Florida Power & Light Company, 6501 South Ocean Drive, Jensen Beach, FL 34957

April 5, 2012

Proprietary Information – Withhold From Public Disclosure Under 10 CFR 2.390. The balance of this letter may be considered non-proprietary upon removal of Attachment 2.

L-2012-131
10 CFR 50.90
10 CFR 2.390

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

Re: St. Lucie Plant Unit 2
Docket No. 50-389
Renewed Facility Operating License No. NPF-16

Response to NRC Reactor Systems Branch Request for Additional Information Regarding Extended Power Uprate License Amendment Request

References:

(1) R. L. Anderson (FPL) to U.S. Nuclear Regulatory Commission (L-2011-021), "License Amendment Request for Extended Power Uprate," February 25, 2011, Accession No. ML110730116.

(2) Email from T. Orf (NRC) to C. Wasik (FPL), "St. Lucie 2 EPU draft RAI – Reactor Systems (SRXB)," March 2, 2012.

By letter L-2011-021 dated February 25, 2011 [Reference 1], Florida Power & Light Company (FPL) requested to amend Renewed Facility Operating License No. NPF-16 and revise the St. Lucie Unit 2 Technical Specifications (TS). The proposed amendment will increase the unit's licensed core thermal power level from 2700 megawatts thermal (MWt) to 3020 MWt and revise the Renewed Facility Operating License and TS to support operation at this increased core thermal power level. This represents an approximate increase of 11.85% and is therefore considered an Extended Power Uprate (EPU).

By email from the NRC Project Manager dated March 2, 2012 [Reference 2], additional information was requested by the NRC staff in the Reactor Systems Branch to support their review of the EPU License Amendment Request (LAR). The request for additional information (RAI) identified six questions. These questions are designated as SRXB-112 through 117.

Attachment 1 contains the non-proprietary responses and Attachment 2 contains the proprietary responses to RAI questions SRXB-112 through SRXB-117.

A002
A001
NRR

Attachment 3 contains a copy of the Proprietary Information Affidavit. The purpose of this attachment is to withhold the proprietary information contained in the responses to SRXB-112, 113, 115 and 116 (Attachment 2) from public disclosure. The Affidavit signed by Westinghouse as the owner of the information sets forth the basis for which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of § 2.390 of the Commission's regulations. Accordingly, it is respectfully requested that the information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10 CFR 2.390.

This submittal does not alter the significant hazards consideration or environmental assessment previously submitted by FPL letter L-2011-021 [Reference 1].

This submittal contains no new commitments and no revisions to existing commitments.

In accordance with 10 CFR 50.91(b)(1), a copy of this letter is being forwarded to the designated State of Florida official.

Should you have any questions regarding this submittal, please contact Mr. Christopher Wasik, St. Lucie Extended Power Uprate LAR Project Manager, at 772-467-7138.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Executed on 05-April-2012

Very truly yours,

Richard L. Anderson
Site Vice President
St. Lucie Plant

Attachments (3)

cc: Mr. William Passetti, Florida Department of Health

Response to NRC Reactor Systems Branch Request for Additional Information

The following information is provided by Florida Power & Light (FPL) in response to the U. S. Nuclear Regulatory Commission's (NRC) Request for Additional Information (RAI). This information was requested to support the Extended Power Uprate (EPU) License Amendment Request (LAR) for St. Lucie Unit 2 that was submitted to the NRC by FPL via letter L-2011-021 dated February 25, 2011 (Accession Number ML110730116).

By email from the NRC Project Manager dated March 2, 2012 [Reference 2], additional information was requested by the NRC staff in the Reactor Systems Branch to support their review of the EPU License Amendment Request (LAR). The request for additional information (RAI) identified six questions. These questions are designated as SRXB-112 through 117 and the non-proprietary version of the responses is provided below.

SRXB-112

Please provide the studies that examine downcomer boiling nodalization mentioned in section 2, "Justification of Downcomer Nodalization" in your response to SRXB-95.

