L. M. Stinson (Mike)
Vice President
Fleet Operations Support

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℠

December 11, 2007

Docket Nos.: 50-321
50-366

NL-07-1949

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

Edwin I. Hatch Nuclear Plant
Request to Implement an Alternative Source Term
Response to Request for Additional Information Regarding the
Turbine Building Ventilation and Leakage Treatment Piping Seismic Evaluations

Ladies and Gentlemen:

On August 29, 2006, Southern Nuclear Operating Company (SNC) submitted a request to revise the Edwin I. Hatch Nuclear Plant (HNP) licensing/design basis with a full scope implementation of an alternative source term (AST). By letters dated November 6, 2006, November 27, 2006, January 30, 2007, June 22, 2007, July 16, 2007, August 13, 2007, and October 18, 2007, SNC has submitted further information to support the NRC review of the HNP AST submittal.

By letter dated August 16, 2007, the NRC requested additional information regarding the seismic evaluations for the: 1) HNP turbine building exhaust ventilation system which is credited in the AST analysis with purging the area around the main control room following three of the four HNP design basis accidents, and 2) leakage treatment piping which is credited in the AST loss-of-coolant accident (LOCA) analysis, specifically, the Unit 1 main steam isolation valve alternate leakage treatment path, and, for both units, the potential secondary containment bypass leakage paths that terminate in the main condenser. The enclosure to this letter contains the SNC response to the referenced NRC request for additional information (RAI).

The 10 CFR 50.92 evaluation and the justification for the categorical exclusion from performing an environmental assessment that were included in the August 29, 2006 submittal continue to remain valid.

(Signature and affirmation are provided on the following page.)

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.

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

Respectfully submitted,

SOUTHERN NUCLEAR OPERATING COMPANY

L. M. Stinson

L. M. Stinson
Vice President Fleet Operations Support

Sworn to and subscribed before me this 11th day of December, 2007.

Gail A. Hicks
Notary Public

My commission expires: July 5, 2010

LMS/CLT/daj

Enclosure: 1. Response to Request for Additional Information Regarding the Turbine Building Ventilation and Leakage Treatment Piping Seismic Evaluations

cc: Southern Nuclear Operating Company
Mr. J. T. Gasser, Executive Vice President
Mr. D. R. Madison, Vice President – Hatch
Mr. D. H. Jones, Vice President – Engineering
RType: CHA02.004

U. S. Nuclear Regulatory Commission
Mr. V. M. McCree, Acting Regional Administrator
Mr. R. E. Martin, NRR Project Manager – Hatch
Mr. J. A. Hickey, Senior Resident Inspector – Hatch

State of Georgia
Mr. N. Holcomb, Commissioner – Department of Natural Resources

Edwin I. Hatch Nuclear Plant
Request to Implement an Alternative Source Term

Enclosure 1

Response to Request for Additional Information Regarding the Turbine Building Ventilation and Leakage Treatment Piping Seismic Evaluations

Edwin I. Hatch Nuclear Plant
Request to Implement an Alternative Source Term

Response to Request for Additional Information Regarding the
Turbine Building Ventilation and Leakage Treatment Piping Seismic Evaluations

TURBINE BUILDING VENTILATION DUCT AND DAMPER QUESTIONS

The HNP Turbine Building (TB) ventilation systems are credited in the AST analysis with purging the area around the main control room (MCR) for the removal of activity at an exhaust rate of 15,000 cubic feet per minute (cfm) following a loss-of-coolant accident (LOCA), a control rod drop accident (CRDA), and a main steamline break (MSLB) accident. Enclosures 11 and 12 of the licensee's August 29, 2006, submittal, include the seismic verification of the TB exhaust ductwork for Units 1 and 2, respectively, following the guidelines in Enclosure 13 of the Electric Power Research Institute's (EPRI) Report No. 1007896, "Seismic Evaluation Guidelines for HVAC [heating, ventilation, and air conditioning] Duct and Damper Systems," supplemented by the peer review comments in its Enclosure 14.

NRC Question 1

(a) Do the TB ventilation systems need to maintain pressure boundary integrity in order to perform their intended function? If so, provide justification.

(b) What are the maximum design and operating pressures for the TB ventilation systems?

SNC Response

(a) The TB ventilation systems consist of a supply system and an exhaust system, but only the exhaust systems are credited in the AST analyses for purging the TB. The exhaust systems take suction from various areas in the TB. Like any ventilation system, an intact duct is required for effective system operation, but it is not essential that the duct pressure boundary be leak tight. Exhaust duct inleakage will not impact the effectiveness of the exhaust fans in purging the TB.

(b) The Units 1 and 2 TB ventilation system duct specifications did not specify a specific maximum design pressure; instead both the referenced specifications cite the Sheet Metal and Air Conditioning National Association (SMACNA) standards for design criteria. The referenced Unit 2 specification specifically referenced SMACNA's "High Velocity High Pressure and High Velocity Low Pressure Duct Construction Standards," Second Edition, dated 1969.

With respect to the Units 1 and 2 TB ventilation system maximum operating pressures, the Unit 1 TB exhaust ductwork maximum operating pressure is approximately 6-inch wg, based on the exhaust fan static pressure. The Unit 2 TB exhaust ductwork maximum operating pressure is approximately 8-inch wg, based on the exhaust fan static pressure.

NRC Question 2

Page 4-1 of Enclosure 11 of the AST application states that "Small tears of the duct skin or small openings at duct joints as a result of an earthquake will not impair the required function of the ductwork and therefore would be acceptable."

(a) Have any openings or tears been recorded in the earthquake experience database and what was the range of sizes (opening area/flow area)?

(b) Were there any openings identified during the Hatch seismic review team (SRT) walkdowns? Quantify your answer.

(c) If the answer to 2.a or 2.b is yes, then what is the maximum area ratio of an opening (or sum of all openings), to duct flow area that a duct could have and still maintain its intended function for the HNP AST analysis?

SNC Response

(a) Small openings or tears have not been recorded in the earthquake experience database, see Table A-2 of AST submittal Enclosure 13, the EPRI Technical Report 1007896. The damage recorded was either falling or denting.

The possibility of small tears in the duct skin or small openings at duct joints comes from the criteria development work associated with the following report by the Advanced Reactor Corporation titled “Advanced Light Water Reactor (ALWR) First-of-a-Kind-Engineering (FOAKE) Project on Design Concepts for HVAC Ducting and Supports,” dated April 1995. The FOAKE report states that “in some shake table tests, minor, localized tearing occurred in duct corner areas before “global” ductile deformations developed. However, these tears did not grow significantly before the ductile deformation occurred.” The EPRI guidelines section 3.6 requires a bounding duct analysis if “full pressure boundary integrity is required”; that is, if small tears or openings must be avoided. Meeting the EPRI bounding analysis requirement assures that deformations in the corner areas are small enough, since the calculated stress is limited to a value below the elastic limit, that small tears or joint opening will not occur. Even though bounding configuration analyses for duct and support systems were performed for the HNP evaluation, as a defense in depth approach, “full pressure integrity” is not required in order for the system to perform the required function (see response to NRC Question 3).

