RAS 5157

RELATED CORRESPONDENCE

December 20, 2002

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:
Thomas S. Moore, Chairman
Charles N. Kelber
Peter S. Lam

In the Matter of	)	
DUKE COGEMA STONE & WEBSTER	)	Docket No. 0-70-03098-ML
(Savannah River Mixed Oxide Fuel Fabrication Facility)	)	ASLBP No. 01-790-01-ML

GEORGIANS AGAINST NUCLEAR ENERGY'S SECOND SUPPLEMENTAL RESPONSE TO APPLICANT'S FIRST SET OF INTERROGATORIES

Introduction

Pursuant to 10 C.F.R. 2.740(e), Georgians Against Nuclear Energy ("GANE") hereby provides its first supplemental response to Duke Cogema Stone and Webster's First Set of Interrogatories to Georgians Against Nuclear Energy and Blue Ridge Environmental Defense League (May 31, 2002).

I. RESPONSES TO GENERAL INTERROGATORIES

GENERAL INTERROGATORY NO. 1 State the name, business address, and job title of each person who was consulted and/or who supplied information for: (a) drafting each of the Admitted Contentions; and (b) responding to these interrogatories. Identify for which specific contentions and interrogatories each such person was consulted and/or supplied information.

If the information or opinions of anyone who was consulted in connection with your response to an interrogatory differs from your written answer to that interrogatory, please describe in detail the differing information or opinions.

Template = SECY-035

SECY-02

RESPONSE: With respect to Contention 3, GANE's supplemental interrogatory answers were prepared by:

Dr. Leland Timothy Long, Professor of Geophysics
School of Earth and Atmospheric Sciences
Georgia Institute of Technology
221 Bobby Dodd Way
Atlanta, Georgia 30332-0340.

> GENERAL INTERROGATORY NO. 2 For each Admitted Contention, give the name, business address, profession, employer, area of professional expertise, education, relevant experience, and qualifications of each person whom you expect to call as a witness at the Hearing to the extent such information has not been provided in response to the Atomic Safety and Licensing Board's April 30, 2002 Memorandum and Order. For purposes of answering this interrogatory, the education and experience of the expected witnesses may be provided by attaching to the response a resume of each person. In addition, provide a list of all publications authored by the expected witness within the preceding ten years, and a list of any other cases in which the person has given testimony, at any time, as an expert at a trial, hearing, or deposition.

RESPONSE: GANE expects to call Dr. Long as its expert witness regarding Contention 3. A copy of Dr. Long's curriculum vita is attached. Dr. Long has testified in the following cases:

1. *Warrior Lighthouse Inc. et al v. Drummond Co.*, No. CV-97-978. Deposition testimony given on 19 November 2001. (Subject of expert testimony was the location of a mine collapse and damage it cause to a nearby boat dock and eating area)

2. : *Burrell et. Al. V. Reheis and Hanson Aggregates Southeast, Inc. State Administrative Hearings, State of Georgia, OSAH-DNR-SM -0233210-60-MMM.* Court testimony given 25 September 2002. (Subject of expert testimony was probability that vibration from blasting activities would damage plantation house).

> GENERAL INTERROGATORY NO. 3 For each Admitted Contention: (a) describe the subject matter on which each witness is expected to testify at the Hearing; (b) describe the facts and opinions to which each witness is expected to testify, including a summary of the grounds for each opinion; and (c) identify the

documents (including all pertinent pages or parts thereof), data or other information which each witness has reviewed and considered, or is expected to consider or to rely on for his or her testimony.

RESPONSE: The essence of GANE's testimony on this contention is that in determining the design basis earthquake for the proposed MOX Facility, DCS did not take into account relevant information that is likely to increase the size of the design basis earthquake. DCS's errors fall into three major categories. First, DCS unreasonably assumed that a Charleston-type earthquake would only occur at Charleston or Bowman. Second, DCS failed to make any evaluation of how long it would take for a new Charleston-like earthquake zone to develop in another location. Third, DCS relied on attenuation data inherent in the LLNL and EPRI studies referenced in the Supplemental CAR, without taking into account more recent studies that provide more detailed and site-relevant information. As a result, it is likely that DCS has underestimated the amplitude of the design basis earthquake at the Savannah River Site. The interrogatory answers below provide additional details regarding GANE's position.

Documents referenced by Dr. Long in his interrogatory responses, and on which he expects to rely at the hearing, including the following:

Ke Hu, Sarah L. Gassman, and Pradeep Talwani, (2002) In-situ Properties of Soils at Paleoliquefaction Sites in the South Carolina Coastal Plain. Seismological Research Letters, V. 73, No. 6. 946-978.

