AmerGen Energy Company, LLC
Clinton Power Station
R.R. 3 Box 228
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AmerGen SM

An Exelon/British Energy Company

RS-01-272

November 21, 2001

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

Clinton Power Station, Unit 1
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Subject: Additional Reactor Systems Information Supporting the License Amendment Request to Permit Uprated Power Operation at Clinton Power Station

References: (1) Letter from J. M. Heffley (AmerGen Energy Company, LLC) to U.S. NRC, "Request for License Amendment for Extended Power Uprate Operation," dated June 18, 2001

(2) Letter from J. B. Hopkins (U.S. NRC) to O. D. Kingsley (Exelon Generation Company, LLC), "Clinton Power Station, Unit 1 – Request For Additional Information (TAC No. MB2210)," dated November 5, 2001

In Reference 1, AmerGen Energy Company (AmerGen), LLC submitted a request for changes to the Facility Operating License No. NPF-62 and Appendix A to the Facility Operating License, Technical Specifications (TS), for Clinton Power Station (CPS) to allow operation at an uprated power level. The proposed changes in Reference 1 would allow CPS to operate at a power level of 3473 megawatts thermal (MWt). This represents an increase of approximately 20 percent rated core thermal power over the current 100 percent power level of 2894 MWt. The NRC in Reference 2 requested additional information regarding the proposed changes in Reference 1. The attachment to this letter provides the requested information pertaining to NRC Questions 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, 3.11, 3.12, 3.13, 3.14, 3.15, 3.16, 3.17, 3.18 and 3.19 of Reference 2. Responses to the remaining NRC questions in Reference 2 will be provided separately.

A portion of the information in Attachment A is proprietary to the General Electric Company, and AmerGen requests that it be withheld from public disclosure in accordance with 10 CFR 2.790, "Public inspections, exemptions, requests for withholding," paragraph (a)(4). The proprietary information is indicated with sidebars. Attachments B-1 through B-4 provide the affidavits supporting the request for withholding the proprietary information in Attachment A from public disclosure, as required by 10 CFR 2.790, paragraph (b)(1). Attachment C contains a non-proprietary version of Attachment A.

A201

Should you have any questions related to this information, please contact Mr. Timothy A. Byam at (630) 657-2804.

Respectfully,

K. A. Ainger for

K. R. Jury
Director – Licensing
Mid-West Regional Operating Group

Attachments:

Affidavit
Attachment A: Additional Reactor Systems Information Supporting the License Amendment Request to Permit Uprated Power Operation at Clinton Power Station (Proprietary version)
Attachment B-1: Affidavit for Withholding Portions of RAI Question 3.4 of Attachment A from Public Disclosure
Attachment B-2: Affidavit for Withholding Portions of RAI Questions 3.8 and 3.13 of Attachment A from Public Disclosure
Attachment B-3: Affidavit for Withholding Portions of RAI Question 3.11 of Attachment A from Public Disclosure
Attachment B-4: Affidavit for Withholding Portions of RAI Questions 3.18 and 3.19 of Attachment A from Public Disclosure
Attachment C: Additional Reactor Systems Information Supporting the License Amendment Request to Permit Uprated Power Operation at Clinton Power Station (Non-proprietary version)

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Clinton Power Station
Office of Nuclear Facility Safety – Illinois Department of Nuclear Safety

STATE OF ILLINOIS	)	
COUNTY OF DUPAGE	)	
IN THE MATTER OF	)	
AMERGEN ENERGY COMPANY, LLC	)	**Docket Number**
CLINTON POWER STATION, UNIT 1	)	**50-461**

SUBJECT: **Additional Reactor Systems Information Supporting the License Amendment Request to Permit Uprated Power Operation at Clinton Power Station**

AFFIDAVIT

I affirm that the content of this transmittal is true and correct to the best of my knowledge, information and belief.

K. A. Ainger
Manager – Licensing
Mid-West Regional Operating Group

Subscribed and sworn to before me, a Notary Public in and for the State above named, this 21st day of November, 2001.

Notary Public

" OFFICIAL SEAL "
Timothy A. Byam
Notary Public, State of Illinois
My Commission Expires 11/24/2001

ATTACHMENT B-1

Affidavit for Withholding Portions of RAI Question 3.4 of Attachment A from Public Disclosure

General Electric Company

AFFIDAVIT

I, George B. Stramback, being duly sworn, depose and state as follows:

(1) I am Project Manager, Regulatory Services, General Electric Company ("GE") and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in Attachment 1 to letter GE-CPS-AEP-066, *Response to NRC RAI Regarding EPU – RAI 3.4*, dated November 1, 2001. The proprietary information in Attachment 1 (*GE-CPS-AEP-066, GE Response to NRC RAI for EPU RAI 3.4,* (GE Company Proprietary)), is identified by bars marked in the margin adjacent to the specific material.

(3) In making this application for withholding of proprietary information of which it is the owner, GE relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), 2.790(a)(4), and 2.790(d)(1) for "trade secrets and commercial or financial information obtained from a person and privileged or confidential" (Exemption 4). The material for which exemption from disclosure is here sought is all "confidential commercial information", and some portions also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by General Electric's competitors without license from General Electric constitutes a competitive economic advantage over other companies;

b. Information which, if used 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 of a similar product;

c. Information which reveals cost or price information, production capacities, budget levels, or commercial strategies of General Electric, its customers, or its suppliers;

d. Information which reveals aspects of past, present, or future General Electric customer-funded development plans and programs, of potential commercial value to General Electric;

e. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in both paragraphs (4)a. and (4)b., above.

(5) The information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GE, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GE, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge. Access to such documents within GE is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GE are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2), above, is classified as proprietary because it contains further details regarding the GE proprietary report NEDC-32989P, *Safety Analysis Report for Clinton Power Station Extended Power Uprate,* Class III (GE Proprietary Information), dated June 2001, which contains detailed results of analytical models, methods and processes, including computer codes, which GE has developed, obtained NRC approval of, and applied to perform

evaluations of transient and accident events in the GE Boiling Water Reactor ("BWR").

