PROPRIETARY

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February 17, 2011
U7-C-NINA-NRC-110022
10 CFR 2.390

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
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Rockville, MD 20852-2738

South Texas Project
Units 3 and 4
Docket Number PROJ0772
Responses to Request for Additional Information

Reference: Letter from Tekia Govan to Mark McBurnett, "Request for Additional Information Re: South Texas Project Nuclear Operating Company Topical Report (TR), WCAP-17203-P Fast Transient and ATWS Methodology (TAC No. RG17203), November 19, 2010 (ML103230418)

Attached are responses to NRC staff questions included in the reference. The following RAI questions are addressed:

RAI-13	
RAI-14	RAI-25
RAI-19	RAI-26
RAI-20	RAI-28
RAI-21	RAI-31
RAI-22	RAI-32

The responses to RAI-21 and RAI-25 contain information proprietary to Westinghouse Electric Corporation. Since these responses contain information proprietary to Westinghouse Electric Company LLC, they are supported by an affidavit signed by Westinghouse, the owner of the information. The affidavit sets forth the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b) (4) of Section 2.390 of the Commission's regulations.

Accordingly, it is respectfully requested that the information which is proprietary to Westinghouse

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be withheld from public disclosure in accordance with 10 CFR Section 2.390 of the Commission's regulations.

Attachments 1 through 11 contain the responses to the above RAI questions. Attachments 12 and 13 contain the non-proprietary versions of the two proprietary responses. Attachment 14 contains the request for withholding of proprietary information, the affidavit, the proprietary information notice, and the copyright notice.

Correspondence with respect to the copyright or proprietary aspects of this information or the supporting Westinghouse Affidavit should reference letter CAW-11-3103 and should be addressed to: J. A. Gresham, Manager, Regulatory Compliance and Plant Licensing, Westinghouse Electric Company LLC, Suite 428, 1000 Westinghouse Drive, Cranberry Township, Pennsylvania, 16066.

If this letter becomes separated from the proprietary material it is no longer proprietary.

There are no commitments in this letter.

If you have any questions other than those relating to the proprietary aspects of this response, please contact me at (361) 972-7136, or Bill Mookhoek at (361) 972-7274.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 2/17/11

Scott Head
Manager, Regulatory Affairs
South Texas Project Units 3 & 4

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Attachments:

1. RAI-13
2. RAI-14
3. RAI-19
4. RAI-20
5. RAI-21 (proprietary)
6. RAI-22
7. RAI-25 (proprietary)
8. RAI-26
9. RAI-28
10. RAI-31
11. RAI-32
12. RAI-21 (non-proprietary)
13. RAI-25 (non-proprietary)
14. Request for Withholding Proprietary Information

cc: w/o enclosure except*

(paper copy)

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RAI-13

LTR Section 5: Section 1.1.4 of RG 1.203 states that the PIRT development is based upon expert opinion and can be a subjective process; it is important to validate the PIRT using experimentation and analysis. Sensitivity studies can be also performed to determine the relative importance of the phenomena and for validation of the PIRT. Discuss the process used for the validation of the PIRT developed in the LTR for the ABWR transients (e.g., experiments, analyses, expert judgment, etc.).

Response to RAI-13

The PIRT developed for the ABWR and BWR/2-6 draws from Westinghouse's large experience base of testing and analyzing done to license BWRs, which have many technical similarities with the ABWR design, as well as validation tests specific to the ABWR and BWR/2-6. Plant data validation studies are provided in the code-specific topical reports.

At the outset of the PIRT development process, an evaluation panel was formed to serve the purpose of identifying and ranking phenomena which have impact on the transients of interest. The panel members consist of Westinghouse experts involved in analytical and experimental work related to BWR transient and accident analyses.