Ke Hu, Sarah L. Gassman, and Pradeep Talwani, (2002) Magnitudes of Prehistoric Earthquakes in the South Carolina Coastal Plain from Geotechnical Data. Seismological Research Letters, V. 73, No. 6.,979-991.

Alan L Kafka, (2002) Statistical Analysis of the Hypothesis that Seismicity Delineates Areas Where Future Large Earthquakes Are Likely to Occur in the Central and Eastern United States. Seismological Research Letters, V. 73, No. 6., 992-1003.

Pradeep Talwani and William T. Schaeffer, (2001). Recurrence rates of large earthquakes in the South Carolina Coastal Plain based on paleoliquefaction data, journal of Geophysical Research, Vol. 106, No. B4, 6621-6642.

D. Amick, R. Gelinas, G. Maurath, R. Cannon, D. Moore, E. Billington, H. Kemppinen,(1990). Paleoliquefaction Features Along the Atlantic Seaboard. NUREG/CR-5613. 148 pp.

Arthur D. Frankel[1], Mark D. Petersen[1], Charles S. Mueller[1], Kathleen M. Haller[1], Russell L. Wheeler[1], E.V. Leyendecker[1], Robert L. Wesson[1], Stephen C. Harmsen[1], Chris H. Cramer[2], David M. Perkins[1],*and* Kenneth S. Rukstales[1] 2002. Documentation for the 2002 Update of the National Seismic Hazard Maps http://pubs.usgs.gov/of/2002/ofr-02-420/ U.S. Geological Survey Open-File Report 02-420

II. SPECIFIC INTERROGATORIES

A. GANE Contention 3 (Seismic Design)

INTERROGATORY NO. 3.1 Does GANE agree that it is appropriate to use a Regulatory Guide ("RG") 1.60 5% damping spectrum scaled up to 0.2g (acceleration of gravity) peak ground acceleration as the design earthquake for the MOX Facility? If not, identify and fully explain what design earthquake GANE believes would be appropriate for the MOX Facility, and identify the regulatory, scientific, technical, legal, and any other bases for GANE's position.

RESPONSE: GANE substitutes the following response for its original response to this Interrogatory: No. GANE agrees that the Regulatory Guide ("RG") 5% damping spectrum is appropriate to us as the design earthquake for the MOX Facility. This spectra should be scaled up to an appropriate value of acceleration at the surface.

INTERROGATORY NO. 3.2 Does GANE agree that a design earthquake with a return interval of 10,000 years for the frequencies of practical structural interest is acceptable for the MOX Facility? If not, identify and fully explain what return interval GANE believes would be appropriate for the design earthquake for the MOX Facility, and identify the regulatory, scientific, technical, legal, and any other bases for GANE's position.

RESPONSE: Yes. The June 2002 USGS hazard map gives an acceleration greater than 0.2g with a 2% probability of exceedance in 50 years at the Savannah River Site. This is

equivalent to a return period of 2500 years. This suggests that the 10,000 year return period should require an acceleration greater than 0.2.

> INTERROGATORY NO. 3.3 Does GANE agree with the information and analysis in Sections 1.3.1.5 and 1.3.1.6 of the DSER? If not, identify the specific sentences in the DSER which GANE believes are incorrect, and identify the regulatory, scientific, technical, legal and any other bases for GANE's position.

RESPONSE: GANE amends its response to this Interrogatory with the following information:

At page 1.3-8, the Staff describes its conclusions regarding the adequacy of DCS's seismic source characterization. GANE disagrees with these conclusions for the same reasons it disagrees with DCS's analysis. *See* supplemental response to Interrogatory 37.

At page 1.3-9, the DSER states that "[g]round motion attenuation models used in the Lawrence Livermore National Laboratory and Electric Power Research Institute studies represent the state of the art ground motion attenuation studies in the southeastern United States." These two studies are not state-of-the-art. They used a mixture of attenuation data from various sources. They did not use attenuation data from local areas, which provide more accurate information about local crustal structure characteristics. These local data show more detail in the velocity structure of the lower crust and the depth to the Moho discontinuity, which can affect acceleration. As a result, DCS may have underestimated the peak hard-rock acceleration factor. In addition, the Herrmann velocity model, cited with approval at page 1.3-9 of the DSER, is seriously outdated. DCS should have used information is now available about the local crustal structure.

