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SOUTHERN COMPANY
Energy to Serve Your World℠

July 3, 2007

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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555-0001

Joseph M. Farley Nuclear Plant – Unit 2
Extension Request for Completion of Corrective Actions
Associated with Generic Letter 2004-02

Ladies and Gentlemen:

By letter dated August 31, 2005, Southern Nuclear Operating Company (SNC) submitted a combined SNC response for Joseph M. Farley Nuclear Plant (FNP) and Vogtle Electric Generating Plant (VEGP) as required by NRC Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized Water Reactors." In this letter, SNC committed to the installation of the FNP Unit 1 and Unit 2 new post-LOCA containment sump recirculation screens, completion of required modifications, and implementation of required procedural changes by December 31, 2007.

SNC is fully committed to resolving GSI-191. Downstream effects evaluations of component operation require plant modifications that include some combination of new ECCS flow orifices and replacement of the high head safety injection throttle valves. To improve existing margins until all modifications can be implemented, SNC has installed new sump screens that increase the available screen area from approximately 50 sq. ft. to 878 sq. ft. for each of the RHR screens and from approximately 50 sq. ft. to 638 sq. ft. for the A-Train and to 433 sq. ft. for the B-Train of the Containment Spray screens, during the Unit 2 18th refueling outage (spring 2007). Required modifications to Unit 1, including modifications to mitigate downstream effects, are scheduled to be completed during the Unit 1 fall 2007 outage.

For the Unit 2 spring 2007 refueling outage, SNC designed and installed new flow restriction orifices in the high head safety injection lines to provide a greater drop in pressure thereby allowing the high head safety injection throttle valves to be more fully open thus ensuring that the flow gap in the valves was at least 110 % of the size of any openings in the new post-LOCA containment sump recirculation screens. The new orifices were installed during the FNP Unit 2 spring 2007 refueling outage and post-installation testing indicates that the orifices increased pressure drop as expected; however, the throttle valves were not opened as far

as predicted. Review of the design indicates that SNC had received incorrect flow performance valve data from the vendor who now owns the throttle valve product line. To correct the design, SNC plans to install new throttle valves with more desirable flow characteristics.

Considering the above, an extension to the completion schedule is respectfully requested for completion of the corrective actions required by Generic Letter 2004-02 for FNP Unit 2 from December 31, 2007 to the end of the fall 2008 refueling outage, which is scheduled to begin in October 2008. Enclosure 1 to this letter provides the basis for SNC's conclusion that it is acceptable to extend the completion of the corrective actions required by Generic Letter 2004-02 and an update of on-going activities and a clarification as to what activities are driving the extension request. SNC requests approval of the extension request by December 1, 2007.

Mr. L. M. Stinson, states he is a Vice President of Southern Nuclear Operating Company, is authorized to execute this oath on behalf of Southern Nuclear Operating Company and to the best of his knowledge and belief, the facts set forth in this letter are true.

The NRC commitments contained in this letter are provided as a table in Enclosure 2.

Respectfully submitted,

SOUTHERN NUCLEAR OPERATING COMPANY

L. M. Stinson

L. M. Stinson
Vice President Fleet Operations Support

Sworn to and subscribed before me this 3rd *day of* July *, 2007.*

Gail A. Hicks
Notary Public

My commission expires: July 5 2010

LMS/WAS/phr

Enclosures: 1. Basis for Proposed Extension Request
2. List of Regulatory Commitments

cc: Southern Nuclear Operating Company
Mr. J. T. Gasser, Executive Vice President
Mr. J. R. Johnson, Vice President – Farley
Mr. D. H. Jones, Vice President – Engineering
RTYPE: CFA04.054; LC# 14603

U. S. Nuclear Regulatory Commission
Dr. W. D. Travers, Regional Administrator
Ms. K. R. Cotton, NRR Project Manager – Farley
Mr. E. L. Crowe, Senior Resident Inspector – Farley

Alabama Department of Public Health
Dr. D. E. Williamson, State Health Officer

Joseph M. Farley Nuclear Plant – Unit 2
Extension Request for Completion of Corrective Actions
Associated with Generic Letter 2004-02

Enclosure 1

Basis for Proposed Extension Request

Joseph M. Farley Nuclear Plant – Unit 2
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Enclosure 1