Recognizing that the credibility of the PIRT would be enhanced if it could be based upon previous PIRT efforts, the panel decided on adopting the PIRT in NUREG/CR-6744 as a starting-point. This PIRT, organized by the NRC, represents the informed judgment of a large number of international experts. The study considers phenomena involved in PWR and BWR loss-of-coolant accidents (LOCA). Both the phenomena that are expected to occur during LOCA and the relative importance of those phenomena were used as input to the Westinghouse evaluation. A refinement of the baseline PIRT was necessary because the Westinghouse PIRT considers AOO and ATWS scenarios. The Westinghouse panel used a combination of analytical knowledge relative to the physical processes (both from integral tests and separate effects tests and from direct experience gained from previous analysis with other transient codes) and analyses (including plant licensing analysis and sensitivity analyses) in the review process and to identify any additional phenomena relevant for AOO and ATWS.

The initial phase relied heavily on the experts' understanding of a particular process or phenomenon based on direct experience and included different viewpoints by panel members representing different disciplines. However, the list of phenomena and rankings were carefully evaluated and revisited throughout the process. Specific evaluation methods used in the PIRT development include sensitivity studies, review of relevant literature, and cross code comparisons. Consideration of experimental data, if available, was given a high value. As answers were collected and issues resolved, the list of phenomena was updated and rankings revised.

RAI-14

Section 6.1 of the LTR states that "[e]ach potentially limiting transient and ATWS event is evaluated for the limiting plant condition(s) throughout the plant operating domain." Clarify whether the limiting event for each class of transient will be determined generically (e.g., for all ABWRs) or on a plant-specific basis.

Response to RAI-14

The limiting event for each class of transient will be determined on a plant specific basis.

RAI-19

In WCAP-17203-P, Section 7, Uncertainty Analysis, the applicant states the intent is to "predict a best estimate value accounting for uncertainties and biases of the relevant input." and seeks approval of a method to estimate operating limits and safety margins to acceptance criteria for Anticipated Operational Occurrences and ATWS events. The resulting uncertainties and biases arise from selection of input and modeling parameters and are evaluated using a Monte Carlo based method. However, SRP Chapter 15, which provides guidance on the evaluation of transients and accidents, only discusses the use of best estimate methods for the evaluation of loss-of-coolant-accidents as an alternative to Appendix K conservative deterministic methods. The only mention in Chapter 15 of the use of 95 percent probability/ 95 percent confidence calculations (for BWRs) is with respect to critical power ratio remaining above the minimum critical power ratio.

a) **Explain what precedent exists for use of best estimate methods to evaluate fast transients and ATWS events.**
b) **In CEND-300-P-A, the applicant proposed and the NRC accepted Approach A (conservative deterministic methods) to evaluate fast and slow transients for boiling water reactor reload fuel. In its evaluation of the submittal, the NRC rejected the applicant's proposed use of statistical techniques stating the "uncertainty analysis approach is not generically acceptable since the acceptability is highly application dependent." The reviewing contractor recommended that the applicant justify the following for the parameters selected for statistical treatment: (1) that those parameters selected are statistically independent and uniformly distributed; (2) that the range of applicability of the parameter is not violated by the distribution chosen by the applicant; (3) that each selected probability function is adequately conservative and well supported by actual applicable data; and (4) that the database used for the parameters is statistically significant. Address the NRC's prior rejection of the use of analysis uncertainty in CEND-300-P-A, including an explanation of the areas recommended for additional discussion and justification.**

Response to RAI-19

Part A:

Section 4.4 of SRP requires the applicant to treat uncertainties in the values of process parameters, core design parameters and in calculational methods (modeling parameters) with at least a 95-percent probability at the 95-percent confidence level when evaluating thermal margins during normal reactor operation and AOOs. This section further requires providing the methodology used to combine these uncertainties in input and modeling parameters.

For the Anticipated Operational Occurences (AOOs) Westinghouse intends to use the best estimate method (95/95 calculations) with respect to critical power ratio remaining above the minimum critical power ratio consistently with the requirements of SRP Chapter 15 and Chapter 4.4. Deterministic approach is used for the evaluation of other AOO event acceptance criteria.

