Entergy

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Waterford 3

Contains 10CFR2.390 Proprietary Information

W3F1-2010-0003

February 22, 2010

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: License Amendment Request for Approval of Leak-Before-Break of the Pressurizer Surge Line
Waterford Steam Electric Station, Unit 3
Docket No. 50-382
License No. NPF-38

Dear Sir or Madam:

Pursuant to 10CFR50.90, Entergy Operations, Inc. (Entergy) hereby requests a license amendment to the Waterford Steam Electric Station, Unit 3 (Waterford 3) Operating License. The proposed amendment will allow implementation of leak-before-break (LBB) on the Waterford 3 pressurizer surge line. Entergy will be replacing the two Waterford 3 steam generators (SG) and reactor vessel closure head during the forthcoming spring 2011 refueling outage. Based on design changes in the replacement SGs, piping systems will require rerouting in the steam generator cavity area. Due to the existing dynamic piping protection associated with the pressurizer surge line, rerouting of the replacement SG blowdown line cannot be effectively performed without the elimination of dynamic protection for the pressurizer surge line.

In accordance with 10CFR50, Appendix A, General Design Criterion 4, "Environmental and Dynamic Effects Design Bases", analyses have performed to demonstrate that the probability of fluid system piping rupture for the Waterford 3 pressurizer surge line is extremely low under conditions consistent with the design basis for the piping. These analyses were prepared and are reported in Westinghouse WCAP-17187-P (Proprietary). The methodology of Standard Review Plan (NUREG-0800), Section 3.6.3, "Leak-Before-Break Evaluation Procedures" was applied in performing these analyses.

Entergy has concluded that the application of this methodology will require NRC approval under 10CFR50.90 based on our review of the Waterford 3 Final Safety Analysis Report (FSAR) under 10CFR50.59. Therefore, Entergy is requesting NRC approval to change the Waterford 3 Operating License. The Waterford 3 surge line LBB analyses contained in the enclosed WCAP-17187-P is considered proprietary by Westinghouse and is being requested to be withheld from public disclosure in accordance with 10CFR2.390.

A001
NRR

The Westinghouse Electric Company (Westinghouse) letter regarding the application for withholding proprietary information from public disclosure is contained in Attachment 1. The description of the proposed change to credit LBB on the Waterford 3 pressurizer surge line is provided in Attachment 2. A markup of the FSAR pages detailing the additional Waterford 3 Reactor Coolant System (RCS) leakage detection and monitoring system capability is contained in Attachment 3. Westinghouse WCAP-17187-P, which provides the LBB analyses in accordance with Standard Review Plan 3.6.3, is contained in Enclosure 1. The Non-Proprietary version of this report (WCAP-17187-NP) is contained in Enclosure 2.

The proposed change has been evaluated in accordance with 10CFR50.91(a)(1) using criteria in 10CFR50.92(c) and it has been determined that the changes involve no significant hazards consideration.

The proposed change includes one new commitment as contained in Attachment 4.

In order to implement design changes for the Steam Generator Replacement Outage, Entergy requests approval of the proposed amendment by November 19, 2010. Once approved, the amendment shall be implemented within 90 days.

If you have any questions or require additional information, please contact Bob Murillo at 504-739-6715.

I declare under penalty of perjury that the foregoing is true and correct. Executed on February 22, 2010.

Sincerely,

JAK/sab

Attachments:
1. Westinghouse Letter CAW-10-2756, Application for Withholding Proprietary Information from Public Disclosure
2. Description of Proposed Change
3. Proposed Final Safety Analysis Report Changes (mark-up)
4. List of Regulatory Commitments

Enclosures:
1. WCAP-17187-P, Revision 0, "Technical Justification for Eliminating Pressurizer Surge Line Rupture as the Structural Design Basis for Waterford 3 Steam Electric Station, Unit 3, Using Leak-Before-Break Methodology" February 2010 (Proprietary)
2. WCAP-17187-NP, Revision 0, "Technical Justification for Eliminating Pressurizer Surge Line Rupture as the Structural Design Basis for Waterford 3 Steam Electric Station, Unit 3, Using Leak-Before-Break Methodology" February 2010 (Non-Proprietary)

cc: Mr. Elmo E. Collins, Jr.
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NRC Senior Resident Inspector
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Attachment 1 to

W3F1-2010-0003

Westinghouse Letter CAW-10-2756,
Application for Withholding Proprietary Information from Public Disclosure

Westinghouse

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CAW-10-2756

February 15, 2010

APPLICATION FOR WITHHOLDING PROPRIETARY
INFORMATION FROM PUBLIC DISCLOSURE

Subject: WCAP-17187-P Revision 0, "Technical Justification for Eliminating Pressurizer Surge Line Rupture as the Structural Design Basis for Waterford Steam Electric Station, Unit 3 Using Leak-Before-Break Methodology" (Proprietary)

The proprietary information for which withholding is being requested in the above-referenced report is further identified in Affidavit CAW-10-2756 signed by the owner of the proprietary information, Westinghouse Electric Company LLC. The affidavit, which accompanies this letter, 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 10 CFR Section 2.390 of the Commission's regulations.