(b) The TB exhaust ductwork has intake register openings and equipment hood openings to draw air from the TB. No other openings in the ductwork were identified during the HNP Seismic Review Team (SRT) walkdowns.

(c) This part is not applicable since the answer to the prior two parts of this question is no. Specifically, no openings or tears in ductwork have been identified in the referenced earthquake experience database or in the referenced HNP SRT walkdowns.

NRC Question 3

The evaluation of ductwork in the AST application follows the guidelines in Electric Power Research Institute's (EPRI's) Technical Report 1007896. This EPRI report recommends an evaluation of the duct material for stresses due to uses of HVAC duct that require pressure boundary integrity. Enclosures 11 and 12 of the AST application acknowledge that the HVAC duct systems are required to maintain pressure boundary integrity. Sections 5 of Enclosures 11 and 12 state that the ductwork does not need to be reviewed for stresses due to pressure since small openings in joints and seams will not adversely affect the ability of the ductwork to perform its intended function. If the duct system experiences insignificant pressure losses due to small openings or tears, then the duct wall experiences pressure induced stresses. Provide a reasonable explanation of why the pressure effects have not been considered for duct wall evaluation.

SNC Response

As discussed in AST submittal Enclosure 1, the Units 1 and 2 TB exhaust ventilation systems are credited in the AST analysis with purging the TB at an exhaust rate of 15,000 cfm to reduce the activity levels in the area around the MCR following a LOCA, CRDA, and MSLB. Therefore, the functional requirement for the TB exhaust ductwork following an earthquake is to have sufficient pressure integrity such that the air can continue to be drawn through the ductwork, and, once out of the TB, be exhausted through the respective reactor building vent plenums by the TB exhaust ventilation system fans. This does not mean "full pressure integrity." Rather, it means that the overall ductwork must stay intact and not be ripped open by earthquake forces. There are already openings in the ductwork where registers allow air to be exhausted through the ductwork.

Small tears or openings at seams in the duct will not impair its function since the small openings will just draw additional air in from the TB, which is the desired state, and will not block air from being transported out of the TB. It should be noted that, as stated in AST submittal Enclosures 11 and 12, the evaluation of the ductwork was actually carried out in accordance with the guidelines for "full pressure integrity" which assure no tears or joint openings; i.e., bounding duct analyses were performed. This approach was used for defense in depth.

Since the ductwork had already been designed for pressure loads in accordance with the SMACNA standards (reference the SNC response to NRC question 1) and had functioned properly for many years, it was considered unnecessary to perform the pressure stress evaluation recommended by the EPRI report.

NRC Question 4

For systems where full pressure boundary integrity is required, EPRI guidelines recommend that the worst case bounding sample should include the duct run itself as well as the supports. Explain how this guideline has been followed.

SNC Response

Bounding configuration analyses for duct and support systems were performed for the HNP evaluation as a defense in depth approach, since “full pressure integrity” is not required in order for the system to perform the AST credited function (see response to NRC Question 3). Three bounding cases were selected for duct analysis. Bounding cases were selected where the SRT judged a duct run would concentrate large loads on a support or a duct section. Contributing factors to a concentrated large load could be duct run configuration or layout (including 90 degree turns), fixed supports, or a longitudinal load path due to the length of the duct run. For example, Outlier 3 in Appendix D of AST submittal Enclosure 11 was one of the three selected bounding cases (Selection 2 in Appendix C of Enclosure 11).

In each of the three selected Unit 1 bounding cases, the duct run and the supports were modeled and analyzed. The duct runs are shown in Appendix C of AST submittal Enclosure 11. The support locations are marked on the drawings. The support configurations were recorded in the field and included in the computer models of the duct runs. The three Unit 1 duct runs that were analyzed were judged by the SRT to also be bounding for Unit 2.

NRC Question 5

For the duct support analytical reviews, the EPRI guidelines recommend selection of 10 to 20 different sample supports. Only 5 duct supports were selected in Enclosure 11, for Unit 1, and 4 in Enclosure 12, for Unit 2. Provide justification for this deviation.

SNC Response

The EPRI guidelines recommend selection of 10 to 20 different support samples for facilities evaluating multiple HVAC systems. The intent of the EPRI guidelines is to enable evaluation of all of the plant HVAC systems, and it was estimated that 10 to 20 supports would be needed to represent the support configurations of an entire plant. This is similar to the number of supports recommended for A-46 seismic evaluation of an entire plant's raceway systems, as stated in Section 8.2.4 of the Seismic Qualification Utility Group (SQUG) Generic Implementation Procedure (GIP) Revision 2. The HNP TB exhaust ventilation ductwork represents only a portion of the entire plant HVAC ductwork, thus a smaller number of support samples is reasonable.

The EPRI guidelines state that the extent of the sample should be determined by the Seismic Capability Engineers based on the diversity, complexity and extent of the systems being reviewed. The Seismic Capability Engineers judged that the five Unit 1 supports and four Unit 2 supports selected for analytical review sufficiently represent and bound the support configurations for the Unit 1 and 2 duct runs under review.

NRC Question 6

According to Enclosures 11 and 12, the in-structure response spectrum (IRS) for HNP is ½ the Seismic Margin Earthquake (SME) IRS at 5 percent (%) damping and is shown in Fig 3-1 of Enclosures 11 and 12. In these enclosures, the peak spectral acceleration (PSA) of the HNP IRS at 5% damping has been used to qualify all of the analytical review duct supports except for two which utilized a more accurate method described in the EPRI guidelines, Enclosure 13. Attachments B of Enclosures 11 and 12 contain the support analytical review data sheets for selected bounding supports. Referring to these selected supports, what were the seismic inputs used and how were they derived? As an option, submit References 12 and 13 of Enclosures 11 and 12 that contain this information.

SNC Response

It is noted that the referenced Figure 3-1 of AST submittal Enclosures 11 and 12 shows the ½ SME ground response spectrum, not the ½ SME IRS. The ½ SME ground response spectrum is used for applicability of earthquake experience data, not for duct or support analytical reviews.

