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DAEC Plant Support Center
Operated by Nuclear Management Company, LLC

April 16, 2001
NG-01-0463

Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station 0-P1-17
Washington, DC 20555-0001

Subject:	Duane Arnold Energy Center Docket No: 50-331 Op. License No: DPR-49 Response to Request for Additional Information (RAI) to Technical Specification Change Request TSCR-042 – Extended Power Uprate. (TAC # MB0543)
Reference:	NG-00-1900, "Technical Specification Change Request (TSCR-042): 'Extended Power Uprate'," dated November 16, 2000.
File:	A-117, SPF-189

Dear Sir(s):

On March 27, 2001, a conference call was held with the NRC Staff regarding the referenced amendment request to increase the authorized license power level of the Duane Arnold Energy Center. In order to complete their review, the Staff requested additional information to our application. Attachment 1 to this letter contains that additional information, as requested in the March 27th conference call.

Please note that the responses to Questions 1, 2 and 3 in Attachment 1 contain information that the General Electric Company (GE) considers to be proprietary in nature and subsequently, pursuant to 10 CFR 9.17(a)(4), 2.790(a)(4) and 2.790(d)(1), requests that such information be withheld from public disclosure. The portion of the text containing the proprietary information is identified with vertical sidebars in the right margin. An affidavit supporting this request is provided as Attachment 2 to this letter. Attachment 3 is the redacted version of Attachment 1, with the GE proprietary material removed, suitable for public disclosure.

No new commitments are being made in this letter.

Please contact this office should you require additional information regarding this matter.

A001

This letter is true and accurate to the best of my knowledge and belief.

NUCLEAR MANAGEMENT COMPANY, LLC

By Gary Van Middlesworth
Gary Van Middlesworth
DAEC Site Vice-President

State of Iowa
(County) of Linn

Signed and sworn to before me on this 16th day of April, 2001,

by Gary Van Middlesworth

Nancy S. Franck
Notary Public in and for the State of Iowa

NANCY S. FRANCK
MY COMMISSION EXPIRES
9-28-01
Commission Expires

Attachments: 1) DAEC Responses to NRC Mechanical and Civil Engineering Branch Request for Additional Information Regarding Proposed Amendment for Power Uprate
2) General Electric Affidavit of Proprietary Information
3) Redacted Version of DAEC Responses to NRC Mechanical and Civil Engineering Branch Request for Additional Information Regarding Proposed Amendment for Power Uprate

cc: T. Browning
M. Wadley (w/o Attachments 1&2)
B. Mozafari (NRC-NRR)
J. Dyer (Region III)
D. McGhee (State of Iowa) (w/o Attachments 1&2)
NRC Resident Office
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Attachment 2 to

NG-01-0463

General Electric Affidavit of Proprietary Information

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 the attachment to letter GEDA –AEP-546, *Responses to NRC Mechanical and Civil Engineering Branch Draft RAIs*, (GE Proprietary Information), dated April 11, 2001. The proprietary information is delineated by bars marked in the margin adjacent to the specific material in the *Attachment 1 to Letter GEDA-AEP-546 (DRF A22-00100-00).*

(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-32980P, *Safety Analysis Report for Duane Arnold Energy Center Extended Power Uprate,* Class III (GE Proprietary Information), dated November 2000, 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 11th day of April 2001.

George B. Stramback
General Electric Company

Subscribed and sworn before me this 11th day of April 2001.

VICKY D. SCHROER
Commission # 1224251
Notary Public - California
Santa Clara County
My Comm. Expires Jun 12, 2003

Notary Public, State of California

Redacted Version of
DAEC Responses to NRC
Mechanical and Civil Engineering Branch
Request for Additional Information
Regarding Proposed Amendment for Power Uprate

Provide the following additional information regarding your application for license amendment, dated November 16, 2000, to increase the authorized operating power level from 1658 MWt to 1912 MWt:

1. In reference to Section 3.3.2 of the transmittal, you indicated that the reduction in some fatigue usage factors (CUFs) in Table 3-2 is a result of a more accurate representation of the fatigue cycles experienced by the reactor components.

   a) Describe how you arrived to an accurate representation of the fatigue cycles, which resulted in a reduction of CUF from 0.825 to 0.572 for the CRD-Hydraulic System Return (HRS) nozzle; from 0.705 to 0.411 for the Recirculation Outlet; and from 0.97 to 0.199 for the shroud support, as shown in Table 3-2.

