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

FPL

February 25, 2011

This letter forwards proprietary information in accordance with 10 CFR 2.390. The balance of this letter may be considered non-proprietary upon removal of Attachment 1.

L-2011-076
10 CFR 50.90

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

Re: St. Lucie Plant Unit 1
Docket No. 50-335
Renewed Facility Operating License No. DPR-67

Response to NRC Request for Additional Information (RAI) Regarding Extended Power Uprate License Amendment Request

References:

(1) R. L. Anderson (FPL) to U.S. Nuclear Regulatory Commission (L-2010-259), "License Amendment Request for Extended Power Uprate, November 22, 2010, Accession No. ML103560419.
(2) Email from T. Orf (NRC) to C. Wasik (FPL), "Requested St. Lucie Unit 1 EPU Information," January 13, 2011, Accession No. ML110130412.
(3) Westinghouse Report, CE-NPSD-683-A Task-1174, Revision 06, "Development of a RCS Pressure and Temperature Limits Report for the Removal of P-T Limits and LTOP requirements from the Technical Specifications," April 2001, Accession No. ML0113503871.

By letter L-2010-259 dated November 22, 2010 [Reference 1], Florida Power & Light Company (FPL) requested to amend Renewed Facility Operating License No. DPR-67 and revise the St. Lucie Unit 1 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 January 13, 2011 [Reference 2], additional information regarding the analysis supporting proposed changes to the reactor coolant system pressure-temperature (P-T) limits was requested by the NRC staff in the Vessels and Internals Integrity Branch (CVIB) to support their review of the EPU LAR.

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NRR

The request for additional information (RAI) identified that an exemption request related to the use of methodology contained within the Reference 3 topical report is required. The RAI also requested a tabulation of stress intensity factors (K values) used to generate the P-T limits. The tabulation of stress intensity factors, along with related curves, is provided in Attachment 1 to this letter. The exemption request will be provided under separate cover.

The Reference 2 RAI email notes that FPL will provide, with the exemption request, responses to the supplemental information questions listed in the Reference 3 topical report and/or identify which questions do not apply; however, in a telephone conference between FPL and the NRC on January 19, 2011, it was agreed that the response to the supplemental information questions would not be included with the exemption request, but would be submitted along with the tabulation of stress intensity values. Attachment 2 to this letter provides responses to the supplemental information questions.

Attachment 3 contains the application for withholding proprietary information contained in Attachment 1 from public disclosure. As Attachment 1 contains information proprietary to Westinghouse Electric Company, LLC (Westinghouse), it is supported by an affidavit signed by Westinghouse, the owner of the information. The affidavit 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 of the Commission's regulations.

Correspondence with respect to the copyright or proprietary aspects of Attachment 1 of this letter or the supporting Westinghouse affidavit should reference CAW-11-3065 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, PA 16066.

Attachment 4 provides a public version of the Attachment 1 tabulation of stress intensity factors and related curves.

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

This submittal does not alter the significant hazards consideration or environmental assessment previously submitted by FPL letter L-2010-259 [Reference 1].

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

Should you have any questions regarding this submittal, please contact Mr. Christopher Wasik, St. Lucie Extended Power Uprate LAR Project Manager, at 772-429-7138.

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

Executed on February 25, 2011.

Very truly yours,

Richard L. Anderson
Site Vice President
St. Lucie Plant

Attachments

cc: Administrator, Region II, USNRC
Project Manager, St. Lucie Nuclear Plant, USNRC
Senior Resident Inspector, St. Lucie Nuclear Plant, USNRC
Mr. William Passetti, Florida Department of Health

Attachment 2

Responses to Supplemental Information Requirements

Discussion

Section 5.0 of the NRC Safety Evaluation (SE) for CE-NPSD-683-A contains twenty-six items of information to be included in pressure-temperature limits report (PTLR) License Amendment Requests to satisfy the criteria of the table in Attachment 1 to Generic Letter (GL) 96-03. GL 96-03, "Relocation of the Pressure Temperature Limit Curves and Low Temperature Overpressure Protection System Limits," provides guidance on relocating the pressure-temperature (P-T) limits and certain low temperature overpressure protection (LTOP) controls from the Technical Specifications to a PTLR. The table in Attachment 1 to GL 96-03 contains information requirements related to the methodology for generating P-T limits and LTOP setpoints.

Florida Power and Light (FPL), in their St. Lucie Unit 1 (PSL1) Extended Power Uprate (EPU) License Amendment Request (LAR), requests approval of changes to the P-T limits based on CE-NPSD-683-A methodology. The technical basis for the new P-T limits and the basis and methodology for the LTOP evaluation that is supported by the proposed P-T limits is described in the Westinghouse document WCAP-17197-NP. WCAP-17197-NP was prepared by Westinghouse and provided to FPL to support the proposed PSL1 P-T limits described in the EPU LAR.