Accordingly, this letter authorizes the utilization of the accompanying affidavit by Entergy.

Correspondence with respect to this application for withholding or the accompanying affidavit should reference CAW-10-2756, and should be addressed to J. A. Gresham, Manager, Regulatory Compliance and Plant Licensing, Westinghouse Electric Company LLC, P.O. Box 355, Pittsburgh, Pennsylvania 15230-0355.

Very truly yours,

J. A. Gresham, Manager
Regulatory Compliance and Plant Licensing

Enclosures

CAW-10-2756

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

ss

COUNTY OF ALLEGHENY:

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, Manager
Regulatory Compliance and Plant Licensing

Sworn to and subscribed before me
this 15th day of February 2010

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 and Plant Licensing, 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 WCAP-17187-P Revision 0, "Technical Justification for Eliminating Pressurizer Surge Line Rupture as the Structural Design Basis for Waterford Steam Electric Station, Unit 3 Using Leak-Before-Break Methodology" (Proprietary) dated February 2010, for Waterford Unit 3, being transmitted by the Entergy letter and Application for Withholding Proprietary Information from Public Disclosure, to the Document Control Desk. The proprietary information as submitted by Westinghouse for the Waterford Unit 3 is expected to be applicable for other licensee submittals in response to certain NRC requirements for justification of eliminating pressurizer surge line rupture as the structural design basis, and may be used only for that purpose.

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

(a) Provide documentation of the analysis, methods, and testing for reaching a conclusion relative to the elimination of pressurizer surge line rupture as the structural design basis.

(b) Establish pipe geometry, loading, material properties and critical locations for analysis to support the elimination of pressurizer surge line ruptures.

(c) Assist the customer in obtaining NRC approval.

Further this information has substantial commercial value as follows:

(a) Westinghouse plans to sell the use of similar information to its customers for purposes of meeting requirements for licensing documentation.

(b) Westinghouse can sell support and defense of the technology to its customers in the licensing process.

(c) 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 methodologies 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).

COPYRIGHT NOTICE

The reports transmitted herewith each bear a Westinghouse copyright notice. The NRC is permitted to make the number of copies of the information contained in these reports which are necessary for its internal use in connection with generic and plant-specific reviews and approvals as well as the issuance, denial, amendment, transfer, renewal, modification, suspension, revocation, or violation of a license, permit, order, or regulation subject to the requirements of 10 CFR 2.390 regarding restrictions on public disclosure to the extent such information has been identified as proprietary by Westinghouse, copyright protection notwithstanding. With respect to the non-proprietary versions of these reports, the NRC is permitted to make the number of copies beyond those necessary for its internal use which are necessary in order to have one copy available for public viewing in the appropriate docket files in the public document room in Washington, DC and in local public document rooms as may be required by NRC regulations if the number of copies submitted is insufficient for this purpose. Copies made by the NRC must include the copyright notice in all instances and the proprietary notice if the original was identified as proprietary.

Attachment 2 to

W3F1-2010-0003

Description of Proposed Change

1.0 DESCRIPTION

This proposed license amendment is a request by Entergy Operations, Inc. (Entergy) to amend Operating License NPF-38 for the Waterford Steam Electric Station, Unit 3 (Waterford 3). Specifically, this proposed amendment will allow the removal of pipe break dynamic protection associated with the Waterford 3 pressurizer surge line using leak-before-break (LBB) methodologies under the guidance of Standard Review Plan (SRP) 3.6.3 (Reference 1).

10CFR50, Appendix A, General Design Criteria (GDC) 4 states that dynamic effects associated with postulated pipe ruptures in nuclear power units may be excluded from the design basis when analyses reviewed and approved by the Commission demonstrate that the probability of fluid system piping rupture is extremely low under conditions consistent with the design basis for the piping. The NRC approved LBB analyses allows licensees to remove protective hardware such as pipe whip restraints and jet impingement barriers, redesign pipe connected components, their supports and their internals, and other related changes.

SRP 3.6.3 provides specific guidance for the piping systems that are to be considered for the LBB application, fracture mechanics analyses of postulated pipe cracks, and leak detection system capability to ensure that the probability of pipe rupture is extremely low. Meeting the requirements of GDC 4 and the guidance of SRP 3.6.3 provides assurance that LBB analyses will satisfy this goal.

