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MFN 03-059
July 29, 2003

U.S Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20852-2738

Attention: Chief, Information Management Branch
Program Management
Policy Development and Analysis Staff

Subject: REQUEST FOR ADDITIONAL INFORMATION RELATED TO REVIEW OF GE LICENSING TOPICAL REPORT NEDE-32906P, SUPPLEMENT 1, "TRACG APPLICATION FOR ANTICIPATED TRANSIENT WITHOUT SCRAM ANALYSES" (TAC NO. MB6359)

In reference 1, the NRC provided GE with a request for additional information regarding its review of GE's Licensing Topical Report NEDE-32906P, Supplement 1, "TRACG Application for Anticipated Transient Without Scram Analysis." The requested information is provided in the enclosures hereto.

Enclosure 1 provides a non-proprietary version of the response to the requested information that is suitable for public disclosure. Enclosure 2 contains proprietary information as defined by 10CFR2.790. GE customarily maintains this information in confidence and withholds it from public disclosure. .

The affidavit contained in Enclosure 3 identifies that the designated information has been handled and classified as proprietary by GE. GE hereby requests that the designated information be withheld from public disclosure in accordance with the provisions of 10CFR 2.790 and 9.17.

If you have any questions, please contact Mike Lalor at (408) 925-2443 or myself.

Sincerely,

George Stramback

George Stramback
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Project No. 710

References:

1. MFN 03-044, Letter from Alan Wang (NRC) to James Klapproth (GE), June 20, 2002, *GE Licensing Topical Report, NEDE-32906P, Supplement 1, "TRACG Application for Anticipated Transient Without Scram Analysis"*

Enclosures:

1. Responses to RAIs 1 thru 8 – Non-Proprietary Information
2. Responses to RAIs 1 thru 8 –Proprietary Information
3. Affidavit

cc: AB Wang (NRC)
MA Lalor (GE/San Jose)
JF Klapproth (GE/San Jose)
FT Bolger (GE/San Jose)
PT Tran (GE/San Jose)

ENCLOSURE 1

MFN 03-059

Responses to RAIs 1 thru 8

Non- Proprietary

NRC RAI 1

Throughout the initial discussions regarding the use of TRACG for ATWS analysis it was stated that the application was limited to the initial pressure peak. The ODYN code would continue to be used for the bulk of the transient.

In NEDE-32906P, Supplement 1, the statement is made in Section 1.3, "...may be applied to ATWS criterion up to the point that Boron begins to inject." In addition, Section 2.4.2 refers to the primary advantage of TRACG as its 3-D kinetic model.

Please clarify the intended usage of TRACG for BWR ATWS, addressing the transient time frame for application. Also, describe an entire typical ATWS transient and the time during which TRACG would be used and when ODYN would be used. Please provide a transient time-line showing the portions of the event predicted by each code.

GE Response:

Section 1.3 states that "GE requests that the NRC approve TRACG for use in analysis of ATWS transients for purposes of evaluation of vessel pressure. The TRACG pressure prediction may be applied to ATWS criterion up to the point that Boron begins to inject". The only known application of the vessel pressure, besides peak vessel pressure, is in the assessment of vessel pressure response up to the time the SLCS is required to inject into the reactor. This response is required for the SLCS system evaluation. The transient time-line showing the portions of the event predicted by each code is shown below.

ATWS MSIVC Event Sequence for Parallel ODYN and TRACG Applications

Key Output?	Response	Event Time (sec)	ODYN Application	TRACG Application
No	MSIV Isolation Initiates	0.0	Start Transient	Start Transient
No	High Pressure ATWS Setpoint	≅ 4	Trip Predicted	Trip Predicted
No	MSIVs Fully Closed	≅ 4	Modeled	Modeled
No	Peak Neutron Flux	≅ 4	Peak Predicted	Peak Predicted
No	Opening of the First Relief Valve Tripped	≅ 4	Trip Predicted	Trip Predicted
No	Suppression Pool Heatup Calculation Initiated	≅ 4	Modeled	Not Modeled
No	Recirculation Pumps Tripped	≅ 5	Trip Predicted	Trip Predicted
Yes	Peak Clad Temperatue Occurs	≅ 45	Peak Predicted	Predicted (but not used)
Yes	Peak Vessel Pressure	≅ 10	Peak Predicted	Peak Predicted (1)

Key Output?	Response	Event Time (sec)	ODYN Application	TRACG Application
No	Feedwater Reduction Initiated	≅ 30	Modeled	Modeled
Yes	Boron Injection Initiation Temperature Reached	≅ 40	Predicted	Not Predicted
Yes	Pre SLCS Pump Start Reactor Pressure	≅ 124	Predicted	Predicted
No	SLCS Pumps Start	≅ 124	Modeled	Transient Terminated
No	Water Level Increased	≅ 1700	Modeled	N/A
Yes	Hot Shutdown Achieved (Neutron flux below 0.1% for more than 100 seconds)	≅ 1800	Predicted	N/A
Yes	Peak Suppression Pool Temperature	≅ 4000	Peak Predicted	N/A

(1) The transient may be terminated after peak pressure is predicted. Data after this point may be used to determine reactor pressure up until the point that SLCS injection begins.