At page 1.3-11, the Staff describes its conclusions with respect to SRS rock and surface response spectra. According to the Staff, the LLNL and EPRI studies "represent the state-of-the art probabilistic hazard studies in the southeastern U.S." In stating this conclusion, the Staff shows that it does not understand the purpose of the LLNL and EPRI studies. The LLNL and EPRI studies were made on a national grid, for the purpose of providing very general information. On a regional basis, the studies were intended for first-guess work only. It was expected that the LLNL and EPRI results would be refined by a re-evaluation of the seismicity and attenuation relationships in light of up-to-date information about local conditions. Moreover, to the extent the LLNL and EPRI studies do have regional information, the information has not been kept up to date.

GANE did not review Section 1.3.1.6 of the DSER, because we are not pursuing that aspect of the contention which relates to site-specific liquefaction.

> INTERROGATORY NO. 3.4 Does GANE agree that DCS did not use a 0.375g event at 5 hertz ("hz") for its design earthquake (*i.e.*, a PC-3 spectrum for SRS), but instead used a RG 1.60 5% damping spectrum scaled up to 0.2g peak ground acceleration? If not, explain the regulatory, scientific, technical, legal, and any other bases for your disagreement.

RESPONSE: There is no change to this response.

> INTERROGATORY NO. 3.5 Does GANE agree that the RG 1.60 5% damping spectrum scaled up to 0.2g peak ground acceleration is more conservative than the PC-3 spectrum for SRS? If not, explain the regulatory, scientific, technical, legal, and any other bases for your disagreement.

RESPONSE: There is no change to this response.

> INTERROGATORY NO. 3.6 Does GANE agree that the RG 1.60 5% damping spectrum scaled up to 0.2g peak ground acceleration has a return interval of 10,000 years at frequencies of practical structural interest for the MOX Facility (*i.e.*, at frequencies that could affect the structural integrity of the structures of the MOX Facility)? If not, explain the regulatory, scientific, technical, legal, and any other bases for your disagreement.

RESPONSE: GANE substitutes the following response for its initial response to this interrogatory: GANE has not yet reached a conclusion regarding this question. GANE will supplement its response to this interrogatory as soon as Dr. Long has reached a conclusion.

~~INTERROGATORY NO. 3.7~~ Identify and fully explain why GANE claims that "conservative design criteria" for the design earthquake have not been established in the DCS CAR.

RESPONSE TO INTERROGATORY 3.7: GANE substitutes the following response for its initial response to this interrogatory:

As stated in GANE's contention, DCS's claim to have established "conservative design criteria" is not supported, because DCS has not performed a seismic analysis that is either adequate in scope or adequately documented. To summarize, the CAR has failed to account for all uncertainties that could increase the hazard in the design criteria in the following respects:

1. DCS accepted the hard rock acceleration defined by the LLNL an EPRI studies. These two studies had a mixture of attenuation functions from various sources (i.e., multiple experts and multiple sources of data. DCS did not use attenuation data from regional studies, which provide more accurate information about local crustal structure characteristics. These local data better define the depth to the Moho and the crustal velocity structure above the Moho, which can affect the attenuation of acceleration with distance. As a result of neglecting possible influence of reflections from the Moho, DCS may have underestimated the acceleration factor in a distance range from the Coastal Plain that includes the SRP.

2. DCS assumed that a Charleston-type earthquake would occur only at Charleston or Bowman. It should have taken into account the potential for Charleston-type earthquakes at other locations in the Coastal Plain. This concept is formalized in a paper by Alan Kafka, (2002) Statistical Analysis of the Hypothesis that Seismicity Delineates Areas Where Future Large Earthquakes Are Likely to Occur in the Central and Eastern United States. Seismological Research Letters, V. 73, No. 6., 992-1003. Kafka recognizes a significant probability (30%) that new events will be in new areas. This could affect the LLNL and EPRI computation of hard-rock acceleration.

3. DCS failed to make any evaluation of how long it would take for a new Charleston-type earthquake zone to develop in another location. This relates to how rapidly new seismic zones can develop and whether the currently observed zones are complete.

INTERROGATORY NO. 3.8 Identify and fully explain why GANE claims that "DCS has not performed a seismic analysis that is...adequate in scope."

RESPONSE: GANE amends its answer to this interrogatory by referring DCS to its supplemental response to Interrogatory No. 3.7.

INTERROGATORY NO. 3.9 Identify and fully explain why GANE claims that "DCS has not performed a seismic analysis that is...adequately documented."