DAEC Response: The power uprate CUF for the CRD Hydraulic System Return Nozzle (HSR), Recirculation Outlet Nozzle, and shroud support were reduced by removing conservatism from the original analysis in the ASME Code Certified Stress Report. For the CRD-HSR and Recirculation Outlet Nozzles, an alternate, conservative method was used to calculate **[[General Electric Proprietary Information Redacted]]**. For the shroud support, the cumulative fatigue usage was determined for the **[[General Electric Proprietary Information Redacted]]**

Reduction of CUF from 0.825 to 0.572 for the CRD-Hydraulic System Return (HSR) Nozzle

[[General Electric Proprietary Information Redacted]]

Reduction of CUF from 0.705 to 0.411 for the Recirculation Outlet Nozzle

[[General Electric Proprietary Information Redacted]]

Reduction of CUF from 0.97 to 0.199 for the shroud support

[[General Electric Proprietary Information Redacted]]

   b) Also, provide the allowable code stress limits for the critical components evaluated.

DAEC Response: See attached Table #1.

2. In regard to Section 3.3.4, provide the maximum calculated stress at the critical locations of the reactor internal components evaluated for both the current design condition and the uprate power condition.

DAEC Response: See attached Table #2.

3. In Section 3.3.5, an assessment of flow-induced vibration of the reactor internal components due to power uprate is performed to address the increase in steam product (>20%) in the core, the increase in the core pressure drop, and the increase in the recirculation pump speed. In that assessment, the vibration levels were estimated by extrapolating the recorded vibration data recorded during the startup testing of DAEC and by using the operating experience of similar plants.

   a) Provide a sample evaluation for the most critical components (i.e., steam dryer, jet pump) and

DAEC Response: The details of the evaluation process have been provided to the Staff previously (Reference, J. Benjamin (ComEd) to USNRC, "Response to Request for Additional Information License Amendment Request for Power Uprate Operation," 2/15/00) and are not repeated here. The process used in the DAEC evaluation is identical to that described in this prior response.

A sample evaluation for a jet pump, using DAEC measured data, is provided in attached Table #3. The jet pumps were instrumented during the original start-up testing to confirm their structural integrity with respect to flow-induced vibration. The sensor signals were recorded on magnetic media. For the extended power uprate (EPU) analysis, these tape recorded signals were played back and analyzed **[[General Electric Proprietary Information Redacted]]**

   b) the basis for using the operating experience of similar plants.

DAEC Response: The evaluation was performed based on measured vibration data from the Duane Arnold plant and on operating experience of similar plants. The operating experience of similar plants was used for two components **[[General Electric Proprietary Information Redacted]]** that were not instrumented during the original DAEC startup tests.

Because the **[[General Electric Proprietary Information Redacted]]** is a non-safety related component, it is typically not instrumented in the start-up test program for the reactor internals. Thus, operating experience at other BWRs, both domestic and foreign, was used to ensure that the increase in steamflow **[[General Electric Proprietary Information Redacted]]** due to the power uprate would not have a major operational impact on the DAEC, **[[General Electric Proprietary Information Redacted]]**. Based upon this review, operation in the power uprate region will not affect the design criterion **[[General Electric Proprietary Information Redacted]]** which requires that the structural integrity **[[General Electric Proprietary**

Information Redacted]] be maintained for a steam line break occurring beyond the main isolation valves.

[[General Electric Proprietary Information Redacted]] have failed in some BWR/4 and BWR/5 plants. Based on this field experience, testing at GE test facilities and dynamic analysis, GE determined in 1987 that the DAEC **[[General Electric Proprietary Information Redacted]]** were susceptible to failure due to vane passing frequency effects from the reactor recirculation pumps. A detailed dynamic analysis, combined with **[[General Electric Proprietary Information Redacted]]** test results, concluded that most of the **[[General Electric Proprietary Information Redacted]]** were susceptible to failure if the recirculation pump operates up to its maximum speed (1710 RPM). Subsequently, clamps were installed on all of the **[[General Electric Proprietary Information Redacted]]** identified as being susceptible. The clamps will prevent resonance vibration up to this maximum pump speed. Since the original analysis was done for the maximum pump speed of 1710 RPM, which is not changing for the power uprate and clamps have already been installed on the affected **[[General Electric Proprietary Information Redacted]]**, there is no additional concern due to power uprate.

c) Also, provide a detailed discussion on the potential for excessive vibrations, high noise levels, and the instrument lines leakage, that might be caused by the increased recirculation pump speed or flow for the DAEC power uprate, as described in the NRC Information Notice 95-16.