For the ATWS events, Chapter 15.8 of the SRP does not refer specifically to the use of 95 percent probability/ 95 percent confidence calculations. Section 15.8.II refers instead to 10 CFR 50.46 as it relates to fuel integrity acceptance criteria. Considering the low frequency of occurrence for an ATWS event and application of 10 CFR 50.46, postulated loss-of-coolant accident best estimate uncertainty evaluation methods are applied for ATWS when evaluating the fuel integrity acceptance criteria. An approach consistent with the fuel integrity evaluation is applied also for other ATWS acceptance criteria.

The best estimate approach, consistent with the approach presented in this LTR, was applied earlier by Westinghouse in, for example, the NRC approved Realistic Large-Break LOCA Evaluation Methodology (Reference 1) and, is applied by other vendors in for instance (Reference 2) for AOO analysis.

Part B:

(1) Method B in CENPD-300 is based on the assumption of normally distributed input parameters. Westinghouse has no intention of applying this method to determine the thermal margins. Instead a new method to treat uncertainties is presented in the LTR, which has no requirements on the shape of the distribution function of these parameters.
Statistical independence of the input parameters to the uncertainty analysis is achieved by the selection process described in this topical report, based on the division of the events to different groups and selection process where only the relevant input and modeling parameters are considered in the analysis.

(2) The range of the applicability of the parameter is not violated by the chosen distribution function. Westinghouse considers three different shapes of distribution functions for the input and modeling parameters. Normal, log-normal and uniform distribution functions. The first two shapes are verified using the normality tests. If the normality test fails, a uniform distribution is assumed as this distribution type represents the maximum ignorance about the distribution and leads to conservative uncertainty estimates.

(3) Adequacy and quality of selected probability functions are addressed in Section 7.3.3 and Section 7.3.4 of this topical report.

(4) Statistical significance of the database used for the parameters is captured by the data uncertainty assessment process, described in the report. If the database is not statistically significant, the parameter is then excluded from the uncertainty evaluation and set to its conservative bounding value according to analysis methodology described in Section 6 of this LTR.

References:

1. WCAP-16009-P-A, Rev.0, "Realistic Large-Break LOCA Evaluation Methodology Using the Automated Statistical Treatment Of Uncertainty Method (ASTRUM)", January 2005
2. NEDO-32906-A, Rev.3,Class I, Non-Proprietary, "TRACG Application for Anticipated Operational Occurrences (AOO) Transient Analyses", September 2006

RAI-20

Section 7.1 of the LTR states that when the code capability is high for certain phenomenon, the phenomenon input and modeling parameters are treated for biases and uncertainties.

a) **Provide information describing why biases should not be considered for medium PIRT rankings.**
b) **Provide a discussion of how biases are treated when developing phenomenon input and modeling parameters for parameters with PIRT rankings "high" and "medium".**

<u>Response to RAI-20</u>

a) Biases and uncertainties of input and modeling parameters are considered for the phenomena that are high ranked in PIRT and at the same time high/medium ranked in CCA. Medium ranked parameters in PIRT only moderately affect the figures-of-merit, as described in section 5.4 of the LTR, and are therefore excluded from further study. For this reason, biases do not need to be considered.

b) Parameters with PIRT ranking "high" are treated for biases and uncertainties. The process of defining these parameters and their probabilistic distributions, consistently with CSAU methodology, is described in Section 7.3 of the topical report and comes primarily from the comparison with separate effect tests. When comparing the data with the measurement data, average bias and standard deviation of the differences are evaluated and a distribution function is established.

   If the normal, log-normal or other distribution function cannot be established, the uniform distribution is conservatively assumed (see section 7.3.3 of the topical report), where the differences are uniformly distributed between the two largest bounding values. When the uniform distribution is conservatively assumed the bias becomes irrelevant as a statistical parameter. When the normal or log-normal distribution function is established both bias and standard deviation are considered in the analysis.

   Phenomena with PIRT ranking "medium" are excluded from the uncertainty analysis due to their moderate impact on the figures-of-merit and the nominal (expected) values of these parameters are used in the analysis.