RESPONSE: GANE amends its response to this interrogatory by referring DCS to its supplemental response to Interrogatory No. 3.7.

INTERROGATORY NO. 3.10 Identify and fully explain why GANE claims that DCS' seismic analysis is not "complete, accurate and up-to-date."

RESPONSE: GANE amends its response to this interrogatory by referring DCS to its supplemental response to Interrogatory No. 3.7.

INTERROGATORY NO. 3.11 Identify and fully explain each respect in which GANE claims that DCS has not considered "recent paleoseismic work on the South Carolina Coastal Plain showing more activity in the last 6000 years, and over a wider area, than previously known." Assuming this is true, what impact, if any, should this have on the design earthquake for the MOX Facility?

RESPONSE: GANE substitutes the following response for its initial response to this Interrogatory: In a recent article, Hu et al. (2002) suggest a number of possibilities concerning the sequence of events in the Coastal Plain. This article updates numerous studies of paleoliquafaction studies in the Carolina Coastal Plain. See Ke Hu, Sarah L. Gassman, and Pradeep Talwani, (2002) Magnitudes of Prehistoric Earthquakes in the South Carolina Coastal Plain from Geotechnical Data. Seismological Research Letters, V. 73, No. 6.,979-991.

The 7 event sequence with 4 mag. 7 and 3 mag 6 is perhaps the least seismically active. Hence full consideration of all the other likely sequences would increase the estimated acceleration when factored into the PSHA or earthquakes propagated to the MOX Facility. Based on the Kafka (2002) and Hu (2002), one should consider a rate of activity consistent with about 7 magnitude 7 events in the last 6000 years. 60 to 70% of these events would be at Charleston or other established epicentral zones and 30+% would float in the Coastal Plain.

INTERROGATORY NO. 3.12 Identify and fully explain each respect in which GANE claims that "major events may have occurred much closer to the SRS than the Charleston Seismic Zone." This identification shall include the date, location, and magnitude of each event.

RESPONSE: GANE amends its response to this Interrogatory with the following information: The paper by Hu et al. cited in GANE's supplemental response to Interrogatory No. 3.11 above, discusses the difficulty in assigning magnitudes and locations to earthquakes in the Coastal Plain.

INTERROGATORY NO. 3.13 With respect to each "major event" identified in GANE's response to INTERROGATORY NO. 3.12, state whether the CAR accounts for the event.

RESPONSE: There is no change to this interrogatory response.

INTERROGATORY NO. 3.14 With respect to each "major event" identified in GANE's response to INTERROGATORY NO. 3.12, state whether consideration of the events (either individually or collectively) should result in a different design earthquake or a different return interval than identified in the CAR.

RESPONSE: GANE amends its response to this interrogatory by stating that if these earthquakes had been considered, the frequency of occurrence, and hence the amplitude, would be increased. The shape of the spectra would remain largely unchanged, although there are some variations in frequency content that occur with a change in magnitude.

INTERROGATORY NO. 3.15 Assuming a magnitude 6 event at Bluffton, SC, what if any effect does GANE believe such an event should have on the design earthquake or its return interval for the MOX Facility site?

RESPONSE: GANE substitutes the following response for its initial response to this interrogatory: We think the design earthquake should be a 7+ event on the Carolina Coastal Plain. The seismic and paleoseismic evidence points to distributed activity on the Carolina Coastal Plain, and makes magnitude 7 events appear probable outside the Middleton Place Summerville Seismic Zone. However, we think it would be reasonable to believe that such an earthquake would call for a design earthquake with higher peak acceleration and a shorter return interval.

INTERROGATORY NO. 3.16 In your opinion, would a magnitude 6 event at Bluffton, SC, result in greater ground motion acceleration at the MOX Facility site than a magnitude 7 event at Charleston, SC? If yes, identify the regulatory, scientific, technical, legal, and any other bases on which GANE bases its response.

RESPONSE: There is no change to this response.

INTERROGATORY NO. 3.17 Identify the date, location, and magnitude of all seismic events that GANE claims were not, but should have been, addressed in the CAR.

RESPONSE: GANE amends its response to this interrogatory with the following information: The listing of seismic events in the CAR now appears to be more or less adequate.

INTERROGATORY NO. 3.18 Identify and fully explain why GANE claims that statements regarding the date, location, magnitude, and frequency of seismic events discussed in the CAR may be incorrect.