Response

The Westinghouse Appendix K Large Break LOCA methods for CE-plants are approved with the following condensation models during reflood:

i. [ ]a,c

ii.

The studies referred to in response to NRC RAI SRXB-95 were performed in a Westinghouse internal calculation to evaluate the impact of condensation in the cold legs and heat transfer in the annulus-downcomer on the temperature response in the downcomer and its possible impact on downcomer boiling for CE-designed plants and is applicable to St. Lucie Unit 2.

The study evaluated the following scenarios:

i. [a,c

ii.

iii.]

In addition, the study evaluated the impact of a lumped wall heat model instead of the currently used semi-infinite slab wall heat model. See Reference 1, Section III.A.2.

The conclusions of the study are as follows:

a,c

a. [

b.

c.

d.

e.]

The results described above demonstrate that downcomer boiling is not a concern for Combustion Engineering plants LOCA calculations because:

i. All CE plants have dry atmospheric containments (the containment pressure is relatively high during reflood thus increasing the downcomer subcooling for a given downcomer temperature).

ii. All CE plants have large SITs with long delivery times (greater than 45 seconds).

iii. CE plants have high capacity safety injection pumps.

iv. Items ii and iii contribute to a significant subcooling in the downcomer.

References

[1] CENPD-134 P, "COMPERC-II, A Program for Emergency-Refill-Reflood of the Core," August, 1974.

[a,c

Figure 1a

Figure 1b

Figure 1c]

SRXB-113

Please address refining downcomer nodalization.

a. **The current nodalization does not appear capable of capturing the effects of downcomer boiling which may be important to the late reflood PCT at SLU2. The more detailed analysis done for SLU1 does not apply to SLU2 as the SITs at SLU2 are much higher pressure and will inject and empty earlier than the lower pressure SITs at SLU1. Additionally the analysis for SLU1 used a realistic evaluation model and did not include the necessary Appendix K assumptions including a 1.2 x decay heat multiplier on the 1971 standard and no credit for ECCS bypass.**

b. **The staff is particularly interested in the amount of water that exits the break and is therefore not available for refill if downcomer boiling is accounted for.**

Response (a)

The COMPERC-II code represents the downcomer using a [a,c] representation (see Reference 1, Section II).

The response to RAI SRXB-112 shows that the downcomer stays significantly subcooled during the reflood portion of a LOCA for CE designed reactors. The response to part b of this RAI describes the relatively large flows entering and exiting the downcomer that support mixing of the fluid in the upper region of the downcomer. This in combination with natural circulation currents caused by wall heat would result in significant mixing in the downcomer. Item (e) of the response to RAI SRXB-112 discusses that for downcomers of CE reactors with large average subcooling during the reflood of a LOCA, coupled with significant mixing of fluid in the downcomer caused by large SI injection and wall heat prevents the occurrence of localized voiding. Thus, downcomer boiling effects do not occur during the reflood portion of a LOCA for CE designed reactors during the time of interest for PCT.

References

[1] CENPD-134 P, "COMPERC-II, A Program for Emergency-Refill-Reflood of the Core," August, 1974.

Response (b)

Reference 1, Section III.A describes the COMPERC-II refill and reflood thermal-hydraulic model and equations for the downcomer. Parameters that illustrate the performance of the model are shown in Figures 2 through 6. The LBLOCA transient chosen for the illustration of results is the limiting break for the St. Lucie Unit 2 EPU analysis. The response is shown for the refill and reflood portion of the transient starting at the end of blowdown (27 seconds). The sequence of events is as follows:

Time (seconds)	Event
27	End of blowdown. Vessel is empty. SI water begins to enter bottom of vessel SITs are discharging.
36.7	SI pumps begin to discharge
41.9	Water level reaches bottom of the core
51.3	Downcomer level reaches the bottom of the cold leg. Downcomer liquid begins to spill to containment
117.6	SITs empty
306.5	Time of Peak Cladding Temperature
600	End of transient (figures show results to 500 seconds)

The figures are the following:

Figure 2, Flow Rates in the downcomer vs. Time,

Figure 3, Steam flow to containment through break vs. Time,

Figure 4, Temperatures in the downcomer vs. Time,

Figure 5, Downcomer liquid level vs. Time,

Figure 6, Wall heat rate to downcomer vs. Time.