Although FPL is not requesting that the PSL1 P-T limits be relocated to a PTLR, since FPL is using the P-T limits methodology from CE-NPSD-683-A for St. Lucie Unit 1, each of the twenty-six information items from Section 5.0 of the CE-NPSD-683-A safety evaluation (SE) is stated below along with an assessment of the applicable proposed change to the St. Lucie Unit 1 P-T limits.

Information Items from Section 5.0 of the CE-NPSD-683-A SE

Information needed to satisfy Criterion 1 of the Table in Attachment 1 to GL 96-03, which deals with the topic of neutron fluence calculational methods - Licensees will need to:

(1) Describe the methodology used to calculate the neutron fluence values for the reactor vessel materials, including a description of whether or not the methodology is consistent with the guidance of Draft Regulatory Guide DG-1053, a description of the computer codes used to calculate the neutron fluence values, and a description of how the computer codes for calculating the neutron fluence values were benchmarked; and

(2) Provide the values of neutron fluence used for the adjusted reference temperature (RT_{NDT}) calculations, including the values of neutron fluence for the inner surface (ID), 1/4T and 3/4T locations of the RPV.

Assessment: Items 1 and 2 do not provide information necessary to support the P-T limit methodology – this information supports fluence determination. No response required for a submittal that is not requesting approval of a PTLR. WCAP-17197-NP does not describe the methodology to calculate neutron fluence.

Information needed to satisfy Criterion 2 of the Table in Attachment 7 to GL 96-03, which deals with the topic of reactor vessel material surveillance program designs and withdrawal schedules - Licensees will need to:

(3) Either provide the surveillance capsule withdrawal schedule in the proposed PTLR for the amendment or reference in the PTLR by title and number the documents in which the withdrawal schedule is located; and

(4) Reference the surveillance capsule reports by title and number if the RT_{NDT} values are calculated using RPV surveillance capsule data.

Assessment: Items 3 and 4 do not provide information necessary to support the P-T limit methodology – this information supports the surveillance capsule schedule and report information. No response required for a submittal that is not requesting approval of a PTLR. WCAP-17197-NP does not describe the surveillance capsule withdrawal schedule or reports.

Information needed to satisfy Criterion 3 of the Table in Attachment 1 to GL 96-03, which deals with the topic of describing the methodologies that will be used to establish the LTOP system limits - Licensees will need to:

(5) Provide a description of the analytical method used in the energy addition transient analysis;

(6) Provide a description of the analytical method used in the mass addition transient analysis, if different from that in Section 3.3.5 of the topical report;

(7) Provide a description of the method for selection of relief valve setpoints;

(8) Provide a justification for use of subcooled water conditions or a steam volume in the pressurizer;

(9) Provide a justification for a less conservative method for determination of decay heat contribution if the method used is less conservative than the "most conservative method" described in the topical report;

(10) Provide justification for operator action time used in transient mitigation or termination;

(11) Provide correlations used for developing PORV discharge characteristics;

(12) Provide spring relief valve discharge characteristics if different from those described in the topical report or if the peak transient pressure is above the set pressure of the valve plus 10 percent;

(13) Provide a description of how the reactor coolant temperature instrumentation uncertainty was accounted for;

(14) Provide a justification for the mass and energy addition transient mitigation which credit presence of nitrogen in the pressurizer; and

(15) Identify and explain any other deviation from the methodology included in Section 3.0 of the topical report.

Assessment: Items 5 through 15 do not provide information necessary to support the P-T limit methodology – this information supports LTOP Evaluation methods. No response required for a submittal that is not requesting approval of a PTLR. WCAP-17197-NP describes LTOP transient methods and assumptions in Sections 3.2 and 3.3.

Information needed to satisfy Criterion 4 of the Table in Attachment 1 to GL 96-03, which deals with the topic of describing the methodologies that will be used to calculate the adjusted reference temperature values for the RPV materials - Licensees will need to:

(16) Identify the limiting materials and corresponding RT_{NDT} values for both the quarter thickness (1/4T) and three-quarter-thickness (3/4T) locations of the RPV shell; and

(17) For pressurized-water-reactor (PWR) design facilities, identify the limiting RT_{NDT} value for RPV as calculated in accordance with the methods and criteria of 10 CFR 50.61.

Assessment: Items 16 and 17 do not provide information necessary to support the P-T limit methodology – this information supports material property information. No response required, for a submittal that is not requesting approval of a PTLR. WCAP-17197-NP describes the adjusted reference temperature in Section 2.1.

