L. M. Stinson (Mike)
Vice President

Southern Nuclear Operating Company, Inc.
40 Inverness Center Parkway
Post Office Box 1295
Birmingham, Alabama 35201

Tel 205.992.5181
Fax 205.992.0341

SOUTHERN COMPANY
Energy to Serve Your World℠

May 18, 2006

NL-06-0739

Docket Nos.: 50-424
50-425

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

Vogtle Electric Generating Plant
Request for Relaxation
of the First Revised NRC Order (EA-03-009) Establishing Interim Inspection
Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors

Ladies and Gentlemen:

In accordance with the requirements of Section IV.F of the February 20, 2004 Commission First Revised Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors, Southern Nuclear Operating Company (SNC) requests relaxation of an inspection coverage requirement for specific penetration nozzles at Vogtle Electric Generating Plant, Units 1 and 2, as described in the enclosure. This request for relaxation is being transmitted to the Commission for filing pursuant to 10 CFR 50.4.

Please note that the previously granted relaxation request regarding extent of coverage for the bare metal visual examination of the reactor pressure vessel head (RPVH) submitted by SNC letter NL-04-0363 dated March 8, 2004, as supplemented by SNC letter NL-05-0990 dated July 1, 2005, remains in effect.

Southern Nuclear Operating Company requests approval of the requested relaxations by August 1, 2006 in order to support the Vogtle Unit 1 and Unit 2 refueling outages that are currently scheduled to begin September 17, 2006, and March 4, 2007, respectively.

This letter contains no new NRC commitments. If you have any questions, please advise.

Sincerely,

L. M. Stinson

LMS/LPH/sdl

Enclosure: NRC First Revised Order EA-03-009, Relaxation Request for Inspection of the Reactor Pressure Vessel Heads, Vogtle Electric Generating Plant

cc: Southern Nuclear Operating Company
Mr. J. T. Gasser, Executive Vice President
Mr. T. E. Tynan, General Manager – Plant Vogtle
RType: CVC7000

U. S. Nuclear Regulatory Commission
Dr. W. D. Travers, Regional Administrator
Mr. C. Gratton, NRR Project Manager – Vogtle
Mr. G. J. McCoy, Senior Resident Inspector – Vogtle

ENCLOSURE

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
Southern Nuclear Operating Company	)	Docket Nos. 50-424 50-425
	)	License Nos. NPF-68 NPF-81
Vogtle Electric Generating Plant	)	EA-03-009
	)	

NRC FIRST REVISED ORDER EA-03-009
RELAXATION REQUEST FOR
INSPECTION OF THE REACTOR PRESSURE VESSEL HEADS
VOGTLE ELECTRIC GENERATING PLANT

On February 20, 2004, the Nuclear Regulatory Commission ("NRC" or "Commission") issued an order in the captioned matter entitled First Revised Order Modifying Licenses ("Revised Order") to Southern Nuclear Operating Company (SNC) in connection with the Vogtle Electric Generating Plant. The Revised Order supersedes the original NRC Order Modifying Licenses (Effective Immediately), dated February 11, 2003 ("Original Order"). The Original Order was issued as a result of the discovery of leaks and nozzle cracking at the Davis-Besse Nuclear Power Station and other pressurized water reactor (PWR) plants, after which the Commission determined that the performance of more effective inspections of the reactor pressure vessel heads (RPVHs) and associated penetrations are necessary. Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) , which is incorporated into NRC regulations by 10 CFR 50.55a, "Codes and Standards," currently specifies that inspections of the RPVH need only include a visual examination of the insulated surface or surrounding area for signs of leakage. Based on recent experience, the Commission determined that such inspections are not sufficient to reliably detect circumferential cracking of RPVH nozzles and corrosion of the RPVH. Circumferential cracking of the RPVH nozzles and corrosion of the RPVH pose a safety concern because of the possibility of a nozzle ejection or loss-of-coolant accident if the conditions are not detected and repaired. Therefore, the NRC Original Order established interim requirements in Section IV to ensure that licensees implement and maintain appropriate measures to inspect and, as necessary, repair RPVHs and associated penetrations. Since issuance of the Original Order, many requests for relaxation have been

reviewed and granted by the NRC staff. Several common issues emerged from these requests prompting revision of certain inspection aspects of the Original Order. Consequently, the Revised Order includes revisions to Section IV addressing bare metal visual inspections, penetration nozzle inspection coverage, flexibility in combination of non-destructive examination methods, flaw evaluation, and requirements for plants which have replaced their RPVH.