The development and approval of these system, component, and thermal hydraulic models and computer codes was achieved at a significant cost to GE, on the order of several million dollars.

The development of the evaluation process along with the interpretation and application of the analytical results is derived from the extensive experience database that constitutes a major GE asset.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GE's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GE's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GE.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GE's competitive advantage will be lost if its competitors are able to use the results of the GE experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GE would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GE of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing these very valuable analytical tools.

STATE OF CALIFORNIA)
) ss:
COUNTY OF SANTA CLARA)

George B. Stramback, being duly sworn, deposes and says:

That he has read the foregoing affidavit and the matters stated therein are true and correct to the best of his knowledge, information, and belief.

Executed at San Jose, California, this 1st day of November 2001.

George B. Stramback
General Electric Company

Subscribed and sworn before me this 1st day of November 2001.

TERRY J. MORGAN
Commission # 1304914
Notary Public - California
Santa Clara County
My Comm. Expires May 18, 2005

Notary Public, State of California

ATTACHMENT B-2

Affidavit for Withholding Portions of RAI Questions 3.8 and 3.13 of Attachment A from Public Disclosure

General Electric Company

AFFIDAVIT

I, George B. Stramback, being duly sworn, depose and state as follows:

(1) I am Project Manager, Regulatory Services, General Electric Company ("GE") and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in Attachment 1 to letter GE-CPS-AEP-067, *Response to NRC RAI Regarding EPU – 3.8 and 3.13*, dated November 1, 2001. The proprietary information in Attachment 1 (*GE-CPS-AEP-067, GE Response to NRC RAIs for EPU RAIs 3.8 and 3.13,* (GE Company Proprietary)), is identified by bars marked in the margin adjacent to the specific material.

(3) In making this application for withholding of proprietary information of which it is the owner, GE relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), 2.790(a)(4), and 2.790(d)(1) for "trade secrets and commercial or financial information obtained from a person and privileged or confidential" (Exemption 4). The material for which exemption from disclosure is here sought is all "confidential commercial information", and some portions also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by General Electric's competitors without license from General Electric constitutes a competitive economic advantage over other companies;

b. Information which, if used 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 of a similar product;

c. Information which reveals cost or price information, production capacities, budget levels, or commercial strategies of General Electric, its customers, or its suppliers;

d. Information which reveals aspects of past, present, or future General Electric customer-funded development plans and programs, of potential commercial value to General Electric;

e. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in both paragraphs (4)a. and (4)b., above.

(5) The information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GE, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GE, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge. Access to such documents within GE is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GE are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2), above, is classified as proprietary because it contains further details regarding the GE proprietary report NEDC-32989P, *Safety Analysis Report for Clinton Power Station Extended Power Uprate,* Class III (GE Proprietary Information), dated June 2001, which contains detailed results of analytical models, methods and processes, including computer codes, which GE has developed, obtained NRC approval of, and applied to perform

evaluations of transient and accident events in the GE Boiling Water Reactor ("BWR").

The development and approval of these system, component, and thermal hydraulic models and computer codes was achieved at a significant cost to GE, on the order of several million dollars.

The development of the evaluation process along with the interpretation and application of the analytical results is derived from the extensive experience database that constitutes a major GE asset.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GE's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GE's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GE.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GE's competitive advantage will be lost if its competitors are able to use the results of the GE experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GE would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GE of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing these very valuable analytical tools.

STATE OF CALIFORNIA)
) ss:
COUNTY OF SANTA CLARA)

George B. Stramback, being duly sworn, deposes and says:

That he has read the foregoing affidavit and the matters stated therein are true and correct to the best of his knowledge, information, and belief.

Executed at San Jose, California, this 1st day of November 2001.

George B. Stramback
General Electric Company

Subscribed and sworn before me this 1st day of November 2001.

TERRY J. MORGAN
Commission # 1304914
Notary Public - California
Santa Clara County
My Comm. Expires May 18, 2005

Notary Public, State of California

ATTACHMENT B-3

Affidavit for Withholding Portions of RAI Question 3.11 of Attachment A from Public Disclosure

General Electric Company

AFFIDAVIT

I, David J. Robare, being duly sworn, depose and state as follows:

(1) I am Technical Project Manager, Technical Services, General Electric Company ("GE") and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in Attachment 1 to GE letter GE-CPS-AEP-074, E. Stromqvist (GE) to D. Spencer (CPS) , *Response to NRC RAIs Regarding EPU – RAIs 3.6, 3.11, and 3.12,* dated November 12, 2001. The proprietary information is delineated by a bar marked in the margin.

(3) In making this application for withholding of proprietary information of which it is the owner, GE relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), 2.790(a)(4), and 2.790(d)(1) for "trade secrets and commercial or financial information obtained from a person and privileged or confidential" (Exemption 4). The material for which exemption from disclosure is here sought is all "confidential commercial information", and some portions also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by General Electric's competitors without license from General Electric constitutes a competitive economic advantage over other companies;

b. Information which, if used 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 of a similar product;

c. Information which reveals cost or price information, production capacities, budget levels, or commercial strategies of General Electric, its customers, or its suppliers;

d. Information which reveals aspects of past, present, or future General Electric customer-funded development plans and programs, of potential commercial value to General Electric;

e. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in both paragraphs (4)a. and (4)b., above.

(5) The information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GE, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GE, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge. Access to such documents within GE is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GE are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2), above, is classified as proprietary because it contains responses containing or based on detailed results of analytical models, methods and processes, including computer code extension, which GE has developed, and applied to perform LOCA analyses associated with BWRs.

The development and approval of the various computer codes associated with the LOCA analyses was achieved at a significant cost, on the order of several million dollars, to GE.

The development of the evaluation process along with the interpretation and application of the analytical results is derived from the extensive experience database that constitutes a major GE asset.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GE's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GE's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GE.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GE's competitive advantage will be lost if its competitors are able to use the results of the GE experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GE would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GE of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing these very valuable analytical tools.