<u>DAEC Response:</u> The maximum design recirculation pump speed of 1710 RPM is not changing with EPU. This pump speed was used in the existing evaluation of pump vane passing frequency effects, the subject of Information Notice 95-16. Thus, there is no increased potential for such vibrations due to EPU.

4. In reference to Sections 3.3.2 and 3.3.4,
   a) provide a discussion of the methodology, assumptions, and loading combinations used for evaluating the reactor vessel and internal components with regard to the stresses and fatigue usage for the power uprate.

<u>DAEC Response:</u> The vessel evaluation methodology is discussed in Section 3.3.2 of the PUSAR.

The discussion on the methodology and loads for the internals assessment is included in Section 3.3.4, followed by the component-unique summaries. In general, for a given component, if the EPU load is smaller than the load used in the existing basis calculation, then no further evaluation is performed. If the EPU load is larger than the existing design basis load, then further reconciliation is performed to determine the effect of the load increase, as applicable to the component. Accordingly, affected stresses are reassessed to ensure that they are within the allowables consistent with the design basis.

b) Were the analytical computer codes used in the evaluation different from those used in the original design-basis analysis?
c) If so, identify the new codes used, provide your justification for using the new codes, and
d) state how the codes were benchmarked for such applications.

DAEC Response: The only code used was in the performance of a finite element stress analysis of the core support plate. See Section 1, Table 1-3, "Reactor Internals Structural Evaluation," for the computer code of record and Footnote 10 of that Table for the qualification basis.

5. a) Discuss the analytical methodology and assumptions used in evaluating pipe supports, nozzles, penetrations, guides, valves, pumps, heat exchangers and anchors at the power uprate condition.

DAEC Response: As stated in PUSAR Section 3.5, the methodology described in App. K to ELTR-1 (NEDC-32424P-A) was used, without deviation, in the analysis of pipe supports, nozzles, penetrations, guides, valves, pumps, heat exchangers and anchors.

b) Were the analytical computer codes used in the evaluation different from those used in the original design-basis analysis?
c.1) If so, identify the new codes,
c.2) provide justification for using the new codes, and
c.3) state how these codes were qualified for such applications.

DAEC Response: No computer codes were used in this analysis.

6. a) Discuss the functionality of safety-related mechanical components (i.e., all safety related valves and pumps, including air-operated valves (AOV) and safety and relief valves) affected by the proposed power uprate to ensure that the performance specifications and technical specification requirements (e.g., flow rate, closing and opening times) will be met for the proposed power uprate.

DAEC Response: As documented throughout the PUSAR, on a system basis, the functionality of all safety-related pumps and valves at the uprated condition was confirmed.

b) Confirm that safety-related AOV and motor-operated valves (MOVs) at DAEC will be capable of performing their intended function(s) following the power uprate including such affected parameters as fluid flow, temperature, pressure and differential pressure, and ambient temperature conditions.

DAEC Response: As part of an industry-wide effort, the DAEC is performing a systematic evaluation of its AOVs, similar to that previously performed for MOVs under GL 89-10, utilizing the Joint Owners' Group (JOG) evaluation methodology. That evaluation is independent of the EPU, which was performed using the existing design basis of record. The current design basis for those safety-related AOVs subjected to containment pressure is based upon a differential pressure of ≥ 50 psig, which exceeds the EPU accident peak pressure of 46 psig (see PUSAR Table 4-1). The Main Steam

Isolation Valves (MSIVs), which are subjected to an increase in steamflow, were evaluated as described in PUSAR Section 3.7. Therefore, all safety-related AOVs were comfirmed to not be adversely impacted by EPU conditions. See Question 7 below for impact on MOVs.

c) Identify the mechanical components for which functionality at the uprated power level could not be confirmed.