The requirements of Section IV were effective and final 20 days from the date of the Revised Order, absent any request for a hearing or written approval of an extension of time in which to request a hearing. Accordingly, pursuant to 10 CFR 2.202(d), SNC consented to the Revised Order, subject to a SNC request for relaxation with regard to paragraph IV.C.(5)(a). Paragraph IV.C.(5)(a) requires bare metal visual examination of 100% of the RPVH surface (including 360° around each RPVH penetration nozzle). The request for relaxation was granted by the NRC on September 17, 2005. In addition, to the previously granted request for relaxation, SNC hereby submits a request for relaxation of the condition described below, as provided for by Section IV, paragraph F.

Request For Relaxation From Requirements IV.C.(5)(b)(i), (ii), and (iii):

Pursuant to Section IV.F of the Revised Order, SNC is required to seek relaxation of any conditions of the Revised Order with respect to any proposed deviations or alternatives to the inspection requirements with which SNC is unable to comply or as to which compliance is unnecessary. A request for relaxation regarding inspection of specific nozzles is required to address the following criteria:

(1) The proposed alternative(s) for inspection of specific nozzles will provide an acceptable level of quality and safety, or

(2) Compliance with this Order for specific nozzles would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The Revised Order requires inspections of the RPVH and its penetration nozzles by means of the techniques specified in Section IV, paragraph C. Relaxation is sought for the Vogtle Electric Generating

Plant from the examination coverage requirements for the nonvisual NDE specified in Section IV.C.(5)(b)(i), (ii), and (iii) of the RPVH penetration nozzles from 2 inches above the J-groove weld to:

- 2 inches below the lowest point at the toe of the J-groove weld (or the bottom of the nozzle if less than 2 inches) OR,
- 1.0-inch below the lowest point at the toe of the J-groove weld and including all RPVH penetration nozzle surfaces below the lowest point at the J-groove weld that have an operating stress level of 20 ksi tension and greater.

Specifically, for those penetration nozzles for which the requirements of the Order can not be met, the relaxation requested would change the examination distance to 2 inches above the J-groove weld down to the lowest elevation that can be practically examined on each nozzle with the ultrasonic testing (UT) or eddy-current testing (ET) probe that is used. It is the intent of SNC to perform UT or ET to the extent necessary to comply with the Order. However, where that cannot be achieved, examinations will be performed to the maximum extent possible with existing examination equipment.

Proposed Alternative:

Southern Nuclear Operating Company proposes to perform UT examination from the inside surface of each RPVH penetration nozzle (i.e., nozzle base material) from 2 inches above the J-groove weld and extending down the nozzle below the toe of the J-groove weld to the extent required to comply with the Order or, where limitations exist, to the extent allowed by geometry and available examination equipment. SNC may choose to perform ET of the wetted surface excluding any threaded surfaces, chamfered regions, or regions having a radius in selected nozzles in lieu of performing UT.