RESPONSE: GANE amends its response to this interrogatory with the following information: See supplemental response to Interrogatory No. 3.17 above.

INTERROGATORY NO. 3.19 Is GANE claiming that the seismic events identified in its responses to INTERROGATORY NOS. 3.17 and 3.18 should impact the design earthquake and its return interval for the MOX Facility? If yes, explain how those events should impact the design earthquake and its return interval. Identify the regulatory, scientific, technical, legal, and any other bases on which GANE bases its response.

RESPONSE: GANE amends its response to this interrogatory with the following information: See supplemental responses to Interrogatory Nos. 3.17 and 3.18 above.

INTERROGATORY NO. 3.20 Identify and fully explain why GANE claims that "the CAR does not adequately account for the risk of a major [seismic] event."

RESPONSE: GANE amends its response to this interrogatory with the following information: GANE's previous response to this interrogatory is supported by Kafka's (2002) observation that 30+% of major events in the eastern United States are in new areas.

INTERROGATORY NO. 3.21 Identify each statement and value in CAR Sections 1.3.5, 1.3.6, and 1.3.7 that GANE claims is incorrect, and fully explain why GANE believes it is incorrect.

RESPONSE: There is no change to this response.

INTERROGATORY NO. 3.22 Identify and fully explain each respect in which GANE claims that a "quantitative site response study for the MFFF has [not] been done."

RESPONSE: GANE substitutes the following response for its initial response to this interrogatory: GANE has decided not to pursue the aspect of Contention 3 which relates to the potential for intense shaking or soil liquefaction at the MOX Facility site. Therefore, we have not developed a response to this interrogatory.

INTERROGATORY NO. 3.23 Identify and fully explain why GANE claims that the design earthquake and the potential for liquefaction at the SRS differ from those at the MOX Facility site.

RESPONSE: GANE substitutes the following response for its initial response to this interrogatory: GANE has decided not to pursue the aspect of Contention 3 which relates to the potential for intense shaking or soil liquefaction at the MOX Facility site. Therefore, we have not developed a response to this interrogatory.

INTERROGATORY NO. 3.24 Identify and fully explain why GANE claims that the seismicity of the MOX Facility site is different from that of the SRS.

RESPONSE: There is no change to this response.

INTERROGATORY NO. 3.25 Identify and fully explain why GANE disagrees with the results of the site-specific studies conducted to date, as reported in CAR Section 1.3.5.2.

RESPONSE: GANE substitutes the following response for its initial response to this interrogatory: GANE has decided not to pursue the aspect of Contention 3 which relates to the potential for intense shaking or soil liquefaction at the MOX Facility site. Therefore, we have not developed a response to this interrogatory.

INTERROGATORY NO. 3.26 Identify and fully explain why GANE claims that "the potential for intense shaking or soil liquefaction at the MFFF site has not been established."

RESPONSE: GANE substitutes the following response for its initial response to this interrogatory: GANE has decided not to pursue the aspect of Contention 3 which relates to the potential for intense shaking or soil liquefaction at the MOX Facility site. Therefore, we have not developed a response to this interrogatory.

INTERROGATORY NO. 3.27 Identify and fully explain why GANE claims that "the Probabilistic Seismic Hazard Assessment (PSHA) is incomplete."

RESPONSE: GANE amends its previous response to this interrogatory with the following information: In addition, by accepting the LLNL and EPRI results, many attenuation functions and seismic source zones were included that would not be accepted today in light of recent studies on crustal structure and historical seismicity. DCS seems to be aware of the existence of this information, as indicated in Sections 1.3.5.3.3.1 and 1.3.6.1.3, but did not address it. For instance, attenuation functions that have been partially updated in the 2002 USGS hazard maps, and those seismic zones generated by the contributors to the LLNL and EPRI analysis that were based on geologic features that have not proven to be direct indicators of seismicity.

INTERROGATORY NO. 3.28 Identify and fully explain why GANE claims that "the applicant has not provided detailed methodologies or references for spectral shape changes applied to the starting spectrum."

RESPONSE: There is no change to this interrogatory response.

INTERROGATORY NO. 3.29 Does GANE agree with DCS' response to the February 28, 2001 CAR RAI referenced in GANE's Basis Statement for this contention? If not, identify the specific CAR RAI Response referenced by GANE and fully explain each respect in which GANE claims that DCS' CAR RAI Response is inadequate or incorrect.

RESPONSE: GANE amends its initial response with the following information: GANE's expert has not completed his review of the RAI response. GANE will provide a supplemental response when he has done so.