The duct and support analytical reviews used IRS calculated from building models (the same IRS as were used for resolution of Unresolved Safety Issue (USI) A-46). The IRS reflect the building motions at the duct support elevations. The support lateral load evaluations used the PSA of the 5% damped IRS for the elevation (El.) where the HVAC duct system is attached, unless the duct system frequency was determined by analysis, in which case the spectral acceleration at the duct frequency was used. The inputs are detailed in the following table:

Selection	Input	Acceleration
1-1	PSA of Unit 1 Reactor Building IRS El. 203’	0.60g
1-2	PSA of Unit 1 Turbine Building IRS El. 147’	0.42g
1-3	Unit 1 Turbine Building El. 209’ IRS spectral acceleration at duct/support system frequency of 19 Hz.	0.20g
1-4	PSA of Unit 1 Turbine Building IRS El. 164’	0.50g
1-5	PSA of Unit 1 Turbine Building IRS El. 164’	0.50g
2-1	Lateral and longitudinal load checks are not applicable since these loads are resisted by adjacent supports. Adjacent supports are checked by Selection 2-2.	N/A
2-2	PSA of Unit 2 Reactor Building IRS El. 203’	0.70g North-South 0.53g East-West
2-3	Lateral and longitudinal load checks are not applicable since the support is ductile.	N/A
2-4	PSA of Unit 2 Turbine Building El. 164’	0.50g

NRC Question 7

This RAI is in reference to duct support analytical review outlier AR-1, discussed in Enclosure 11. This support was an outlier of the Vertical Capacity Check at 5 times the dead load. Per the EPRI guidelines, the Lateral and Longitudinal Load Check may be used to evaluate outliers that do not meet the Vertical Capacity Check. This is most applicable to supports characterized as non-ductile. From review of the support drawing shown on page B-4 of Enclosure 11, this support appears to be non-ductile. The bottom and particularly the top welds appear to be weaker than the support vertical members and a plastic hinge may not be formed in the vertical member(s) preventing possible weld failure by allowing ductile response. As stated in the EPRI report, a brittle failure (weld failure) is not acceptable seismic performance. Page E-2 of Enclosure 11 states that this support was evaluated for both lateral and longitudinal seismic loading and was found adequate. From the support drawing shown on page B-4 of Enclosure 11, the vertical support members are skewed to the top and bottom welds. The all around 1/8-inch fillet weld designation on the bottom weld is considered a weak weld. In addition, due to its skewed orientation, the effective weld throat is less than 0.707 x 0.125 on the longitudinal direction side of the angle iron which compounds its ineffectiveness. The top weld is a flash (fill) weld and by common engineering practice is not considered to provide resistance to structural loads, seismic horizontal plus dead load in this case.

(a) For the "Lateral Load Check" EPRI recommends using a horizontal static equivalent seismic input of 1.0 times the PSA of the IRS at 5% damping. Figure 3-1, Enclosures 11 and 12, indicates this value to be approximately 0.32. If a different value was used provide technical justification.

(b) Provide technical justification regarding the structural adequacy of these welds to support the design loading. Also, provide the size of the vertical members (size is not shown on support drawing).

SNC Response

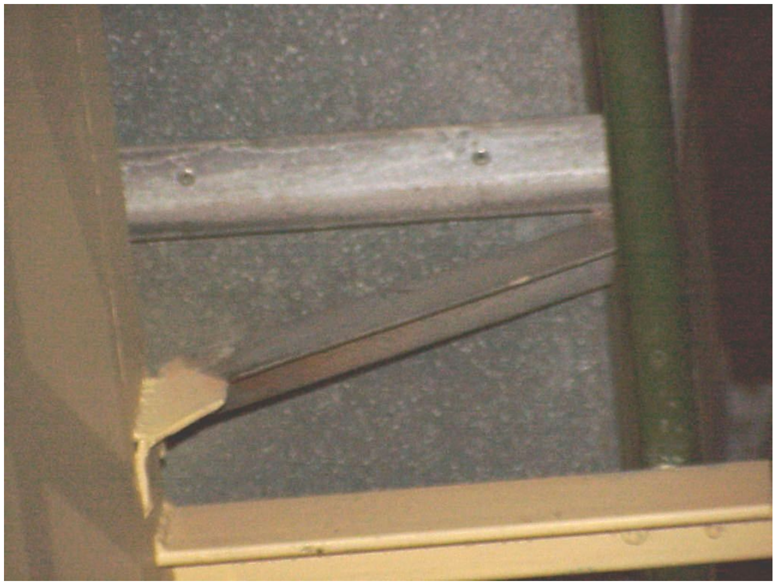
(a) The EPRI guidelines recommend using the PSA of the IRS unless the frequency of the duct-support system is calculated. For this support, the PSA was quite high, so the duct-support system frequency was calculated. The combined lateral frequency of the duct and supports was found to be 19 Hz. The spectral acceleration of the IRS for the turbine building El. 209' at 19 Hz is 0.20g. This is the acceleration that was used for the lateral load check.

(b) The vertical members are 1½ x 1½ x ⅛" angles. The welds at the ends of the angles are of two types. At the duct end, the weld is a full penetration square-groove butt weld. These welds were visually inspected by the SRT. They appeared to be of good quality and joined the adjacent pieces through the full thickness. This type of weld is an allowable American

Institute of Steel Construction (AISC) structural weld for thicknesses up to ¼ inch.

With reference to the support drawing on Page B-4 of AST submittal Enclosure 11, the following clarifies the configuration of the angle at the point of attachment to the wall based on updated information. The support angle leg has an extension welded on with a square-groove butt weld. This extension piece is fillet welded to the vertical leg of the embedded angle on the top corner of the concrete wall. At the wall attachment, the weld consists of two ⅛" vertical fillet welds, one on each side of the vertical leg of the support angle. Each weld is approximately 2" long.

The following photographs show the support configuration, looking up at the weld to the embedded wall corner angle.



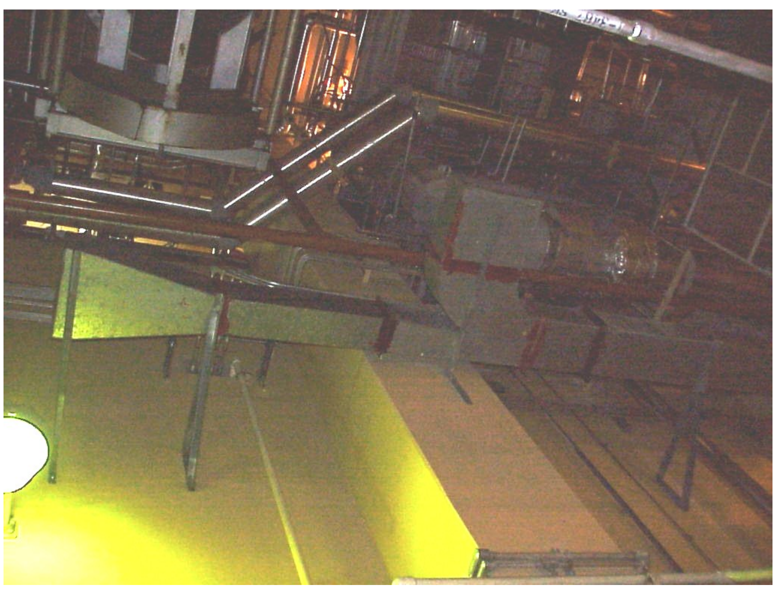
The weld capacity was not evaluated for the lateral load check (it was judged to be adequate, so only the angle section was evaluated). The following provides an evaluation of the fillet-welded connection for the lateral and longitudinal loads. The resultant forces (seismic demand due to dead load plus seismic loads) on the weld are 368 lb/in for the lateral load check and 164 lb/in for the longitudinal load check. The weld electrode is taken as E60XX. The weld seismic capacity is 1.7 times 0.3 times the weld metal tensile strength from AISC 9th Edition Table J2.5 (this is the same weld capacity recommended in Section C.6.1 of the SQUG GIP Revision 2). The capacity of the ⅛" fillet weld is 1.7 x 0.3 x 60,000 psi x 0.707 x 0.125 in = 2704 lb/in. The seismic capacity of the weld is seen to be greater than the seismic demand for the lateral and the longitudinal loads. This confirms the original judgment.