RAI-22

Section 7.2.4, Example of Code Capability Assessment Matrix, of the LTR provides an example of a code capability assessment matrix.

a) **Provide information describing the criteria against which the qualification data will be judged in determining the "sufficiency" and "relevancy" of the data for the phenomenon of interest.**
b) **Provide additional information describing how scaling considerations are incorporated in the bias and uncertainty evaluation.**

<u>Response to RAI-22</u>

a) Relevancy of a particular test record judges the applicability of an experimental dataset to test a particular model or phenomenon. The relevancy of a Separate Effect Test is usually judged high while, for example, the relevancy of a Benchmark with other codes may be judged medium. Low relevancy is assigned when a test is not applicable or the phenomenon under consideration has only a minor influence on the test results.

   Sufficiency judges the completeness of an experimental database. High ranking is assigned to a test database that covers the whole application range. For a test database where only a part of the application range is covered, additional constraints have to be applied and sufficiency is therefore ranked medium or low. Medium ranking is also assigned to a sub-scale test database.

b) The bias and uncertainty of the input and modeling parameters are extrapolated from sub-scale to full scale, by identifying the trends of uncertainty and bias dependencies on scale and by utilizing the scaling law, consistently with CSAU (Code Scaling, Applicability and Uncertainty) methodology described in Reference 1.

<u>References:</u>

1 W. Wulff et al., Quantifying reactor safety margins, Part 3: Assessment and ranging of parameters, Nuclear Engineering and Design 119 (1990) 33-65

RAI-26

The uncertainty analysis methodology discussed in Section 7 and Appendix B of the LTR provides for a best-estimate value and a 95% probability/95% confidence level to be determined. However, it does not appear to provide some other items of information that would be typically available (e.g., standard deviation or variance, the shape of the underlying probability density or distribution function, or correlation of particular input parameter uncertainties to uncertainty in the code output). Clarify whether and how the indicators of result uncertainty will be reported for transient analysis that uses the methodology outlined in the LTR.

Response to RAI-26

The statistical method used in the uncertainty methodology outlined in the LTR is based on either the analysis of variance method or the order statistics method. The choice of the statistical method used depends on the result of a normality test. In the case that the result passes the normality test, the analysis of variance method is used to evaluate the 95% probability/95% confidence value. In the case that the result does not pass the normality test, the order statistics method is used.

The analysis of variance method provides the underlying probability density function (normal distribution, tested by a statistical test) together with the sample mean value, sample standard deviation and 95% probability/95% confidence value.

The order statistics method, by its nature does not provide the shape of the underlying probability density function. Sample mean and sample standard deviation may be calculated; however, their values are irrelevant when the shape of the density function is not known.

In either case, the 95% probability/95% confidence value is reported for the parameter under investigation, consistent with NRC requirements. In addition, information about the number of code runs is documented.

RAI-28

Section 6.2.3.2 of the LTR describes the methodology used to calculate Over-pressurization Protection. The method includes confirmation that the MSIV closure event is the most limiting licensing basis over-pressurization event for the plant in question. Section 15.2.1 of the SRP assumes that rapid closure of the turbine control valves is the most limiting over-pressurization event, since the turbine control valves close in a shorter time than the MSIVs. Provide the rationale for choosing MSIV closure rather than turbine control valve closure as the dominant over-pressurization event.

Response to RAI-28:

In overpressurization protection analysis, the first SCRAM-signal from the reactor protection system is assumed to fail and the second signal initiates hydraulic control rod insertion per SRP Section 5.2.2. The signal that initiates SCRAM, is usually activated on high Average Power Range Monitor (APRM) and not on valve closure or valve position. Therefore, the valve closure time is less important for the peak pressure. Instead, the important aspect for this analysis is the free steam volume available in the Reactor Pressure Vessel and in the steamlines. The available free steam volume is smaller after MSIVs closure compared to turbine valve closure (the MSIVs are located closer to the RPV than the turbine control valves). Thus, the smaller free steam volume causes a larger pressurization during the transient. Consequently, the MSIV closure is chosen as the dominant overpressurization event for overpressurization protection analysis. If another pressurization event is identified in the plant specific licensing bases to be potentially more severe, that event is also assessed.