2.0 PROPOSED CHANGE

10CFR50.59 states that a licensee may make changes in the facility and procedures as described in the final safety analysis report (FSAR) and conduct tests or experiments not described in the FSAR without obtaining a license amendment pursuant to 10CFR50.90 if a change to the technical specifications is not required, and the change, test, or experiment does not meet any of the criteria in paragraph (c)(2) of 10CFR50.59. Otherwise, a license amendment pursuant to 10CFR50.90 will be obtained prior to implementing a proposed change, test, or experiment.

As discussed in Waterford 3 FSAR Section 3.6.3, Waterford 3 has obtained NRC approval for LBB on the Reactor Coolant System (RCS) main coolant loop piping based on Topical Report CEN-367-A (Reference 2). However, RCS branch lines were not included in the methodology under CEN-367-A including that for the pressurizer surge line. Westinghouse Electric Company (Westinghouse) has conducted fracture mechanics, leak rate predictions, and fatigue crack growth analyses using NRC established LBB methodologies which justify the removal of the dynamic protection for the Waterford 3 pressurizer surge line. The results of these analyses are contained in WCAP-17187-P which is provided in Enclosure 1. However, the implementation of LBB for the pressurizer surge line has been concluded by Entergy to require a license amendment under 10CFR50.90 since one or more of the criteria of 10CFR50.59(c)(2) is met. There are no technical specifications affected by the proposed change.

3.0 BACKGROUND

The Waterford 3 pressurizer surge line is a 12 inch nominal size schedule 160 stainless steel pipe. The surge line is designed in accordance with ASME Code, Section III, Class 1 and seismic Category I requirements. The isometric of the pressurizer surge line indicating postulated break points and pipe whip restraint locations is shown on FSAR Figure 3.6A-38c. Pipe breaks are conservatively postulated at each fitting or welded attachment. Circumferential as well as longitudinal breaks are postulated at each location since the piping is larger than four inches. Rupture restraints are located on the piping to prevent adverse pipe whip effects on essential systems and components. FSAR Table 3.6A-8 lists the rupture restraints currently provided on the surge line. The pressurizer surge line is located in the number 1 steam generator (SG-1) cavity as shown on FSAR Figure 5.1-1.

Entergy will be replacing the two Waterford 3 steam generators and the reactor vessel closure head during the RF17 refueling outage which commences in the spring of 2011. The replacement steam generators (RSGs) will be of similar size and dimensions to the original SGs; however, several changes are being made to facilitate SG design improvements. Specifically, the SG blowdown nozzles are being lowered approximately 17 inches to improve blowdown chemistry. The SG blowdown line will be rerouted from the new nozzles located at the steam generator tubesheet, through the SG-1 cavity and to the existing containment blowdown penetration. Due to the existing dynamic protection currently required for the pressurizer surge line, there is limited space available to effectively reroute the SG blowdown line. The elimination of dynamic protection associated with a pressurizer surge line rupture will allow improved access in the SG-1 cavity to perform the required blowdown line rerouting. Additionally, the SG blowdown piping restraints that would be necessary due to jet impingement from a surge line rupture can be reduced or eliminated.

4.0 TECHNICAL ANALYSIS

Analyses Performed to Satisfy the Guidance of SRP 3.6.3

The fracture mechanics and fatigue crack growth analysis performed in WCAP-17187-P modeled the surge line to identify the most limiting stress and material location that would provide the greatest leakage flaw. The scope of this work covers the entire pressurizer surge line from the primary loop hot leg nozzle junction to the pressurizer nozzle junction. As discussed in this report, the limiting location occurs at Node 70 which is located at an elbow near the pressurizer. However, as noted in WCAP-17187-P, the Waterford 3 surge line has nozzle welds that contain Alloy 82/182 weld material. These welds are at the nozzle to safe end connections for both the pressurizer nozzle and the hot leg nozzle. Entergy chose to proactively mitigate these welds to prevent them from being a possible pressure boundary leakage concern. To perform these repairs, Entergy chose to use ASME Code Case N-740 for performing full structural weld overlays (SWOLs) on the dissimilar metal welds. However, this code case had not received generic NRC approval under NRC Regulatory Guide (RG) 1.147. On April 26, 2007, (Reference 3) Entergy sought NRC approval to use this code case as the basis to perform full SWOLs on these nozzles during the spring 2008 (RF15) refueling outage. The SWOLs applied a reinforcement layer of Alloy 52M using analysis that assumed a 75% throughwall flaw, 360° around the nozzle. It is important to note that no flaws were detected in the Waterford 3 surge line nozzles. The NRC staff approved the use of this code case in letter dated April 21, 2008 (Reference 4). As requested, the surge line SWOLs were completed during the spring 2008 refueling outage. The analysis and installation acceptability for the as-built SWOLs were subsequently reported to the NRC in letters dated May 10, 2008

(Reference 5) and May 29, 2008 (Reference 6), respectively. As discussed in WCAP-17187-P, the surge line at these two locations was modeled with the as-built SWOL nozzle configuration. The Alloy 82/182 and Alloy 52M materials were modeled using techniques consistent with current industry practice. The welds at these locations were shown to have substantial fracture toughness and will remain stable.

