the LPSW WPS is found to be inoperable. The accumulator level will be checked every 12 hours to ensure that the level is half full and full (38 gallons to 76 gallons). Every 18 months the licensee will verify the accumulator can make up flow lost as a result of boundary valve leakage and that the boundary valve leakage is ≤ 20 gpm.

The NRC staff finds that by designing, procuring, and installing the check valves and accumulator in accordance with the licensee's QA Program the licensee satisfies the intent of GDC 1.

The LPSW system is a seismic category I system as are the additional check valves and accumulator; thus, the NRC staff finds the additional components satisfy the intent of GDC 2.

GL 96-06 raised the possibility of a waterhammer event resulting in the LPSW system being rendered unable to perform the functions required by GDCs 38 and 44. The addition of the check valves to the LPSW system will preclude a void forming in the system that could cause a waterhammer to occur when the system restarts after a LOOP event. The NRC staff estimates that in the event of a LOOP, the maximum leakage through the boundary valves, plus miscellaneous leakage, would be a maximum of 13.75 gallons. This is based on a maximum leakage rate of 25 gpm for 33 seconds, the maximum amount of time the LPSW system would be expected to be out of service in the event of a LOOP. Since the accumulator is sized to provide make-up of 25 gpm and the volume in the accumulator will be greater than 25 gallons based on TS requirements, the accumulator will be capable of providing make-up for any leakage that may occur in the LPSW system in the event of a LOOP. Thus the NRC staff finds that with the addition of the check valves and accumulator as described above, the LPSW system will satisfy the intent of the requirements of GDCs 4, 38, and 44.

The additional components will be capable of being inspected and tested based on satisfying the proposed TS requirements. Thus, the staff finds that the LPSW system will satisfy the intent of GDCs 45 and 46 with the proposed check valves and accumulator installed.

The licensee proposed the addition of TS 3.3.27 to support design changes to modify portions of the low-pressure service water (LPSW) system that serve the containment. The licensee is installing the modification to mitigate waterhammer described in GL 96-06, which concludes that waterhammer can occur in LPSW system piping during loss of offsite power (LOOP) events. The design change will add associated instrumentation and controls needed to isolate nonsafety portions of the LPSW piping inside the containment in the event of a LOOP.

The licensee stated that with low and decreasing LPSW system pressure due to loss of offsite power or loss of LPSW pumps, the waterhammer prevention logic circuit will close the pneumatic discharge isolation valves. The isolation function will be performed by one out of two digital channels consisting of safety-related relays, which are triggered by two of four analog channels, each consisting of a pressure transmitter/current switch.

The licensee proposed that the LPSW reactor building (RB) waterhammer prevention circuitry be required to be operable in Modes 1, 2, 3, and 4 to ensure that LPSW is available to support the operability of the equipment serviced by the LPSW system. In Modes 5 and 6 the probability and consequences of a loss-of-coolant accident are reduced because of pressure and temperature limitations in these modes. Therefore, the LPSW RB waterhammer prevention reset circuitry is not required to be operable during Modes 5 and 6.

The proposed new TS 3.3.27 requires entry into Condition A if one of the three required analog LPSW RB waterhammer prevention channels is inoperable. Condition A requires that in the event of one required LPSW RB waterhammer analog channel is inoperable, the inoperable analog LPSW RB waterhammer prevention channel be restored to operable status within 7 days. If the 7-day completion time of Condition A cannot be met, entry into Condition C is required.

The proposed new TS 3.3.27 requires entry into Condition B if one of the two required LPSW RB waterhammer prevention digital logic channels is inoperable. Condition B requires that in the event one required LPSW RB waterhammer prevention digital logic channel is inoperable, the inoperable LPSW RB waterhammer prevention digital channel be restored to operable status within 7 days. If the 7-day completion time of Condition B cannot be met, entry into Condition C is required.

The proposed new TS 3.3.27 requires entry into Condition C if two or more analog channels are inoperable, if two digital logic channels are inoperable, or if the required actions and associated completion times of Condition A or B are not met. Condition C requires that two LPSW RB waterhammer prevention pneumatic discharge isolation valves in the same header be opened immediately and that actions to restore LPSW RB waterhammer prevention circuitry to operable status need be taken immediately.

The 7-day completion time to restore an inoperable channel to operable status under Conditions A and B is appropriate. The NRC staff notes that a 7-day completion time is specified for restoration of one inoperable channel in the current TS 3.3.23, "Main Feeder Bus Monitor Panel," and TS 3.3.28, "Low Pressure Service Water Standby Pump Auto-Start Circuitry." The licensee stated that the 7-day completion time provides reasonable time for repairs and is consistent with the low probability of an event occurring during this period. The licensee's statement is based on engineering judgment. The NRC staff finds the 7-day completion time acceptable to repair the degraded condition described by Conditions A and B because sufficient channels and trip logic remain operable to perform the instrumentation safety function.

The licensee proposed that Surveillance Requirement (SR) 3.3.27.1 requires a channel check of each channel every 12 hours. The channel check will ensure that gross failure of instrumentation has not occurred. The NRC staff notes that a 12-hour channel check is specified in current SR 3.3.5.1 for TS 3.3.5, "Engineered Safeguards Protective System (ESPS) Analog Instrumentation," SR 3.3.9.1 for TS 3.3.9, "Source Range Neutron Flux," current SR 3.3.11.1 for TS 3.3.11, " Automatic Feedwater Isolation System (AFIS) Instrumentation," and current SR 3.3.16.1 for TS, "3.3.16 Reactor Building (RB) Purge Isolation - High Radiation." Based on engineering judgment performance of a channel check once every 12 hours ensures that gross failure of instrumentation has not occurred. The NRC staff finds the 12-hour channel check time acceptable.