RAI-31

SRP Section 15.0.2 - III.3.d directs the reviewer to confirm that the code assessment adequately covers all of the important code models and the full range of conditions encountered in the accident scenarios. In LTR, Section 8.1 the Load Rejection without Bypass transient is used to demonstrate that the BISON evaluation model is an acceptable analysis method for fast transients and ATWS.

(a) In LTR, Subsection 4.1.1 it is stated that the Load Rejection without Bypass is one of seven (7) transients in the Pressure Increase (PI) category. Explain the reason for selecting this particular transient for demonstration (e.g. is it bounding, typical, etc.).

(b) In LTR, Section 8.2 it is stated that "only one parameter, the OLMCPR" is evaluated. Provide a justification for using this one power-related parameter to characterize a pressure related transient when the methodology in Subsection 6.4.1.2.1 identifies additional parameters of concern such as steam dome volume and the related system pressure.

<u>Response to RAI-31</u>

a) Load Rejection without Bypass is typically the limiting Anticipated Operational Occurrence that establishes the Operating Limit MCPR. Therefore, the selected transient is used in the subject LTR to demonstrate that the BISON evaluation model is an acceptable analysis method for fast transients and ATWS.

b) Section 8 of the subject LTR demonstrates Westinghouse Fast Transient methodology. The section goes through each step of the process from the 'Specification of transient group and power plant type' through the PIRT creation, Selection of computational tool, CCA and DUA. For this particular case; the demonstration is performed to establish the Minimum CPR for a Load Rejection without Bypass transient. The section does not aim to characterize a pressure related transient by one power-related parameter. Instead, the section aims to facilitate a general understanding of Westinghouse process to establish the Operating Limit MCPR for Fast Transients.

   The methodology in Subsection 6.4.1.2.1 presents the modeling techniques to ensure a conservative computer model for pressure increase transients when a non-statistical treatment is required for a specific high ranked phenomenon. This situation may arise when the code capability is judged Low for a certain phenomenon. In order to provide a better clarification of this approach, the formulation:

   "To ensure the computer models used in the analysis of transients are conservative, the following modeling techniques are used:"

   used in sections 6.4.1.2.1, 6.4.1.3.1, 6.4.2.2.2, 6.4.2.3.2, 6.4.3.2.1, 6.4.3.3.2 and 6.4.4.2.2, will be replaced in the final version of the LTR by the following:

   "When the conservative treatment is required in the evaluation instead of statistical for a certain high ranked phenomenon/phenomena (see Table 7-1 for details), the following modeling techniques are used in the analysis:"

RAI-32

SRP Section 15.0.2 - III.3.d directs the reviewer to confirm that the assessment is consistent with the accident scenario identification process in that all models must have assessment commensurate with their importance and required fidelity. In LTR, Table 5-2 the PIRT is described; in Table 8-5 the predicted sequence of events for a transient are presented; in Table 8-6 some analysis results are presented.

(a) Table 8-5 provides a predicted sequence of events, but there is no comparison to the analyzed sequence of events. Describe whether the transient results show acceptable comparison with the predicted sequence.
(b) Table 8-6 presents results that are all related in some manner to power and there is no information pertaining to pressure, level, etc. Explain why the results are presented without addressing other important plant parameters.
(c) Table 8-5 refers twice to Recirculation Pump Trip (RPT). Explain whether this refers to ABWR Reactor Internal Pumps (RIP) and are such pumps defined in the BISON evaluation model used in the transient.
(d) Table 8-5 indicates the participation of the Reactor Protection System ("reactor SCRAM"), Recirculation Flow Control System ("RTT"), and the Steam Bypass & Pressure Control System ("turbine bypass" and "turbine control" valves) in the BISON evaluation model. Confirm this understanding and identify whether any other ABWR safety or non-safety systems contribute in any appreciable manner in the ABWR response to this transient.