Basis for Proposed Extension Request

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1.0 Background

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SNC is fully committed to resolving GSI-191. Downstream effects evaluations of component operation require plant modifications that include some combination of new ECCS flow orifices and replacement of the high head safety injection throttle valves. To improve existing margins until all modifications can be implemented, SNC has installed new sump screens that increase the available screen area from approximately 50 sq. ft. to 878 sq. ft. for each of the RHR screens and from approximately 50 sq. ft. to 638 sq. ft. for the A-Train and to 433 sq. ft. for the B-Train of the Containment Spray screens, during the Unit 2 18th refueling outage (spring 2007). Required modifications to Unit 1, including modifications to mitigate downstream effects, are scheduled to be completed during the Unit 1 fall 2007 outage.

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Generic Letter (GL) 2004-02 (Reference 1) required that addressees provide by September 1, 2005, a description of and implementation schedule for all corrective actions, including any plant modifications, that are identified while responding to the GL. The GL requested that all licensees complete actions related to the GL by December 31, 2007, or provide justification for continued operation until the actions are completed.

SNC believes it is prudent to defer the replacement of the throttle valves until the Unit 2 fall 2008 refueling outage. The scheduled start of U2R19 is currently October 11, 2008, approximately 10 months after the December 31, 2007 date specified in GL 2004-02 for completion of all corrective actions and modifications. An extension of that date for Unit 2 is therefore required. The following provides a basis for the proposed extension.

2.0 Justification for Proposed Extension

The NRC staff provided a justification for continued operation (JCO) in Reference 3 that justifies continued operation of pressurized water reactors through December 31, 2007. Elements of the JCO applicable to Unit 2 include:

- The FNP containments are compartmentalized making transport of debris to the sump difficult.
- FNP does not require switchover to recirculation from the sump during a large-break loss-of-coolant accident (LOCA) until 20 to 35 minutes after accident initiation, allowing time for much of the debris to settle in other places within containment.
- The probability of the initiating event (i.e., intermediate-break LOCAs) is extremely low.
- Leak-before-break (LBB) qualified piping is of sufficient toughness that it will most likely leak (even under safe shutdown earthquake conditions) rather than rupture. The current issue regarding primary water stress corrosion cracking (PWSCC) associated with pressurizer Alloy 600/82/182 dissimilar metal welds was addressed during the Unit 2 spring 2007 refueling outage by inspection and the use of weld overlay techniques on the pressurizer surge line nozzle. Additional inspections and mitigation by weld overlay techniques will be completed by the end of the Unit 2 spring refueling outage in 2010.
- SNC installed debris interceptors in the containment which will limit the amount of debris that reaches the screens.

These elements will remain valid during the extension period requested by this submittal.

3.0 Reason for the Request for Proposed Extension

FNP has performed analysis of downstream effects in accordance with WCAP 16406-P, "Evaluation of Downstream Sump Debris Effects in Support of GSI-191" and Nuclear Energy Institute (NEI) Document NEI 04-07, Revision 0, Dated December 2004, "Pressurized Water Reactor Sump Performance Evaluation Methodology." The following components were evaluated for wear and plugging:

- Residual Heat Removal (RHR) Pumps and Heat Exchangers
- Charging / High Head Safety Injection (HHSI) Pumps
- Containment Spray (CS) System Pumps and spray nozzles
- Flow Orifices
- Throttle Valves
- Instrumentation
- Check Valves
- Drain Lines
- Reactor fuel and vessel internals

The ECCS throttle valves were the only components, other than the refueling cavity drain covers, identified as being susceptible to debris plugging. The covers for the refueling cavity drains are now removed in Modes 1 through 4 to prevent the potential for plugging. Farley Unit 2, which has a refueling outage planned for the fall of 2008, was not successful in resolving the potential for throttle valve blockage during the Unit 2 spring 2007 refueling outage. A schedule has been developed which includes finalization of the design and procurement and installation of the modification in accordance with the fall 2008 refueling outage schedule. Required modifications, including modifications to mitigate downstream effects, to Unit 1 are scheduled to be completed during the fall 2007 outage.

The schedule for resolution of modifications to replace the Unit 2 ECCS throttle valves is detailed below.

