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January 15, 2010

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C., 20555-001

Subject: Duke Energy Carolinas, LLC
Oconee Nuclear Station, Units 1, 2, and 3
Renewed Facility Operating License, DPR-38, DPR-47, and DPR-55
Docket Numbers 50-269, 50-270, and 50-287
Oconee External Flood Interim Actions

References:

1. Duke Letter From Dave Baxter to NRC Document Control Desk, "Oconee External Flood Analyses and Associated Corrective Action Plan," dated November 30, 2009
2. Duke Letter From Dave Baxter to NRC Document Control Desk, "Response to 10 CFR 50.54(f) Request [NRC Letter dated August 15, 2008]," dated September 26, 2008
3. NRC Letter From Joseph G. Giitter to Dave Baxter, "Information Request Pursuant to 10 CFR 50.54(f) Related to External Flooding Including Failure of the Jocassee Dam, at Oconee Nuclear Station, Units 1, 2, and 3 (Oconee) (TAC Nos. MD8224, MD8225, and MD8226), dated August 15, 2008

By letter dated November 30, 2009 (Reference 1), Duke provided the NRC with additional information to address the consequences of external flooding, including a postulated failure of the Jocassee Dam. Specifically, that letter included: 1) technical justification for inundation study input parameters used in the 2D model analysis, 2) technical justification for sensitivity analysis input parameters evaluated with the Hydrologic Engineering Center – River Analysis System (HEC-RAS) model and 3) an external flood corrective action plan with tentative completion dates.

On December 2, 2009, Duke met with the NRC to discuss; Reference 1, the timeliness of corrective actions, and measures to address postulated external flooding during the corrective action period.

As a follow-up to the December 2, 2009, meeting, Duke is providing additional information in Attachments 1, 2, and 3 of this letter as follows:

- Attachment 1, "In Place Measures that Address Postulated External Flood Threat Issues," provides information on measures in place at Oconee Nuclear Station (ONS) addressing issues concerning external flood threats due to a postulated "sunny day" failure of the Jocassee Dam.

~~This letter contains security sensitive information.~~
~~Withhold from Public Disclosure under 10 CFR 2.390 (d)(1)~~

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- Attachment 2, "Interim Commitments and Implementation Dates," provides a list of commitments that will be implemented during the corrective action period to enhance prevention/detection activities and mitigation strategies.
- Attachment 3, "Discussion of Jocassee Risk Model," addresses compliance with the ASME/ANS Standard on PRAs for External Events, provides some background on the methodology used in development of the model, and describes Duke's basis for acceptability of the model for risk-informed decision making.

Jocassee Dam is a robustly constructed, well maintained, FERC-regulated facility. Duke has previously undertaken steps and herein commits to additional measures to address concerns regarding the consequences of external flooding, including a postulated failure of the Jocassee Dam. Duke believes that these additional measures, in combination with measures already in place at ONS, provide an effective methodology to (1) minimize the likelihood of the failure of the Jocassee Dam; (2) provide an early detection capability such that a failure could be prevented; and (3) mitigate the consequences of a postulated failure of the Jocassee Dam. The planned measures will remain in place during the corrective action period or longer, but may be revised, as appropriate, as final corrective actions are implemented.

Since this letter contains security sensitive information, Duke hereby requests the NRC withhold the letter from public disclosure pursuant to 10 CFR 2.390 (d)(1), "Public inspections, exemptions, requests for withholding."

If you have any questions on this matter, please contact Bob Meixell, Oconee Regulatory Compliance, at 864-873-3279 or Jeff Thomas, Fleet Regulatory Compliance Manager, at 704-382-3438.

Sincerely,

Dave Baxter, Vice President
Oconee Nuclear Station

Attachments

1. In Place Measures that Address Postulated External Flood Threat Issues
2. Interim Commitments and Implementation Dates
3. Discussion of Jocassee Risk Model

bc:

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Attachment 1

In Place Measures that Address Postulated External Flood Threat Issues

This attachment describes measures and attributes currently in place at both Jocassee and Oconee that address issues raised by the NRC concerning external flood threats due to a postulated 'sunny day' failure of the Jocassee Dam.