<u>Response to RAI-32</u>

a) Table 8-5 shows the analyzed sequence of events (code results) for the example transient. At time 0 s the initiating event is shown (fast closure of the turbine control valves due to generator load rejection) followed by the sequence calculated by the transient code utilizing the methodology described in the LTR. The analyzed sequence of events in the case compares well with the expected sequence of events and is thereby acceptable for the purpose of demonstrating the analysis methodology described in the LTR.

   The transient scenario presented in the LTR is generic. For each particular plant the mitigation systems available are provided by the Plant during the vendor transition phase and documented according to the Westinghouse QA/QC system.

   Caption of Table 8-5 will be updated in the final version of the LTR to: "Generator load rejection without bypass – analyzed sequence of events (code results)". The first sentence in Section 8.7.2 of the LTR will be updated to: "Table 8-5 shows the analyzed sequence of events for the generator load rejection without bypass transient event".

b) In transient safety analysis all the important parameters are evaluated and presented according to the requirements. In the demonstration analysis presented in Chapter 8 of the LTR, the list of parameters was limited for the sake of simplicity to those parameters important to the determination of the MCPR. In this demonstration analysis, focus was put on the methodology (Specification of transient group, power plant type, PIRT, CCA, DUA process and the uncertainty analysis) instead of providing the complete list of result parameters. MCPR was chosen for that purpose as the representative Figure-of-Merit.

c) RPT in Table 8-5 refers to trip of ABWR Recirculation Internal Pumps (RIP). The example transient in the LTR is analyzed with BISON and an ABWR RIP model is used in the BISON code.

d) In the BISON evaluation model for ABWR Generator Load Rejection without Bypass, the following high level systems are modeled to simulate the system actions/performance as described:

   The Steam Bypass & Pressure Control System is used to model the closure of the Turbine Control Valves. The Reactor Protection System senses the closure of two or more Turbine Control Valves and initiates the reactor scram and the trip of 4 recirculation pumps. The Recirculation Flow Control System receives the RPS signal and trips 4 out of 10 recirculation pumps whereas the remaining pumps decrease their speed to the minimum speed. The Feedwater Control System reduces the feedwater pump demand to maintain the RPV water level post scram. However, the Feedwater Control System, which is categorized as a Control System not required for safety, has an insignificant impact on the transient response. This is mainly due to the rapid transient response and that the Feedwater Control System acts slowly. The Safety and Relief Valves open to mitigate the pressure increase caused by the closure of the Turbine Control Valves.

RAI-21

Section 7.2.3, Review of Code Adequacy, of the LTR states that results of assessments to verify model accuracy in the code for important phenomena identified in the PIRT will be presented in a "model assessment table." Elaborate on the process and criteria used to assess model accuracy and include examples.

Response to RAI-21

Model accuracy is judged by the subject matter experts based on the validation against the Separate Effect Test data and/or Integral Effect Test data primarily. As Section 7.2.3 of the topical report describes, a high (H) code capability is assigned to a model when the average bias and deviation is low when comparing the code results with experimental data. Medium (M) code capability is assigned when either the low averaged bias is combined with high deviation, or the low deviation is combined with high average bias. Low (L) code capability is assigned when the general trend in code results does not follow the experimental data and/or both the bias and deviation are high. Low ranking applies also when the phenomenon is not modeled by the code.

A demonstrative example of a model assessment process is the verification of the advanced control rod insertion model from WCAP-17202-P (Reference 1) which is recreated here in Table 1.

The advanced control rod hydraulic insertion model has been verified against measurements of control rod hydraulic insertion at [ ]^{a,c}. The tests have been performed at different reactor dome pressures and different pressures in the hydraulic rod insertion system gas tanks. The reactor dome pressures were in the range [^{a,c} and the gas tank pressures in the range [ ]^{a,c} (resulting in a pressure difference of [6.42-9.69 MPa]^{a,c} between the reactor dome and the gas tanks). Sufficiency and Relevancy of the experimental data is high (H) for the pressure difference interval of [ ]^{a,c}.