NRC Question 8

In Enclosure 11, duct supports AR-2 and AR-3 failed the vertical Capacity Check. These supports were further evaluated using the Lateral and Longitudinal Load Check and found acceptable. The bolt pattern in these supports does not appear to be capable of supporting applied dead weight plus seismic longitudinal loads. Provide detailed justification regarding the structural adequacy of these supports.

SNC Response

Outliers AR-2 and AR-3 (Sheets E-3 and E-4 of AST submittal Enclosure 11) apply to duct support analytical review selections 4 (Sheet B-5 of Enclosure 11) and 5 (Sheet B-6 of Enclosure 11), respectively. These analytical review selections apply to supports on duct runs along the east (AR-2) and west (AR-3) walls inside the condenser bay. The ducts run horizontally adjacent to large concrete pilasters that project out from the walls. The photo below shows the duct run on the east wall in Unit 1. The cantilever supports of AR-2 configuration are shown to the right and left of the pilaster.



At the pilaster, there is a short rigid support that will resist the longitudinal duct load. The duct configuration on the west wall (AR-3) is similar.

The duct will impose vertical and lateral load on the wall supports, but not longitudinal load. Because these supports are more flexible in the duct longitudinal direction than the supports on the pilasters, the duct longitudinal load is resisted by the supports on the pilasters. Thus analytical review selections 4 and 5 (AR-2 and AR-3) were determined to be adequate for the longitudinal load check based on the duct configuration and the judgment of the SRT that the supports will not be loaded in the longitudinal direction.

NRC Question 9

The screening and evaluation work sheets (SEWS) of Enclosure 11, sheet A-27, identifies a masonry wall between columns TC and TB south of row T10. It is stated that this "wall was evaluated per the IE [Inspection and Enforcement] Bulletin 80-11 program and is therefore not a seismic interaction concern." Was this wall included in the re-evaluation of the design adequacy of the masonry walls for IE Bulletin 80-11 and was it determined to be adequate to withstand seismic loads?

SNC Response

This wall was included in the evaluations in response to IE Bulletin 80-11. The masonry wall between columns TC and TB south of row T10 was determined to be adequate to withstand seismic loads.

NRC Question 10

Walkdown Outlier No. 4 in table 4-1 of Enclosure 11, identifies a duct penetrating a masonry wall at column TB between rows T7 and T8, at TB floor elevation 112, and references Unit 1 drawing H-16048. Failure of this wall could cause the duct to fail. It is also stated that the licensee will modify the masonry block wall to prevent potential seismic interaction with the ductwork.

(a) Confirm that this duct to masonry wall penetration is shown on drawing H-16047 and not on H-16048.

(b) Has a design modification been prepared with the SRT's concurrence?

(c) Provide a brief description of the proposed repair.

(d) Provide the schedule for completion of the modification.

SNC Response

(a) Based on updated information, Table 4-1 “Walkdown Outlier Summary” of AST submittal Enclosure 11 should list drawing number H-16047 for outlier number 4.

(b) Yes, a design modification was prepared and issued to the plant with the SRT’s concurrence.

(c) The potential seismic interaction was resolved by removing the concrete masonry wall around and above the duct up to the reinforced concrete floor above the ductwork. Concrete masonry units were also removed to the face of the adjacent reinforced concrete wall at column line T7. Removal of the concrete masonry units above and adjacent to the duct eliminates any possible masonry wall interaction with the duct, and therefore, resolves this outlier.

(d) This modification has been completed as part of a design change package implemented during the Unit 1 outage 1R22 which ended on April 1, 2006.

NRC Question 11

Walkdown Outlier No. 2 in Enclosure 11 identifies an unbolted duct strap hanger which needs to be restored to its original configuration. If restoration has not been completed, provide the schedule for completion.

SNC Response

The repair of the unbolted strap hanger on a 14” diameter duct, Outlier No. 2, was completed on August 16, 2006 by Maintenance Work Order.

NRC Question 12

Unit 2 walkdown outlier Nos. 2 and 5 in Enclosure 12, identifies masonry walls as possible seismic interactions that could cause duct failure. Walkdown outlier No. 3 identifies a seismic interaction hazard with the moisture separator reheater (MSR) vessel, a large vessel suspended on long rods and positioned against a bend of a 12"x18" duct. Walkdown outlier No. 4 identifies supports missing hardware. Walkdown outlier No. 6 involves a cantilever duct section that is inaccessible for inspection. To resolve these outliers, the SRT performed qualitative failure modes and effects analyses (FMEA). Provide these FMEAs which conclude that duct failure would not compromise the ability of the duct system involved to perform its required function.

SNC Response

The outliers that resulted from the walkdown of the HNP Unit 2 TB exhaust ventilation system are summarized in AST submittal Enclosure 12 Table 4-1. The resolution of the walkdown outliers, either by repair or a qualitative FMEA is described in section 6.1 of Enclosure 12. Further information on the FMEAs described in Section 6.1 is presented under the “Proposed Method of Outlier Resolution” on the HVAC System Outlier Sheets contained in Attachment D of Enclosure 12.

The duct runs associated with outliers Nos. 2, 4, 5 and 6 are extensions of the condenser bay ductwork that draw air from outside condenser bay area. The referenced outliers involve small size duct runs (reference Attachment D for the respective duct sizes) outside of the condenser bay area. The ducts draw in air from areas within the TB but outside of the condenser bay and then pass into the condenser bay through penetrations in the condenser bay walls. Inside the condenser bay, the duct runs increase in size and draw air from inside the condenser bay through air registers (openings) in the duct. The duct runs eventually tie into the main TB exhaust duct. The duct run associated with outlier No. 3 is entirely inside the condenser bay. Outlier No. 4 consists of a fume hood exhaust fan support rod that is missing some nuts (note the fume hood exhausts into the TB exhaust ventilation system) and a missing anchor bolt on a duct support. The fan support was repaired by Maintenance Work Order on April 20, 2007. The duct support was not repaired due to access difficulties, but failure will not compromise the ability of the TB exhaust ventilation system to perform its AST credited function.