In summary, WCAP-17187-P concludes that the leak rate calculations, fracture mechanics analysis, and fatigue crack growth assessment conservatively meets the analytical margins requested by SRP 3.6.3. These margins are summarized as follows:

Margin on Leak Rate:

A margin of 10 exists between the calculated leak rate from the leakage flaw and the leak detection capability of 0.25 gallons per minute (gpm).

Margin on Flaw Size:

Using faulted loads obtained by the absolute sum method, a margin of 2 or more exists between the critical flaw and the flaw having a leak rate of 2.5 gpm (the leakage flaw).

Margin On loads:

The faulted loads are combined by absolute summation method and therefore the recommended margin on loads of 1.0 is satisfied per SRP 3.6.3.

As a result, the SRP 3.6.3 recommended LBB margins are satisfied.

Waterford Leakage Detection System Capability and Sensitivity

SRP 3.6.3 (Reference 1) provides the overall NRC guidance for determining an acceptable leakage crack and the RCS leakage detection sensitivity based on the fracture mechanics analysis. SRP 3.6.3, Section III.11(C)(iii) states that the size of the flaw should be large enough so that leakage from the flaw during normal operation would be 10 times greater than the minimum leakage the detection system is capable of sensing. SRP 3.6.3, section III.4, states that leakage detection systems are evaluated to determine whether they are sufficiently reliable, redundant, and sensitive so that a margin on the detection of unidentified leakage exists for through-wall flaws to support the deterministic fracture mechanics evaluation.

Waterford 3 is committed to compliance with the initial issuance of RG 1.45 (Reference 7). However, Revision 1 of RG 1.45 (Reference 8) expanded the NRC guidance and expectations for RCS leakage detection systems and their capability over that contained in original issuance of RG 1.45. Revision 1 of RG 1.45 states that plants should use multiple, diverse, and redundant detectors at various locations in the containment, as necessary, to ensure that the transport delay time of the leakage from its source to the detector (instrument location) will yield an acceptable overall response time.

Additionally, RG 1.45, Revision 1, has also embodied the industry initiatives for having improved control room RCS monitoring capability. Regulatory Position C.3 states that plant procedures should specify operator actions in response to leakage rates less than the limits set forth in the plant technical specifications. These procedures should include actions for such things as confirming the existence of a leak, identifying its source, increasing the frequency of monitoring, verifying the leakage rate (through a water inventory balance), responding to trends in the leakage rate, performing accessible walkdowns, and planning containment entries.

As determined by WCAP-17187-P, the postulated leakage flaw results in a leakage rate of 2.5 gpm including margin to critical crack size. Applying a factor of 10 margin for detection capability consistent with SRP 3.6.3, Waterford 3 would need to have the capability to detect an RCS unidentified leakage rate of ≤ 0.25 gpm. The following provides the basis for Waterford 3's RCS leakage detection instrumentation and control room leakage monitoring that meets the 0.25 gpm leakage detection capability.

Containment Sump Level Computer Point - A Containment sump level computer point has been added to the control room Plant Monitoring Computer (PMC) which provides data from the containment sump level transmitter (SP-ILT-6705B) to calculate the level change in the sump over a specified time period. The level change in the sump is converted to a volume change based on the size of the sump deep pit. The change in volume over time is used to conservatively calculate the in-leakage flow rate. The leak rate calculation is based on 10 minutes of previous level data from transmitter SP-ILT-6705B. The calculation is performed and displayed at a PMC scan rate of once per second. Therefore, the calculated computer point is available every second and displays a leak rate that is based on 10 minutes of previous data. Based on this scan rate and data period, the PMC computer point has the ability to detect a 0.1 gpm leak rate. Even though the computer point on the PMC is not seismically qualified, the transmitter (SP-ILT-6705B) is safety-related, seismically and environmentally qualified. In 2004, Entergy sought a license amendment request for reestablishing the Waterford 3 TS 3/4.4.5 leakage detection instrumentation for compliance to RG 1.45 (Reference 9). Details of the containment sump level PMC computer point was provided as one means of complying with RG 1.45. Even though the lower limit of RCS leakage detection sensitivity was not discussed, the overall design and implementation of the sump level computer point was provided in Reference 9. The NRC Staff approved the containment sump level computer point as an acceptable means for TS 3/4.4.5 RCS leakage detection instrumentation and RG 1.45 compliance (Reference 10).