Specific parameters shown in the figures are as follows and are consistent with the description in Reference 1, Section III.A.

- SI flow: Summation of SIT flow to three intact loops plus summation of SI pump to three intact loops plus total steam condensation in cold legs.

- SI temperature: Mixed temperature of SI flows described above (note it includes the effect of condensing steam during SIT injection).

- Break flow: Spillage liquid flow from the vessel. It does not include the SIT and SI pump flows to the broken loop that are discharged directly to the containment.

- Core flow: Core flow rate entering the core from the downcomer – lower plenum.

- Bypass flow: Core bypass flow.

Note that the figures illustrate the following specific features of the Appendix K model:

a,c

- Figure 6 shows the magnitude of the downcomer wall heat rate.

References

[1] CENPD-134 P, "COMPERC-II, A Program for Emergency-Refill-Reflood of the Core," August, 1974.

a,c

SRXB-114

Item 1c from section 2 of your SRXB-95 RAI response states, "CE plants have high capacity safety injection (SI) pumps. These plant features reduce the susceptibility to downcomer boiling." Please confirm whether LHSI pumps have adequate NPSH to operate during recirculation.

Response

The low pressure safety injection (LPSI) pumps do not operate during the recirculation mode following a LBLOCA (*i.e.*, after the recirculation actuation signal (RAS) has been activated and ECCS pump suction has switched from the refueling water storage tank (RWST) to the containment sump). Only the high pressure safety injection (HPSI) pumps with relatively low flow capacity operate during the recirculation mode. The adequacy of the HPSI pump NPSH during the recirculation mode of operation has been addressed in RAI response SCVB-10 for the St. Lucie Unit 2 EPU (FPL letter L-2011-383 dated 9/22/11, ML11269A222).

SRXB-115

Item 4 from section 2 of your SRXB-95 RAI response states, "The COMPERC-II/LB computer code wall heat model is a very conservative model using a semi-infinite slab presentation at a constant uniform initial temperature (vessel wall) which calculates wall heat to the downcomer fluid using a constant film coefficient and heat transfer area."

a. **Please demonstrate that the wall heat model properly computes the transfer of heat from the walls to the coolant. Describe the model and how the wall heat model was validated.**

b. **Please confirm that the COMPERC-II/LB code initial wall temperature is as much as or exceeds the maximum wall temperatures calculated for the SLU1 ECCS evaluation.**

Response (a)

a,c

Response (b)

Not applicable, as no credit is taken for the St. Lucie Unit 1 ECCS evaluation.

References

[1] CENPD-134 P, "COMPERC-II, A Program for Emergency-Refill-Reflood of the Core," August, 1974.

SRXB-116

Item 6 from section 2 of your SRXB-95 RAI response states, "Neglecting these voids during reflood can over-estimate the gravitational head in the downcomer. "Please demonstrate that the Appendix K conservatisms are sufficient to compensate for the code simplicity by performing an analysis of downcomer heat transfer that treats two-phase flow behavior more realistically.

Response

a,c

( )

Some of the 1999EM conservatisms (Reference 1, Section 3.7) during the refill/reflood calculations that can compensate possible downcomer boiling effects are:

a,c

( )

References

[1] CENPD-132 Supplement 4-P-A, "Calculative Methods for the CE Nuclear Power Large Break LOCA Evaluation Model," March, 2001.

[2] NUREG/IA-0127, "Reactor Safety Issues Resolved by the 2D/3D Program," July, 1993.