As noted in Enclosure 12 Table 4-1 and section 6.1, outliers 2, 3, 4, 5, and 6 have been resolved by a qualitative FMEA. As discussed in detail in AST submittal Enclosure 1, the Units 1 and 2 TB exhaust ventilation systems are credited in the AST analysis with purging the TB at an exhaust rate of 15,000 cfm to reduce the activity levels in the area around the MCR following a LOCA, CRDA, and MSLB. For reference, the MCR is located on the turbine deck at El. 164’. As described previously, outliers 2, 3, 4, 5, and 6 are all associated with small size duct runs either in the condenser bay or in the vicinity, specifically at TB El.112' and El. 130'.

The referenced qualitative FMEA demonstrates that potential failure modes from the associated outliers will not compromise the ability of the TB exhaust ventilation system to perform its AST credited function. There are two possible failure modes for the duct referenced in each outlier situation: (1) tearing of the duct, or (2) crushing of the duct which leads to closure of the air pathway.

In the first failure mode, another air intake pathway will be introduced but this will not have any effect on the ability of the TB exhaust fans to purge the credited airflow. Specifically, any potential tears would be limited in size based on the small size of the impacted ducts. Additionally, since the potential tears would occur at the outlier locations in the TB, at the opposite end of the duct runs from the TB exhaust ventilation system fans, which exhaust thru the respective reactor building vent plenums, such tears would simply act as additional suction points. These new suction points would not adversely affect the ability of the TB exhaust ventilation systems to exhaust at least 15,000 cfm due to the limited tear size based on the small size of the impacted ducts. The location of the new suction points in the condenser bay would not adversely affect the flow distribution of the system allowing for continued effective purging of the TB.

For the second failure mode, if the duct is crushed and the air pathway closed off, air intake from other areas will increase sufficiently to ensure adequate air flow. Again, neither credited TB exhaust ventilation system flow nor distribution would be adversely impacted.

NRC Question 13

Unit 2 walkdown outlier No. 1 identifies that the east filter train housing has a nut missing from one of its anchor bolts. Confirm that this nut has been reinstalled.

SNC Response

The replacement of the missing anchor bolt nut for the east filter train housing was completed on April 20, 2007 by Maintenance Work Order.

NRC Question 14

Unit 2 walkdown outlier No. 7 involves 3 duct strap hangers on a duct run that is not connected to overhead structural members. At least two of these appear to be adjacent to each other. Confirm whether this is correct. If missing supports are not adjacent to each other, ignore the remainder of this RAI. The affected duct run (19x12) appears to have changes in direction (at least two) between supports adjacent to these unconnected straps. It was judged that the duct runs containing these three hangers were acceptable as adequately supported without these strap hangers.

(a) Provide a line sketch with approximate support span dimensions that shows the duct run containing these 3 strap hangers and 2 functional adjacent hangers on each side of the run containing a missing hanger (existing walkdown information and drawings could be utilized).

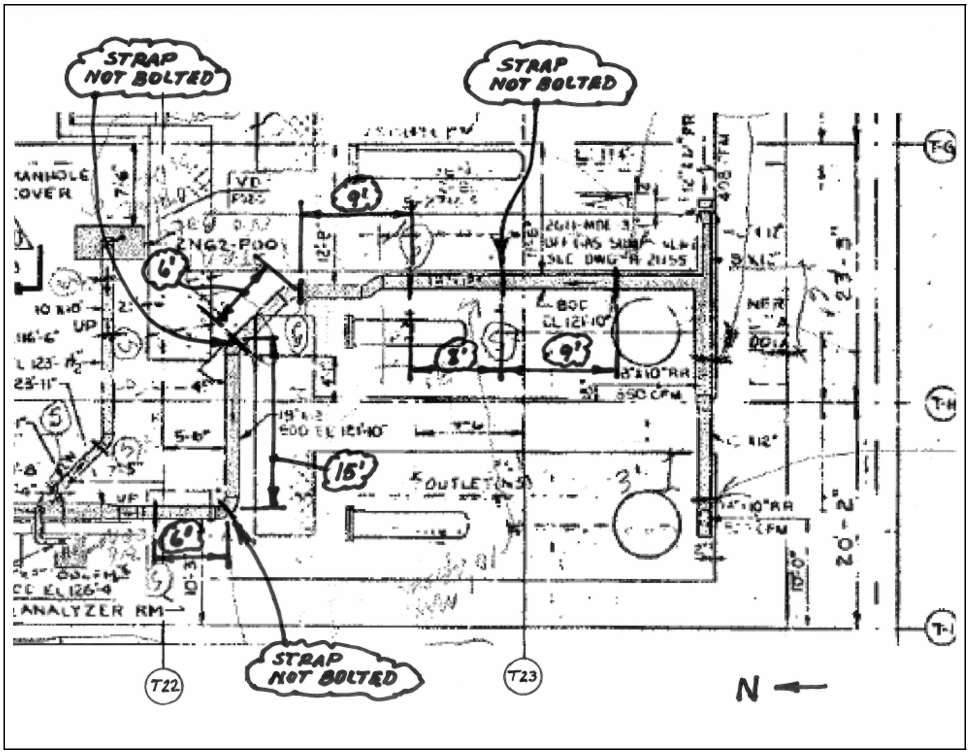
(b) Related to item 14.a above, provide the allowable duct spans and any span associated data, such as span stresses and loads, to confirm that existing spans without the three nonfunctional supports still meet allowable span criteria. Discuss whether you included reduction factors for changes in direction. Also provide your technical justification if reduction factors were not included in your evaluation.

(c) Provide the load rating for this type of strap hanger and compare it to the approximate loading of the straps adjacent to the nonfunctional supports.

SNC Response

It is correct that two of the un-attached strap hangers are at adjacent support points. See the response to Question 14b below for justification of the existing condition observed during the walkdowns.

(a) The approximate support span dimensions for the duct run containing the un-attached strap hangers are shown on the following mark-up of the original walkdown drawing. Two of the hangers are adjacent and the span between them is 15 feet. The other hanger is between two hangers that are properly attached, and the span is 8 feet on one side and 9 feet on the other. It should be noted that at this location and at one of the other locations, only one strap on the duct is not attached to the ceiling. The strap on the other side is properly attached to the ceiling and is directly attached to the duct. It has sufficient capacity to support the duct by itself, and the unattached strap was accepted on this basis.