Waterford RCS Leakage Monitoring Capability - Waterford has implemented RCS unidentified leakage monitoring and action levels in accordance with the guidance of WCAP-16465 (Reference 11). The PWR Owners Group concluded that leak rate measurements can reveal small leaks (< 0.1 gpm) when data is recorded for a sufficient period of time. WCAP-16465 established RCS unidentified leakage trending and action levels during normal plant operation.

At the beginning of each operating cycle, Waterford establishes an RCS leakage baseline which is taken from a combination of previous cycle operation or steady state operation in the current cycle. If the baseline standard deviation is less than +0.01 gpm, +0.01 gpm is used. The upper limit for the baseline standard deviation is 0.1 gpm. The baseline data is obtained from the RCS water inventory balance measurements. This data is used to establish total leakage (gpm), seven day average unidentified leakage (gpm), short term (30 day) total integrated unidentified leakage, and long term (operating cycle) total integrated unidentified leakage. The water inventory balance is further compared and validated against the containment sump level and containment radiation monitoring instrumentation data. A containment sump equivalent leakage rate and containment activity equivalent leakage rate are determined and compared to the water inventory balance which provides diverse means of identifying RCS actual leakage conditions. Trending of various RCS unidentified leakage indications are also performed routinely including containment sump level and sump weir flow, containment gaseous iodine and particulate levels, humidity, and volume control tank level.

Various short term and long term action levels have been procedurally established. These include three primary standard action levels which are the monitoring absolute unidentified leak rate (in gpm), the deviation from the baseline mean (in gpm), and the total integrated unidentified leakage (in gallons). The first action level, absolute unidentified leak rate, provides a direct indication of RCS unidentified leakage which establishes the following individual action levels:

- One seven (7) day rolling average of daily unidentified RCS leak rates > 0.1 gpm.
- Two consecutive daily unidentified RCS leak rates > 0.15 gpm.
- One daily unidentified RCS leak rate > 0.3 gpm.

Actions are taken well ahead of approaching the RCS leakage actions required by the Technical Specification unidentified leakage rate requirement of 1.0 gpm. If any action level is exceeded, a condition report is initiated in accordance with Entergy's corrective action program. Actions are initiated as part of the corrective action process to identify and correct the condition. A leakage investigation plan will be prepared if the condition cannot be readily corrected. Actions may include performing containment walkdowns of accessible areas up to performing a plant shutdown to address and correct the RCS leakage condition.

Based on the improved RCS unidentified leakage monitoring program developed through WCAP-16465, Waterford trends RCS normal unidentified leakage at levels below 0.1 gpm and takes action beginning at 0.1 gpm. The action level of 0.1 gpm is one tenth of the TS Limit for unidentified leakage which ensures that early detection of changes in RCS unidentified leakage will be identified and addressed prior to TS limiting conditions for operation are reached.

Therefore, Waterford 3 has the ability to detect and monitor RCS unidentified leakage for the limiting surge line flaw analyzed in WCAP-17187-P including prescribed margins. The Waterford 3 leakage detection capability is provided by both installed RG 1.45 leakage detection instrumentation and by improved control room leakage monitoring performed by procedure. This leakage detection capability satisfies SRP 3.6.3 for elimination of postulated Waterford 3 surge line breaks per GDC 4.

The Waterford 3 RCS leakage detection details discussed above are not currently reflected in the Waterford 3 FSAR. Therefore, in support of the requirements for having RCS leakage detection capability with sufficient sensitivity to meet the surge line leak before-break analysis, Entergy commits to provide RCS unidentified leakage detection details in FSAR section 5.2.5 as provided in Attachment 3.

5.0 REGULATORY ANALYSIS

5.1 Applicable Regulatory Requirements/Criteria

Entergy Operations, Inc. (Entergy) proposes to eliminate the Waterford Steam Electric Station, Unit 3 (Waterford 3) pressurizer surge line as a potential rupture location in accordance with 10CFR50, Appendix A, General Design Criterion (GDC) 4. WCAP-17187-P has been prepared which has analyzed the Waterford 3 pressurizer surge line using methodologies found acceptable under the guidance of NUREG-0800, Standard Review Plan, Section 3.6.3, "Leak-Before-Break Evaluation Procedures." Entergy has concluded that

Waterford 3 has the capability to detect a postulated leakage flaw consistent with the analysis results provided in WCAP-17187-P before it could become a pipe rupture.

In conclusion, Entergy has determined that the proposed amendment does not require any technical specification changes, exemptions, or relief from regulatory requirements, but requires a change to the Waterford 3 operating license in accordance with 10CFR50.90 since one or more of the criteria of 10CFR50.59(c)(2) is met. Related discussion contained in the Waterford 3 Final Safety Analysis Report (FSAR) will be revised to be consistent with results of this amendment request.