For those penetrations where inspection coverage does not meet the requirements of the Order, SNC proposes that the minimum required inspection coverage below the lowest point at the toe of the J-groove weld be based on stress analysis and crack growth evaluations. A stress analysis and a crack growth evaluation were performed for the Vogtle RPVH penetration nozzles. Five bounding nozzle

angles were analyzed. The results of these analyses are reflected in the enclosed table and are described below:

1. For penetration nozzles numbered 1 through 21 the bounding nozzle angle analyzed was 0.0°. This bounding analysis is applicable to penetrations with nozzle angles at 0.0°, 11.4°, 16.2°, 18.2°, 23.3°, and 24.8°. The analysis concluded if examination coverage of 0.55 inches is achieved below the lowest point at the toe of the J-groove weld for these penetrations, the upper crack tip of any undetected axial through-wall flaw in the region not being inspected will not reach the toe of the J-groove weld in less than 7.1 Effective Full Power Years (EFPY).
2. For penetration nozzles numbered 22 through 61 the bounding nozzle angle analyzed was 26.2°. This bounding analysis is applicable to penetrations with nozzle angles at 26.2°, 30.2°, 33.9°, 35.1°, 36.3°, and 38.6°. The analysis concluded if examination coverage of 0.50 inches is achieved below the lowest point at the J-groove weld for these penetrations, the upper crack tip of any undetected axial through-wall flaw in the region not being inspected will not reach the toe of the J-groove weld in less than 7.4 EFPY.
3. For penetration nozzles numbered 62 through 65 the nozzle angle analyzed was 44.3° which is the nozzle angle for these penetrations. The analysis concluded if examination coverage of 0.35 inches is achieved below the lowest point at the toe of the J-groove weld for these penetrations, the upper crack tip of any undetected axial through-wall flaw in the region not being inspected will not reach the toe of the J-groove weld in less than 7.4 EFPY.
4. For penetration nozzles numbered 66 through 73 the nozzle angle analyzed was 45.4° which is the nozzle angle for these penetrations. The analysis concluded if examination coverage of 0.35 inches is achieved below the lowest point at the toe of the J-groove weld for these penetrations, the upper crack tip of any undetected axial through-wall flaw in the region not being inspected will not reach the toe of the J-groove weld in less than 8.8 EFPY.

5. For penetration nozzles numbered 74 through 78 the nozzle angle analyzed was 48.7° which is the nozzle angle for these penetrations. The analysis concluded if examination coverage of 0.25 inches is achieved below the lowest point at the toe of the J-groove weld for these penetrations, the upper crack tip of any undetected axial through-wall flaw in the region not being inspected will not reach the toe of the J-groove weld in less than 9.2 EFPY.

To summarize, SNC proposes that, for each RPVH penetration nozzle whereby compliance with the Order can not be met due to limitations inherent with component geometry and available inspection equipment, the minimum inspection coverage required by the stress analysis and crack growth evaluation for a service time of at least 6 EFPY be approved as an acceptable alternative to the requirements of the Order. This alternative requires examining the base metal material below the lowest point at the toe of the J-groove weld to:

1. 0.55 inches for penetrations 1 through 21,
2. 0.50 inches for penetrations 22 through 61,
3. 0.35 inches for penetrations 62 through 65,
4. 0.35 inches for penetrations 66 through 73, and
5. 0.25 inches for penetrations 74 through 78.

Discussion of Proposed Alternative and Consideration of Criteria:

The design configurations at the bottom of the Vogtle RPVH penetration nozzles include threaded sections, chamfered regions, and regions having a radius. The dimensional configuration at some nozzles is such that the inspectable distance from the lowest point at the toe of the J-groove weld to the bottom of the scanned region is less than the 1-inch lower boundary limit specified in Section IV.C.5(b) of NRC First Revised Order EA-03-009. SNC will maximize coverage using currently available inspection technology to comply with the subject order to the extent practical.

Ultrasonic examination from the ID surface of the threaded region of the nozzle is partially achievable by vendor scanning techniques. The geometry of the regions having a chamfer or radius is not

examinable with currently available UT equipment. ET probes are not capable of examining the threaded surfaces or regions having a chamfer or radius. Although dye penetrant testing (PT) of threaded surfaces, and regions having a chamfer or radius is possible, it would require that personnel be located under the RPVH to manually perform the surface cleaning and penetrant testing operations, resulting in significant personnel radiation exposure and is contrary to the principles of As Low as Reasonably Achievable (ALARA). UT from the inside surface of the threaded region of the nozzle is the primary method at Vogtle Units 1 and 2 to remotely inspect the portion of the nozzle below the J-groove weld to minimize radiation exposure to inspection personnel.