(b) Allowable span tables were calculated for field walkdown screening of existing duct spans. Allowable duct span lengths between vertical supports and lateral restraints were determined following the approach in Appendix C of the EPRI Guidelines. Separate tables were determined for each applicable building elevation. Spans were determined using an allowable bending stress of 8 ksi for dead load and 13.6 ksi for seismic loads as detailed in Sections 4.2.1 and 4.2.2 of the EPRI Guidelines. Calculations assumed straight duct sections with bolted companion angle flanged joints. No reduction factors for change in direction were included in the span table calculations. Allowable span information was applied in the field based on the judgment and experience of the SRT. Duct configuration and changes in direction were considered by the SRT when reviewing allowable spans in the field. In general, there was a support placed at each change of direction including on the run with the un-attached straps.

The duct that has the un-attached strap hangers is 12 inches high and 18 inches wide. The allowable span between vertical supports for this duct size in the Unit 2 Turbine Building at El. 112'-0" based on allowable stress is 33 feet, conservatively assuming a horizontal restraint spacing of 99 feet. However, the walkdown screening criteria also used a maximum duct span of approximately 15 feet, based on peer review comments of the EPRI Guidelines.

The east-west duct run with the two adjacent un-attached strap hangers passes through two barriers constructed of structural steel and steel grating. Pictures of the barriers, the duct and the un-attached strap hangers are shown below. The walkdown team judged that the allowable span criteria was met for the east-west duct run on the basis that the structural steel of the barriers provide effective support points for the duct, replacing the function of the un-attached hangers.

TB 112 west outside. Looking northeast, at column lines T-22, T-H.5. The strap is not connected to the Unistrut insert. This is the support on the west end of the run.

TB 112 west outside. Looking west, at column lines T-22, T-G.7. The strap on the other side of the duct is not attached to the ceiling. This is the support on the east end of the run.

(c) The two strap hangers on the east-west run with un-attached straps were accepted based on the structural steel angles of the barriers providing the necessary support. The isolated support on the north-south run was accepted based on the single attached strap being capable of supporting the duct by itself.

The 12-inch high by 18-inch wide duct weighs 17.2 lbs/ft. The tributary weight on this support is 8.5' x 17.2 lb/ft = 146.2 lb. The 5 times dead load (DL) force is 731 lb. The net section of the strap is 1" x ⅛" = 0.125 sq. in. The resulting DL stress in the strap is 1170 psi, and the 5 times DL stress is 5848 psi. The DL capacity of the strap is 0.6 x 36,000 psi = 21,600 psi. The catalog capacity of a ⅜" channel nut in an embedded P3300 Unistrut insert is 1000 lb. Thus the capacity of the single strap and bolted connection to the embedded strut is greater than the 5 times DL demand.

MAIN STEAM ISOLATION VALVE AND SECONDARY CONTAINMENT BYPASS LEAKAGE TREATMENT PIPING QUESTIONS

NRC Question 15

Walkdown data sheets signed by qualified SRT personnel, used for screening and evaluation of walkdown structures, systems and components (SSCs) similar to the ones contained in Enclosure 10, are not included with Enclosures 8 and 9 to the August 29, 2006, application. Justify the omission of the walkdown data sheets from Enclosures 8 and 9.

SNC Response

AST submittal Enclosure 10, titled "Hatch Nuclear Plant Unit 2 Seismic Verification of Potential Secondary Containment Bypass Leakage Paths Terminating at the Main Condenser," was prepared for SNC by ABS Consulting. That document, report number 1302241-R-002 Revision 0, was provided by ABS to SNC, and contained the ABS work associated with the Unit 2 Bypass Leakage Path. Therefore, the associated "Completed Walkdown Data Sheets" were simply provided to SNC as an attachment to the report (Attachment B of Report number 1302241-R-002 Revision 0).

AST submittal Enclosure 8, titled "Edwin I. Hatch Nuclear Plant Unit 1 Main Steam Isolation Valve Alternate Leakage Treatment Path Description and Seismic Evaluation," was prepared by SNC personnel. The SNC work was compiled into different documents in accordance with SNC procedures. Completed Walkdown Data Sheets, prepared and signed by qualified SRT personnel and used for the screening and evaluation walkdowns of SSCs, were also prepared by SNC personnel for the Unit 1 MSIV ALT Path work. They are contained in a procedurally controlled design basis calculation.

AST submittal Enclosure 9, titled "Edwin I. Hatch Nuclear Plant Unit 1 Seismic Verification of Potential Secondary Containment Bypass Leakage Paths Terminating at the Main Condenser," was also prepared by SNC personnel. The SNC work was compiled into different documents in accordance with SNC procedures. Completed Walkdown Data Sheets, prepared and signed by qualified SRT personnel and used for the screening and evaluation walkdowns of SSCs, were also prepared by SNC personnel for the Unit 1 Bypass Leakage Path work. They are contained in a procedurally controlled design basis calculation.

As with other reports, like the USI A-46 summary reports for HNP Units 1 and 2 previously submitted and accepted by the NRC, the walkdown data sheets were not required nor provided as part of the summary reports. The summary reports provide the justification for the methodology used and summarize the results of the walkdowns, the analytical assessments, all outliers, and how the outliers were resolved. The signed walkdown data sheets are controlled as calculations.

In summary, the walkdown data sheets were prepared by SNC qualified SRT personnel for the work associated with Enclosures 8 and 9. The walkdown data sheets are simply maintained in other design basis documentation.

NRC Question 16

The main steam isolation valve (MSIV) alternate leakage treatment (ALT) path is credited in AST for HNP Unit 1 and the seismic evaluation is contained in Enclosure 8. Some of the lines included in the ALT path were seismically analyzed prior to this submittal. According to Enclosure 8, the ALT path lines that were designed by rule or by empirical/approximate methods have been seismically qualified in accordance with the generic method in General Electric (GE) topical report NEDC-31858P, Revision 2, "BWROG Report for Increasing MSIV Leakage Limits and Elimination of Leakage Control Systems." To address the seismic adequacy of the ALT piping, the Boiling-Water Reactor Owners Group (BWROG) report utilizes an earthquake experience data base for the performance of main steam piping in past earthquakes. The methodology is conceptually similar to that utilized by the Seismic Qualification Utility Group (SQUG) in the Generic Implementation Procedure (GIP) for the seismic adequacy verification of nuclear plant equipment. Section 3.2 of Enclosure No. 8, "Main Steam Drain to Condenser," identifies the following pipe sizes:

NPS 3, schedule 160, D/t = 8, and NPS 1, schedule 160, D/t = 5

(a) Were these lines included in their entirety in the analysis model of Section 3.2.2.5, “Bounding Seismic Analysis of the Main Drain Piping?”

(b) What was the calculated combined maximum displacement from the bounding analysis model and the clearance used during the walkdowns to evaluate seismic interactions?

(c) The following lines shown in table 1 of Enclosure 8, are not included in the BWROG report seismic experience database piping data.