SRXB-117

The response to RAI SRXB-89 was incomplete. The severed injection line break has some significant differences from the other small breaks and therefore cannot be included in the assumptions about small break sizes greater than 0.06 ft^2/PO. The SIT break will depressurize faster and the accumulators will cut in faster than with smaller breaks, but the SIT injection and SI pump spillage is unquantified, and the treatment of ECC bypass is not addressed. A large amount of the SIT flow that enters the downcomer may also go out the break. Please provide the results of the broken injection line break. If the SBLOCA methodology is not appropriate please provide an analysis using a different method.

Response

A severed Safety Injection (SI) line break of 0.5592 ft^2 was explicitly analyzed for St. Lucie Unit 2 at Extended Power Uprate (EPU) conditions using the NRC accepted Appendix K Small Break Loss-of-Coolant Accident (SBLOCA) Analysis methodology. This methodology is consistent with that used in the SBLOCA reported in the St. Lucie Unit 2 EPU Licensing Amendment Report. Conservatively the analysis did not credit the SI pump delivery flow to the intact cold legs by assuming 100% flow diversion of the SI pump flow to the broken SI line. A limiting resultant PCT of 1347 °F was attained which is bounded by the reported PCT for both SBLOCA and LBLOCA EPU analyses.

The PCT results for the analysis are given in Table 1. The sequence of events/Times of interest table is provided in Table 2. Plots for the following parameters are provided in Figures 1 through 4.