Design and Construction of the Jocassee Project

The Main Jocassee Dam, which forms part of the Jocassee Hydroelectric Project, was completed in 1972. Commercial operation of Units 1 & 2 began on May 1, 1975. The main dam has performed well, with no significant issues for almost thirty-eight years. The main dam was designed and constructed in accordance with current state of practice technology, employing conservative assumptions and appropriate design margins. Design and construction was completed under the oversight of a Federal Power Commission approved Board of Consultants.

The project is designed for seismic ground acceleration equal to or greater than that used in the design of the downstream Oconee Nuclear Station (ONS). Revised stability analysis of the main dam and abutments, and the spillway were completed in 1990 and 1994 respectively. Both analyses used generally accepted engineering calculation methods. The analyses included a seismic evaluation with input ground acceleration greater than or equal to that used in the Oconee Nuclear Site (ONS) seismic analyses. Results of the analyses indicate that the factors of safety against sliding or tipping of the structural components was greater than required by Federal Energy Regulatory Commission (FERC) regulations for normal conditions, Probable Maximum Flood (PMF) conditions, and seismic conditions.

The project is also designed to hold and pass a PMF without overtopping the main dam and abutments. The ability of the project to contain the increased inflow during a PMF is due to the available freeboard and to the combined discharges of the turbines and spillway gates[1] available during the event. In addition, overtopping of the main dam and abutments from excessive pump back from Lake Keowee to Lake Jocassee is considered not credible due to the spillway arrangement and due to an established overpumping protection procedure, which includes high forebay level alarms and redundant monitoring capabilities provided from the Jocassee main control room and Hydro Central in Charlotte. Finally, overtopping of the Jocassee dam, following a postulated failure of the main dam of the Bad Creek Pump Storage Project upstream of the Jocassee reservoir, is not possible due to the freeboard available to hold the relatively small Bad Creek reservoir volume.

Dam Safety Inspections

The project has periodic dam safety inspections performed by Duke Energy personnel, FERC representatives, and independent consultants.

Duke Energy personnel visually inspect the dam and spillway bi-weekly and after a 2 inch or greater rainfall or felt seismic event. In addition, Duke Energy personnel routinely observe the dam on a daily basis as part of the facility maintenance program.

[1] The operating chains on the Jocassee spillway gates were replaced on November 19, 2009

Attachment 1
In Place Measures that Address Postulated External Flood Threat Issues

Annual inspections are performed independently by FERC representatives and Duke Energy personnel. Five-Year dam safety inspections are performed in accordance with FERC Order No. 122, by an independent consultant approved in advance of the inspection by FERC. Underwater inspections are also performed every five years. No serious performance issues have been identified and no major remedial projects have been required.

Instrumentation and Monitoring

Since pre-construction, an extensive instrumentation and monitoring program has been established for the Jocassee Project. The monitoring program includes inspection and data collection for observation wells, seepage collection weirs, Parschall Flume, discharge pipes, and vertical/horizontal displacement monument points. There are ten observation wells that are monitored once a month for changes in the phreatic water surface. There are twelve seepage collection points that are monitored monthly for changes in flow and turbidity. There are seventeen surface monuments that are surveyed annually for vertical and horizontal displacement changes of the main dam and the abutments.

The Jocassee Hydroelectric Project is staffed 24 hours per day, 7 days per week. The project is also monitored by the Hydro Central operating center in Charlotte, NC, which is also staffed 24 hours per day, 7 days per week. This staffing allows a round the clock surveillance of the facility. In addition, the project has a camera mounted to monitor the forebay. This video feed is monitored in the Jocassee station control room. This camera has the capability to view a staff gauge which measures the reservoir elevation. A second camera is dedicated to monitor only the reservoir staff gauge. The video feed for the second camera is monitored in the Jocassee station control room as well as by Hydro Central in Charlotte. In addition to the cameras, electronic forebay and tailrace elevation instruments are monitored in the Jocassee station control room and by Hydro Central in Charlotte.

Seismic events are recorded by two strong-motion seismographs located around the reservoir. Following a felt seismic event, inspections are performed on all observation wells and seepage collection points.