Stress analysis and crack growth evaluations for postulated through-wall axial flaws located in regions not being inspected and extending upward toward the toe of the J-groove weld were performed by SNC. Three dimensional elastic-plastic finite element analyses were performed to obtain the stresses for the RPVH penetration nozzles. The finite element model used in the analyses was comprised of iso-parametric brick and wedge elements. The analyses considered all the pertinent loadings on the penetrations. The most important loading conditions were found to be those which normally exist on the penetration nozzle. These loadings included pressure and temperature loading associated with the steady state operation condition. In addition, the residual stresses resulting from the weld fabrication process were also considered. The penetration nozzle, weld metal, cladding and the RPVH were modeled in accordance with the relevant material properties.

The crack growth evaluation for a hypothetical flaw used the EPRI Technical Report MRP-55, Revision 1, "Materials Reliability Program (MRP) Crack Growth Rates for Evaluating Primary Water Stress Corrosion Cracking (PWSCC) of Thick-Wall Alloy 600 Materials." The report recommended PWSCC crack growth rate taking into account a head temperature of 565° F. The current operating temperatures for Vogtle Units 1 and 2 are 560° F. Due to power uprate considerations, a head temperature of 565° F (560° F plus 5° F) was conservatively chosen for use in this evaluation. SNC recognizes that the NRC staff has not yet made a final determination on the acceptability of MRP-55. Should the staff determine the crack growth formula used by SNC is unacceptable, SNC will revise the

analysis that justifies relaxation of NRC First Revised Order EA-03-009 within 30 days after the NRC advises SNC of an NRC-approved crack growth formula. If the revised analysis shows that the crack growth acceptance criteria are exceeded prior to the end of the then current operating cycle, this relaxation will be considered rescinded and written justification for continued operation shall be submitted to the NRC within 72 hours. If the revised analysis shows that the crack growth acceptance criteria are exceeded during the subsequent operating cycle, SNC will submit the revised analysis for NRC review within 30 days. If the revised analysis shows that the crack growth acceptance criteria are not exceeded during the current operating cycle or the next operating cycle, SNC shall confirm that the analysis was performed in a letter to the NRC within 30 days. Any crack growth analyses performed for RPVH inspections after the NRC advises SNC of an NRC-approved crack growth formula shall use that formula.

Based on the results from the crack growth evaluation, the service life required for the upper crack tip of any undetected axial through-wall flaws in the region not being inspected to reach the lowest point at the toe of the J-groove weld all exceeded 6 EFPY. The time for the upper crack tip of the postulated flaw to reach the lowest point at the toe of the J-groove weld is greater than 6 EFPY (see enclosed table) based on minimum examination coverage below the toe of the J-groove weld. The Order requires nonvisual NDE at least every 4 refueling outages or every 7 years, whichever occurs first, for plants categorized as "Low" susceptibility. Both Vogtle RPVHs are currently categorized as "Low" susceptibility. Therefore a service time of greater than 6 EFPY is acceptable for the bases for the stress analysis and crack growth evaluations. The categorization as "Low" susceptibility is defined in the Order as having a value of less than 8 Effective Degradation Years (EDY). The following summarizes the EDY value for both units:

- The current operating cycle for Vogtle Unit 1 is cycle 13. The calculated value of EDY for the end of the current operating cycle is 3.30.
- The current operating cycle for Vogtle Unit 2 is cycle 12. The calculated value of EDY for the end of the current operating cycle is 3.06.

The time duration between inspection cycles is 4 fuel cycles, i.e., 6 years, for Vogtle Units 1 and 2 in accordance with the NRC First Revised Order for "Low" category plants. Therefore, in the next refueling outages for each unit, as a screening rule, if the Minimum Required Coverage Below the J-groove Weld as shown in the enclosed Table is achieved on all of the RPVH penetration nozzles, the upper crack tip of any undetected axial through-wall flaw located outside the region being inspected will not reach the lowest point at the toe of the J-groove weld in less than 6 EFPY. The value of 6 EFPY is greater than the 6 year time duration between inspection cycles as specified in the NRC First Revised Order for Low category plants. Therefore, in accordance with 10 CFR 50.55a(a)(3)(i), the proposed alternative will provide an acceptable level of quality and safety.