4.0 Compliance with SECY-06-0078 Criteria

SECY-06-0078 (Reference 4) specifies two criteria for short duration GL 2004-02 extensions, limited to several months, and a third criterion for extensions beyond several months. These three criteria and SNC's responses are provided below.

4.1 SECY-06-0078 Criterion No. 1:

The licensee has a plant-specific technical/experimental plan with milestones and schedule to address outstanding technical issues with enough margin to account for uncertainties.

SNC Response

The ECCS throttle valves require careful setup and testing prior to declaring the system operable. The installed valves must be able to pass a particle size (plus margin) that could be passed by the new ECCS sump screens (i.e., the screen hole size is being reduced from 1/8" to 3/32"). Additionally, the valves must be able to throttle and balance injection flows to maintain safety system operability. The clearance associated with the current Farley ECCS High Head Safety Injection Throttle Valves position has been found to be susceptible to debris plugging. Several alternatives were evaluated to resolve this issue including:

- Change the orifice size upstream of throttle valves so that valves can be opened farther - this was completed during the Unit 2 spring 2007 refueling outage and, although the pressure differential across the orifices was increased to allow for the throttle valves to be more fully open, the resulting clearance did not meet the requirement of 110 % of the size of any openings in the new post-LOCA containment sump recirculation screens.

- Replace installed valve trim and eliminate/modify orifices - this is not desired because of very long lead times or inability to acquire valve trim. Further branch line orifice reduction is limited due to the potential for cavitation at the orifice.

- Add a new ECCS breakdown orifice to the Charging system – this is not desired due to the impact of the orifices on normal charging, seal injection, and branch line spillage margin.

- Replace the High Head Safety Injection throttle valves with new valves having a smaller, documented flow coefficient range with enhanced adjustment capability - this is the desired solution. The following items were considered in selecting this option:

  1. The existing valves are obsolete. Replacement valves and valve parts are difficult to obtain. Valves of the same design would not meet the requirements.

  2. The existing valves lack the fine-tuning adjustment capability of currently available valves for this application.

  3. Documentation related to the actual flow characteristics of the existing valves is unobtainable.

As a result of the Unit 2 experience with replacement of the flow orifices, new valves will be procured for the Unit 1 fall outage. Work on the design change for Unit 2 will begin after the Unit 1 outage to incorporate lessons learned from the Unit 1 replacement. SNC has evaluated the alternatives to develop a design change and procure parts for the planned modifications and the lowest risk option to the ECCS system is estimated to take 39 weeks from November 2, 2007.

	Schedule	Date
Develop Design Change	25 weeks	4/25/08
Procure Parts for installation	14 weeks	8/1/08
Total	39 weeks	Early August 2008

The above schedule allows sufficient time to incorporate any lessons learned from the Unit 1 valve installation and thus represents the lowest risk for an adverse impact on the Unit 2 ECCS design. The Unit 2 spring 2007 outage schedule included contingencies for replacement of orifices, but replacement of the valves was not anticipated prior to the outage and could not be supported during the spring 2007 refueling outage for Farley Unit 2 due to the

late discovery of the erroneous design data as a result of post-installation testing. However, there is ample time to support installation in the fall 2008 refueling outage. The extension requested would support the design change development and parts procurement prior to installation with sufficient margin to account for uncertainties. Required modifications, including modifications to mitigate downstream effects, to Unit 1 are scheduled to be completed during the fall 2007 outage.

Based on the above discussion, SNC meets the requirements of SECY-06-0078 Criterion No. 1.

4.2 SECY-06-0078 Criterion No. 2:

The licensee identifies mitigative measures to be put in place prior to December 31, 2007, and adequately describes how these mitigative measures will minimize the risk of degraded ECCS [emergency core cooling system] and CSS [containment spray system] functions during the extension period.

SNC Response

The following mitigative measures have already been implemented to minimize the risk of degraded ECCS and CSS functions during the extension period.

4.2.1 Mitigative Measures

Farley is continuing efforts to complete the corrective actions committed to in the August 31, 2005 GL 2004-02 response. Farley is currently on schedule to install new sump screens and debris interceptors for both units by December 31, 2007. The schedule is as follows:

- Farley Unit 2 (spring 2007) - Complete
- Farley Unit 1 (fall 2007)

In support of this extension, SNC notes that the following favorable conditions exist at FNP:

- Procedural guidance exists regarding containment foreign material exclusion (FME) controls.
- Bulletin 2003-01 training and procedural guidance to expedite plant cooldown in response to a small break LOCA.
- Insulation inside containment that is affected during a LOCA event is mostly Reflective Metal Insulation (RMI) with very little fiber.
- Application of the leak-before-break analysis principle has been approved by the NRC Staff for FNP in relation to breaks in the

reactor coolant loop primary piping and pressurizer surge line piping.

