December 26, 2002

Mr. Robert C. Mecredy, Vice President
Nuclear Operations
Rochester Gas and Electric Corporation
89 East Avenue
Rochester, New York 14649-0001

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING SEVERE ACCIDENT MITIGATION ALTERNATIVES FOR THE R. E. GINNA NUCLEAR POWER PLANT

Dear Mr. Mecredy:

The staff is reviewing Rochester Gas and Electric Corporation's analysis of severe accident mitigation alternatives (SAMAs) submitted in support of its application for license renewal for the R. E. Ginna Nuclear Power Plant, and has identified areas where additional information is needed to complete its review. The staff's RAI is enclosed.

We request that you provide your responses to these RAIs by January 31, 2002, in order to support the license renewal review schedule. If you have any questions, please contact me at (301) 415-1312.

Sincerely,
/RA/
Robert G. Schaaf, Project Manager
Environmental Section
License Renewal and Environmental Impacts Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No.: 50-244

Enclosures: As stated

cc w/enclosures: See next page

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Request for Additional Information Regarding
Severe Accident Mitigation Alternatives (SAMAs)
for the R. E. Ginna Nuclear Power Plant (Ginna)

1. Although the process used by Rochester Gas and Electric Corporation (RG&E) to identify and screen potential SAMAs is described in general terms in the environmental report (ER), additional details are needed to understand how RG&E arrived at the final set of eight candidate SAMAs and to conclude that the full set of SAMAs evaluated by RG&E address the major risk contributors for Ginna. For example, RG&E states in the ER that it identified potential SAMAs from the Ginna Station Probabalistic Safety Assessment (PSA) and SAMA analyses submitted for other nuclear plant license renewals (Section 4.14.1), and that it focused on the dominant risk sequences identified by the model as well as the results of other risk-importance studies to further focus the evaluation (Section 4.14.3). However, few specifics are given. RG&E provides the Ginna risk profile and the importance analyses in Sections 1.2 and 1.3, but little information is provided on how the risk profile and importance analyses were used to identify or screen potential SAMAs. Additionally, the NRC staff notes that shutdown and fuel handling/spent fuel pool (SFP) cooling events are important contributors to core damage frequency (CDF) and large early release frequency (LERF), yet none of the SAMAs mentioned in the ER appear to address these contributors. In this regard, please provide the following additional information:

    a. A description of how the dominant risk contributors at Ginna, including dominant sequences and cut sets from the PSA, were used to identify potential plant-specific SAMAs;

    b. A description of how many sequences and cut sets were considered in the SAMA identification process and what percentage of the total CDF they represent;

    c. A listing (more detailed than in Section E.1.3) of equipment failures and human actions that have the greatest potential for reducing risk at Ginna based on importance analyses and cut set screening;

    d. A description of how many SAMAs were considered before arriving at the final set of eight candidates, and the process used to eliminate candidate SAMAs from further review or consideration; and

    e. Justification that SAMAs that address each of the major risk contributors, including shutdown and fuel handling/SFP cooling events, have been adequately addressed.

2. In Section 1.1 of Appendix E to the ER, RG&E states that Revision 4.1 of the Ginna PSA was used for the SAMA analysis, and a brief description of the major changes to the preceding models is given. To gain a better understanding of how the PSA model has evolved and the impacts of the changes made to the model, please provide the following:

a. A description of the major differences when comparing the Revision 4.1 PSA to the individual plant examination (IPE) model, which had an internal event CDF of 5.02E-05/y, including the plant and/or modeling changes that have resulted in the new CDF and LERF. According to Table E.1-2, the new internal-event CDF (not including shutdown and the "Fuel handling accident/Spent Fuel Pool") is 23 percent of the total CDF or 9.15E-06/y. Explain the principal reasons for this fivefold decrease in the full-power, internal events CDF, relative to the IPE results.

b. A list of plant improvements identified through the IPE and individual plant examination of externally initiated events (IPEEE), the status of each, and whether any improvements not implemented are among the SAMAs considered. (Note: plant modifications are provided in Section 1.4.2 of Appendix E to the ER, but it is not clear whether any of these were identified in the IPE or IPEEE as proposed modifications.) In particular, address the five "potential vulnerabilities" that were discussed in Section 11.1.3 of the Ginna revised IPE submittal.

c. A short description defining all the plant damage states (PDSs), and the accident sequences that dominate the PDSs (for the version of the model that was used for the SAMA analysis).