DAEC Response: No such safety-related mechanical components were identified.

d) Also, discuss effects of the proposed power uprate on the pressure locking and thermal binding of safety-related power-operated gate valves for Generic Letter (GL) 95-07 and

DAEC Response: In response to GL 95-07, screening criteria were developed to identify any valves which could be susceptible to either pressure locking or thermal binding (Reference DAEC letter NG-96-1397, dated July 3, 1996.) Those screening criteria are not impacted by EPU. Thus, no additional valves would be included within the scope of GL 95-07. All valves susceptible to pressure locking have had their disks drilled or bonnets vented to eliminate this potential. Only three valves were originally screened to be potentially susceptible to thermal binding: MO-2202 (HPCI Steam Supply), MO-2312 (HPCI Injection) and MO-2512 (RCIC Injection). The original evaluations for these three valves concluded that they were not susceptible to thermal binding. Those evaluations are not impacted by the changes due to EPU. MO-2312 and MO-2512 are both located in the Steam Tunnel and were evaluated based upon a 100°F change in ambient temperature. As stated in PUSAR Section 5.3.9, steam tunnel temperature is expected to increase only 1.3°F due to EPU. This change is negligible with respect to thermal binding. The key input parameter for the MO-2202 evaluation is the change in pressure from normal operating pressure to the lower end of the HPCI operating range (i.e., 150 psig). As shown in Table 1-2 of the PUSAR, normal operating pressure is not changing with EPU, nor is the lower end of the HPCI operating range. Therefore, none of these valves will be be susceptible to thermal binding at EPU.

e) on the evaluation of overpressurization of isolated piping segments for GL 96-06.

DAEC Response: As stated in PUSAR Section 4.1.6, because the UFSAR design temperature (340°F) was used in the original GL 96-06 evaluations, EPU does not have an impact on those evaluations.

7. In reference to Section 4.1.4, you indicated that the GL 89-10 MOV program requires calculation revisions, and switch setting adjustments and/or modifications to ensure satisfactory performance, and that these changes will be completed before the proposed power uprate.

a) Identify these MOV valves in your GL 89-10 MOV program that are affected by the power uprate.

DAEC Response: The Maximum Expected Differential Pressure (MEDP) calculations for the GL 89-10 MOVs in the Reactor Water Cleanup (RWCU) and Recirculation systems reference the system flowrates, which are increasing slightly due to EPU. However, these flowrates are not used to establish the design basis MEDPs. Thus, the calculations of record do not require revision, but the design record should be revised at the next convenient opportunity to update the references to these new flowrates. No modifications, or switch setting adjustments were required.

b.1) Also, identify the piping systems, equipment and supports, if any, that require modification for the power uprate and

DAEC Response: As discussed in PUSAR Section 3.5.2.2, a minor modification to one snubber on the Safety/Relief Valve discharge line is required.

b.2) discuss the nature of these modifications.

DAEC Response: The extension piece on this snubber is to be replaced with one with a higher load capacity.

Table 1
Limiting RPV components
Primary plus Secondary stress intensities, Comparison to Allowable

Component	Location	Current P + Q, psi	EPU P + Q, psi	Code Allowable P + Q, psi
Core Spray Nozzle	Low Alloy Steel	37,569	40,387	70,000
CRD-HSR Nozzle	Pt. 9	32,257	34,676	39,900
Main Closure Flange[1]	Vessel	48,975 29,306	55,097 32,969	80,100 44,450
Main Closure Flange[2]	Head	68,768 29,306 37,556	77,364 32,969 38,495	80,100 44,450 44,345
Main Closure Flange[3]	Bolting	45,445 92,090	46,581 94,392	79,480 107,298
Shroud Support[4]	Vessel Shell	17,994 75,605	18,984 79,763	80,100 106,400
Recirculation Outlet Nozzle	Nozzle Forging	34,848	38,751	80,100
Feedwater Nozzle[4,5]	Inconel, Pt. 3	37,791 58,337	39,000 62,829	69,900 69,181
Feedwater Nozzle[4,5]	Inconel, Pt. 7	52,922 75,127	54,616 80,912	69,900 88,804

1. The values correspond to the primary plus secondary and maximum bearing stresses, respectively.
2. The values correspond to the primary plus secondary, maximum bearing stress at the flange contact surface, and maximum bearing stress beneath the washers, respectively.
3. The values correspond to the average and maximum service stresses, respectively.
4. The values correspond to the P + Q stress with thermal bending removed and the thermal bending stress, respectively.
5. The values correspond to the limiting P + Q stress without thermal bending and the thermal bending stresses, respectively.

Table 2
RPV Internals
EPU Stresses(*) Comparison to Allowable

Component	Condition	EPU Stress	Allowable Stress

[[General Electric Proprietary Information Redacted]]

(*)If the EPU load is larger than the load used in the existing design basis, the critical stress affected by the load change is recalculated and reported.

Notes to Table 2:

[[General Electric Proprietary Information Redacted]]

Table 3

Extrapolation for Jet Pump Vibration Data, Sensor S15/16

[[General Electric Proprietary Information Redacted]]