- The design basis NPSH analysis for the CS System pumps and the RHR pumps do not credit containment overpressure.

4.2.2 New Screen Installation

FNP has installed new sump screens that increase the available screen area from approximately 50 sq. ft. to 878 sq. ft. for each of the RHR screens and from approximately 50 sq. ft. to 638 sq. ft. for the A-Train and to 433 sq. ft. for the B-Train of the Containment Spray screens, during the Unit 2 spring 2007 refueling outage to improve existing margins until the final design can be implemented. The Unit 1 screens will be installed during the fall 2007 refueling outage.

4.2.3 Debris Generation

Debris generation analysis has been completed. Insulation inside containment that is affected during a LOCA event is mostly Reflective Metal Insulation (RMI) with very little fiber. A walkdown of containment has been performed and the amount of latent debris is very small. The qualified coatings in containment are in good condition. Periodic condition assessments are performed and as localized areas of degradation are identified, those areas are evaluated and scheduled for repair or replacement as necessary. These periodic condition assessments, and the resulting repair/replacement activities ensure that the amount of coatings that may be susceptible to detachment from the substrate during a LOCA event is minimized.

4.2.4 Leak-Before-Break (LBB)

Postulated breaks in the reactor coolant loop (RCL) and the pressurizer surge line have been eliminated for both Unit 1 and Unit 2 by application of leak-before-break technology.

While leak-before-break is not being used to establish the design basis debris load on the new sump screens, the use of LBB would result in a substantial reduction in the zone of influence, and thus a significant reduction in the postulated debris generation, loading on the sump screens, and potential clogging of the throttle valves. With the installation of the additional sump screen area, the possibility of screen clogging due to debris is greatly reduced. With a smaller screen opening size, the potential of debris passing through the screens capable of clogging the throttle valves is reduced. Therefore, the operation of Unit 2 until the fall 2008 refueling outage is acceptable.

4.2.5 Containment Floor Configuration

Heavy particles are impeded from reaching the sumps because the new screens are mounted approximately four inches above the containment floor. This facilitates settling of debris on the floor prior to reaching the sump area. This raised mounting would allow accumulation of debris below the screen inlet levels and the possibility of sump screen clogging is reduced. In addition, debris interceptors have been installed to limit the amount of debris reaching the screens.

4.2.6 Zone-Of-Influence Reduction for Qualified Coatings

FNP is currently applying a reduction in the Zone-Of-Influence for Qualified Coatings in accordance with WCAP-16568, "Jet Impingement Testing to Determine the Zone of Influence (ZOI) for DBA-Qualified / Acceptable Coatings." This has resulted in a lower particulate loading on the sump screens, allowing for additional margin. In addition, reduction of the ZOI results in less overall debris generation, reducing the potential of high head safety injection throttle valves.

4.2.7 Emergency Containment Coolers

Safety-related emergency containment coolers can supplement containment heat removal capability if spray flow is degraded.

4.2.8 Procedure Guidance, Training and Actions

By letter dated August 7, 2003, SNC responded to NRC Bulletin 2003-01, "Potential Impact Of Debris Blockage On Emergency Sump Recirculation At Pressurized Water Reactors." SNC's letter stated that Farley had implemented the following interim compensatory measures:

(1) training on monitoring of indications of and responses to sump clogging; enhancement of ECCS logs to provide additional detail concerning the recognition and response to ECCS sump suction screen fouling; new training materials and job performance measures addressing the need for long-term monitoring of the recirculation phase; how to recognize that sump blockage is taking place; and actions to be taken if blockage is encountered.

(2) guidance to reduce depletion of the RWST and initiate makeup to the RWST from normal and alternate sources during efforts to restore normal ECCS flowpaths.

(3) containment exit inspections with logged material accounting procedures, and comparable controls for emergency entries into containment; and post-outage ECCS recirculation sump cleanliness and material control procedures to ensure the sumps are free of debris (trash, rags, protective clothing, etc.).