NRC RAI 2

NEDE-32906P Supplement 1, states in Section 2.7, first sentence, that the application is to "...associated with ATWS in BWR/2..." It is the staff's understanding that maximum extended load line limit analysis plus (MELLLA+) is not applicable to BWR/2's. Please reconcile the application of TRACG to BWR/2 ATWS, use of the MELLLA+ in the main steam isolation valve closure (MSIVC) and pressure regulator failed open (PRFO) transients, and the non-applicability of MELLLA+ to BWR/2's.

GE Response:

It is correct that MELLLA+ would not be applicable to product lines other than BWR/3-6 (e.g., BWR/2) without a further submittal to justify the application. Please refer to NEDC-33006P for more details.

The initial total core flow condition for the ATWS overpressure application is determined in accordance with Section 6.2 of NEDE-32906P Supplement 1. The demonstration of this determination is given in Section 8.2.1, where it is shown that the minimum core flow case is limiting for both MSIVC and PRFO (note that this was the expected conclusion based on past experience with ODYN). Consequently, the TRACG ATWS overpressure MSIVC and PRFO analyses are to be initiated from the lowest licensed core flow (at the highest licensed thermal power). In accordance with Section 7.2, this conclusion is applicable to BWR/2-6, based on the demonstration analyses and analysis experience.

For purposes of the demonstration analyses, initial conditions were chosen which may be typical of an expected TRACG ATWS overpressure application. Specifically, the initial conditions represent an extended power uprate with MELLLA+. Of course, the appropriate flow, consistent with a particular plant's licensed operating domain, would be used for the plant-specific analysis.

NRC RAI 3

NEDE-32906P Supplement 1, Tables 8-2 and 8-3, MSIVC and PRFO Key Transient Parameters, respectively, indicate the core power used is 100 percent. What is meant by 100 percent power - true 100 percent or 120 percent of rated power?

GE Response

The 100% power means 100% of the licensed core power. For the demonstration plant, 100% of licensed power corresponds to 113.4% of the original rated power (see Section 8.1).

NRC RAI 4

NEDE-32906P Supplement 1, Tables 8-2 and 8-3, Key Transient Parameters indicate that the core flow is 73 percent (MELLLA+). Our understanding is that the MELLLA+ value would be different for different plants. What is the limiting value and how can that be justified for the entire operating fleet?

GE Response

MELLLA+ will be different for different plants. The value of 73% is the lowest possible MELLLA+ flow corresponding to an uprated power of 113.4% of original rated thermal power (demonstration plant power uprate). For a plant with an uprate to 120% of original rated thermal power, the minimum MELLLA+ flow is 80%, although the plant may choose to license a higher minimum flow (e.g., 85%). Please refer to NEDC-33006P for more details.

The limiting value of core flow for the MSIVC and PRFO ATWS overpressure events is the lowest licensed core flow, at the highest licensed core power, for the particular plant of interest. This sensitivity is determined for the demonstration plant in Section 8.2.1. The application of the core flow initial condition sensitivity to the rest of the BWR/2-6 operating fleet is justified in Section 7.2 based on the demonstration analysis results and analysis experience (REDY and ODYN). Also see the response to RAI-2.

NRC RAI 5

Please discuss the neutron flux event as predicted with and without scram. The results provided in NEDE-32906P, Figure 8-11 indicate a neutron flux peak of 310 percent at 3.42 sec with scram, while Supplement 1 indicates a peak of 225 percent at 4 sec without scram. Please explain why the flux peak is higher and earlier in the transient when scram occurs.