STATE OF CALIFORNIA)
) ss:
COUNTY OF SANTA CLARA)

David J. Robare, being duly sworn, deposes and says:

That he has read the foregoing affidavit and the matters stated therein are true and correct to the best of his knowledge, information, and belief.

Executed at San Jose, California, this 12TH day of NOVEMBER 2001.

David J. Robare
General Electric Company

Subscribed and sworn before me this 12TH day of NOVEMBER 2001.

Notary Public, State of California

ANNA HANLIN
Commission # 1184507
Notary Public - California
Santa Clara County
My Comm. Expires Jun 19, 2002

ATTACHMENT B-4

Affidavit for Withholding Portions of RAI Questions 3.18 and 3.19 of Attachment A from Public Disclosure

General Electric Company

AFFIDAVIT

I, George B. Stramback, being duly sworn, depose and state as follows:

(1) I am Project Manager, Regulatory Services, General Electric Company ("GE") and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in Attachment 1 to letter GE-CPS-AEP-073, *Response to NRC RAI Regarding EPU – RAIs 3.18, 3.19 and 5.7*, dated November 9, 2001. The proprietary information in Attachment 1 (*GE-CPS-AEP-073, GE Responses to NRC RAIs for EPU – RAIs 3.18, 3.19 and 5.7,* (GE Company Proprietary)), is identified by bars marked in the margin adjacent to the specific material.

(3) In making this application for withholding of proprietary information of which it is the owner, GE relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), 2.790(a)(4), and 2.790(d)(1) for "trade secrets and commercial or financial information obtained from a person and privileged or confidential" (Exemption 4). The material for which exemption from disclosure is here sought is all "confidential commercial information", and some portions also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by General Electric's competitors without license from General Electric constitutes a competitive economic advantage over other companies;

b. Information which, if used 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 of a similar product;

c. Information which reveals cost or price information, production capacities, budget levels, or commercial strategies of General Electric, its customers, or its suppliers;

d. Information which reveals aspects of past, present, or future General Electric customer-funded development plans and programs, of potential commercial value to General Electric;

e. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in both paragraphs (4)a. and (4)b., above.

(5) The information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GE, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GE, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge. Access to such documents within GE is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GE are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2), above, is classified as proprietary because it contains further details regarding the GE proprietary report NEDC-32989P, *Safety Analysis Report for Clinton Power Station Extended Power Uprate,* Class III (GE Proprietary Information), dated June 2001, which contains detailed results of analytical models, methods and processes, including computer codes,

which GE has developed, obtained NRC approval of, and applied to perform evaluations of transient and accident events in the GE Boiling Water Reactor ("BWR").

The development and approval of these system, component, and thermal hydraulic models and computer codes was achieved at a significant cost to GE, on the order of several million dollars.

The development of the evaluation process along with the interpretation and application of the analytical results is derived from the extensive experience database that constitutes a major GE asset.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GE's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GE's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GE.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GE's competitive advantage will be lost if its competitors are able to use the results of the GE experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GE would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GE of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing these very valuable analytical tools.

STATE OF CALIFORNIA)
) ss:
COUNTY OF SANTA CLARA)

George B. Stramback, being duly sworn, deposes and says:

That he has read the foregoing affidavit and the matters stated therein are true and correct to the best of his knowledge, information, and belief.

Executed at San Jose, California, this 9th day of November 2001.

George B. Stramback
General Electric Company

Subscribed and sworn before me this 9th day of November 2001.

TERRY J. MORGAN
Commission # 1304914
Notary Public - California
Santa Clara County
My Comm. Expires May 18, 200

Notary Public, State of California

TERRY J. MORGAN
Commission # 1304914
Notary Public - California
Santa Clara County
My Comm. Expires May 18, 200

ATTACHMENT C

Additional Reactor Systems Information Supporting the License Amendment Request to Permit Uprated Power Operation at Clinton Power Station (Non-Proprietary)

Question 3.4

It is stated that "The plant condition assumed in the ELTR2 Evaluations bound the conditions for this EPU." But ELTR2 evaluations were performed mainly for BWR/3 and BWR/4 plants with little reference to BWR/6 plants. Describe in detail how ELTR2 BWR/6 evaluations bound the conditions for Clinton. Identify the appropriate sections of ELTR2 which support the above conclusion. Also, Clinton extended power uprate (EPU) operation will not involve any reactor pressure increase, while ELTR2 assumes an increase in reactor pressure. Confirm that the above conclusion is valid for Clinton EPU operation.

Response 3.4

ELTR2 includes evaluations that are applicable to all Boiling Water Reactor (BWR) product lines. The applicability of each evaluation section is included in ELTR2 and its supplements. Attachment E to Reference 1 only references those sections of ELTR2 applicable to CPS (i.e., applicable to a BWR/6-type plant). Each section of Attachment E to Reference 1 that references ELTR2 includes a specific section number. A plant-

specific review of each system and limiting event is performed to confirm the design capability at the CPS EPU conditions.

Question 3.5
In Section 1.2.3, "Approach (a) Reactor Core and Fuel Design Performance," there is the following statement, "Analyses are performed for a representative equilibrium cycle with the reactor core operating at EPU conditions."

In Section 2.1, "Fuel Design and Operation," there is the following statement, "Detailed fuel cycle calculations of representative core design for this plant demonstrate a representative core design for this plant…."

Explain in detail what is "a representative equilibrium fuel cycle" and what is "representative core design"? Also, explain in detail PUREC (Power Uprate Representative Equilibrium Cycle).

Response 3.5
A fuel cycle is represented by a three-dimensional model of the reactor core and fuel bundles. Use of this model demonstrates the capability of the core to achieve a given cycle energy output while maintaining required margins to reactivity safety limits and margins to fuel thermal and exposure limits over an entire cycle or several cycles of operations. Fuel cycle analysis forms the basis for fuel bundle design, core loading, and reactor operations. An equilibrium fuel cycle represents results of several cycles of operations with identical fuel bundle design, loading strategy, control blade sequencing, and flow control.

There is a wide range of flexibility when designing a fuel cycle. It is possible for several different designs to meet performance and safety goals with these designs differing only in operational flexibility or being optimized to specific economic circumstances. The design is termed representative in that, it represents one of these possible design alternatives.