(4) post-refueling and heat-up procedures to inspect that reactor cavity drains are properly restored with their blind flanges removed.

(5) inspections to ensure ECCS subsystem inlets are not restricted by debris and sump components (trash racks, screens, etc.) show no evidence of abnormal corrosion or structural distress, and that the sump screens are correctly configured.

The above measures will continue in effect until such time that all evaluations and all required plant modifications are complete.

4.2.9 Containment Cleanliness

A containment exit inspection procedure is implemented after every containment entry and during each refueling outage, prior to entering Mode 4 from Mode 5 and establishing containment integrity. The primary purpose of this procedure is to ensure compliance with the Farley Technical Requirements Manual by verifying that no loose debris (rags, trash, clothing, etc.) is present in the Containment Building which could be transported to the emergency sump and cause restriction of ECCS pump suctions during LOCA conditions.

In addition to the Operations Department procedure described above, a post maintenance containment inspection procedure establishes comparable controls for ensuring emergency sump cleanliness and integrity for containment entries in Modes 1 through 4. When in Modes 1-4, the procedure also requires that any material taken into containment be logged in and the disposition of each item recorded (e.g., installed).

Based on the above discussion, SNC meets the requirements of SECY-06-0078 Criterion No. 2.

4.3 SECY-06-0078 Criterion No. 3:

For proposed extensions beyond several months, a licensee's request will more likely be accepted if the proposed mitigative measures include temporary physical improvements to the ECCS sump or materials inside containment to better ensure a high level of ECCS sump performance.

SNC Response

FNP has installed new sump screens that increase the available screen area from approximately 50 sq. ft. to 878 sq. ft. for each of the RHR screens and from approximately 50 sq. ft. to 638 sq. ft. for the A-Train and to 433 sq. ft. for the B-Train of the Containment Spray screens, during the Unit 2 spring 2007 refueling outage to improve existing margins until the final design can be implemented. The Unit 1 screens will be installed during the fall 2007 refueling outage. In addition, SNC has implemented other physical improvements that include installation of orifices drain lines that drain to the

reactor cavity containment sump and installation of debris interceptors. Specific modifications include:

- Installation of new replacement sump screens for each pump suction. The new sump screens are relatively large, 878 sq. ft. for each of the RHR screens and 638 sq. ft. for the A-Train and 433 sq. ft. for the B-Train of the Containment Spray screens;

- New screen mesh size is smaller than original (3/32" versus 1/8" originally).

- Addition of four approximately 30-inch high perforated plate debris interceptors in doorways in the biological shield wall and between the biological shield wall and the Containment wall.

- Changes to the containment drain piping system have been made to ensure proper sump level is achieved during the recirculation mode of a design basis accident response. These changes consist of installation of orifices in two separate drain lines that drain to the reactor cavity containment sump. This will limit the loss of sump inventory to the reactor cavity during the early stages of a design basis LOCA.

- New orifices were installed in the High Head Safety Injection lines to increase the pressure differential across the orifices to allow for the High Head Safety Injection throttle valves to be more fully open.

Based on the above discussion, SNC meets the requirements of SECY-06-0078 Criterion No. 3.

5.0 Risk Assessment

In response to a LOCA, the RHR and Charging (HHSI) pumps automatically start upon receipt of a safety injection signal. These pumps inject to the reactor coolant system (RCS) cold legs, taking suction from the refueling water storage tank (RWST). This system line-up is referred to as the ECCS Injection phase. The Containment Spray (CS) pumps start automatically when the containment pressure reaches the setpoint for CS actuation; the CS pumps also take suction from the RWST. The switchover to the ECCS recirculation sumps as suction source to the RHR pumps is manually initiated when the RWST water level decreases to 12.5 feet. After the ECCS recirculation line-up is established, the RHR pumps continue to inject to the RCS cold legs and also supply water to the suction of the Charging pumps. The Charging pumps continue to inject to the RCS cold legs. This line-up is referred to as ECCS cold leg recirculation. At 7.5 hours into the event, the ECCS line-up is modified for simultaneous cold and hot leg recirculation. The RHR pumps supply the suction to the Charging pumps and the RHR and Charging pumps simultaneously inject to the RCS cold and hot legs (in some combinations). The CS pumps (if running) continue to take suction from

the RWST until the suction source is manually switched over to the ECCS recirculation sumps when the RWST water level decreases to 4.5 feet.