A Probable Failure Modes Analysis (PFMA) was conducted in 2004 for the Jocassee project. The PFMA was completed in response to FERC requirements related to a program noted as Dam Safety Performance Monitoring Program (DSPMP). The intent of the PFMA process is for the FERC and the licensee to identify and develop a good understanding of the potential failure modes of the project. The PFMA also focuses attention on the more probable failure modes and assists the licensee in developing appropriate risk reduction measures and an adequate surveillance/monitoring program. The Jocassee PFMA was conducted by a team made of FERC engineers, an independent consultant, Duke engineers, Duke Hydro Operations Staff, and Duke's dam safety engineering consultants. The PFMA core team concluded that an appropriate instrumentation and monitoring program was in place at Jocassee and should be continued.

The combination of inspections, monitoring, direct and video surveillance, and seismic monitoring provides a robust means to provide early detection of possible problems with the facility.

Emergency Procedures

Jocassee and ONS both have emergency procedures to mitigate events that may cause flooding of the ONS site. As a FERC regulated facility, Jocassee is required to develop and file an Emergency Action Plan (EAP). The FERC regulations further require a comprehensive review of EAP and annual testing and training of personnel. Duke complies with all FERC requirements in this regard by maintaining an EAP, training personnel, and holding annual tests.

Attachment 1

In Place Measures that Address Postulated External Flood Threat Issues

The Jocassee EAP identifies two conditions related to the status of the dam: Condition A – Failure is Imminent or Has Occurred; Condition B- Potentially Hazardous Situation is Developing. These conditions are determined and communicated by Area Hydro Group personnel. For the postulated Jocassee 'sunny day' break scenario, Condition A initiates a call tree that notifies offsite agencies to implement specific actions to protect/warn the public as well as notifications to the ONS Unit 2 Control Room.

Once notification has been received at ONS, the ONS Emergency Plan (EP) and associated response procedures are implemented. The site will progress through the response procedures and implement actions that include: activation of the Emergency Response Organization (ERO); notification to offsite agencies including specific protective action recommendations and site specific protective actions (e.g., relocation of personnel in low lying areas to the World of Energy/Ops Training Center).

For postulated Jocassee dam failures that result in a flood height $\leq$ 803.5 ft Mean Sea Level (MSL) in the ONS yard, the extended flood wall[2] surrounding the SSF provides adequate protection of the SSF. Therefore the SSF remains available to achieve and maintain stable Mode 3 conditions for each ONS unit.

For flood heights $\geq$ 803.5 ft MSL, the use of EM 5.3, "Evaluations by Station Management in the Technical Support Center (TSC)-Beyond Design Basis Mitigation Strategies for Jocassee Dam Failure" would be used to mitigate the event. The EM provides guidance to relocate plant equipment needed for mitigation of the event, and eventual plant recovery. This activity includes the staging of the Oconee B.5.b pump[3] above the anticipated flood level in order to prepare to feed each of the six ONS steam generators. The EM includes guidance to trip each of the ONS units and bring the units to a safe shutdown condition. Following that the EM provides guidance for keeping the units in a safe shutdown condition, using the B.5.b pump for feeding the steam generators, while plant recovery is progressing. Should the strategies in EM 5.3 prove to be ineffective, the event scenario would be similar to that described in the December 21, 1995 ONS IPEEE Submittal Report:

- Once secondary side heat removal is lost, a potential failure of Reactor Coolant System (RCS) integrity can occur if an RCS safety relief valve fails to reseat after relieving liquid.
- IPEEE sequences involve a flood-induced failure of Secondary Side Decay Heat Removal (SSDHR), Reactor Coolant Pump (RCP) seal cooling, and High Pressure Injection (HPI). Neither the Auxiliary Service Water Pumps (Both Station & SSF) nor Reactor Coolant Makeup (RCM) pumps are available. The seal failures are assumed to produce the equivalent of a small-break LOCA leakage rate. The failure of both SSDHR and HPI leads to early core damage.