NPS 6, schedule 80, D/t = 15;	NPS 8, schedule 80, D/t = 17
NPS 4, schedule 120, D/t = 10;	½” tubing, wall=0.065, D/t = 8

Provide technical justification for the provision that the non-seismically analyzed ALT lines are well represented in the earthquake experience database.

(d) Section 3.1, "Main Steam and Turbine Bypass," contains a list of pipe sizes. Were any of these lines qualified using the BWROG report generic method?

(e) Identify all systems and pipe sizes that were seismically qualified using the BWROG report generic method that are not included in table 1 of Enclosure 8.

SNC Response

As referenced, AST submittal Enclosure 8 contains the Unit 1 MSIV ALT path description and seismic evaluation, developed in accordance with the referenced BWROG report NEDC-31858P, Revision 2. The Unit 1 MSIV ALT path and associated seismic evaluation conforms to the NRC safety evaluation dated March 3, 1999 covering NEDC-31858P, Revision 2. The following information is provided to clarify the elements of the seismic evaluation and their interrelationship, and to provide a common foundation for the following SNC responses to the specific NRC questions.

The NRC concluded in section 3.0 of the NRC safety evaluation that the BWROG report generic method of utilizing earthquake experience-based methodology, supplemented by plant specific seismic walkdowns and analytical evaluations, provides a viable alternative for demonstrating the seismic ruggedness of generally non-seismically analyzed main steam system piping, related components and supports, and condensers, more specifically described as piping and components downstream of the outboard MSIVs.

The Unit 1 MSIV ALT primary and alternate drain paths consist of drain lines coming off of the main steam lines (MSLs) downstream of the outboard MSIVs. These drain lines terminate at the main condenser. The boundaries of the Unit 1 MSIV ALT primary and alternate drain paths are established by boundary valves, including those on branch lines off of the drain lines. In Enclosure 8 sections 3.0 and 4.0 the current licensing basis (CLB) design bases, including analysis, are described for the piping and components that are part of the ALT paths, including boundary valves (it is noted that the interconnected systems section 4.0 covers branch lines to associated boundary valves).

The CLB design bases, and associated analysis, are provided to demonstrate that the piping and components in the ALT paths are enveloped by the seismic experience database, the first component of the BWROG report generic method. The next component of the BWROG report generic method is to perform a seismic walkdown that encompasses the entirety of the credited ALT primary and alternate paths, as well as any lines to boundary valves. Finally, further analysis and calculations, beyond CLB analysis, were performed in compliance with NRC safety evaluation section 6.0 limitations 3, 4, 6, and 7. Enclosure 8 section 5.0 provides a summary of the design reviews, walkdowns and seismic analyses performed to demonstrate the seismic ruggedness of the Unit 1 MSIV ALT paths. Section 5.0 also summarizes conformance to the NRC safety evaluation limitations.

(a) Only the three inch drain line, not the one inch lines, was included in the referenced bounding seismic analysis since the analysis scope is a representative portion of the ALT drain piping. The following describes the bounding seismic analysis intent and scope in more detail.

The analysis summary provided in Enclosure 8 section 3.2.2.5 is intended to address NRC safety evaluation section 5.8 and section 6.0 limitation 6. As noted in Enclosure 8 section 5.0 with respect to limitation 6, HNP Unit 1 was licensed prior to issuance of 10 CFR Part 100 Appendix A. Therefore, it is not required for HNP Unit 1 to perform a bounding seismic analysis for the MSIV ALT path piping. However, the bounding analysis was performed to provide additional assurance of the seismic robustness of the piping used for the MSIV ALT path.

As stated in NRC safety evaluation section 5.8, the bounding seismic analysis should be for a representative portion of the ALT drain piping. The bounding analysis described in section 3.2.2.5 includes the three inch drain line, starting at the reactor building and turbine building interface anchor. Of the drain lines and branch lines connected to boundary valves within the scope of the MSIV ALT path, the three inch line is the ALT primary drain path (see Figure 1 of Enclosure 8) and is the largest drain line in the scope of the MSIV ALT path. Since only a representative portion of the ALT piping is required for the bounding analysis, the referenced one inch lines are not included in the bounding analysis.

(b) Calculations of maximum seismic displacements yielded results of less than six inches in the horizontal plane. The maximum displacements are associated with portions of the piping system supported by rod hangers.

With regard to seismic interaction, walkdowns were performed using the guidance of Appendix D of the SQUG GIP Revision 2. In Appendix D of the SQUG GIP, titled "Seismic Interaction," it states "The motion of piping … may result in impact interactions with safe shutdown equipment. Non-safety-related piping is commonly supported with rod hangers or other forms of flexible dead load support, with little or no lateral restraint. Where adequate clearance with safe shutdown equipment is not provided, potential impact interaction may result. The integrity of the piping is typically not a concern. … Judgment should be exercised by the Seismic Capability Engineers in estimating potential motions of distribution systems in proximity to the safe shutdown equipment under evaluation. For screening purposes, a clearance of … 6 inches for relatively flexible systems would normally be adequate to prevent impacts, subject to the judgment of the Seismic Capability Engineers."

In summary, the maximum displacement based on analysis techniques was less than 6 inches. For seismic interaction screening purposes of flexible systems a clearance of 6 inches was used subject to the judgment of the Seismic Capability Engineers.

(c) Reference 1 of AST submittal Enclosure 8, specifically BWROG report NEDC-31858P-A dated August 1999, is a two volume document. Volume 1 contains the NRC SER in addition to RAI and RAI responses.

Within Tab 5 of NEDC-31858P-A Volume 1 August 1999, a report entitled "Supplemental Piping Earthquake Performance Data" by EQE dated November 1995 is provided. In table 4 of this report, titled "Seismic Experience Data Base Piping Data," information is provided from plants in the Earthquake Experience database including the pipe sizes/schedules at those plants. The piping in this seismic experience database ranged in size from ¼ inch to 30 inches. The diameter to thickness ratios ranged from 4 to 64. These parameters envelop the sizes and D/t ratios shown in Table 1 of Enclosure 8.

(d) Yes, the BWROG report generic method, as described in the overall opening response to this question, was used to qualify the entirety of the credited MSIV ALT primary and alternate paths, as well as any lines to boundary valves. Sections of most of the lines described in Enclosure 8 section 3.1 are included in the MSIV ALT path scope and therefore, qualified by the BWROG report generic method. Most of these lines are included because the lines interface with the ALT primary or alternate drain line paths, so the lines up to the boundary valves must be qualified. These lines encompass the range of pipe sizes listed in section 3.1, up to the 24" MSLs between the outboard MSIVs and credited boundary valves, specifically the turbine stop valves.