The ECCS throttle valves subject to potential plugging due to downstream effects during ECCS recirculation are located on the High Head Safety Injection Lines to the RCS cold legs and hot legs. Throttle valves are not installed in the discharge lines from the RHR pumps to the RCS cold legs and hot legs.

5.1 ECCS Throttle Valve Risk Implications

The additional 10 months of operation (based on the current FNP outage schedule) with the existing ECCS throttle valves in place represents a very small increase in incremental risk. All of the sump screen replacement modifications have been completed for FNP Unit 2. Therefore, the ECCS and CS System recirculation capability has been enhanced. The new sump screens have a smaller mesh size (3/32" versus 1/8" originally) which limits the potential for plugging of the ECCS throttle valves. In addition, the installation of new orifices in the ECCS High Head Safety Injection lines has increased the pressure differential across the orifices to allow for the throttle valves to be more fully open. Therefore, the risk associated with the potential for debris to be transported into the Charging system during the recirculation mode of ECCS operation has been reduced by the completed modifications.

Quantification of the risk associated with such throttle valve plugging is very difficult because of the difficulties in estimating the likelihood of the debris being transported to and significantly plugging the high pressure injection throttle valves (down stream debris will likely consist of coating particles and latent debris); however, it was qualitatively determined that the risk associated with plugging of the high pressure injection throttle valves would be very low due to the following reasons:

- The LOCAs most likely to transport the debris to the ECCS sumps are:

  (a) Large LOCAs due to the large ZOI they present, and
  (b) LOCAs in which the CS (Containment Spray) system actuated and provided an additional generation and transport mechanism.

- According to the FNP PRA success criteria, high pressure injection and recirculation are not required for Large LOCA (break size > 6 inch in diameter) because accumulator injection, low pressure injection and recirculation by 1 RHR pump can prevent core damage. Thus, for a Large LOCA, plugging of high pressure injection throttle valves during ECCS recirculation would not increase the risk of core damage. Long-term boron precipitation concerns can be mitigated by alternating low head recirculation flow between the hot leg injection path and cold leg injection path if the high-head hot leg injection path becomes plugged

during simultaneous cold and hot leg recirculation due to downstream debris effects.

- The only LOCAs requiring Charging pumps to operate and provide core cooling while in recirculation from the ECCS sump are LOCAs from smaller sizes. These smaller LOCAs deplete the inventory in the RWST and do not cause depressurization of the RCS to a pressure below the shutoff head of RHR pumps. However, these smaller LOCAs also do not require entry into the ECCS recirculation mode of operation until several hours into the event allowing additional time for settling of debris in the containment sump.

- For a Small LOCA (3/8 inch ≤ equivalent diameter < 2 inch), high pressure injection by 1 of 3 Charging Pumps is required during the ECCS injection phase. However, high pressure recirculation would not be required unless RCS cooldown and depressurization to allow alignment of normal shutdown cooling per FNP Emergency Operating Procedure (EOP) FNP-2-ESP-1.2 failed. If RCS cooldown and depressurization are successful, core cooling can be provided by either shutdown cooling operation or low pressure recirculation (if shutdown cooling can not be established) using 1 RHR pump. Therefore, there is a low probability that high pressure recirculation would be required in a Small LOCA.

- Per NUREG/CR-6916, Hydraulic Transport of Coating Debris, it is determined that coating chips will not likely transport at velocities below 0.2 ft/sec. Therefore, a Small LOCA is not likely to generate large amounts of debris or transport the debris that is generated to the sump which could cause plugging of high pressure injection throttle valves unless containment spray actuated. Containment Spray actuation during a Small LOCA is not likely as long as at least 1 of 4 Containment Cooling Units are operable. FNP utilizes 2 safety-related containment cooling trains with 2 coolers per train. Thus, it is very unlikely that CS spray would actuate during a Small LOCA. Even if containment spray is actuated, as explained above, high pressure recirculation is not required unless cooldown and depressurization fails.

Therefore, consideration of Large and Small LOCAs were screened from the quantitative assessment of the risks associated with the extension of the time to resolve potential plugging of the ECCS throttle valves due to downstream effects during ECCS recirculation.