Figure 1. Core Power

Figure 2. Core pressure

Figure 3. Core Node Mixture Level

Figure 4. Hot Spot Cladding Temperature

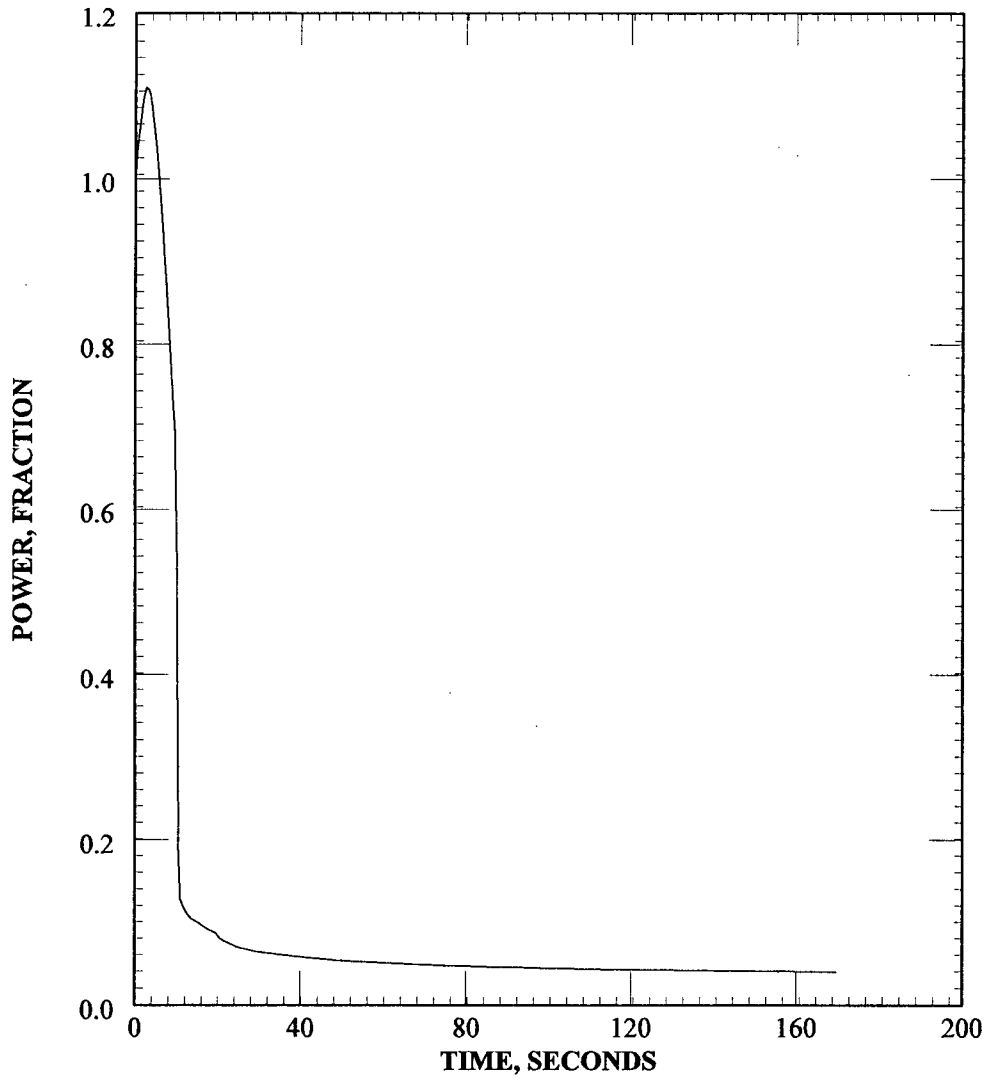
Table 1
Summary of PCT Results

Case	Blowdown PCT (°F)	Reflood PCT (°F)
Safety Injection Severed Line Break	1347	1160

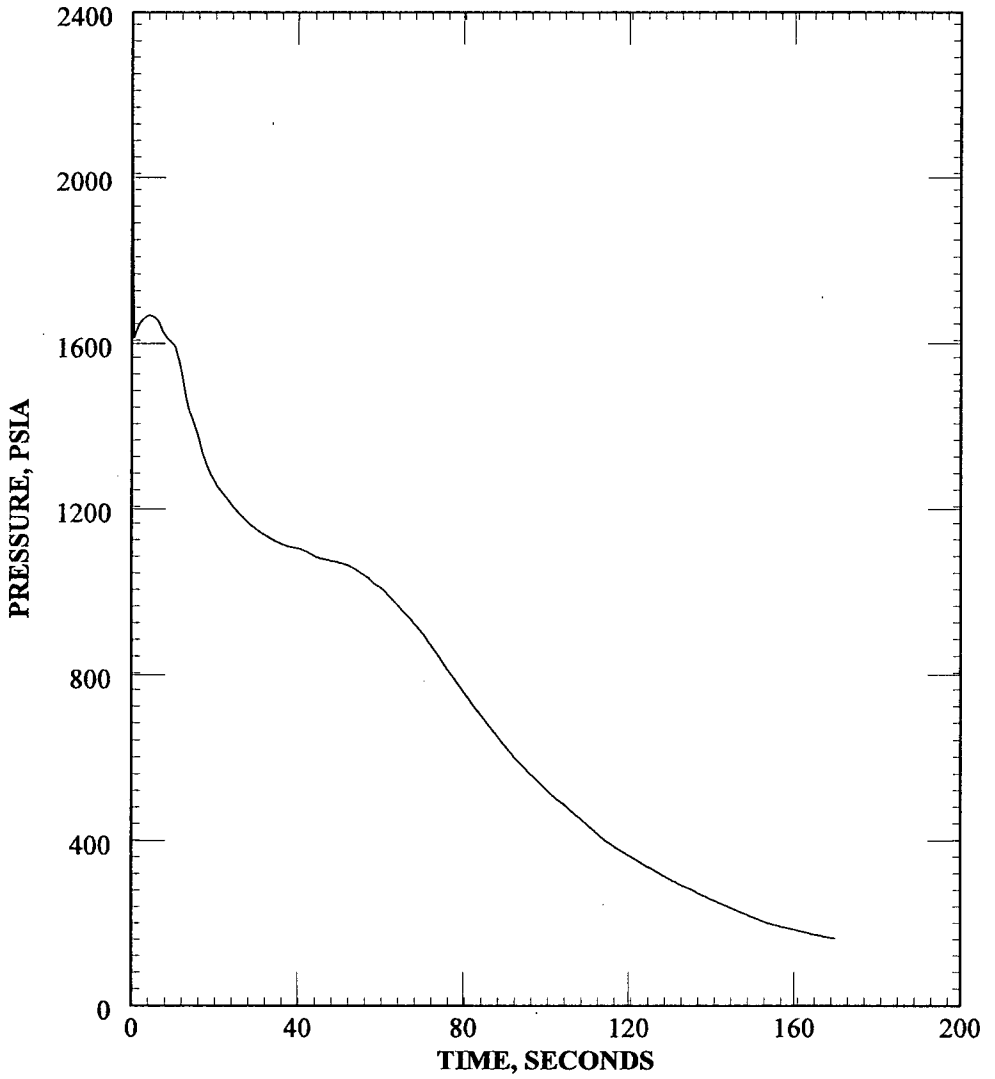
Table 2
Sequence of Events/Times of Interest