Information needed to satisfy Criterion 5 of the Table in Attachment 1 to GL 96-03, which deals with the topic of describing the methodologies used to generate plant specific P-T limit curves - Licensees will need to:

(18) Ensure that the ferritic RPV materials that have accumulated neutron fluences in excess of $1.0x10^{17}$ n/cm^2 (E > 1 MeV) will be assessed according to Section 4.0 of the CE Topical Report CE NPSD-683, Revision 6, regardless of whether the materials are located within the region immediately surrounding the active core;

Assessment: This item is not related to the C-E NPSD-683 P-T methodology. No response required, for a submittal that is not requesting approval of a PTLR. WCAP-17197-NP describes the material fluence projections in Section 2.1.

(19) Identify which method (i.e., K_{IC} or K_{IA}) will be used to calculate the reference intensity factor (K_{IR}) values for the RPV as a function of temperature;

Assessment: ASME Code has since been updated to use K_{IC} criteria and, hence, was used in generating the St. Lucie Unit 1 P-T limits.

(20) *(Applicable only if Code Case N-640 and K_{IC} are used as the basis for calculating the K_{IR} values)* submit an exemption request [pursuant to alternative program provisions of 10 CFR 50.60(b)] to use the methods of Code Case N-640 and apply them to the P-T limit calculations. Note that the staff will approve an exemption request to use Code Case N-640 and K_{IC} as the bases for generating the P-T limit curves only if a licensee indicates that it will limit the maximum pressure in the vessel to 100 percent of the pressure satisfying Paragraph G-2215 of the 1996 Edition of Appendix G to the Code for establishing LTOP limit setpoints. This condition is consistent with Note (2) on page 5-6 of CE NPSD-683, Revision 6;

Assessment: The 2004 Edition of the American Society of Mechanical Engineers (ASME) Code codified in the Code of Federal Regulations has incorporated the use of K_{IC} criteria. No response required.

(21) *(Applicable only if the CE NSSS methods for calculating K_{im} and K_{it} factors, as stated in Section 5.4 of CE NPSD-683, Revision 6, are being used as the basis for generating the P-T limits for their facilities)* apply for an exemption against requirements of Section IV.A.2 of Appendix G to Part 50 to apply the CE NSSS methods to their P-T curves. This is consistent with the 'note" on page 5-15 of CE NPSD-683, Revision 6. Exemption requests to apply the CE NSSS to the generation of P-T limit curves should be submitted pursuant to the provision of 10 CFR 50.60(b) and will be evaluated on a case-by-case basis against the exemption request acceptance criteria of 10 CFR 50.12; and

Assessment: An Exemption is requested for the application of the CE NSSS P-T methodology to generate P-T limits for St. Lucie Unit 1.

(22) Include in their PTLRs the P-T curves for heatup, cooldown, criticality, and hydrostatic and leak tests of their reactors.

Assessment: This item is not applicable to St. Lucie Unit 1 as it does not have a PTLR. No response required for a submittal that is not requesting approval of a PTLR.

Information needed to satisfy Criterion 6 of the Table in Attachment 7 to GL 96-03, which deals with the topic of describing how the P-T limit curves for normal operations and pressure testing conditions will satisfy the appropriate minimum temperature requirements, as stated in Table 1 of Appendix G to Part 50 - Licensees will need to:

(23) Demonstrate how the P-T curves for pressure testing conditions and normal operations with the core critical and not-critical will be in compliance with the appropriate minimum temperature requirements as given in Table 1 to Appendix G to Part 50.

Assessment: Item 23 was considered in generating the P-T limits for St. Lucie Unit 1 in addition to the CE NSSS P-T methodology. No response required for a submittal that is not requesting approval of a PTLR. WCAP-17197-NP describes the hydrostatic and core critical limits in Section 2.6.

Information needed to satisfy Criterion 7 of the Table in Attachment 7 to GL 96-03, which deals with the topic of how the plant-specific RPV material surveillance data will be evaluated and applied to the adjusted reference temperature calculations - Licensees will need to:

(24) Include in their PTLRs the supplemental surveillance data and calculations of the chemistry factors if surveillance data are used for the calculations of the adjusted reference temperatures;
(25) Provide the evaluation of whether the surveillance data are credible in accordance with the credibility criteria of RG 1.99, Revision 2;
(26) In addition, if licensees seek to use surveillance data from supplemental plant sources, licensees must:

(a) Identify the source(s) of the data; and
(b) Either identify by title and number the safety evaluation report that approved the use of the supplemental data, along with a justification of why the data is applicable; or compare the licensee's (applicant's) data with the data from the supplemental plant(s) for both the radiation environments (i.e., neutron spectrums and irradiation temperatures) and the surveillance test results, and pursuant to Section III.C of Appendix H to Part 50, submit the proposed integrated surveillance program and evaluation of the data to the NRC for review and approval.

Assessment: Items 24 through 26(b) do not provide information necessary to support the P-T limit methodology – this information supports surveillance data evaluation. No response required for a submittal that is not requesting approval of a PTLR. WCAP-17197-NP describes the surveillance data and RG 1.99 in Section 2.1.