The Medium LOCA category as defined for the Farley PRA covers breaks in the range of 2 inch to 6 inch equivalent diameter. Breaks at the lower end of this range would be expected to behave similarly to a Small LOCA. Therefore, at the lower end of the medium LOCA range, High Head ECCS recirculation flow would only be required if operator action to establish normal shutdown cooling fails. Breaks at the upper end of the Medium LOCA range would behave similarly to a Large LOCA and would result in RCS pressure

falling below the shutoff head of the low pressure injection system without the need for operator action. There is the potential that breaks in the middle of the Medium LOCA range could result in high RCS pressure at the time ECCS recirculation alignment is required. However, the assumption used in the following quantitative risk assessment that plugging of the High Head ECCS throttle valves will be guaranteed to occur for a Medium LOCA is believed to be conservative for the following reasons:

- The Medium LOCA success criteria for high pressure cold leg recirculation in the Farley PRA model is for 1 Charging pump to inject into 2 of 3 cold legs. There are two train-related flow paths available for high head cold leg recirculation. Each of these flow paths provides injection into each of the 3 loops through separate lines, each equipped with a flow orifice and throttle valve. This diversity and redundancy of these flowpaths should allow for decreased risk due to total plugging.

- Westinghouse was requested to perform analysis of system behavior for breaks smaller than 6 inch diameter using a Farley NOTRUMP model. The results of the evaluation show that for a 6 inch equivalent break size or less, the RCS will depressurize, either on its own accord or by operator action, to RHR system cut-in pressure (155 psia) before the minimum deliverable volume of the RWST is exhausted. Since the RHR system can deliver flow at this pressure or less, the charging system would not be required for core cooling if and when the ECCS is in a sump recirculation mode (cold or hot leg recirc). Therefore, based on the assumptions listed above, it can be concluded that for Medium LOCAs, the charging system is not required at the Farley units during ECCS cold or hot leg recirculation unless RCS cooldown and depressurization to bring the RCS to the shutdown cooling entry condition per FNP Emergency Operating Procedure (EOP) FNP-2-ESP-1.2, "Post LOCA Cooldown and Depressurization," failed. However, this calculation assumes that all Containment Fan Coolers are operating. Since the Farley PRA model does not assess operation of the Containment Fan Coolers as a primary function for Medium LOCA, it is conservatively assumed that Containment Spray could actuate for all Medium LOCAs, creating a risk of High Head throttle valve plugging

- No credit is taken for the reduction in the amount of debris available for transportation to sump due to debris settlement during the injection phase of a Medium LOCA event. For breaks at the upper end of the Medium LOCA range, the injection phase takes about 20 to 35 minutes. During this phase there is no recirculation flow, and therefore, no RHR suction to assist in the transport of the debris to the sump screen. A significant amount of debris is expected to settle before the initiation of recirculation. For breaks at the lower end of the Medium LOCA range, the available time for debris settlement would extend to several hours.

In summary, the risk associated with the plugging of the high pressure injection throttle valves due to transported debris would be very low for the upper end of the range of Medium LOCAs because the RCS would depressurize below the shutoff head of the low head system prior to initiation of ECCS recirculation. Breaks at the lower end of the range of Medium LOCAs would create a low risk of high head throttle valve plugging due to the time available for operator action to cool and depressurize the RCS to establish either shutdown cooling operation or low pressure recirculation (if shutdown cooling can not be established) using 1 RHR pump. However, because there is some possibility that a Medium LOCA could occur for which the RCS would not depressurize below the shutoff head of the low head injection system prior to the need for ECCS recirculation, it is assumed that there is an increased risk associated with any Medium LOCA for the extended period required to meet the requirements of GL 2004-02 with respect to downstream effects. A quantitative probabilistic risk assessment (PRA) was performed by SNC (Reference 5) that specifically assessed the impact of extending the time for meeting GL 2004-02 requirements for Unit 2 for 10 additional months of operation. Based on the above analysis, this quantitative assessment was limited to addressing the risk increase due to Medium LOCA assuming that ECCS high head recirculation flow to the cold legs and hot legs would be unavailable.