Question 3.6
Reference Section 2.1, "Fuel Design and Operation"
The staff safety evaluation report (SER) for ELTR-2 states that "Each applicant for extended power uprate should adhere to existing radial power shape limitations when designing core reloads for uprated conditions. Provided that the radial power distribution remains within the bounds of the loss-of-coolant accident (LOCA)/emergency core cooling system (ECCS) assumptions, the effect of power uprate on the short-term response to a postulated LOCA should be minimal." Confirm that this is true for the Clinton EPU.

Response 3.6
There are no explicit radial power shape limitations in the core design process. The core and control rod patterns are designed to keep the individual bundles within minimum critical power ratio (MCPR) and linear heat generation rate (LHGR) limits. The loss of

coolant accident (LOCA) / emergency core cooling system (ECCS) analysis does not make any assumptions with respect to the core radial power distribution. The LOCA/ECCS analysis models two fuel bundles: the average bundle whose power is determined by the core power and number of fuel bundles, and the hot bundle whose power is determined by setting the MCPR and LHGR bundle limits simultaneously. The radial power shape must be left free to vary to avoid over-constraining the initial conditions for the analysis.

The safety evaluation report (SER) approving ELTR2 (Reference 5) denotes a concern that the core radial power shape may adversely affect the core spray distribution during a LOCA, resulting in increased peak cladding temperatures. The core radial power shape will flatten as the core power is increased, thus increasing the power in the peripheral bundles. Increased power in the peripheral bundles could result in an increased steam updraft in the region of the spray nozzles that affects the nozzle spray pattern or results in counter current flow limiting (CCFL) holdup at the top of the bundle forming a pool of water that may block the spray nozzles. There is also a concern that EPU conditions could lead to more CCFL holdup, thus delaying core re-flooding.

The effect of EPU on core spray distribution is not a concern for the LOCA/ECCS analysis. Testing at the 30° Steam Sector Test Facility has shown that there are three flow regimes in the core during the time period of interest: CCFL breakdown and draining of the upper plenum to the lower plenum through the peripheral bundles, steam venting of the lower plenum up through the central region of the core, and CCFL holdup of spray water in the middle "ring" of the core. The steam venting through the central region of the core produces updraft velocities that are high enough to keep the spray droplets from penetrating the bundle. In addition, the spray distribution for BWR/4 and BWR/5 plants is adversely affected by the steam environment and the spray may not reach the central region of the core. The spray distribution in a steam environment is less of an issue for BWR/3 and BWR/6 plants. The BWR/3 core spray nozzle design is such that the spray pattern is less susceptible to the effects of steam. The core spray nozzle and sparger design for BWR/6 plants (including CPS) took into account the effects of steam on the core spray distribution. Because of the steam venting and questions with respect to spray distribution in a steam environment, the LOCA/ECCS analysis does not take any credit for direct spray cooling to the hot channel. Core spray cooling is allowed in the hot channel only if a large enough pool of water forms in the upper plenum to cover the core, thus ensuring distribution over the entire core.

EPU will have no overall effect on CCFL breakdown and draining of the upper plenum. The CCFL holdup occurs when saturated steam flowing up through the bundle holds up the saturated spray water trying to drain through the upper tie plate of the bundle. CCFL breakdown occurs when the water being held up becomes sufficiently sub-cooled such that it condenses all the steam that is holding it up. Without the steam holding it up, the water is then free to flow down into the bundle. The concern expressed was that the higher power in the peripheral bundles would delay the CCFL breakdown, resulting in a delay in re-flooding the core. This is actually a self-limiting situation. If there is enough CCFL occurring such that a pool of water forms in the upper plenum, the pool of water

will cover the spray nozzles. When the spray nozzles are covered, the pool of water becomes sub-cooled (the sprays are injecting directly into the pool and are no longer condensing steam). When the pool becomes sub-cooled, CCFL breakdown will occur and the pool will drain. If EPU results in more CCFL holdup, the pool of water will form faster and CCFL breakdown will occur earlier. Therefore, EPU will have no overall effect on CCFL breakdown and draining of the upper plenum and the core re-flooding will not be impacted.

The concern behind the SER statement on the core radial power shape is that the core radial power shape may adversely affect the core spray distribution during a LOCA. The central region of the core may not receive core spray flow due to steam venting through the bundles and due to the effects of a steam environment on the spray distribution. To conservatively account for this, the LOCA/ECCS analysis does not take credit for direct core spray cooling. CCFL holdup in the upper plenum is a self-limiting phenomenon. If the power uprate results in more CCFL holdup, the holdup will cover the spray nozzles sooner, resulting in an earlier breakdown and draining. There will be no impact on the core re-flooding. Based on these arguments, there is no need to establish any restrictions on the core radial power shape due to LOCA/ECCS analysis considerations.

Question 3.7
Reference Section 2.2.1, "Minimum Critical Power Ratio"
The staff SER for ELTR-2 states that "A plant-specific power uprate and the reload submittal should contain analyses to confirm that the safety limit for minimum critical power (SLMCPR) is appropriate for the average bundle power at the uprated conditions." Describe in detail that the SLMCPR is appropriate for the EPU?

Response 3.7
The safety limit minimum critical power ratio (SLMCPR) is calculated on a plant/cycle specific basis as required by the NRC. Following EPU implementation, these evaluations are performed at the uprated conditions using the specific bundle and core loading designed to operate at those conditions. The SLMCPR is not based on just an average bundle power but instead depends most strongly on the MCPR distribution for the entire core and the R-factor distributions for the bundles in the core. The elevated power does not affect the applicability of the SLMCPR evaluation methodology since the GEXL correlation is appropriate up to the critical power. Margin to the critical power is maintained for the uprated conditions and thus the critical power is not exceeded.