3. In Section 2.1.2 of Appendix E to the ER, RG&E states that the source terms (STs) were obtained from the latest Level 2 Ginna Station PSA model analysis. Please provide more detailed information (e.g., a tabular list) on the release categories used in the SAMA analyses, including the definition, fractional releases, timing of releases, frequency, containment matrix (relationship between PDSs and release categories), and the associated conditional consequences. Confirm whether the STs are the same as in the IPE and, if not, explain how/why they are different.

4. In Section 4.14.2 of the ER, RG&E states that the Ginna Station PSA model includes internal events, external events, and shutdown events, and that the model has been upgraded since the completion of the IPE and IPEEE. Please address the following in this regard:

a. Describe how fires and internal floods are addressed in the current PSA model, and the major changes made to the PSA model to accommodate these events since the issuance of the IPEEE.

b. Based on the information provided in the ER, it is not clear to what extent, if at all, seismic events were evaluated in the SAMA analysis. Please describe how seismic events were addressed in the SAMA analysis, including: (1) consideration of potential plant improvements to address risk-significant seismic events, and (2) consideration of the additional risk reduction that internal event SAMAs (i.e., SAMAs intended primarily to address specific internal events) might offer in seismic events. Justify why the consideration of seismic events in the SAMA assessment is adequate.

c. In Tables E.1-1 and E.1-2 of Appendix E to the ER, fires are shown to be significant contributors to the CDF. The staff recognizes that RG&E has

implemented procedural changes that deal with fire scenarios, and that one of the SAMAs considered is due to fire or flooding. Please describe the treatment of fires in the current PSA model and any other SAMAs that were considered that could reduce the risk due to fire. If no other SAMAs were considered, please justify why the consideration of fire in the SAMA assessment is adequate.

d. In the NRC technical evaluation report on the Ginna IPEEE, RG&E states that:

> *... the licensee's response to the RAI on the selection of a second success path mentions an outlier which is still being investigated. As discussed in Section 2.4 of this TER, a second success path, for small LOCA, was evaluated by the licensee for potential failure due to seismically induced damage from other equipment, and it was found to be vulnerable to failures caused by seismically induced flooding. The Reactor Makeup Water Tank and the Monitor Tank, if failed, can cause the interruption of one or more of the systems selected for the second success path. According to the licensee's response to the RAI, "these tanks will be considered outliers and will be examined to determine the correct course of action to reduce as needed the core damage risks associated with a seismic event."*

Please discuss whether this matter was considered as part of the SAMA assessment and, if not, explain why.

5. The SAMA analysis did not include an assessment of the impact that PSA uncertainties would have on the conclusions of the study. Some license renewal applicants have opted to double the estimated benefits (for internal events) to accommodate any contributions for other initiators (e.g., seismic) when sound reasons exist to support such a numerical adjustment, and to incorporate additional margin in the SAMA screening criteria to address uncertainties in other parts of the analysis. Please provide the following information to address these concerns:

   a. An estimate of the uncertainties associated with the calculated core damage frequency (e.g., the mean and median CDF estimates and the 5^{th} and 95^{th} percentile values of the uncertainty distribution), and

   b. An assessment of the impact on the SAMA screening process if the risk reduction estimates are increased to account for uncertainties in the risk assessment and the additional benefits associated with seismic events.

6. In Section 1.1 of Appendix E to the ER, RG&E states that an industry peer review was performed in May 2002, and that the findings of the peer review will be incorporated into future revisions of the model. RG&E also states that, while the peer review findings could not be incorporated into the model in time to support the ER submittal, it did account for anticipated model impacts in the analysis of the candidate SAMAs. Please

provide details regarding the major findings of the peer review and the potential impact of these findings on the identification and dispositioning of potential SAMAs. Also, describe how the peer review findings were considered or accounted for in the SAMA evaluation.

7. During the staff's review of the SAMA analysis, numerous inconsistencies and apparent errors were noted, as summarized below. Please reconcile these differences.

   a. Table 4.14-2 of the ER, indicates that SAMA 1 reduces CDF by 14.8 percent and has an estimated benefit of $813K. SAMA 5 reduces CDF by 3.3 percent and has an estimated benefit of $844K. Both of these benefits are close to the maximum attainable benefit (MAB) of $992K, and appear to be too high given their relatively small impact on total CDF. Please explain this apparent inconsistency.