The measurements and the simulations with the advanced control rod hydraulic insertion model are shown in Figure 1. In the graph the three lines display the calculated hydraulic insertion times for [ ]^{a,c} control rods and the measured data is shown with small symbols.

As can be seen in Figure 1, the code model is in a good agreement with measurements. The code capability in calculating the hydraulic control rod insertion time is high (H) because the average bias and standard deviation of the bias are both low. The comparison of the test data with the code predictions shows an average bias of [ ]^{a,c} and standard deviation of [ ]^{a,c} in the control rod insertion time [ ]^{a,c}. Difference between calculated and measured data is normally distributed according to Anderson-Darling normality test.

[1] [ ]^{a,c}

a,c

References:

1. Westinghouse Report WCAP-17202-P, Rev.0, "Supplement 4 to BISON Topical Report RPA 90-90-P-A", June 2010

RAI-25

SRP Section 15.0.2 states that separate effects testing should be used to determine the uncertainty bounds of individual physical models.

a) **Indicate where this guidance is addressed in the LTR.**
b) **Clarify how your uncertainty analysis takes into account the uncertainties in the mathematical models, closure relationships in the underlying codes, and the user modeling (e.g., nodalization and solution techniques). As part of your discussion, indicate if and how these are part of the Data Uncertainty Assessment or whether they are addressed in another step in the process.**
c) **Discuss how uncertainties in the experimental data base, such as those arising from measurement errors and experimental distortions, are factored into the uncertainty analysis.**

<u>Response to RAI-25</u>

a) SRP Section 15.0.2 guidance regarding separate effect testing is addressed in Section 7.3.3 of the LTR. This section, consistent with CSAU methodology, states that the parameters describing component-specific processes, such as heat transfer coefficients, pump performance parameters, etc., must have their uncertainties estimated from the comparison between separate effect tests (SETs) data and computer code simulations of such SETs. Separate effect testing is used primarily by Westinghouse to determine the uncertainty bounds of individual physical models.

b) The evaluation of uncertainties in mathematical models and closure relationships is a part of the Data Uncertainty Assessment process and the uncertainties are evaluated according to Section 7.3 in the LTR. Take the slip (void) correlation as an example. Assuming that the evaluation code with one momentum equation is utilized, closure in the form of slip equation is required in order to resolve the governing equation system.

   As the slip correlation is coupled to two High ranked phenomena ([ ]^{a,c}), the uncertainties in this closure relation are considered in the uncertainty analysis. Statistical data comes from the comparison of the slip correlation with separate effect tests.

   The evaluation of uncertainties in user modeling (nodalization and solution techniques) is a part of the Data Uncertainty Assessment process. [ ]^{a,c} is considered as a modeling parameter for high ranked plant components (- Section H in PIRT) and is therefore a part of the uncertainty evaluation process. This process may be demonstrated on the steam line example. [ ]^{a,c} Assuming that the chosen code has a high or medium code capability to model the steam lines, the following treatment of nodalization uncertainties is performed:

   - It is shown by the sensitivity study that further increasing the number of nodes does not significantly influence the figures-of-merit and this model parameter becomes therefore excluded from further study (nodalization insensitive), or
   - If it is shown that the nodalization influences the transport time, additional constraints such as the refinement of spatial discretization are applied.

c) Uncertainties in experimental database are accounted for in two different ways depending on the type of parameter under consideration.
   - Parameters describing thermo-physical data (as described in Section 7.3.3 of the topical report) have their uncertainties evaluated in terms of standard deviation from the original experiment. In this case the uncertainty in experimental database represents the total parameter uncertainty.
   In the case of uncertainty bounds arising from the comparison with Separate Effect Tests, the uncertainties in experimental database are accounted for on a case by case basis depending on nature of the underlying experiment. The uncertainty in the underlying experiment is combined with model uncertainty by defining one leading parameter which accounts for both experimental and model uncertainties. In order to combine these uncertainties, CSAU methodology is followed. An example of such an effort is provided in section 4.4.4 of reference 1. Even though the demonstration is presented on a typical LBLOCA phenomenon, the same steps are applicable to (and followed by) Westinghouse fast transient and ATWS methodology.