In this scenario, with the loss of the SSF and the inability of the B.5.b pump to cool the steam generators, the remaining credited defense-in-depth for the ONS units includes the reactor containment(s) and Oconee Severe Accident Guideline (OSAG). Additionally, other recovery actions will be directed by the Emergency Response Organization (ERO). In this scenario the dam is assumed to fail at time zero.

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[2] SSF flood wall height was extended to 803.5 ft MSL. (see commitments in Reference 2)

[3] Two additional B.5.b pumps are available to be sent to Oconee from Catawba and McGuire.

Attachment 1
In Place Measures that Address Postulated External Flood Threat Issues

Notification from Jocassee would occur before a total failure of the dam (manifestation of an impending dam failure would in all likelihood be exhibited days to weeks before the actual failure); however, for purposes of this timeline, notification is assumed to be at the same time the dam fails. Following notification from Jocassee, the reactor(s) are shutdown within approximately 1 hour. The predicted flood would reach ONS in approximately 3 hours following the failure initiation at Jocassee. At this time the SSF walls are overtopped. The SSF is assumed to fail, with no time delay, following the flood level exceeding the height of the extended SSF wall. The failure scenario results are predicted such that core damage occurs in about 8 to 9 hours following the dam break and containment failure in about 59 to 68 hours. When containment failure occurs, significant dose to the public would result.

The scenario description above does not acknowledge that the postulated flood arrives at the site and then recedes rather quickly. In the scenario above, ONS is no longer flooded approximately 10 hours following failure initiation at Jocassee. At this point, recovery actions can begin to mitigate the loss of AC power and thus extend the time to a potential containment breach.

As the situation evolves, OSAG guidance will be utilized to identify and implement appropriate strategies. The flood induced loss of AC power limits the success of mitigation strategies; however, the ERO will determine the best way to implement the appropriate strategies based on the given conditions. Duke Energy has an agreement with the Keowee Fire Department whereby they will respond to a request by Duke for firefighting resources for any condition at the Oconee site. Firefighting resources (pumps, hoses, etc.) are therefore available to augment B.5.b strategies.

Summary

As described herein, Jocassee is designed and constructed using the state of the art practice. The facility is designed to withstand a seismic event equal to or greater than the seismic design of ONS. The facility is designed to hold and pass a PMF event without overtopping the crest of the main dam.

The facility has a robust inspection and monitoring program that provides early detection capability of potential problems with the main dam. The project, from its inception, has had an extensive monitoring program that includes surveillance of observation wells, seepage monitoring points, and displacement monuments. As a FERC regulated facility, the project is subjected to periodic safety inspections by Duke Energy personnel, FERC representatives, and FERC approved independent consultants. The facility is staffed 24 hours a day 7 days week and is remotely monitored continuously from the Hydro Central Operating Center in Charlotte, NC.

The Jocassee Hydroelectric Project along with ONS have in place emergency procedures that would be used to mitigate the inundation of the ONS site following a postulated failure of the main dam at Jocassee. As demonstrated, even for the case when the extended SSF wall is overtopped and the B.5.b pump cannot be employed there remains substantial time following the event for plant recovery before failure of the ONS containments.

These attributes, taken collectively, provide an effective methodology to (1) minimize the likelihood of the failure of the Jocassee dam; (2) provide an early detection capability such that an impending failure could be prevented; and (3) mitigate the effect of the event at the ONS site should the main dam at Jocassee fail.

Attachment 2
Interim Commitments and Implementation Dates

PREVENTION / DETECTION	
Commitment	**Implementation Date**
Assign an Oconee engineer as Jocassee Dam contact to heighten awareness of Jocassee Dam status	February, 2010
Increase frequency of inspection and monitoring of the Jocassee Dam	February, 2010
Install ammeters and voltmeters on Keowee spillway gates for equipment condition monitoring	February, 2010
Provide additional forebay and tailrace level alarms for Jocassee (critical levels and/or rate-of-change) for timely detection of degrading conditions	May, 2010
Instrument and alarm selected seepage monitoring locations for timely detection of degrading conditions	August, 2010
Provide additional video monitoring of Jocassee Dam (e.g. dam toe, abutments, and groin areas) for timely assessment of degrading conditions	August, 2010