Event	Time after Break (seconds)
Reactor Trip	5.7
Blowdown PCT Time	9
SIAS Time	10
Initiation of Safety Injection Flow	40[1]
Safety Injection Tank Injection	103
Reflood PCT Time	121

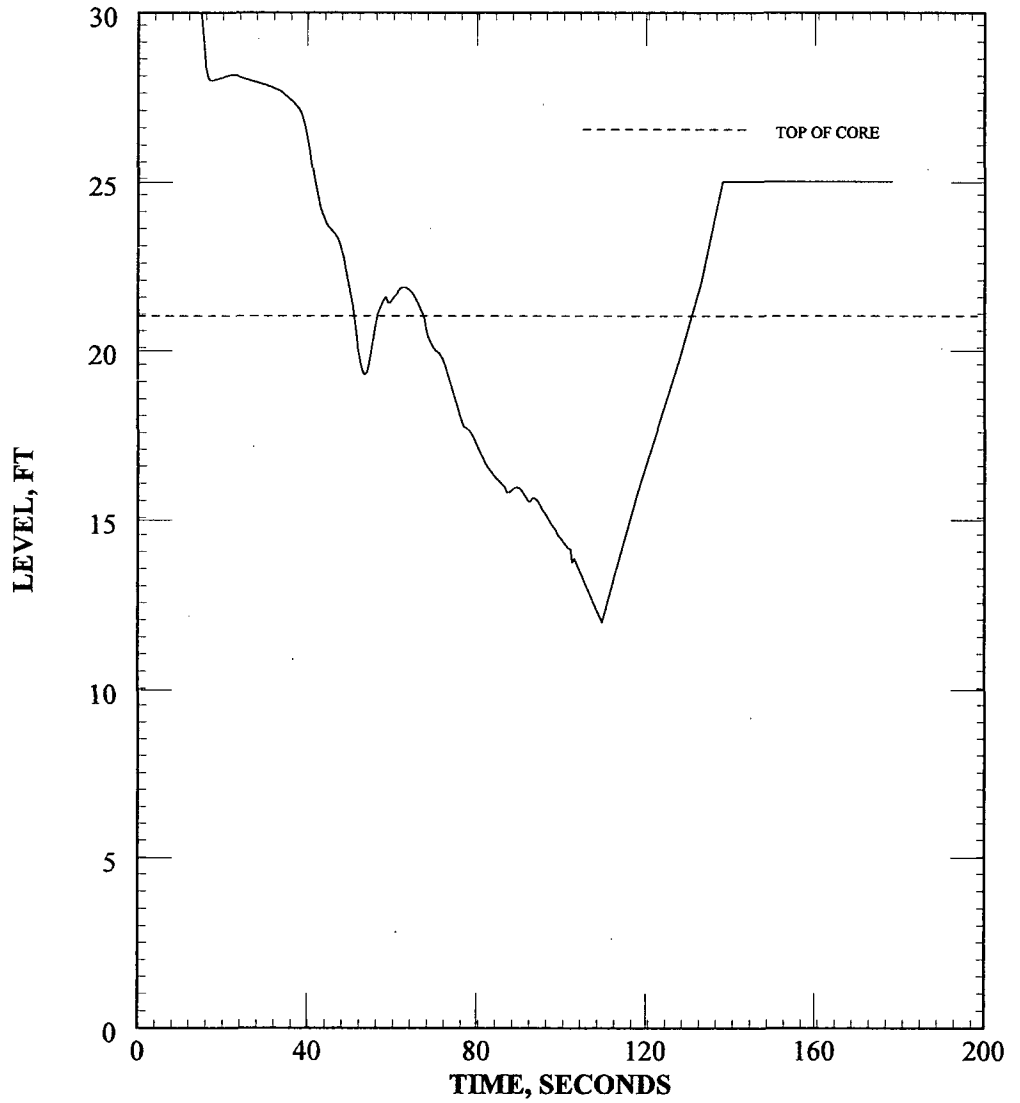
[1] SI pump injection is spilled to containment