The PRA reflects the same conservative assumptions as the prescriptive analysis, with respect to debris generation and debris transport. Additionally, no credit is taken for actions taken in response to NRC Bulletin 2003-01 that could mitigate sump blockage.

This assessment estimates that the increase in core damage frequency (CDF) due to a Medium LOCA during the 10-month extension of the time to meet the GL 2004-02 requirements is 1.5E-7 per year, which is less than the 1 E-6 per year acceptance limit in Regulatory Guide (RG) 1.174 (Reference 6). The large early release frequency (LERF) risk increase is 2.3E-10 per year, which is less than the 1 E-7 per year RG 1.174 acceptance limit. Therefore, the calculated increases of CDF and LERF are very small, as defined by the RG 1.174 acceptance limits.

6.0 Conclusion

An extension of the Unit 2 date for completing all corrective actions and modifications required by GL 2004-02 until the end of the Unit 2 fall 2008 refueling outage is acceptable because:

- There is a low probability of the initiating event (i.e., Medium LOCA) during the period prior to the Unit 2 fall 2008 outage. The 10-month extension of Unit 2 operation results in PRA calculated increases of CDF and LERF that are very small as defined by RG 1.174.

- SNC has completed significant actions, including extensive analysis and has implemented physical improvements (including a larger new sump screens), to better ensure a high level of sump performance.

- SNC currently has implemented mitigative measures to minimize the risk of degraded ECCS/CSS functions during the extension period.

- SNC has a plant-specific plan with milestones and schedule to address outstanding technical issues with enough margin to account for uncertainties.

- The current issue regarding PWSCC associated with pressurizer Alloy 600/82/182 dissimilar metal welds was addressed during the Unit 2 spring 2007 refueling outage by inspection and the use of weld overlay techniques on the pressurizer surge line nozzle. Additional inspections and mitigation by weld overlay techniques will be completed by the end of the Unit 2 spring refueling outage in 2010.

SNC's request for extension to the completion schedule for downstream effects related modifications is needed to support identified procurement and installation of Unit 2 ECCS throttle valves. Per the criteria listed in SECY 06-0078, SNC has established a plant-specific plan with milestones and schedules to address outstanding technical issues with enough margin to account for uncertainties. Additionally, SNC has identified mitigative measures which have been put in place and adequately described how these mitigative measures will minimize the risk of degraded ECCS functions during the extension period.

7.0 References

1. NRC Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," dated September 13, 2004

2. Nuclear Energy Institute (NEI) 04-07, Volume 1, "Pressurized Water Reactor Sump Performance Methodology," and NEI 04-07, Volume 2, "Safety Evaluation by the Office of Nuclear Reactor Regulation Related to NRC Generic Letter 2004-02," Revision 0, dated December 2004

3. Summary of July 26-27, 2001, Meeting with Nuclear Energy Institute and Industry on ECCS Strainer Blockage in PWRs, dated August 14, 2001

4. SECY-06-0078, from L. A. Reyes, NRC Executive Director for Operations, to NRC Commissioners, "Status of Resolution of GSI-191, 'Assessment of [Effect of] Debris Accumulation on PWR [Pressurized Water Reactor] Sump Performance,"' dated March 31, 2006

5. SNC Probabilistic Risk Assessment Calculation File No. RBA 07-003-F

6. Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," dated July 1998

7. WCAP-12825, "Technical Justification for Eliminating Large primary Loop Pipe Rupture as the structural Design basis for the Joseph M. Farley Units 1 and 2 Nuclear Power Plants," January 1991

8. Nuclear Regulatory Commission Docket #'s 50-348 and 50-364 Letter from Stephen T. Hoffman, Project manager Project Directorate 11-1 Division of Reactor projects 1/11 Office of Nuclear Reactor Regulation, to W. G. Hairston III, Senior Vice President Alabama Power Company, dated August 12, 1991

Joseph M. Farley Nuclear Plant – Unit 2
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Enclosure 2

List of Regulatory Commitments

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Enclosure 2

List of Regulatory Commitments

The following table identifies those actions committed to by SNC in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments.

Regulatory Commitments	Due Date / Event
FNP Unit 2 will be in compliance with the regulatory requirements listed in the Applicable Regulatory Requirements section of GL 2004-02.	On completion of the Unit 2 Nineteenth Refueling Outage scheduled for the Fall of 2008.