Attachment 3
Application for Withholding Proprietary Information from Public Disclosure

(Westinghouse Letter CAW-11-3065 next 7 pages)

Westinghouse Electric Company
Nuclear Services
1000 Westinghouse Drive
Cranberry Township, Pennsylvania 16066
USA

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555-0001

Direct tel: (412) 374-4643
Direct fax: (724) 720-0754
e-mail: greshaja@westinghouse.com
Proj letter:

CAW-11-3065

February 3, 2011

APPLICATION FOR WITHHOLDING PROPRIETARY INFORMATION FROM PUBLIC DISCLOSURE

Subject: Information Responding to NRC's RAI on the St. Lucie Unit 1 EPU License Amendment Request (Proprietary) (Submitted for Approval)

The proprietary information for which withholding is being requested in the above-referenced response to a NRC request for additional information (RAI) is further identified in Affidavit CAW-11-3065 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 Florida Power and Light.

Correspondence with respect to the proprietary aspects of the application for withholding or the Westinghouse affidavit should reference this letter, CAW-11-3065, 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.

Very truly yours,

G. D. Hess for

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

Enclosures

CAW-11-3065

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 and Plant Licensing

Sworn to and subscribed before me
this 3rd day of FEBRUARY 2011

Notary Public

Subscribed and sworn before me, a Notary Public, in and for County of Hartford and State of Connecticut, this 3rd day of FEBRUARY, 2011.

JOAN GRAY
Notary Public
My Commission Expires January 31, 2012

(1) I am Senior Engineer, 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 Florida Power and Light's responses to NRC requests for additional information regarding pressure/temperature limits in the St. Lucie Unit 1 extended power uprate license amendment request for submittal to the Commission, being transmitted by FPL 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 K_{IM} influence coefficients due to unit internal pressure for 1/4t inside and 1/4t outside surface flaw and may be used only for that purpose.

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

(a) Support the St. Lucie Unit I extended power uprate license amendment request.

Further this information has substantial commercial value as follows:

(a) Westinghouse plans to sell the use of similar information to its customers for the purpose of justifying the acceptability of pressure/temperature limits.

(b) Westinghouse can sell support and defense of its methodology for developing pressure/temperature limits.

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 information 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

Attachment 4

Stress Intensity Factors (Non-Proprietary)

Crack Tip Stress Intensity Factors for Mechanical (K_{IM}) and Thermal ($K_{Ithermal}$) for 1/4t Inside and 1/4t Outside Surface Flaw

The K_{IT} values in this Attachment were calculated using CE NPSD-683-A, Revision 6 methodology. The information in this Attachment is that requested by NRC for their review.

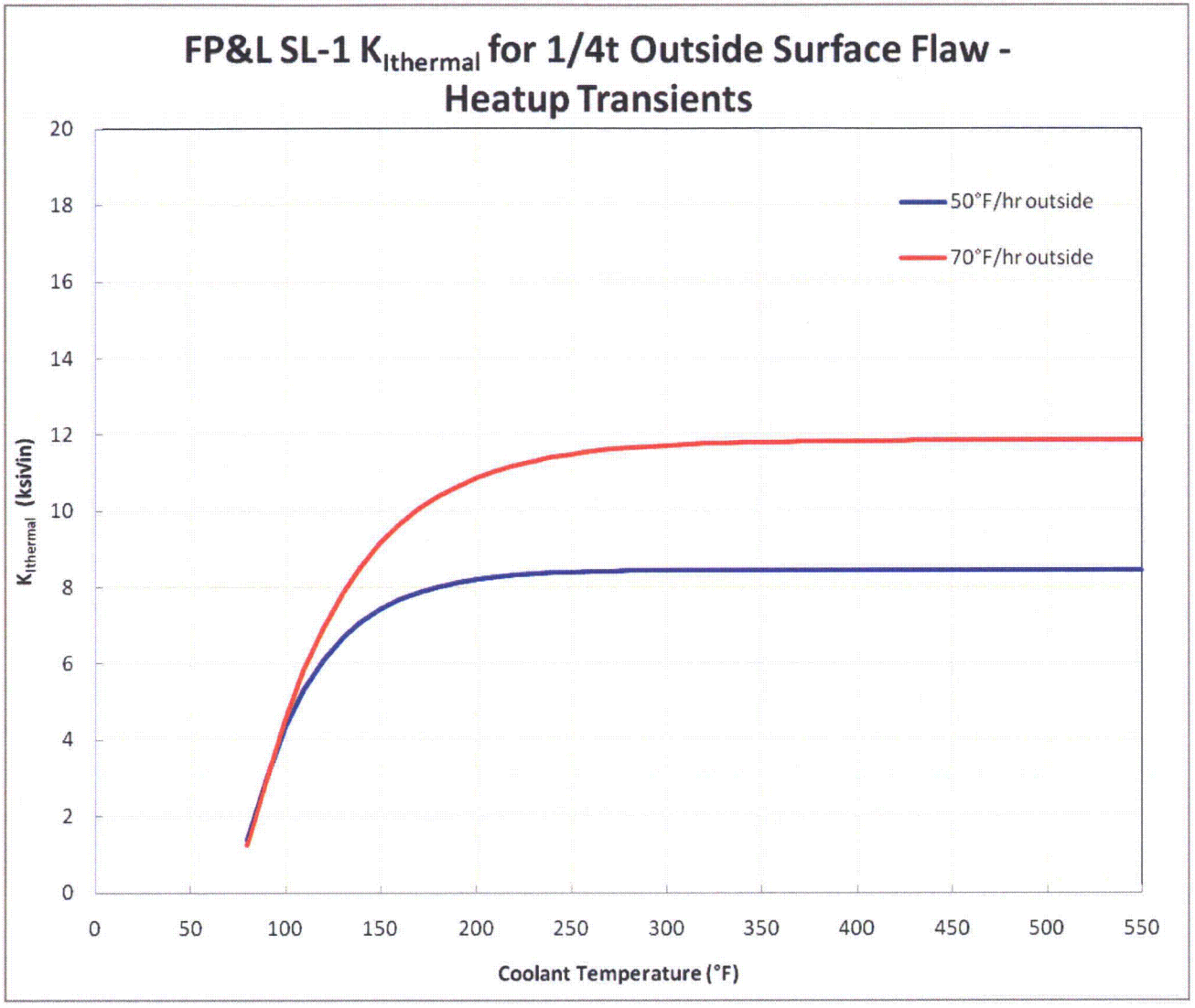
Table of K_{IM} Influence Coefficients due to unit (1ksi) Internal Pressure