For EPU, the amount of total power increase necessary to approach the SLMCPR is actually reduced since the core power at which the SLMCPR will occur remains essentially unchanged from the non-uprated case unless fresh fuel with improved critical power ratio (CPR) performance is loaded. Generally, the core power distributions for uprated conditions are designed to be flatter to accommodate the increased power while still maintaining adequate CPR margin. These flatter core minimum critical power ratio (MCPR) distributions tend to result in a higher SLMCPR; however, this tendency is usually nullified by bundle designs that are more peaked in order to provide the increased fuel enrichments necessary to operate at the higher power. The application of

GE14 fuel provides the CPR capability to accommodate the higher peaking factors in the fuel bundle.

In summary, all the elements that impact the calculated SLMCPR are well within the bounds of the plant/cycle specific application of the methodology that has been approved by the NRC and are properly accounted for in the process for the uprated conditions.

Question 3.8
The following transients are to be analyzed for EPU conditions as required by ELTR-1, Appendix E. Why were these transients not analyzed for the Clinton EPU?

Response 3.8
Table E-1 of Reference 3 (i.e., ELTR1) identifies the transient events to be analyzed for EPU. Included in Table E-1 are the following transients.

Section 9.1 of Reference 2 clarifies that the limiting overpressure event was analyzed for CPS EPU. Section 3.2 of Attachment E to Reference 1 presents the analysis of the limiting overpressure protection transient. Additional justification is provided below for each of the above transients.

Subsequent to the issuance of ELTR1 and with the introduction of maximum extended operating domain (MEOD), this event has been reclassified and is no longer an anticipated operational occurrence (AOO) for BWR/6s such as CPS. In Reference 6 the NRC approved the re-classification of this event for BWR/6 plants documented in Reference 7. Therefore, MEOD plants with associated pressure control systems are not

required to evaluate this event, other than to assure that the pressure control of each plant is consistent with the approved MEOD basis. As stated above, the CPS reload analysis confirms the power and flow dependent limits. Consequently, the analysis of this event is not required for the CPS EPU.

Section 2.4 of the SER approving ELTR1 (Reference 8) states that only the limiting transients need to be included in the uprate request, but a list of all the transients analyzed in support of the power uprate should be included, with an explanation of how the limiting transients were selected. Reference 2 addressed exceptions to ELTR1, and discuss the transients that were analyzed.

Consequently, these events are non-limiting for EPU and no analysis is required for the OLMCPR.

Section 5.5.1.4 of ELTR1 (Reference 3) states that the worst transient event with failure of the first scram signal is evaluated for EPU, which is usually the MSIV closure with position switch scram failure.

Section 3.8 of the SER approving ELTR2 (Reference 5) states that the closure of all MSIVs is more severe than the turbine/generator trip with coincident failure of the turbine steam bypass system valves at EPU conditions when credit is taken for the first backup scram. The SER further acknowledges that the closure of all MSIVs event is used as the ASME overpressure protection basis event. The analysis of the closure of all MSIVs event is discussed in Section 3.2 of Attachment E to Reference 1.

Consequently, the analysis of this event is not required for the CPS EPU.

Question 3.9
Reference Section 2.4, "Stability"
Confirm that the Option III continues to be applicable to the EPU conditions.

Clinton is going to implement Option III OPRM system for EPU operation. General Electric Company (GE) issued a 10 CFR Part 21 Interim report notifying the licensees that OPRM SCRAM set points are non-conservative due to a non-conservative GE analysis (Ref. Daily Event Report Number 38099 regarding Perry dated 7/27/01). Explain Clinton's position on the OPRM SCRAM set points in conjunction with the DIVOM curve determination for GE14 fuel under Clinton EPU conditions.

Response 3.9
In the Illinois Power Company response (Reference 9) to Generic Letter 94-02, "Long-Term Solutions and Upgrade of Interim Operating Recommendations for Thermal-Hydraulic Instabilities in Boiling Water Reactors," CPS committed to implement the Option III Oscillation Power Range Monitor (OPRM). A commitment was made to address the long-term solution for thermal instabilities by installing the Asea Brown Boveri (ABB) Combustion Engineering Option III OPRM. The OPRM system was installed during the sixth refueling outage. Upon restart from the outage in which the OPRM instrumentation was installed, CPS committed to operate the OPRM system in a disabled or unarmed state such that it would have alarm capability but not be able to effect a reactor scram. Operating the system without its automatic protection enabled would allow for evaluation of system performance, the potential for spurious trips, and familiarization with system operation. During the period in which the OPRM system was in operation in an unarmed state, the Interim Corrective Actions (ICAs) described in NRC Bulletin 88-07, Supplement 1, "Power Oscillations in Boiling Water Reactors (BWRs)," remained in effect. The ICAs address the potential for thermal hydraulic instabilities by requiring that plant operation be restricted to certain regions of the power/flow map.

Additional Reactor Systems Information Supporting the License Amendment Request to Permit Uprated Power Operation at Clinton Power Station (Non-Proprietary)

In Reference 10, AmerGen submitted an amendment request to incorporate the necessary changes to the operating license in support of making the OPRM system operable. This amendment request was under review by the NRC staff at the time General Electric (GE) Nuclear Energy issued the 10 CFR Part 21, "Reporting of Defects and Noncompliance," interim report. As a result of the 10 CFR Part 21 report, AmerGen has decided not to arm the OPRM trip functions at CPS until after resolution of the issue. In the interim, CPS will continue to implement the ICAs. The use of the ICAs ensures that appropriate actions are taken to prevent or mitigate any potential core instability event, thus ensuring continued safe plant operation. In addition, based on the time period GE is projecting to resolve the setpoint issue and the potential changes needed to the submittal to address the nonconservative OPRM assumptions, AmerGen requested withdrawal of the OPRM amendment request in Reference 11. The NRC Staff acknowledged the withdrawal in Reference 12.

As stated in Reference 1, AmerGen will revise the power/flow map, including the boundary of the ICA restricted region, to address the effect of power uprate. In addition, the OPRM alarm setpoints will be adjusted to account for the change in thermal power. The OPRM system will continue to be operated in the unarmed condition until the GE 10 CFR Part 21 issue is resolved.