   b. Table E.1-1 indicates that the interfacing-systems loss-of-collant accident (ISLOCA) CDF is 8E-7/y (two percent of the total CDF) whereas Table E.1-3 indicates its contribution to LERF is 6E-9/y (2.09E-06/y times 0.3 percent), and Table E.2-4 shows the ISLOCA Release Category contribution to be 4E-9/y. This suggests that there is greater than a two order-of-magnitude difference between the ISLOCA CDF and the ISLOCA LERF and release to the public. Most ISLOCAs in other PSAs are unattenuated containment by-pass events with a conditional large early release probability of 1.0. Please explain the attenuation and mitigation features of ISLOCA events that justify the apparent conditional large early release probability of <1 percent.

   c. Table E.1-2 indicates the CDF for fuel handling accident/SFP cooling is 1.3E-6/y (3.37 percent of the CDF) for a fully off-loaded core, whereas Table E.1-3 indicates the LERF for SFP cooling is 4.7E-7/y. Thus, the probability of a large early release, given a spent fuel pool cooling accident, is about 36 percent. Please explain why all of these core damage events do not result in a large early release.

   d. In Table E.2-4, the sum of all frequencies is 4.03E-5/y versus the stated CDF of 3.97E-5/y. Although the difference is only 6E-7/y, and may be due to rounding, this is larger than many of the frequency entries in the table. Please explain the reasons for the difference in these values.

   e. In Table E.2-4, the sum of all Release Categories that would appear to be LERF contributors is 1.67E-6/y, which is less than the stated LERF of 2.09E-6/y. Please explain the reasons for the difference in these values. Also identify which Release Categories are considered to contribute to LERF.

   f. Table E.2-4 reports the frequency of steam generator tube rupture (SGTR) (WET) as 1.02E-6/y, but Table E.1-3 indicates it is 7.5E-7/y. Please explain the reasons for the difference in these values. Also, explain why all SGTR events are assumed to be wet.

g. SAMA 1 - The reduction in CDF is said to be 5.88E-6/y, but from Table E.1-2, SBO is only 2.43 percent of the total CDF, or 9.6E-7/y. Also, SAMA 1 indicates a reduction in population dose by 4.39 person-rem per year, but according to the text and Table E.2-4, the total population dose for all events is 4.09 person-rem per year. Please address these inconsistencies.

h. SAMA 5 indicates a reduction in population dose by 17.6 person-rem per year, but according to the text and Table E.2-4, the total population dose for all events is 4.09 person-rem per year. Please address this inconsistency.

i. Please define "Accident Scenario" and "Accident Type" as used in Tables E.1-1 and E.1.2, respectively. The terminology is confusing. For example, "small loss-of-coolant accidents" contribute 4 percent to CDF while "small break loss-of-coolant accidents" contribute 11.79 percent. What accidents, in addition to the "small loss-of-coolant accidents" are included in the "small break loss-of-coolant accidents"?

8. In Section 1.1 of Appendix E to the ER, RG&E states that the original PSA model has been expanded to include, among other things, shutdown operation. In Section 1.2 of Appendix E to the ER, RG&E provides the Ginna Station risk profile. As part of the profile, RG&E indicates that LERF is dominated by loss of spent fuel pool cooling under full-core offload conditions and loss of containment heat removal. However, the ER does not provide sufficient details on these two particular areas to provide the staff with a understanding of how they were considered by SAMA analysis. Please address the following:

a. Provide details on how spent fuel pool cooling is modeled in the PSA, the dominant accident sequences related to the loss of spent fuel pool cooling, and their contributions to CDF and dose consequences. Describe how spent fuel cooling accidents that contribute to CDF are treated in the Level 2 analysis.

b. Identify and describe those SAMAs considered for preventing or mitigating the consequences of a loss of SFP cooling event. If none were considered, explain why.

c. Provide details on how shutdown operation is modeled in the PSA, the dominant accident sequences during shutdown, and their contributions to CDF and dose consequences. Describe how shutdown operation accidents that contribute to CDF are treated in the Level 2 analysis.

d. Identify and describe those SAMAs considered for preventing or mitigating the consequences of an accident during shutdown. If none were considered, explain why.

9. The Ginna IPE indicated that a management tracking tool has been implemented to ensure that all vulnerabilities are appropriately evaluated and which provides a mechanism to initiate plant changes, as required. As indicated in the ER, RG&E will continue to refine the risk evaluation and consider implementation of these potentially cost-beneficial modifications through the current plant change process. Please provide a brief description of the management tracking tool, the current plant change process, and how a cost-beneficial modification is expected to be processed.

R.E. Ginna Nuclear Power Plant

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