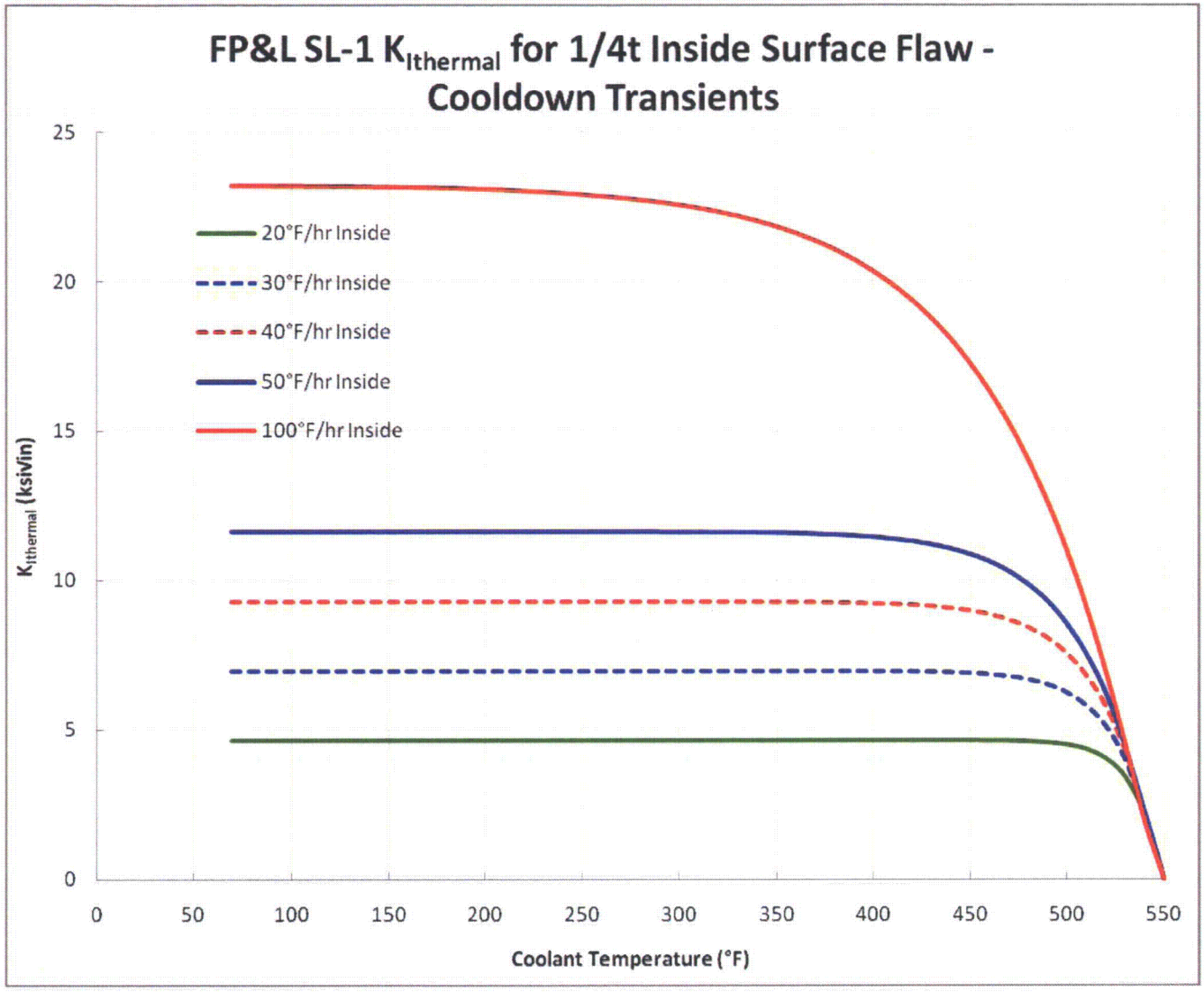
Crack Location	K_{IP} (ksi$\sqrt{in}$)
1/4t Inside	[(a,c)
1/4t Outside	]