GE Response

There are several factors that contribute to the differences in timing and magnitude of the first flux peaks for the cited MSIVF (with scram) and MSIVC (without scram) cases. [[

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Also complicating the comparison between the first flux peak for the MSIVF and MSIVC baseline transient cases is the different core and different initial conditions. For instance, the MSIVF case was initiated from rated core flow and a core power of 2558 MW_{th}, while the MSIVC case was initiated from 73% of rated core flow and a core power of 2763 MW_{th}. In each case, the core power represents 100% of the licensed value at the time of the analysis (For this plant, the original rated thermal power (ORTP) was 2436 MW_{th}. The plant then uprated to 105% of ORTP, and again to 113.4% of ORTP). Further, the MSIVF analysis was performed with a transition core of GE9B and GE13, while the MSIVC analysis was performed with a transition core of GE13 and GE14. Finally, the MSIVF analysis was performed at an End-of-Cycle condition, while the MSIVC analysis was performed at a Beginning-of-Cycle condition.

Figure 1 – Comparison of MSIV Closure Characteristic for AOO MSIVF and ATWS MSIVC

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NRC RAI 6

In response to question 3, it is stated that 100 percent power means 100 percent of licensed core power, which corresponds to 113.4 percent of the original rated power for the demonstration plant. Please clarify this in regard to the ordinate title of Figure 8-8 in NEDE32906P, Supplement 1, which says Power (% of Original Licensed Thermal Power).

GE Response

In Section 8 of NEDE-32906P Supplement 1, it has been assumed that the *rated* power and *licensed* power are the same. Consequently, for Figure 8-8, the axis label "Power (% of Original Licensed Thermal Power)" could have been written "Power (% of Original Rated Thermal Power)." Obviously, the ATWS overpressure analysis would have to be performed utilizing a core power greater than or equal to the *licensed* core power to support the applicable licensing basis.

Throughout the document, use of the unqualified term "% power" does mean "% of licensed core power". If another meaning is desired, the term is qualified (e.g., "% of Original Licensed Thermal Power" for Figure 8-8).

Figure 8-8 is not the actual power/flow map for the demonstration plant, but is a typical map utilized to demonstrate the MELLLA+ boundary relation to the MELLLA boundary. However, this figure does indicate the MELLLA+ flow at the currently licensed thermal power for the demonstration plant (also see the response to RAI7). The "% of Original Licensed Thermal Power" terminology is utilized to make the figure as generically representative as possible, given the range of licensed power uprates that have occurred for various operating GE BWRs.

NRC RAI 7

Tables 8-2 and 8-3 in NEDE-32906P, Supplement 1, indicate that the core flow (%) is 73.0 (MELLLA+), while Figure 8-8 would indicate that the 73 percent flow point would lie on the MELLLA line at 100 percent power. Please clarify which line (MELLLA or MELLLA+) is meant and the corresponding core power.

GE Response

Please also see the response to RAI 6.

As indicated in Section 8.1 of NEDE-32906P Supplement 1, the demonstration plant current rated thermal power is 113.4% of the original rated thermal power. Consequently, the minimum MELLLA+ core flow for the demonstration plant at current rated power is determined by finding the core flow corresponding to a power of 113.4% on the MELLLA+ Boundary of Figure 8-8. The 73% core flow, 113.4% of original licensed thermal power point does lie on the MELLLA+ boundary of Figure 8-8.

NRC RAI 8

Please clarify that the use of TRACG for ATWS analysis is being considered under the condition of no-instability.

GE Response

NEDE-32906P Supplement 1 does not consider the use of TRACG for ATWS vessel pressure prediction under the condition of thermal hydraulic – neutronic instability.

ENCLOSURE 3

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Affidavit

General Electric Company

AFFIDAVIT

I, David J. Robare, state as follows:

(1) I am Technical Projects 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 enclusures to letter MFN 03-059 from General Electric (George Stramback) to the US Nuclear Regulatory Commission (Chief, Information Management Branch), *"Response to Request for Additional Information on General Electric Nuclear Energy Licensing Topical Report NEDE-32906P, Supplement 1, TRACG Application for Anticipated Transient Without Scram Analysis",* dated July 29, 2003. The specific [[proprietary information]] is delineated by double brackets, as shown in this sentence, 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), and 2.790(a)(4) for "trade secrets" (Exemption 4). The material for which exemption from disclosure is here sought 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 aspects of past, present, or future General Electric customer-funded development plans and programs, resulting in potential products to General Electric;

d. 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 paragraphs (4)a., and (4)b, above.

(5) To address 10 CFR 2.790 (b) (4), 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 detailed results of analytical models, methods and processes, including computer codes, which GE has developed, discussed with the NRC, and intends to apply to perform evaluations of transients for the BWR.

The development and approval of the TRACG computer code 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.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed on this 23TH day of JULY 2003.

David J. Robare
General Electric Company