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ATTACHMENT A
NRC STAFF RESPONSES TO THE LICENSING BOARD'S INITIAL QUESTIONS REGARDING THE SER

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SER Question No. 1: *Except for the laser-based separations process, much of the proposed facility is similar to previously licensed enrichment plants. While the safety risks may well be dominated by operations outside the cascade area, the understanding and control of these risks is rooted in an extensive operational history in other enrichment facilities. By contrast, there is no full-scale long-term operational experience for the laser-based separations process. Given these circumstances, explain the approach of the NRC Staff in testing the adequacy of the Applicant's safety evaluation related to this unique part of the facility.*

Response No. 1 (T.C. Johnson, M. Baker): The use of lasers to separate uranium isotopes is a new process for enriching uranium. However, the safety evaluation uses the same principles as those that were applied to review of other uranium enrichment facilities. While the engineering and components differ in different types of enrichment facilities, the safety objectives and review methods described in the "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," NUREG-1520, remain the same. The review methods include horizontal and vertical slice reviews of the Integrated Safety Analysis Summary as described in Section 3.5.2.3 of NUREG-1520.

The primary safety objectives for uranium enrichment facilities are nuclear criticality safety and the safe containment and handling of uranium hexafluoride (UF_6). For the nuclear criticality safety program, NRC staff evaluated: (1) the Applicant's proposed use of industry consensus standards for nuclear criticality safety; (2) the proposed program organization and qualifications of the managers and staff that would implement the program; (3) how the Applicant would establish and maintain nuclear criticality controls over processes involving enriched uranium; (4) how the Applicant would maintain subcriticality under normal and abnormal process conditions; (5) how nuclear criticality accidents would be prevented; (6) how a nuclear criticality accident alarm system would be established; and (7) how emergency procedures would be used to respond to a criticality event. These program requirements are applicable to both laser-based enrichment systems and gas centrifuge enrichment systems.

To ensure the safe containment and handling of UF_6, the NRC staff evaluated the Applicant's proposed chemical, radiological, and fire safety programs to ensure that: (1) the programs would be managed and conducted by qualified staff; (2) the programs were based on appropriate codes and standards; (3) appropriate evaluations were conducted to ensure both public and worker safety during normal and accident conditions; and (4) the programs include the application of management measures needed to ensure that safety systems would be reliable and available when needed. For example, to ensure the safe containment of UF_6, pressure vessels containing UF_6 need to be designed in accordance with industry standards such as American Society of Mechanical Engineers (ASME) Section VIII, "Boiler and Pressure Vessels" (2007). These standards would apply regardless of the separation methods used for uranium enrichment.

Reference

U.S. Nuclear Regulatory Commission. NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," Rev. 0, March 2002. ADAMS Accession No. ML020930033.

SER Question No. 2: *Except as already discussed in the FSER or in response to other, more specific questions set forth below, identify any regulatory guides that were either directly or indirectly applicable to the proposed facility, and explain how they were applied or adapted to the NRC Staff's review.*

Response to No. 2 (T.C. Johnson): Other than those cited in the SER, no other regulatory guides or other NRC guidance documents were used either directly or indirectly or relied on in the NRC staff's review.

SER Question No. 3: *Except as otherwise discussed in the responses to more specific questions set forth below, identify significant issues to which the NRC staff determined that no regulatory guide applied, and explain how the NRC staff addressed such issues.*

Response to No. 3 (T.C. Johnson): There were no significant issues identified in the NRC staff's safety review where no regulatory guides or other NRC guidance applied. Where regulatory guides or other NRC guidance were adapted to be specifically used for this review, the NRC staff explains those issues, and the rationale the staff used for making its determinations, in the SER. For example, in addressing natural phenomena hazards for the design of the Operations Building, the staff adapted guidance from Interim Staff Guidance FCSS-ISG-08, "Natural Phenomena Hazards," as discussed in Section 3.3.4.10.3 of the SER. In the case of the Wilmington, North Carolina, site, the staff determined that the guidance in FCSS-ISG-08 was inconsistent with the performance goals for "highly unlikely" likelihood determinations for seismic hazards. This resulted in the Applicant changing its approach for meeting the performance requirements in 10 CFR Part 70, Subpart H, as described in the SER Section 3.3.4.10.3. Another example is in the human factors engineering area, where NRC guidance in NUREG-0711, "Human Factors Engineering Program Plan Review Model," developed for nuclear power plants was adapted for use for the proposed facility. The staff discusses how this reactor guidance was adapted in Section 15.2 of the non-public version of the SER. NUREG-0711 was also used in the reviews of the Louisiana Energy Services and the AREVA Eagle Rock enrichment plants. In addition, the SER refers to several regulatory guides (designated as "Division 1" regulatory guides) that were developed for nuclear power plants. However, the guidance in these regulatory guides was used as it applies generally to the proposed facility. For example, in Chapter 16 of the non-public version of the SER for electrical and instrumentation and controls, the NRC staff refers to several Division 1 regulatory guides, which are applied generally to meet the intent of the safety objective as applicable to the proposed facility. That is, the staff used the Division 1 regulatory guides, which were prepared specifically for nuclear power plants and use terminology specific to nuclear power plants, by applying the safety objectives as applicable to the proposed facility. Division 1 regulatory guides were also used in the electrical and instrumentation and controls reviews of the Louisiana Energy Services and the AREVA Eagle Rock enrichment plants.