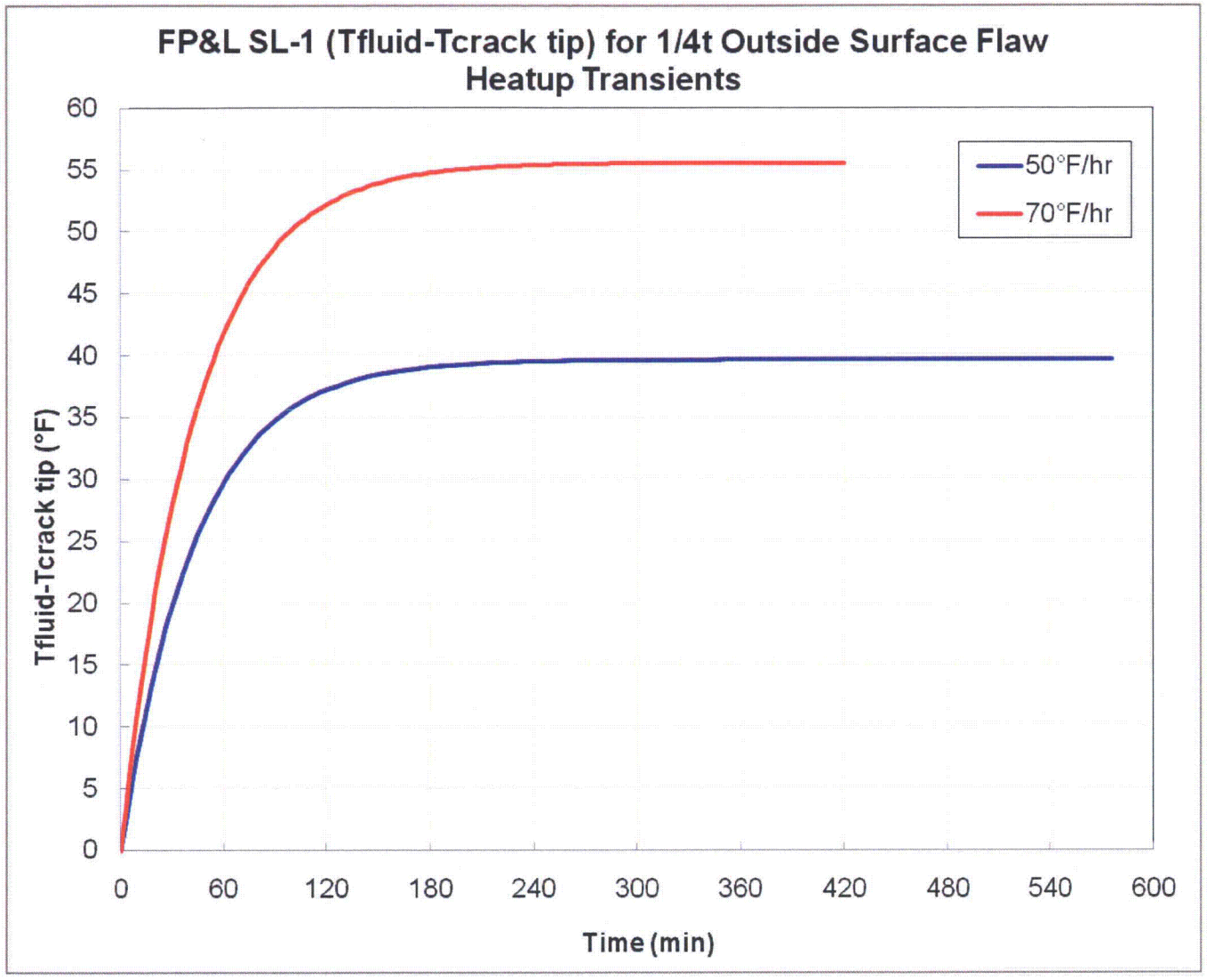
Table of K_{IT} Values

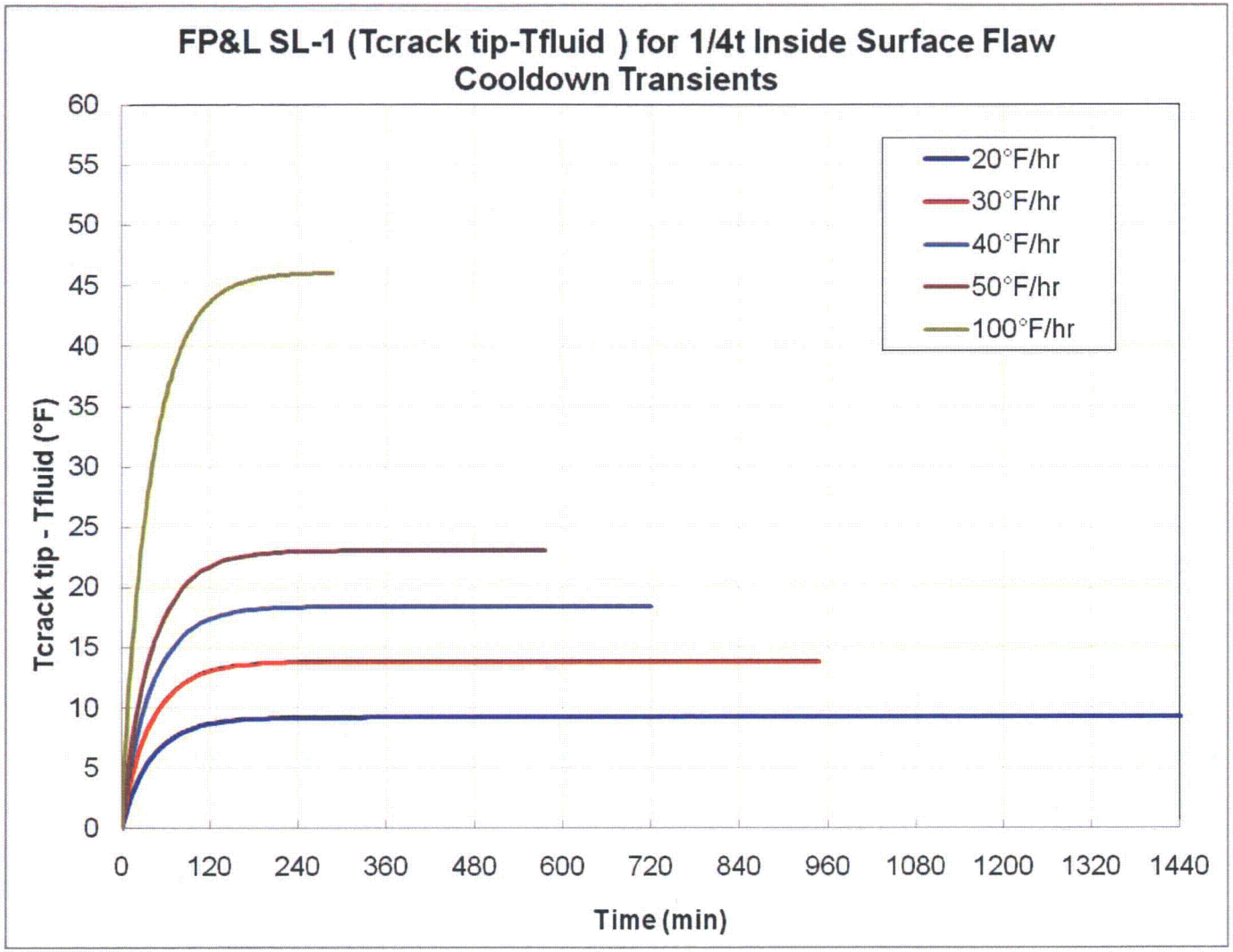
Fluid Temperature (°F)	Heatup		Cooldown				
	50°F/hr outside (ksi√in)	70°F/hr outside (ksi√in)	20°F/hr Inside (ksi√in)	30°F/hr Inside (ksi√in)	40°F/hr Inside (ksi√in)	50°F/hr Inside (ksi√in)	100°F/hr Inside (ksi√in)
70	0	0	4.650	6.974	9.299	11.624	23.223
80	1.380	1.250	4.650	6.974	9.299	11.624	23.220
90	3.008	2.963	4.650	6.974	9.299	11.624	23.215
100	4.351	4.532	4.650	6.974	9.299	11.624	23.210
110	5.344	5.853	4.650	6.974	9.299	11.624	23.204
120	6.108	6.943	4.650	6.974	9.299	11.624	23.197
130	6.695	7.837	4.650	6.974	9.299	11.624	23.189
140	7.122	8.569	4.650	6.974	9.299	11.624	23.180
150	7.451	9.165	4.650	6.974	9.299	11.624	23.170
160	7.703	9.653	4.650	6.974	9.299	11.624	23.157
170	7.886	10.053	4.650	6.974	9.299	11.624	23.143
180	8.027	10.379	4.650	6.974	9.299	11.624	23.127
190	8.136	10.647	4.650	6.974	9.299	11.624	23.108
200	8.214	10.866	4.650	6.974	9.299	11.623	23.086
200	8.214	10.866	4.650	6.974	9.299	11.623	23.086
210	8.275	11.045	4.650	6.974	9.299	11.623	23.061
220	8.322	11.190	4.650	6.974	9.299	11.623	23.032
230	8.355	11.310	4.650	6.974	9.299	11.623	22.999