5.2 No Significant Hazards Consideration

Entergy Operations, Inc. has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10CFR50.92, "Issuance of amendment," as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No.

   The proposed change uses an approved leak-before-break (LBB) fracture mechanics methodology, in accordance with 10CFR50, Appendix A, General Design Criterion (GDC) 4 to demonstrate that the probability of fluid system rupture for these lines attached to the Reactor Coolant System (RCS) is extremely low under conditions associated with the design basis for the piping. The proposed change does not adversely affect accident initiators or precursors nor significantly alter the design assumptions, conditions, and configuration of the facility or the manner in which the plant is operated and maintained. Overall protection system performance will remain within the bounds of the previously performed accident analyses. The design of the protection systems will be unaffected. The Reactor Protection System (RPS) and Emergency Core Cooling System (ECCS) will continue to function in a manner consistent with the plant design basis. All design, material, and construction standards that were applicable prior to the request are maintained. There will be no change to normal plant operating parameters or accident mitigation performance. The proposed amendment will not alter any assumptions or change any mitigation actions in the radiological consequence evaluations in the FSAR.

   Therefore, this change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No.

   The proposed change does not create the possibility of a new or different kind of accident, since it provides an NRC acceptable alternate means for demonstrating that the probability of a fluid system rupture is extremely small. There are no changes in the methods by which any safety-related plant system performs its safety function. No new accident scenarios, transient precursors, failure mechanisms, or limiting single failures are introduced as a result of this amendment. There will be no adverse effect or challenges imposed on any safety-related system as a result of this amendment. LBB methodology per GDC-4 still requires that ECCS, containment, and equipment qualification (EQ) requirements be maintained consistent with the original postulated accident assumptions. Only protection from dynamic effects is modified.

   Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

   Response: No.

   The proposed changes apply conservative approved analytical methods to demonstrate that the probability of a fluid system rupture is very low. This analysis retains substantial margins to assure that pipe rupture is extremely low and justifies differences in protection from dynamic effects with these extremely low probability ruptures. There will be no effect on the manner in which safety limits or limiting safety system settings are determined nor will there be any effect on those plant systems necessary to assure the accomplishment of protection functions. For overall ECCS, containment, and EQ requirements, there will be no changes to the assumed margins.

   Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, Entergy concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10CFR50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

5.3 <u>Environmental Considerations</u>

The proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10CFR51.22(c)(9). Therefore, pursuant to 10CFR51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6.0 PRECEDENCE

The NRC has approved a similar request dated September 22, 2005 for the R.E. Ginna Power Plant (Reference 12).

7.0 REFERENCES

1. NUREG-0800, Standard Review Plan, Section 3.6.3, *Leak-Before-Break Evaluation Procedures*, Revision 1 (March 2007).

2. Topical CEN-367-A, *Leak-Before-Break Evaluation of Primary Coolant Loop Piping in Combustion Engineering Designed Nuclear Steam Supply Systems*, prepared for the C-E Owners' Group, February 1991.

3. Entergy letter to NRC dated April 26, 2007, *Request for Alternative W3-R&R-006 Proposed Alternative to ASME Code Requirements for Weld Overlay Repairs* (CNRO-2007-00021) [ML080950273]

4. NRC letter to Entergy dated April 21, 2008, Waterford Steam Electric Station, Unit 3 - Request for Alternative W3-R&R-006 – Proposed Alternative to ASME Code Requirements for Weld Overlay (TAC No. MD5388) [ML071230223]

5. Entergy letter to NRC dated May 10, 2008, *Summary of Design and Analyses of Weld Overlays for Pressurizer and Hot Leg Nozzle Dissimilar Metal Welds for Alloy 600 Mitigation Waterford Steam Electric Station, Unit 3* (W3F1-2008-0037) [ML081350064]

6. Entergy letter to NRC dated May 29, 2008, *Summary of Weld Overlay Ultrasonic Examinations for Pressurizer And Hot Leg Nozzle Welds at Waterford 3 Steam Electric Station Waterford Steam Electric Station, Unit 3* (W3F1-2008-0040) [ML081540252]

7. Regulatory Guide 1.45, *Reactor Coolant Pressure Boundary Leakage Detection Systems,* Initial Issuance (May 1973).

8. Regulatory Guide 1.45, *Guidance on Monitoring and Responding to Reactor Coolant System Leakage,* Revision 1 (May 2008).