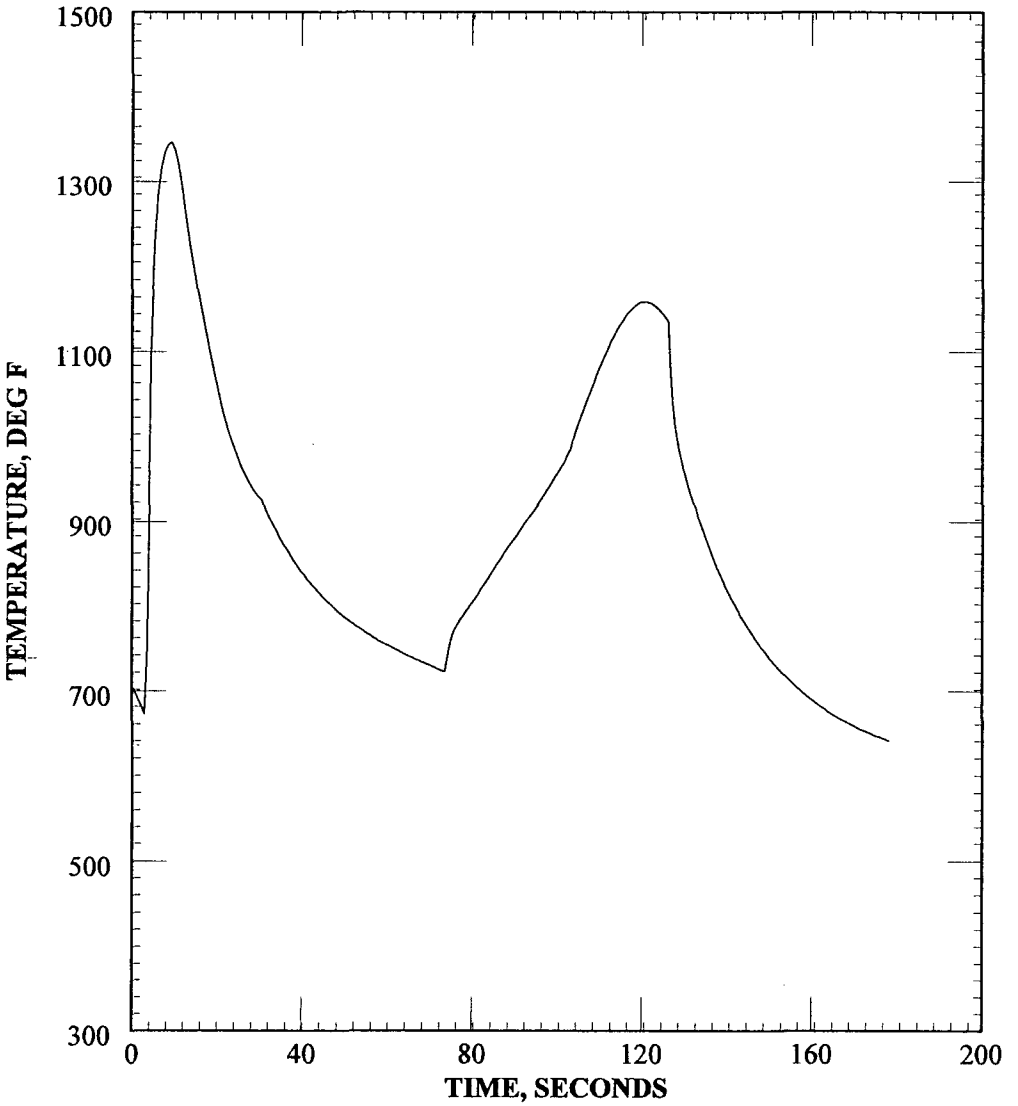
St. Lucie Unit #2	Severed SI Line CORE POWER vs TIME	Figure 1