Question 3.10
Reference Section 3.4, "Recirculation System"
(a) The staff SER for ELTR-2, states that "Plant-specific data will be reviewed to confirm that the existing recirculation system will accommodate the increase in resistance, due to an increase in core average void fraction at the uprated condition when operating at maximum core flow." Confirm that this review was performed for Clinton EPU operation.

(b) The staff SER for ELTR-2, states that "Each applicant for EPU will be expected to review plant-specific operating data to ensure that the recirculation system, including the recirculation pumps and its associated components, will accommodate the increase in system pressure as well as the increase in flow resistance that is expected due to the increase in core average void fraction due to uprate." Even though there is no pressure increase, flow resistance is changed due to power uprate. Confirm that the plant operating data was reviewed.

Response 3.10
(a) The analysis of the reactor recirculation system for EPU conditions determined the system operating parameters considering the increased void fraction inherent with uprated power conditions creates additional resistance to flow. These parameters were analyzed for rated core flow, the maximum capable core flow and the potential for system vibration. In addition, the analysis compared the maximum capability of the system for the current licensed thermal power (CLTP) and EPU rated thermal power. This analysis uses design values as the input to predict design capability. Analysis shows that the predicted maximum capability is decreased from 103% core flow to 100.8% core flow. Evaluation of the actual performance of the system indicates that the reactor recirculation system at CPS is currently capable of approximately 102% core

flow. This is due to a small amount of material degradation of the system, likely due to fouling of the jet pump flow surfaces. Applying the same ratio of reduced capability in the design analysis to the actual performance data, it is expected that the maximum core flow capability following EPU will be 99.8%. This amount of core flow is sufficient to operate the station at the EPU power level.

(b) The EPU analysis is based on design data. The evaluation of actual plant operating data is discussed in the response to Question 3.10(a), above. The reactor recirculation system performance is monitored by station personnel during all modes of system and plant operation. Any unexpected changes in system performance would be evaluated and dispositioned in accordance with the CPS corrective action program.

Question 3.11
Reference Section 4.3, "ECCS performance"
The results of SAFER/GESTR-LOCA analysis are presented in Table-2. Explain the methodology used for the LOCA analysis. Describe in detail what parameters are used for this analysis which are different from the actual core design. Is this analysis based on an equilibrium core design?

Response 3.11
The ECCS performance characteristics are not changed for the constant pressure EPU. ECCS performance analyses were performed to demonstrate that 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," requirements are met at the EPU RTP conditions. The topics addressed in this evaluation are:

Topic	Disposition
Large break peak clad temperature	Plant Specific
Small break peak clad temperature	Plant Specific
Local cladding oxidation	Generic
Core wide metal water reaction	Generic
Coolable geometry	Generic
Long-term cooling	Generic

The peak cladding temperature (PCT) for the limiting large break LOCA is determined primarily by the hot bundle power, which is unchanged by the constant pressure EPU. The analysis assumes the hot bundle is operating at thermal limits (e.g., MCPR, MAPLHGR, and LHGR) which are not changed by EPU.

Because the constant pressure EPU has only a small effect on PCT, there is a negligible effect on compliance with the other acceptance criteria of 10 CFR 50.46 (i.e., local cladding oxidation, core-wide metal-water reaction, coolable geometry and long-term cooling). The local fuel conditions are not significantly changed with EPU, because the hot bundle operation is constrained by the same operating thermal limits. The EPU affects the relative flow distribution between the hot and average channel. As the average channel power increases with the EPU, the fraction of

the flow passing through the hot channel increases, which keeps the cladding temperature from increasing. Since a constant pressure EPU has such a small effect on the PCT, the system response over the large break spectrum is not affected.

The limiting case that defines the plant licensing basis PCT (break size, fuel type, and single active failure combination) is reanalyzed on a plant specific basis using both nominal and 10 CFR Part 50, Appendix K, "ECCS Evaluation Models," assumptions to determine the change in PCT resulting from the constant pressure EPU. The licensing basis PCT is based on the 10 CFR Part 50, Appendix K PCT. The upper bound PCT is based on the nominal PCT. The effect of EPU on the licensing basis PCT and upper bound PCT is based on the most limiting PCT change shown by the two cases such that the licensing basis and upper bound PCTs are maximized (i.e., the largest increase or smallest decrease in PCT is applied). The PCT change determined from the limiting fuel type is added to the licensing basis PCTs and upper bound PCTs for all fuel types in the core. Use of the most limiting of the nominal or 10 CFR Part 50, Appendix K PCT changes for both the licensing basis PCT and upper bound PCT ensures compliance with the NRC SER requirements on the SAFER/GESTR application methodology.

The evaluation of the limiting large break LOCA PCT for CPS at the EPU RTP is discussed in Attachment E of Reference 1, Section 4.3, "Emergency Core Cooling System Performance." In addition, the response is evaluated to demonstrate that the automatic depressurization system (ADS) capacity is adequate for small break LOCAs when operating at EPU conditions.

The CPS EPU SAFER/GESTR LOCA analysis assumed an equilibrium core loading of GE14 fuel. This approach is acceptable because of the channeled configuration of BWR fuel assemblies. There is no channel-to-channel cross flow inside the core and the only issue of hydraulic compatibility of the various bundle types in a core is the bundle inlet flow rate variation. In order to provide an acceptable response during normal operation and transients, the overall bundle design is constrained such that the hydraulic response is similar between different fuel product lines. As a result, there is no significant difference in the hydraulic response for a mixed core as compared to an equilibrium core. From a regulatory standpoint, the NRC has accepted separate ECCS evaluations for plants with mixed cores containing fuels from different vendors. In these situations, each fuel vendor performs the ECCS evaluation for its fuel. The fact that there is no channel-to-channel interaction allows the vendor to perform these evaluations without consideration of the effects of the other vendor's fuel on the ECCS evaluation.

The SAFER analysis is insensitive to mixed cores where hydraulic compatibility is demonstrated. The PCT is determined by hot channel response. The hot bundle hydraulics are driven by the overall core pressure drop. This basic premise is valid because no channel-to-channel interaction occurs during a LOCA. In addition, the SAFER single channel modeling is conservative when compared to a multiple channel model (such as TRACG). TRACG models several core regions with multiple channels in each region. The conservatism in the SAFER modeling is shown in the upper bound

PCT evaluation in Appendix A of Reference 13.