9. Entergy letter to NRC dated July 16, 2004, *Supplement to License Amendment Request NPF-38-254, Reactor Coolant System Leakage Detection Waterford Steam Electric Station, Unit 3* (W3F1-2004-0060). [ML042020391]

10. NRC letter to Entergy dated July 30, 2004, *Waterford Steam Electric Station, Unit 3 - Issuance of Amendment Re: Reactor Coolant System Leakage Detection (TAC No. MC3085).* [ML042150057]

11. WCAP-16465, *Pressurized Water Reactor Owners Group Standard RCS Leakage Action Levels and Response Guidelines for Pressurized Water Reactors*, Revision 0 (September 2006). [ML070310082]

12. NRC letter to Constellation Entergy dated September 22, 2005, *R.E. Ginna Nuclear Power Plant - Amendment Re: Application of Leak-Before-Break Methodology for Pressurizer Surge Line and Accumulator Lines (TAC No. MC4929*) [ML052430343]

Attachment 3 to

W3F1-2010-0003

Proposed Final Safety Analysis Report Changes (mark-up)

5.2.5.1 Leakage Detection Methods

The means provided for leak detection consists of instrumentation which can detect general leakage from the reactor coolant pressure boundary. Through changes in liquid level, flow rate or radioactivity level, specific sources of leakage can frequently be identified. The various methods of detecting leakage (unidentified and identified) are discussed in the following paragraphs.

5.2.5.1.1 Sump Level and Flow Monitoring

The collection of water in the reactor cavity containment sump indicates possible reactor coolant leakage. Reactor Building floor drains and containment fan cooling unit condensate drains are routed to the sump so that water does not accumulate in areas of the containment other than the sump.

→(DRN 00-1059, R11-A; 06-250, R14-B)

Equipment and floor drains are routed through a single eight in. diameter pipe to a measurement tank and from there to the sump. A triangular notch weir is machined on the outlet side of the measurement tank. The flow through the weir causes the level of the measurement tank to correspond to the flow of water into the tank. The measurement tank is fitted with a level transmitter. The measuring tank level is a function of the flow into the tank. The level transmitter sends 4-20 ma dc signal proportional to the tank level to the main control room for signal linearization, recording, input to the plant monitoring computer and annunciator. The alarm is set at one gpm leakage flow above normal as required by the Regulatory Guide 1.45. A second alarm is set at a higher flow rate to alert the Control Room Operator of rising leakage flow. The level transmitter is non-safety-related and capable of performing its function following seismic events up to a safe shutdown earthquake per Regulatory Guide 1.45.

←(DRN 00-1059, R11-A; 06-250, R14-B)

← INSERT A

→(DRN 04-1221, R13-A)

A second method of containment sump monitoring utilizes the containment sump level indication to formulate in-flow leakage rates. By maintaining level in the deep pit area of the containment sump, a change in sump level can be converted to an in-leakage flowrate. The calculation of in-flow leakage rate is performed on the plant computer. The containment sump level transmitter is safety related and seismically qualified.

←(DRN 04-1221, R13-A)

In order to assist the operator to detect the source of leakage, the four containment fan cooler pan drains are piped to the containment sump measuring tank inlet pipe. The presence of flow in each of the drain lines is detected by six flow switches which are monitored by the plant monitoring computer. The following are possible sources of flow in the fan coolers drain:

a) Normal condensation from the containment air.

b) Steam pipe rupture.

c) Component cooling water coil rupture inside of the fan cooler enclosure.

→(DRN 00-1059, R11-A)

All of the above will be detected by the sump measuring tank input flow transmitter.

←(DRN 00-1059, R11-A)

→(DRN 04-1221, R13-A)

5.2.5.1.2 Containment Airborne Particulate Radioactivity Monitoring

←(DRN 04-1221, R13-A)

The containment atmosphere radiation monitor is designed to provide a continuous indication in the main control room of the particulate, iodine and gaseous radioactivity levels inside the containment. Radioactivity in the containment atmosphere indicates the presence of fission products due to a Reactor Coolant System leak or leakage of a contaminated secondary fluid system. This system is described in Subsection 12.3.4.

5.2.5.1.8 Steam Generator Tube Leakage

→(DRN 01-3692, R12)

An increase in radioactivity indicated by the condenser vacuum pump exhaust radiation monitors, the steam generator blowdown radiation monitors, and the main steam line N-16 Sodium Iodide monitors will indicate reactor coolant leakage to the secondary side. Routine analysis of steam generator water samples would also indicate increasing leakage of reactor coolant.

←(DRN 01-3692, R12)

5.2.5.1.9 Reactor Vessel Head Closure Leakage

The space between the double 0-ring seal is monitored to detect an increase in pressure, which indicates a leak past the inner 0-ring. Alarm of this condition is available in the main control room.

5.2.5.1.10 Reactor Coolant Pump Flange Closure Leakage

→(DRN 02-317, R12)

The Reactor Coolant Pump case and pump cover / driver mount is sealed by an inner and outer gasket. Reactor Coolant Pump leak-off into the annulus between these two gaskets may be aligned to pressure switches, the Reactor Drain Tank, or isolated from the pressure switches or the Reactor Drain Tank.