References:

1 W. Wulff et al., Quantifying reactor safety margins, Part 3: Assessment and ranging of parameters, Nuclear Engineering and Design 119 (1990) 33-65

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

ss

COUNTY OF BUTLER:

Before me, the undersigned authority, personally appeared J. A. Gresham, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Company LLC (Westinghouse), and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief:

J. A. Gresham
J. A. Gresham, Manager
Regulatory Compliance

Sworn to and subscribed before me
this 14th day of February 2011

Renee' Giampole
Notary Public

COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
Renee Giampole, Notary Public
Penn Township, Westmoreland County
My Commission Expires September 25, 2013

(1) I am Manager, Regulatory Compliance, in Nuclear Services, Westinghouse Electric Company LLC (Westinghouse), and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rule making proceedings, and am authorized to apply for its withholding on behalf of Westinghouse.

(2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.390 of the Commission's regulations and in conjunction with the Westinghouse Application for Withholding Proprietary Information from Public Disclosure accompanying this Affidavit.

(3) I have personal knowledge of the criteria and procedures utilized by Westinghouse in designating information as a trade secret, privileged or as confidential commercial or financial information.

(4) Pursuant to the provisions of paragraph (b)(4) of Section 2.390 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.

(i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse.

(ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitutes Westinghouse policy and provides the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

(a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of

Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.

(b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.

(c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.

(d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.

(e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.

(f) It contains patentable ideas, for which patent protection may be desirable.

There are sound policy reasons behind the Westinghouse system which include the following:

(a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.

(b) It is information that is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.

(c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.

(d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.

(e) Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market advantage to the competition of those countries.

(f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.

(iii) The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.390; it is to be received in confidence by the Commission.

(iv) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.

(v) The proprietary information sought to be withheld in this submittal is that which is appropriately marked in, "Response to NRC Request for Additional Information for WCAP-17203 'Fast Transient and ATWS Methodology'" (Proprietary) for submittal to the Commission, being transmitted by South Texas Project Nuclear Operating Company (STPNOC) letter and Application for Withholding Proprietary Information from Public Disclosure, to the Document Control Desk. The proprietary information as submitted by Westinghouse is that associated with the NRC review of WCAP-17203.

This information is part of that which will enable Westinghouse to:

(a) Assist customers in obtaining NRC review of the Westinghouse Fast Transient and ATWS Methodology topical as applied to current BWR and ABWR plant designs.

Further this information has substantial commercial value as follows:

(a) Assist customer to obtain license changes.

(b) The information requested to be withheld reveals the distinguishing aspects of a methodology which was developed by Westinghouse.

Public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar fuel design and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information would enable others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

The development of the technology described in part by the information is the result of applying the results of many years of experience in an intensive Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended.

Further the deponent sayeth not.

PROPRIETARY INFORMATION NOTICE

Transmitted herewith are proprietary and/or non-proprietary versions of documents furnished to the NRC in connection with requests for generic and/or plant-specific review and approval.

In order to conform to the requirements of 10 CFR 2.390 of the Commission's regulations concerning the protection of proprietary information so submitted to the NRC, the information which is proprietary in the proprietary versions is contained within brackets, and where the proprietary information has been deleted in the non-proprietary versions, only the brackets remain (the information that was contained within the brackets in the proprietary versions having been deleted). The justification for claiming the information so designated as proprietary is indicated in both versions by means of lower case letters (a) through (f) located as a superscript immediately following the brackets enclosing each item of information being identified as proprietary or in the margin opposite such information. These lower case letters refer to the types of information Westinghouse customarily holds in confidence identified in Sections (4)(ii)(a) through (4)(ii)(f) of the affidavit accompanying this transmittal pursuant to 10 CFR 2.390(b)(1).

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