The first peak PCT is primarily influenced by the timing of boiling transition at the various elevations in the bundle. The boiling transition in the bundle is governed by the core flow coastdown characteristics and the bundle power level. The core flow coastdown is a core-wide phenomenon determined by the initial core flow and the recirculation pump coastdown, neither of which are dependent on the fuel type. Because of the channeled configuration of BWR fuel assemblies, there is no channel-to-channel cross flow inside the core. The boiling transition in one bundle will not affect the other bundles in the core. Because of relaxation in ECCS parameters, the CPS SAFER/GESTR LOCA analysis is second peak PCT limited. The second peak PCT is primarily influenced by bundle flooding from the bottom. This is a low flow rate process that is governed by the ECCS system capacity. Because the ECCS performance is independent of fuel type, the transition from a mixed core to an equilibrium core is not expected to impact the second peak PCT response.

Question 3.12

Spray cooling of the core following the LOCA is important for Clinton post-accident long-term cooling. It is not clear whether a particular spray pattern is assumed in the LOCA analysis or whether the LOCA analysis simply assumes that a given amount of water is pumped inside through the top of the core without any spray distribution. Are you relying on a specific spray pattern to obtain the core spray heat transfer coefficient assumed in the analysis? What is the value of the core spray heat transfer coefficient assumed in the Appendix K analysis?

Response 3.12

There are two periods of interest with respect to core spray cooling during the LOCA event. The first period of interest is the short-term core uncovery period following vessel blowdown and prior to core re-flooding. As discussed above in the response to Question 3.6, no direct core spray cooling credit is assumed for the hot channel during the short-term core uncovery period because of the steam venting and questions with respect to spray distribution in a steam environment. Core spray cooling is allowed in the hot channel only if a large enough pool of water forms in the upper plenum to cover the core, thus ensuring distribution over the entire core. Mechanistically-based core spray heat transfer coefficients are applied during this time. The core spray heat transfer coefficient correlations are described in Section 4.6.6 of Reference 14. This approach is used for all jet pump BWRs using the SAFER methodology and is independent of fuel type.

The second period of interest is the long-term cooling period that begins when the decay power in the bundle falls below that needed to maintain a two-phase level at the top of the active fuel. The water level in the bundle will then fall to the top of the jet pumps (approximately two-thirds core height). The core spray keeps the uncovered portion of the fuel cooled by supplying enough water to keep the fuel rods wetted. Adequate core spray distribution is required to assure that sufficient flow is delivered to each fuel bundle in the core. The effect of a steam environment on spray distribution is not an issue for

long-term cooling. In the long-term cooling period, the vessel will have been fully depressurized and non-condensibles will have been drawn back into the vessel from the drywell. The presence of a small amount of non-condensibles is enough to restore the spray pattern. The long-term spray cooling does not rely on a specific spray heat transfer coefficient. The long-term cooling relies on sufficient flow being delivered to each bundle to keep the exposed portion of the fuel rods wetted. Adequate spray distribution is assured by maintaining the sparger flow rate at the design value, which provides more than enough flow to each bundle to keep the rods wetted. The long-term core cooling evaluation is documented in Reference 15. This evaluation is applicable to all BWRs and is independent of fuel type.

Question 3.13

Reference Section 9.1, "Reactor Transients"

The staff SER for ELTR1 states, "Only the limiting transient need be included in the uprate amendment request, but a list of all transients analyzed in support of power uprate should be included, with an explanation of how the limiting transients were selected." And the staff SER for ELTR2 states, "...Operating limit MCPR will be documented in each plant-specific power uprate submittal..." List the transients considered with an explanation how the limiting transient was selected.

Response 3.13

Question 3.14

Reference Section 9.3.1, "Anticipated Transient Without Scram (ATWS)"

What ATWS events were analyzed at the EPU condition? Confirm that for all limiting ATWS conditions, the standby liquid control system (SLCS) will be able to inject whenever it can be actuated without lifting the SLCS pump discharge relief valves. For example, will the SLCS be able to inject the required flow rate at the assumed time for the ATWS/LOOP event without reaching the rated SLCS relief valve set point?

Regarding the ATWS recovery scenario and the ATWS rule, does the power uprate affect the time available for the recovery process? Is AmerGen satisfied that operators can identify and adequately respond to an ATWS event in four minutes?

Response 3.14
The anticipated transient without scram (ATWS) events analyzed were the MSIV closure, turbine pressure regulator failure-open, loss of offsite power, and inadvertent opening of a safety relief valve. The standby liquid control system (SLCS) relief valves do not lift during the ATWS events.

An ATWS event under EPU conditions has identical symptoms and actions to pre-EPU conditions. The plant operating staff would be able to identify and respond in the same time as under the CLTP. The shutdown boron concentration is not changed with EPU. The EPU analysis was performed with the same timing of operator actions. Boron injection was assumed to start upon reaching the boron injection initiation temperature or 2 minutes after the ATWS trip point (i.e., low reactor water level or high reactor pressure), whichever is later. In both CLTP and EPU conditions the SLCS pumps are started at 2 minutes after the trip point. The times to reach hot shutdown are similar in both cases.

Question 3.15
Confirm that the EPU will be implemented in two stages over 2 operating cycles and the first power uprate will be about a 7 percent increase and the second increase about 13 percent.

Response 3.15
To facilitate better fuel utilization and balance the requirements of the plant regarding outage duration and capital costs, the implementation of power uprate will occur over two operating cycles. Cycle 9 operations, which is scheduled to begin in Spring 2002, will be at an "interim" power level, limited by balance of plant (BOP) components which have not yet been modified to operate at the fully uprated power levels. Specifically, the main generator exciter is expected to be the limiting component during this cycle, restricting generator capability to 1179 MVA. Additional modifications will be completed during the ninth refueling outage to enable the second stage of power uprate. Cycle 10 operations will also be limited by BOP components. The limiting component during this cycle will be the main generator itself, with total capability limited to 1265 MVA. In both of these operating cycles, as well as all future operation, the thermal power capability of the reactor will exceed the capability of the BOP equipment. This provides operational flexibility and enables the maintenance of constant generation output during times of reduced plant efficiency, such as that caused by high summer lake temperatures which reduce the overall efficiency of the station.