INTERROGATORY NO. 3.30 Identify and fully explain why GANE claims that "the approach to the PSHA has been insufficiently conservative."

RESPONSE: GANE amends its initial response with the following information:

GANE's expert has not completed his review of the PSHA and related documents.

GANE will provide a supplemental response when he has done so.

INTERROGATORY NO. 3.31 Contention 3 does not contain any references to NRC regulations. Is GANE contending that DCS' design earthquake or its return interval for the MOX Facility do not comply with any NRC regulation applicable to the MOX Facility? If yes, identify each such regulation and the bases for GANE's contention that DCS' design earthquake or its return interval for the MOX Facility do not comply with that regulation.

RESPONSE: GANE amends its response to this interrogatory to state that in addition to 10 C.F.R. §§ 70.23(a)(3) and (b), the MOX Facility seismic design does not comply with 10 C.F.R. § 70.64(a)(2).

INTERROGATORY NO. 3.32 10 CFR § 70.64(a)(2) states that the "design must provide for adequate protection against natural phenomena with consideration of the most severe documented historical events for the site." Is GANE contending that DCS' design earthquake for the MOX Facility does not comply with this regulation? If yes, provide the regulatory, scientific, technical, legal, and any other bases on which GANE bases its response, including identification of the most severe documented historical seismic events for the site that GANE claims DCS did not consider (or did not consider adequately).

RESPONSE: There is no change to this response.

INTERROGATORY NO. 3.33 With respect to Table 1 in Contention 3, does GANE agree that the cited events on 1974/10/28, 1974/11/05, and 1988/01/23 are in fact included in CAR Table 1.3.6-1? If no, provide the bases for your answer. If yes, does this fact change any of the conclusions in Contention 3? If not, explain why not.

RESPONSE: There is no change to this response.

INTERROGATORY NO. 3.34 What is the basis for GANE's statement that the Talwani and Schaeffer paper "indicates . . . that the frequency of major events is higher in the South Carolina Coastal Plain than previously thought?"

(a) Does GANE agree that the Talwani and Schaeffer paper itself does not contain such a statement? If not,

identify the passage within the paper that contains the alleged statement.
(b) Identify the person or persons who, according to GANE, "previously thought" that the frequency of major events is lower in the South Carolina Coastal Plain than the values provided in the Talwani and Schaeffer paper.
(c) Is GANE claiming that the frequency of major events in the South Carolina Coastal Plain as provided in the Talwani and Schaeffer paper is higher than the frequency of major events identified in the CAR? If yes, provide the basis for your answer.

RESPONSE: GANE amends its previous response to this interrogatory as follows: (c) The Hu Gassman and Talwani (2002) article lists events at 546, 1021, 1648 (or 1683) 3548, 5038 and two others that are undated. The lists include a wide variation in magnitudes, as expected for such data; and points out difficulties in determining size and date from such field data. Nevertheless, the paper provides strong evidence of significant events in the Coastal Plain.

INTERROGATORY NO. 3.35 Contention 3 states that the Talwani and Schaeffer paper identifies a scenario with "seven magnitude seven (or stronger) Charleston events in the last 6000 years." DCS has been able to identify only six such Scenario 2 events in the referenced paper (designated as Episodes A, B, C', E, F, and G). Please identify the seven events.

RESPONSE: GANE amends its previous response to this interrogatory by referring DCS to its supplemental response to Interrogatory No. 3.34 above.

INTERROGATORY NO. 3.36 Contention 3 states that the U.S. Geological Survey's Preliminary Determination of Epicenters (URL: http:/neic.usgs.gov/neis/epic/epic_global.html) shows a magnitude of 4.9 for the August 2, 1974 event, while the CAR reports a maximum magnitude of 4.3.

(a) Do you agree that the magnitude of 4.9 that you quote from the USGS is based upon the Mn (local magnitude) scale, whereas the magnitude of 4.3 in the CAR is based upon the mb (body-wave) scale? If you do not agree, provide the basis for your answer.

RESPONSE: There is no change to this response.

(b) Do you agree that the Mn scale and the mb scale are different, and that the same earthquake may have different magnitudes on the Mn and mb scales? If you do not agree, provide the basis for your answer.

RESPONSE: Yes. GANE amends its previous response to this interrogatory with the following information: The normal variation in magnitude determination is on the order of 0.3 magnitude units, so these are still consistent within a couple standard deviations.