240	8.382	11.408	4.650	6.974	9.299	11.622	22.960
250	8.401	11.488	4.650	6.974	9.299	11.621	22.916
260	8.416	11.553	4.650	6.974	9.299	11.621	22.864
270	8.427	11.606	4.650	6.974	9.299	11.619	22.804
280	8.436	11.650	4.650	6.974	9.299	11.618	22.736
290	8.442	11.686	4.650	6.974	9.298	11.616	22.656
300	8.447	11.715	4.650	6.974	9.298	11.613	22.564
310	8.451	11.739	4.650	6.974	9.297	11.610	22.458
320	8.453	11.759	4.650	6.974	9.296	11.605	22.336
330	8.455	11.775	4.650	6.974	9.295	11.598	22.194
340	8.457	11.788	4.650	6.974	9.293	11.590	22.031
350	8.458	11.798	4.650	6.974	9.290	11.579	21.842
360	8.459	11.807	4.650	6.973	9.287	11.564	21.624
370	8.460	11.814	4.650	6.973	9.282	11.545	21.372
380	8.460	11.820	4.650	6.972	9.274	11.519	21.081
390	8.460	11.825	4.650	6.970	9.263	11.485	20.745
400	8.461	11.829	4.650	6.968	9.248	11.440	20.357
410	8.461	11.832	4.649	6.964	9.226	11.379	19.909
420	8.461	11.835	4.649	6.957	9.195	11.300	19.391
430	8.461	11.837	4.649	6.948	9.152	11.196	18.793
440	8.461	11.838	4.647	6.931	9.089	11.054	18.103
450	8.461	11.840	4.645	6.905	9.000	10.869	17.305
460	8.461	11.841	4.641	6.864	8.877	10.628	16.383
470	8.462	11.842	4.632	6.797	8.695	10.298	15.319