(e) As stated previously, the BWROG report generic method was used to qualify the entirety of the credited MSIV ALT primary and alternate paths, as well as any lines to boundary valves. The MSIV ALT paths, including the lines to the boundary valves, are described in path description section and Figure 1 of Enclosure 8. Sections 3.0 and 4.0 of Enclosure 8 contain the CLB design bases, including pipe sizes and analysis, for the piping and components that are part of the ALT paths, including boundary valves. Enclosure 8 Table 1, as referenced in section 4.1, is intended to describe only a subset of the piping included in the qualified scope of the MSIV ALT paths, specifically interconnected system piping which are typically branch lines to associated boundary valves.

NRC Question 17

The path description and scope of work for the unit 1 MSIV ALT piping are shown in Enclosure 8. The staff cannot identify in Enclosure 8 that the lines from the main steam turbine bypass valve manifold to the condenser have been included in the ALT path. This is not in accordance with the BWROG report which credits these lines for ALT (see BWROG report, Volume II, Section 6.7). Explain this apparent discrepancy.

SNC Response

The referenced BWROG report NEDC-31858P, Revision 2, provides for two potential pathways to the main condenser: 1) the main steam drain lines or 2) the turbine bypass lines. SNC chose the main steam drain line path as described below.

As previously referenced, AST submittal Enclosure 8 contains the Unit 1 MSIV ALT path description and seismic evaluation, developed in accordance with the referenced BWROG report. The Unit 1 MSIV ALT path and associated seismic evaluation conforms to the NRC safety evaluation dated March 3, 1999 covering NEDC-31858P, Revision 2.

The referenced section 6.7 of NEDC-31858P states that the “primary components to be relied upon for pressure boundary integrity in resolution of the BWR MSIV leakage issue are: (1) the main turbine condenser, (2) the main steam lines from the MSIVs to the turbine stop and bypass valves, and (3) the main steam turbine bypass and/or drain line piping to the condenser. Plant-specific reviews and evaluations should be performed to provide reasonable assurance of the integrity of these systems and components.”

In the Unit 1 MSIV ALT path description section of Enclosure 8, SNC states that: “The ALT pathway utilizes MSL drains to direct MSIV leakage to the main condenser.” As discussed in section 4.3 of NEDC-31858P, use of the isolated condenser is the preferred MSIV leakage treatment method. Further discussion in section 4.3.1.1 indicates that there are two pathways to convey MSIV leakage to the main condenser, either the turbine bypass lines to the main condenser or the main steam drain lines to the main condenser. SNC chose to use the drain line path over the turbine bypass line path, consistent with the BWROG recommendation, because it would be much more difficult to assure the turbine bypass valves could be opened following a loss of offsite power to establish that MSIV leakage pathway. The referenced section 6.7 reflects the two optional pathways to the condenser in item 3. It is noted that sections 5.1 and 5.3 of the March 3, 1999 NRC safety evaluation reflect the BWROG recommendation for the use of the isolated condenser method, specifically using the main steam drain line piping to convey MSIV leakage to the condenser.

Given the selection of the recommended drain line path to the main condenser, the turbine bypass valves function as boundary valves for the Unit 1 MSIV ALT path. As described in the path description section of Enclosure 8, the turbine bypass valves will automatically close in the event of a LOCA.

Therefore, the Unit 1 MSIV ALT path reflects the recommendations of BWROG report NEDC-31858P, Revision 2 and conforms to the NRC safety evaluation dated March 3, 1999 without including the lines from the main steam turbine bypass valve manifold to the condenser in the designated MSIV ALT path.

NRC Question 18

Table 2 of Enclosure 8 contains a list of outliers that were resolved either by analysis or by modification design change packages (DCPs). Provide a schedule for completion of modifications that have not been completed.

SNC Response

All modifications listed in Table 2 of enclosure 8 were completed as part of a design change package implemented during the Unit 1 outage 1R22 which ended on April 1, 2006.

NRC Question 19

With the exception of items requested in RAI 18, provide a list of modifications and additions required for SSCs credited in the AST that have not been completed along with a schedule of completion.

SNC Response

SNC has documented remaining identified modifications necessary for the implementation of AST as regulatory commitments (it is noted that an "addition" would also be considered a modification) with scheduled completion dates. Specifically, a list of AST modifications was provided in AST submittal Enclosure 7. SNC made an additional regulatory commitment to provide an alternate safety related power supply to the HNP Units 1 and 2 TB exhaust ventilation systems via a manual switchover in the AST related SNC letter dated October 18, 2007 (reference Enclosure 2 of that letter).

The modifications applicable to the Unit 1 MSIV ALT path have been completed (see response to NRC Question 18).

NRC Question 20

Are there any air handling units (AHUs), motor control centers (MCCs), Fans and I&C cabinets associated with the AST that need to be seismically qualified? If yes, when will their evaluation be completed?

SNC Response

The scope of structures, systems, and components that needed to be seismically qualified for AST implementation was identified in AST submittal Enclosure 1 section 2.7 as well as in the AST submittal letter. The seismic evaluations for the Unit 1 MSIV ALT path, Units 1 and 2 secondary containment bypass leakage paths, and the Units1 and 2 turbine exhaust ventilation systems were provided as AST submittal Enclosures 8, 9, 10, 11, 12, 13, and 14.

As documented in AST submittal Enclosure 1 section 2.7.3.2 and Enclosure 7, SNC has committed to completing seismic evaluations of the Units 1 and 2 TB MCCs associated with crediting the Units 1 and 2 turbine exhaust ventilation systems by May 31, 2008. Any modifications needed to address outliers from those evaluations will be completed on a schedule consistent with AST implementation by May 31, 2010.

With respect to AHUs, MCCs, fans and I&C cabinets, there are no AHUs or I&C cabinets associated with seismically qualified scope of the referenced systems. Of the referenced systems, only the Units 1 and 2 turbine exhaust ventilation systems include fans, specifically four exhaust fans and they are addressed in AST submittal Enclosures 11 and 12. I&C components that are necessary for the Units1 and 2 turbine exhaust ventilation systems to perform their credited functions have been addressed as part of the referenced MCC evaluation. The Unit 1 MSIV ALT path evaluation includes valves in various functions which have been evaluated in conformance with the NRC safety evaluation dated March 3, 1999 covering NEDC-31858P, Revision 2.

NRC Question 21

Were there any inaccessible areas for seismic ruggedness walkdowns of piping and or ductwork credited for the AST? If yes, discuss the schedule of completion.

SNC Response

All walkdowns of piping and ductwork for seismic ruggedness have been completed. Normally inaccessible areas were walked down during plant outages in order to gain access to them. One section of inaccessible duct was listed as outlier No. 6 on Table 4-1 of AST submittal Enclosure 12. As described in Section 6.1 of Enclosure 12, the worst case for this duct was assumed and analysis determined that duct failure would not compromise the ability of the system to perform its required function. Therefore, AST credited piping and ductwork seismic evaluations have been completed.