(c) Do you agree that the same USGS web page that is cited above (when using the data base for Eastern, Central and Mountain States of U.S., 1534 – 1986) shows that the August 2, 1974 event has a magnitude of 4.3 on the mb scale? If you do not agree, provide the basis for your answer.

RESPONSE: There is no change to this response.

(d) Do you agree that the magnitude of the August 2, 1974 event as provided by the USGS and the CAR is the same, when using the mb scale? If you do not agree, provide the basis for your answer.

RESPONSE: There is no change to this response.

INTERROGATORY NO. 3.37 Do you agree that DOE Standard 1023 is appropriate guidance for developing the design earthquake for a nuclear materials facility? If not, identify the regulatory, scientific, technical, legal, and any other bases on which GANE bases its response.

RESPONSE: There is no change to this response.

INTERROGATORY NO. 3.38 Has GANE, its consultants, or its experts performed either a deterministic or probabilistic evaluation of the appropriate design earthquake for the MOX Facility? If yes, please identify the methodology used in performing the evaluation, the source of seismic input data for the evaluation (*e.g.*, U.S. Geological Survey, Lawrence Livermore National Laboratory, Electric Power Research Institute, etc.), and the results of the evaluation. Also, does GANE recommend a probabilistic or deterministic approach to be used for seismic design of the MOX Facility? Identify the regulatory, scientific, legal, and any other basis for GANE's recommendation.

RESPONSE: No.

INTERROGATORY NO. 3.39 Has GANE, its consultants, or its experts performed an evaluation of the potential for liquefaction at the MOX Facility site? If yes, please identify the methodology used in performing the evaluation, the

source of seismic input data for the evaluation, the magnitude and response spectra of the earthquake used in the evaluation, the soil properties used in the evaluation, and the results of the evaluation.

RESPONSE: There is no change to this response.

INTERROGATORY NO. 3.40 Contention 3 states that the CAR cites a number of Westinghouse Savannah River Company ("WSRC") technical reports that are not available, and therefore "it is not possible to verify the assertions made in the CAR regarding the MFFF site geology." Subsequent to the filing of Contention 3, DCS docketed with the NRC references to WSRC technical reports. Has GANE reviewed these WSRC reports that have been docketed with the NRC? If yes, does GANE agree that these reports verify the assertions made in the CAR regarding the MFFF site geology and seismicity? If not, identify each assertion in the CAR that GANE contends is not verified by the WSRC reports, and provide the basis for your answer.

RESPONSE: GANE amends its previous response to this interrogatory with the following information: GANE's expert, who was retained in recent weeks, has not yet had the opportunity to review the Westinghouse technical reports. GANE will supplement its response when has had the opportunity to do so.

For the objections,

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:
Thomas S. Moore, Chairman
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In the Matter of	)	
DUKE COGEMA STONE & WEBSTER	)	Docket No. 0-70-03098-ML
(Savannah River Mixed Oxide Fuel Fabrication Facility)	)	ASLBP No. 01-790-01-ML

DECLARATION OF DR. LELAND TIMOTHY LONG IN SUPPORT OF INTERVENORS' DISCOVERY RESPONSES

Under penalty of perjury, I, Leland Timothy Long, declare that I am responsible for the factual information and professional opinions stated in response to interrogatories regarding Contention 3 (Seismic Design) in Georgians Against Nuclear Energy Objections and Responses to Applicant's Second Set of Interrogatories (December 20, 2002), and Georgians Against Nuclear Energy's Second Supplemental Response to Applicant's First Set of Interrogatories (December 20, 2002). The factual information in these interrogatory responses is true and correct to the best of my knowledge, and the opinions expressed therein are based on my best professional judgment.

Leland Timothy Long

Date: 19 December 2002

LELAND TIMOTHY LONG

Biographical Sketch

Professor of Geophysics, School of Earth and Atmospheric Sciences
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Personal Data: Born: 6 September 1940, Auburn, New York, U.S. Citizen
Married, 3 Children

Education:

BS	1962	University of Rochester	Geology
MS	1964	New Mexico Institute of Mining and Technology	Geophysics
Ph.D.	1968	Oregon State University	Geophysics

Employment History:

1981-Present	Professor, Georgia Institute of Technology
1972-1981	Associate Professor, Georgia Institute of Technology
1968-1972	Assistant Professor, Georgia Institute of Technology
1964-1969	Research Assistant, Oregon State University, Department of Oceanography
1964	Junior Geophysicist(for summer), Pan American Petroleum Corp.
1962-1964	Graduate Research Assistant, New Mexico Inst. of Mining and Technology
1969-present	Consultant in Geophysics, Professional Geologist in Georgia