St. Lucie Unit #2	Severed SI Line CORE PRESSURE vs TIME	Figure 2



St. Lucie Unit #2	SEVERED SI LINE CORE NODE MIXTURE LEVEL vs TIME	Figure 3



St. Lucie Unit #2	Severed SI Line HOT SPOT CLADDING TEMPERATURE vs TIME	Figure 4

ATTACHMENT 3

RESPONSE TO NRC REACTOR SYSTEMS BRANCH REQUEST FOR ADDITIONAL REGARDING EXTENDED POWER UPRATE LICENSE AMENDMENT REQUEST

Affidavit to Withhold from Public Disclosure Proprietary Information Under 10 CFR 2.390

(Cover page plus 7 pages)

Westinghouse Electric Company
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1000 Westinghouse Drive
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USA

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11555 Rockville Pike
Rockville, MD 20852

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Direct fax: (724) 720-0754
e-mail: greshaja@westinghouse.com
Proj letter: FPL-12-106

CAW-12-3451

March 28. 2012

APPLICATION FOR WITHHOLDING PROPRIETARY INFORMATION FROM PUBLIC DISCLOSURE

Subject: Response to NRC Requests for Additional Information on the St. Lucie Unit 2 Extended Power Uprate License Amendment Request (Proprietary)

The proprietary information for which withholding is being requested in the above-referenced response to Requests for Additional Information (RAIs) is further identified in Affidavit CAW-12-3451signed by the owner of the proprietary information, Westinghouse Electric Company LLC. Specifically, the proprietary information is contained in the responses to RAIs SRXB-112, SRXB-113, SRXB-115 and SRXB-116. 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 Florida Power and Light

Correspondence with respect to the proprietary aspects of the application for withholding or the Westinghouse affidavit should reference CAW-12-3451, and should be addressed to J. A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company, Suite 428, 1000 Westinghouse Drive, Cranberry Township, Pennsylvania 16066.

Very truly yours,

for J. A. Gresham, Manager
Regulatory Compliance

Enclosures

CAW-12-3451

AFFIDAVIT

STATE OF CONNECTICUT:

ss WINDSOR LOCKS

COUNTY OF HARTFORD:

Before me, the undersigned authority, personally appeared C. M. Molnar, 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:

C. M. Molnar, Senior Engineer
Regulatory Compliance

Sworn to and subscribed before me
this 28th day of MARCH 2012

Notary Public

Subscribed and Sworn to before me, a Notary Public, in and for County of Hartford and State of Connecticut, this 28th day of MARCH 2012.

JOAN GRAY
Notary Public
My Commission Expires January 31, 2017

(1) I am Senior Engineer, 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 the responses to NRC's requests for additional information SRXB-112, SRXB-113, SRXB-115 and SRXB-116, for submittal to the Commission, being transmitted by Florida Power and Light 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 St. Lucie Unit 2 extended power uprate license amendment application and may be used only for that purpose.

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

(a) Support Florida Power and Light in obtaining approval of the St. Lucie Unit 2 extended power uprate license amendment request.

Further this information has substantial commercial value as follows:

(a) 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 technical evaluation justifications 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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