Question 3.16
ELTR-1, Section 5.6.2, "Recirculation System," states that "A review of plant-specific operating data will be performed to confirm that the recirculation system will accommodate the expected insignificant increase in the flow resistance at the uprated

power condition when operating at maximum core flow. Potential increases in system vibration will be evaluated from plant data." Confirm that this plant-specific evaluation was conducted for Clinton EPU operation.

Response 3.16
The response to Question 3.10(a), above, provides the response confirming that operating data was evaluated for rated core flow, maximum capable core flow and potential increases in systems vibration. The evaluation confirmed that there are no significant potential increases in system vibration for EPU.

Question 3.17
Reference Section 10.6, "Operator Training and Human factors" and ELTR2, Section 2.3, "Emergency Operating Procedures."

Confirm that emergency operating procedures (EOPs) will be reviewed and appropriate changes will be made to the plant variables and limit curves. Since Operator response time will be reduced due to power uprate, discuss the Operator training planned for EPU conditions.

Response 3.17
The response confirming that emergency operating procedures will be reviewed and appropriate changes made to the plant variables and limit curves and the discussion on CPS operator training has been provided in response to Questions 2.1 and 2.5 of Reference 16.

Question 3.18
The EPU submittal did not address whether operation at the higher MELLLA/EPU operation with introduction of GE14 fuel might affect the potential for and impact of thermal-hydraulic instability. Section L.3.1, "Power Conditions for ATWS Evaluation," and L.3.2, "Operator Action," of the ELTR1 discuss some aspects of the ATWS instability and typical ATWS operator actions. NEDO-32047-A, "ATWS Rule Issues Relative to BWR Core Thermal-hydraulic Stability," provided generic evaluations of ATWS instability events for BWR/5 and BWR/6.

Confirm that the power shape assumed in NEDO-32047-A bounds the conditions expected for Clinton during ATWS.

Confirm that the Clinton EOPs will be consistent with the recommendations of ELTR1 and the Nuclear Regulatory Commission (NRC) staff's positions in NEDO-32047-A SER.

Response 3.18
A bottom-peak axial power shape is bounding for the ATWS stability evaluation in NEDO-32047-A (Reference 17). The reported axial power shape is 1.34 at Node 4 (i.e., 1.34N4, out of 25 equal-length axial nodes, from bottom to top of active fuel length) during middle-of-cycle (MOC) exposure.

The axial power shape assumed in NEDO-32047-A may not bound that in the CPS EPU at MOC. However, the difference is relatively minor and there is sufficient margin in energy deposition (i.e., 78 calorie per gram versus the 280 calories per gram). The slightly higher peak values in axial power shape would yield an acceptable energy deposition value.

The required operator actions during ATWS events listed in Reference 3 (ELTR1), Section L3.2 mitigate extended dryout and excessive power generation and, therefore, maintain the integrity of the reactor vessel, fuel and containment. These actions are consistent with the ATWS mitigation strategy recommended in Emergency Procedure Guidelines (EPG). Hence, regardless of whether CPS EPU is bounded by NEDO-32047-A, the required operator actions ensure the reactor system integrity.

The CPS EOP actions for ATWS are not changed for EPU conditions. The specified actions are consistent with the "typical" actions listed in Reference 3 (ELTR1), Section L.3.2. The actions specified in the CPS EOPs are not consistent with the NRC staff positions in Reference 18 since the CPS EOPs are based on the recommendations contained in the Emergency Planning Guidelines/Severe Accident Guidelines (EOP/SAG), Revision 1. These recommendations differ from the original analysis in NEDO-32047-A, which was also contained in the EPG, Revision 4.

Question 3.19

Table 5-1, "ATWS/Stability Transient Analysis Parameters," of NEDO-32047-A provides the initial conditions assumed in the ATWS instability evaluations. Confirm that the key parameters (i.e., initial feedwater temperature, core power density) used in the generic ATWS instability evaluation remain applicable and bounding for Clinton. Explain why the generic ATWS instability analysis is applicable to the Clinton EPU operation using the factors that affect thermal-hydraulic instability.

Response 3.19

These are slightly higher than the values used in NEDO-32047-A (Reference 17), in which the initial feedwater temperature is 420°F and the power/core flow ratio is 40.9 MWt/Mlbm (i.e., 3323 MWt and 10,250 Kg/s or 81.3 Mlbm/hr). The higher values for the CPS EPU can make the ATWS response marginally less stable than the results in NEDO-32047-A. However, there is sufficient margin in energy deposition (i.e., 78 calories per gram versus the 280 calories per gram). The slightly higher initial values in power/flow ratio and feedwater temperature would yield an acceptable energy deposition value.

The required operator actions during ATWS events listed in Reference 3 (i.e., ELTR1), Section L.3.2 mitigate extended dryout and excessive power generation and, therefore, maintain the integrity of the reactor vessel, fuel and containment. These actions are consistent with the ATWS mitigation strategy recommended in the EPGs. Hence,

regardless of whether CPS EPU is bounded by NEDO-32047-A, the required operator actions ensure the reactor system integrity.

REFERENCES

1. Letter from J. M. Heffley (AmerGen Energy Company, LLC) to U.S. NRC, "Request for License Amendment for Extended Power Uprate Operation," dated June 18, 2001

2. Letter from K. A. Ainger (Exelon Generation Company, LLC) to U.S. NRC, "Supplemental Safety Analysis Report Information Supporting the License Amendment Request to Permit Uprated Power Operation at Clinton Power Station," dated October 26, 2001

3. General Electric Company Licensing Topical Report, "Generic Guidelines for General Electric Boiling Water Reactor Extended Power Uprate," NEDC-32424P-A, Class III, February 1999

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