Current Fields of Interest:

Dr Long is a seismologist with research experience in earthquake tectonics, wave propagation, seismic imaging, and the environmental impact of seismic vibrations. His principal area of research specialization has been the seismicity of Georgia and the southeastern United States. He has studied the mechanism of reservoir-induced earthquakes. Recent studies include the tomographic inversion of surface waves to image soil structure and the inversion of travel time anomalies to image crustal velocity structure. He has studied and developed a model for the tectonic mechanism for major intraplate earthquakes. In these studies, he has considerable experience in seismic instrumentation and monitoring methods. His theoretical seismology studies include the modeling of seismic coda and the modeling of wave propagation using the finite difference method Dr. Long has experience in estimating the hazards caused by seismic vibrations from by vehicles, quarry blasts, and earthquakes. His gravity studies include regional surveys, the location of sinkholes, the calibration of "g" for sensitive instruments and determination of deflections of the vertical. Educational outreach projects have included the organization of seismicity workshops for k-12 teachers and providing information to the news media following major earthquakes.

Refereed Publications:

Long, L.T., (2002) Group Velocity Inversion Using Synthetic Surface Waves *in* Proceedings of the Symposium on the Application of Geophysics to Engineering and Environmental Problems, The Environmental and Engineering Geophysical Society, February, 2002. (SAGEEP02)

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M S. Craig, L.T. Long, and A. Tie, (1991). Modelling the seismic P-coda as the response of a discrete-scatterer medium, Symposium Proceedings, "Scattering and Attenuation of Seismic Waves" *Physics of the Earth and Planetary Interiors*, 67, p. 20-35.

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Sanford, A. R., and L. T. Long (1965). Microearthquake crustal reflections, Socorro, New Mexico, *Bull Seismol Soc Amer.*, 55, 587-597

Consulting and Professional Activities:

(Licensed Professional Geologists, State of Georgia #455)

Summary: Dr. Long is a geophysicist with extensive experience in seismology. He has consulting experience in a wide range of applications of geophysics to environmental topics including the following:

1) Measurement of the level of seismic vibrations from vehicles (cars, trucks and trains) and evaluation of their environmental impact on historic and critical structures
2) Determination of amplitude of waves from blasting and evaluation of the probability that they could or did cause damage to critical structures.
3) Evaluated regional seismic hazard.
4) Evaluation of the seismic hazard of dams.
5) Preparation of educational material for emergency management planning.
6) Evaluation of the potential of reservoirs to trigger significant seismicity.
7) Analysis of surface waves to determine shear-wave velocity for foundation strength and waste site structure.
8) Field measurements and analysis of magnetic and gravity data over mineral prospects
9) Evaluated absolute gravity for calibration of sensitive instruments.
10) Used microgravity measurements to evaluate the location and size of sink holes.

Consulting Projects:

Location of mine collapse in Alabama from seismic data (for litigation)
Georgia Emergency Management Agency, Assist preparation of Earthquake Video
DOE, Project evaluation team for bore hole geophysics.
Georgia Emergency Management Agency, Estimation of seismic hazard.
Lawrence Livermore Nuclear Lab, University of California, Expert panel in seismology.
Law Environmental Services, Consultant in seismology.
Law Engineering Testing Co. Consultant in seismology.
U.S. Corps of Engineers, Waterways Exp. Station, Evaluation of maximum earthquake.
Member of LETCO Technical Evaluation Committee in EPRI Seismicity Study.
U.S. Corps of Engineers, Advisory Committee, Seismic design evaluation, Albin Barkley Dam.
Collaborator in Seismology to USGS (formerly NOAA).
Greiner Environmental Services, Environmental impact of seismic road noise
U.S. Corps of Engineers, Seismic evaluation of Richard B. Russell Dam.
U.S. Corps of Engineers, Seismic evaluation of Strom Thurmond Reservoir.
Georgia Geological Survey, Siting of Nuclear waste depository in crystalline rock.
Georgia Geological Survey, Gravity data evaluation of sinkholes and talc deposits.

CERTIFICATE OF SERVICE

I hereby certify that on December 16, 2002, copies of the foregoing Georgians Against Nuclear Energy's Second Supplemental Response to Applicant's First Set of Interrogatories, and Georgians Against Nuclear Energy's Objections and Responses to Applicant's Second Set of Interrogatories were served on the following by e-mail and/or first-class mail:

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