←(DRN 02-317, R12)

← INSERT B

5.2.5.2 <u>Indication in Main Control Room</u>

The primary indications of reactor coolant leakage are:

a) High containment sump flow alarm

b) Very high containment -sump flow alarm

c) Containment airborne radioactivity monitor indication (particulate and iodine and gaseous)

d) High containment particulate radioactivity alarm

→(DRN 04-1221, R13-A)

e) Deleted

f) Deleted

←(DRN 04-1221, R13-A)

Other main control room instrumentation that indicates significant reactor coolant leakage includes:

→(DRN 00-1059, R11-A)

a) Temperature detectors downstream of primary (pressurizer) safety valves (M-107/108)

←(DRN 00-1059, R11-A)

b) Primary safety valves accoustic position monitors

c) Safety injection tank level indication (LI-311/321, LI-331/341)

d) High and high-high safety injection tank levels alarm

e) Safety injection tank pressure indication and high pressure alarm

f) CCW Radiation indication

SECTION 5.2.5: REFERENCES

(1) Flow of Fluids, Technical Paper No. 410, Crane Co. 1957.

(2) The Discharge of Saturated Water Through Tubes, H.K. Fauske, Chemical Engineering Progress Symposium Series, Heat Transfer Cleveland, No. 59, Vol. 61.

INSERT C

INSERT A

A containment sump level computer point is provided on the control room Plant Monitoring Computer (PMC) which displays data from the containment sump level transmitter (SP-ILT-6705B) to calculate the level change in the sump over a specified time period. The level change in the sump is converted to a volume change based on the deep portion of the sump pit. The change in sump volume over time is used to conservatively calculate the in-leakage flow rate. The leak rate calculation is based on 10 minutes of previous level data. The calculation is performed and displayed at the PMC scan rate of once every 1 second. Therefore, the calculated computer point is performed every second and it will display a leak rate that is obtained from 10 minutes of previous data. The PMC sump data could be delayed up to 10 minutes during a sump pump run to return sump level to its normal monitoring level or after a PMC restart. The sump level computer point on the PMC is non-seismic, however, transmitter SP-ILT-6705 B is safety-related, seismic qualified and environmentally qualified. This PMC sump level computer point meets the sensitivity requirements of 0.25 gpm unidentified leakage rate in WCAP-17187-P (Reference 3) to prevent potential surge line ruptures.

INSERT B

5.2.5.1.11 Control Room Leakage Monitoring

Waterford has implemented RCS unidentified leakage monitoring and action levels in accordance with the guidance of WCAP-16465, "Pressurized Water Reactor Owners Group Standard RCS Leakage Action Levels and Response Guidelines for Pressurized Water Reactors" (Reference 4). The PWR Owners Group concluded that leak rate measurements can reveal small leaks (< 0.1 gpm) when data is recorded for a sufficient period of time. WCAP-16465 established RCS unidentified leakage trending and action levels for three conditions during normal plant operation. This includes monitoring absolute unidentified leak rate (in gpm), deviation from the baseline mean (in gpm), and total integrated unidentified leakage (in gallons). The absolute unidentified leak rate action levels which a direct indication of RCS unidentified leakage are established at:

- One seven (7) day rolling average of daily unidentified RCS leak rates > 0.1 gpm.
- Two consecutive daily unidentified RCS leak rates > 0.15 gpm.
- One daily unidentified RCS leak rate > 0.3 gpm.

Waterford trends RCS normal unidentified leakage at levels below 0.1 gpm. The action level of 0.1 gpm is one tenth of the TS Limit for unidentified leakage which ensures that early detection of changes in RCS unidentified leakage will be identified and addressed prior to TS limiting conditions for operation are reached.

INSERT C

(3) WCAP-17187-P, Technical Justification for Eliminating Pressurizer Surge Line Rupture as the Structural Design Basis for Waterford Steam Electric Station, Unit 3, Using Leak-Before-Break Methodology Revision 0, February 2010.

(4) WCAP-16465, *Pressurized Water Reactor Owners Group Standard RCS Leakage Action Levels and Response Guidelines for Pressurized Water Reactors*, Revision 0, September 2006.

Attachment 4 to

W3F1-2010-0003

List of Regulatory Commitments

LIST OF REGULATORY COMMITMENTS

This table identifies actions discussed in this letter for which Entergy commits to perform. Any other actions discussed in this submittal are described for the NRC's information and are not commitments.

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
Entergy will modify the Waterford 3 Final Safety Analysis Report to include additional details on RCS Leakage Detection System capability.	X		The next regularly scheduled Waterford 3 FSAR Update submittal after approval