480	8.462	11.843	4.613	6.690	8.440	9.866	14.089
490	8.462	11.843	4.576	6.524	8.084	9.306	12.670
500	8.462	11.844	4.500	6.247	7.562	8.536	11.032
510	8.462	11.844	4.349	5.811	6.829	7.533	9.145
520	8.462	11.845	4.036	5.131	5.804	6.229	6.983
530	8.462	11.845	3.421	4.002	4.309	4.452	4.548
540	8.462	11.845	2.143	2.242	2.259	2.222	1.960
550	8.462	11.845	0	0	0	0	0


FP&L SL-1 K Ithermal for 1/4t Outside Surface Flaw - Heatup Transients
K Ithermal (ksivin)
Coolant Temperature (°F)
50°F/hr outside
70°F/hr outside
0
2
4
6
8
10
12
14
16
18
20
0
50
100
150
200
250
300
350
400
450
500
550


FP&L SL-1 K Ithermal for 1/4t Inside Surface Flaw - Cooldown Transients
25
20
15
10
5
0
K Ithermal (ksiVin)
20°F/hr Inside
30°F/hr Inside
40°F/hr Inside
50°F/hr Inside
100°F/hr Inside
0
50
100
150
200
250
300
350
400
450
500
550
Coolant Temperature (°F)


FP&L SL-1 (Tfluid-Tcrack tip) for 1/4t Outside Surface Flaw Heatup Transients
Tfluid-Tcrack tip (°F)
Time (min)
50°F/hr
70°F/hr
0
5
10
15
20
25
30
35
40
45
50
55
60
0
60
120
180
240
300
360
420
480
540
600


FP&L SL-1 (Tcrack tip-Tfluid) for 1/4t Inside Surface Flaw
Cooldown Transients
Tcrack tip - Tfluid (°F)
Time (min)
0
5
10
15
20
25
30
35
40
45
50
55
60
0
120
240
360
480
600
720
840
960
1080
1200
1320
1440
20°F/hr
30°F/hr
40°F/hr
50°F/hr
100°F/hr