The licensee proposed that SR 3.3.27.2 require a channel functional test of each channel every 92 days. The channel functional test will ensure that the circuitry will perform its intended function. The NRC staff notes that the 92-day channel functional test is specified in current SR 3.3.5.2 for TS 3.3.5, "Engineered Safeguards Protective System (ESPS) Analog Instrumentation," SR 3.3.7.1 for TS 3.3.7, "Engineered Safeguards Protective System (ESPS) Digital Automatic," and SR 3.3.14.2 for TS 3.3.14, "Emergency Feedwater (EFW) Pump Initiation Circuitry." The licensee stated that a channel function test frequency of 92 days is appropriate based on engineering judgment, operating experience, and the assurance that the circuitry is available to perform its intended function. The NRC staff finds the licensee's justifications acceptable.

The licensee proposed that SR 3.3.27.3 require a channel calibration of each channel every 18 months. The channel calibration test will verify that the system instrument channels, including the sensors, respond to the measured parameters with necessary range and accuracy. The staff notes that channel calibration frequency of 18 months is specified in current SR 3.3.1.5 for TS 3.3.1, "Reactor Protective System (RPS) Instrumentation," SR 3.3.5.3 for TS 3.3.5., "Engineered Safeguards Protective System (ESPS) Analog Instrumentation," SR 3.3.8.3 for TS 3.3.8, "Post Accident Monitoring (PAM) Instrumentation," SR 3.3.9.2 for TS 3.3.9, "Source Range Neutron Flux," SR 3.3.11.3 for TS 3.3.11, "Automatic Feedwater Isolation System (AFIS) Instrumentation," the licensee stated that the 18 months channel calibration is consistent with plant refueling cycles and is based on drift determination of the setpoint analysis. Based on above considerations, the NRC staff finds the proposed channel calibration frequency of 18 months acceptable.

The NRC staff reviewed the licensee's technical analysis of the proposed TS changes against the requirements in 10 CFR 50.36. Based on this review , the NRC staff concludes that the addition of TS 3.3.27 for the LPSW RB waterhammer prevention circuitry is consistent with the requirements of 10 CFR 50.36. Therefore, the proposed addition of TS 3.3.27 is acceptable to the NRC staff.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the South Carolina State official was notified of the proposed issuance of the amendments. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to the installation or use of facility components located within the restricted area as defined in 10 CFR Part 20 and change surveillance requirements. The NRC staff has determined that the amendments involve no significant increase in the amounts and no significant change in the types of any effluents that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (72 FR 65364, November 20, 2007). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: S. Mazumdar, NRR/DE/EICB
K. Scales, NRR/DE/EICB
E. Smith, NRR/DSS/SBPB

Date: October 29, 2008

October 29, 2008

Mr. Dave Baxter
Vice President, Oconee Site
Duke Power Company LLC
7800 Rochester Highway
Seneca, SC 29672

SUBJECT: OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3, ISSUANCE OF AMENDMENTS REGARDING WATER HAMMER CONCERNS (TAC NOS. MD7000, MD7001, AND MD7002)

Dear Mr. Baxter:

The Nuclear Regulatory Commission has issued the enclosed Amendment Nos.363, 365, and 364 to Renewed Facility Operating Licenses DPR-38, DPR-47, and DPR-55, for the Oconee Nuclear Station, Units 1, 2, and 3, respectively. The amendments consist of changes to the Technical Specifications (TSs) in response to your application dated October 16, 2007, as supplemented by letters dated May 7, September 2, and October 23, 2008.

These amendments revise the Technical Specifications to accommodate plant modifications that address water hammer concerns described in Generic Letter 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Conditions," dated September 30, 1996.

A copy of the related Safety Evaluation is also enclosed. A Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

/RA/
Leonard N. Olshan, Sr. Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-269, 50-270, and 50-287

Enclosures:
1. Amendment No.363 to DPR-38
2. Amendment No.365 to DPR-47
3. Amendment No. 364to DPR-55
4. Safety Evaluation

cc w/encls: Distribution via Elist Serve

DISTRIBUTION:
Public
LPLII-1 R/F
RidsNrrDorlLp2-1 Resource
RidsNrrPMLOlshan (hard copy)
RidsNrrLAMO'Brien (hard copy)
RidsAcrsAcnw_MailCTR Resource
GHill, OIS (6 hard copies)
RidsNrrDirsItsb Resource
RidsRgn2MailCenter Resource
RidsNrrDorlDpr Resource
RidsItsbRElliott
NrrDeEicbKScales
NrrDssSbpbESmith
NrrDeEicbSMazumdar
RidsOgcRpResource
RidsNrrBicbWKemper
RidsNrrSbpbDHarrison

Accession Number: ML082960070

OFFICE	NRR/LPL2-1/PM	NRR/LPL2-1/LA	NRR/BICB/BC	NRR/SBPBA/BC
NAME	LO LOshan	MO'Brien	WKemper	MRahimi
DATE	10/ 29 /08	10/22/08	9 / 5 /08	10/28/08
OFFICE	NRR/ITSB/BC	OGC w/ comments	NRR/LPL2-1/BC	
NAME	RElliott	LSubin	MWong/JStang for	
DATE	10/29/08	10/28/08	10/ 29 /08	

OFFICIAL AGENCY RECORD