Duration of Relaxation:

Relaxation of the requirement of Section IV.C.5(b) of the First Revised NRC Order EA-03-009 is requested by SNC for all nozzle inspections to be performed in the Vogtle Unit 1 1R13 and the Vogtle Unit 2 2R12 refueling outages and those inspections to be performed during future outages in accordance with the subject order, provided that conditions do not change that would otherwise invalidate this relaxation request.

In accordance with 10 CFR 2.202(a)(2) for an Answer to an Order, the following affirmation is required:

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.

Respectfully submitted,

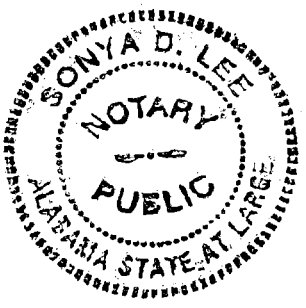
SOUTHERN NUCLEAR OPERATING COMPANY

L. M. Stinson

Sworn to and subscribed before me this 18th day of May, 2006.

Notary Public

My commission expires: 7-1-06



TABLE

Vogtle RPVH Penetrations – Minimum Coverage Requirements Below J-groove Weld

Nozzle Penetration Number(s)	Actual Penetration Angle of Incidence (Degrees)	Summary of the Stress and Fracture Mechanics Analysis				Estimated Potential Coverage Below Toe of the J-groove Weld Based on Dimensions Obtained from Design and Fabrication Drawings			
		Applicable Analyzed Penetration Angle of Incidence (Degrees)	Length below the lowest point at the toe of the J-groove weld that has an operating stress level of ≥ 20 ksi (Inches)	Minimum Required Coverage Below J-groove Weld with > 6 EFPY by Crack Growth Evaluation (Inches)	Time to Reach the Lowest Point of the Toe of the J-groove Weld (EFPY)	Vogtle Unit 1		Vogtle Unit 2	
						Uphill Side (Inches)	Downhill Side (Inches)	Uphill Side (Inches)	Downhill Side (Inches)
1	0.0	0.0	1.02	0.55	7.1	1.781	1.781	2.341	2.341
2 through 5	11.4	0.0	1.02	0.55	7.1	2.602	1.613	3.183	2.191
6 through 9	16.2	0.0	1.02	0.55	7.1	2.971	1.543	3.557	2.128
10 through 13	18.2	0.0	1.02	0.55	7.1	3.644	2.030	4.222	2.604
14 through 17	23.3	0.0	1.02	0.55	7.1	3.477	1.363	4.104	1.983
18 through 21	24.8	0.0	1.02	0.55	7.1	3.699	1.428	4.255	1.982
22 through 29	26.2	26.2	<1.00	0.50	7.4	4.294	1.868	4.884	2.454
30 through 37	30.2	26.2	<1.00	0.50	7.4	4.153	1.266	4.733	1.840
38 through 41	33.9	26.2	<1.00	0.50	7.4	4.524	1.144	5.114	1.764
42 through 49	35.1	26.2	<1.00	0.50	7.4	4.669	1.162	5.256	1.741
50 through 53	36.3	26.2	<1.00	0.50	7.4	4.795	1.126	5.384	1.708
54 through 61	38.6	26.2	<1.00	0.50	7.4	5.030	1.021	5.626	1.607
62 through 65	44.3	44.3	<1.00	0.35	7.4	5.699	0.731	6.331	1.348
66 through 73	45.4	45.4	<1.00	0.35	8.8	5.917	0.744	6.511	1.329
74 through 78	48.7	48.7	<1.00	0.25	9.2	6.677	0.774	6.733	0.808