MITIGATION	
Commitment	**Implementation Date**
Review and improve Emergency Action Plans for response to events at Keowee and Jocassee Hydro Stations	February, 2010
Duke Energy Hydro Generation will create a guidance document to consolidate river management and storm management processes. (Includes the Jocassee Development and the Keowee Development)	February, 2010
Duke will reevaluate the external flood mitigation guidance completed in February of 2009 and incorporate current perspectives gained following the HEC-RAS sensitivity studies and the subsequent 2D inundation studies	March, 2010
Add equipment to provide third means of operating Jocassee spillway gates	April, 2010
Add a Storage Building at Jocassee Spillway to house the backup compressor and air wrench locally	May, 2010
Conduct Jocassee Dam failure drills with Oconee participation to exercise and improve response procedures	Table Top: June, 2010 Jocassee Hydro / Oconee ERO Drill: December, 2010
Obtain and stage a second set of equipment (including a B.5.b-type pump) for implementation of the external flood mitigation guidance	November, 2010

NOTE: The above commitments will remain in place during the corrective action period or longer, but may be revised, as appropriate, as final corrective actions are implemented.

Attachment 3
Discussion of Jocassee Risk Model

The ASME/ANS Standard, ASME/ANS RA-Sa-2009, entitled "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications" (endorsed by RG 1.200 Rev. 2) provides technical requirements and quality guidelines for performing and documenting a PRA external flood analysis. The standard does not require that any specific methodology be used but rather defines key elements that should be addressed and documented for the analysis. Broadly, the standard requires the following:

- The frequency of external flooding is based on site-specific hazard analysis that reflects recent available regional and site-specific information
- Uncertainties in the models and parameter values are properly accounted for and fully propagated to derive a mean hazard curve
- The hazard analysis addresses phenomena applicable to the site such as extreme river flooding (including upstream dam failures), lake flooding (including surges and wind-wave effects), ocean flooding, or tsunami flooding
- The plant-specific realistic susceptibility of failure is assessed for structures, systems, or components (or combination thereof) whose failure contributes to core damage or large early release

The Jocassee Risk Assessment will provide a detailed site-specific evaluation of the frequency and flooding effects of a postulated catastrophic dam failure, including uncertainty analysis of all important analysis parameters. The assessment includes a comprehensive evaluation of all potential non-seismic failure modes[4] and other important site-specific analysis such as local and regional hydrological data, Jocassee spillway gate and generating unit reliability, breach analysis, flood routing, and inundation pathways for plant equipment. The results of this study will provide the primary inputs for the updated external flood model for the Oconee PRA to provide CDF and LERF results. The incorporation of these analyses provides a risk analysis model that generally meets Capability Category III of the technical requirements of the ASME/ANS standard. When the industry guidance document for conducting peer reviews is complete, this additional review will be conducted as directed by the Standard.

This process ensures that the model will be of sufficient technical adequacy to be used by NRC and Duke for risk-informed decision making.

To perform the Jocassee Risk Assessment, Duke has employed RAC Engineers & Economists (RAC) of Providence, Utah. RAC has more than two decades of experience with applying dam safety risk assessment (RA) for decision-support purposes in North America, Australia and Europe. RAC has pioneered the state of the practice in this field for almost three decades and served as the principal consultants to the Bureau of Reclamation (Reclamation) during their transition to using RA in the mid-1990s. Currently, RAC is assisting Headquarters of the US Army Corps of Engineers (USACE) with the development and implementation of procedures, policies and methodology for RA and portfolio RA in a collaborative effort that includes Reclamation and the Federal Energy Regulatory Commission (FERC). In total, RAC has conducted RAs on more than 600 dams and is involved with the development and review of guidance documents for dam safety RA for owners, regulators and professional bodies in the US, Canada, Australia and England and for the International Commission on Large Dams (ICOLD). Duke selected RAC because of their extensive experience with a proven methodology that is very similar to the existing internal events PRA model methodology.

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[4] The potential for seismic failure of Jocassee dam has been addressed separately and incorporated in the Oconee Seismic PRA Analysis.