<u>Reference</u>

U.S. Nuclear Regulatory Commission (NRC). NUREG-0711, "Human Factors Engineering Program Review Model," Rev. 2, February 2004. ADAMS Accession No. ML040770540.

SER Question No. 4: *Except as otherwise discussed in response to more specific questions set forth below, describe the process (including timing considerations) by which the NRC Staff ensures that all of the Applicant's commitments, assumptions and procedures regarding the not-as-yet built facility are tracked and how it is determined that the assumptions are verified, commitments have been met, and procedures are in place at the appropriate time prior to facility operation.*

Response No. 4 (D. Seymour): The licensee has the primary responsibility for constructing the facility as designed and licensed. However, Section 193(c) of the Atomic Energy Act of 1954 (AEA), as amended, provides that, "prior to commencement of operation of a uranium enrichment facility licensed hereunder, the Commission shall verify through inspection that the facility has been constructed in accordance with the requirements of the license for construction and operation." This requirement is codified in the NRC's regulations under Title 10 of the *Code of Federal Regulations* (10 CFR) 40.41(g) and 70.32(k) and applies to each construction phase and each cascade planned to be placed into operation. The NRC staff will conduct construction inspections, in addition to operational readiness review (ORR) inspections, to confirm that the licensee has constructed the GLE facility in accordance with applicable commitments. Where appropriate, the construction and ORR inspections may be combined. The ORR inspections will address construction for each of the applicable phases and will also address the operational programs, or significant changes to those operational programs, for each of the applicable phases.

A Senior Project Inspector from the Division of Construction Projects in NRC's Region II Office, in conjunction with a Senior Project Manager from Nuclear Materials Safety and Safeguards (NMSS) will be assigned to the GLE facility to oversee and coordinate the construction inspection program. Regional construction inspectors along with other headquarters inspectors will perform inspections at the GLE facility to sample the licensee's compliance with applicable commitments. The inspectors are required to be familiar with the License Application, Integrated Safety Analysis (ISA) Summary, and other license application commitments, and to develop their inspection plans to verify implementation of the licensee's commitments through routine construction inspections. The Senior Project Inspector uses a customized computer program to track inspection completion. Inspection results are assessed periodically to determine the licensee's level of compliance in meeting their commitments.

The Senior Project Inspector, in coordination with NMSS and the regional inspectors responsible for inspecting a specific technical area, is responsible for ensuring that an appropriate sample of these commitments and requirements are adequately incorporated into the construction and ORR inspections. The inspection sample is based upon the complexity of the items relied on for safety (IROFS) and the risk method outlined in 10 CFR 70.61, Performance Requirements. NMSS will provide a risk ranking of the IROFS before the Region II inspections begin.

The inspection program will be outlined in an inspection manual chapter (IMC) that describes fuel facility construction and pre-operational readiness review inspection programs. This IMC is expected to be issued in advance of the onset of construction at the GLE facility.

Before the NRC authorizes operation of the facility, ORR inspections will be conducted to verify safety programs and operational readiness. Typical areas covered by ORR inspections include radiation safety, environmental and waste, transportation, nuclear criticality, operations, fire protection, emergency preparedness, and material control and accountability. Another program office that participates in the construction and ORR inspections is the Office of Nuclear Security and Incident Response (NSIR), in conjunction with Region II physical security inspectors. These inspectors are responsible for verifying that the information security and physical security commitments are met. The ORR inspections evaluate licensee construction of the facility and implementation of the safety programs in accordance with the regulations, licensee's License Application, ISA, and other license application commitments.

The Senior Project Inspector for the GLE facility will routinely communicate with the licensee to discuss the construction inspection schedule and typically obtains licensee construction schedules in Primavera scheduling software (commonly used by many NRC licensees). The Primavera schedule is integrated into the NRC's construction inspection schedule. Currently, weekly scheduling meetings are held in Region II with key NRC staff to discuss and allocate inspection resources for inspections for each facility under construction. The goal is to inspect early in the process, identify issues early in the process, and verify implementation of appropriate corrective actions early in the process.

SER Question No. 5: *What is the rationale for a notice-only license condition for changes made when the Applicant moves to enrichment greater than 5 percent U235 by weight? What recourse would the NRC Staff have if it were concerned about any changes to the facility, equipment, shipments, or operations? (SER, 1-9)*

Response No. 5 (C. Tripp, B. Purnell, T.C. Johnson): As discussed on page 1-9 of the SER, the purpose of this license condition is to ensure that enriched uranium is only transported in approved product cylinders. Currently, the standard shipping cylinder for enriched product from a uranium enrichment plant is the 2.5 ton 30B cylinder that is limited to 5 weight percent ^{235}U. For enrichments greater than 5 weight percent ^{235}U, the largest currently approved cylinder is the 8A cylinder that is limited to 255 pounds and 12.5 weight percent ^{235}U. Because the 8A cylinder will probably be impractical for shipping quantities of UF_6 needed for fuel production, new transportation cylinders will need to be approved for such shipments. The license condition was added to ensure that if, in the future, the Applicant produces enriched product at assays greater than 5 weight percent ^{235}U, appropriate approved shipping containers will be used.

In addition to this license condition, as discussed on page 5-20 of the SER, the staff has proposed another license condition that requires the licensee to submit, at least 60-days prior to initial customer product withdrawal of licensed material exceeding 5 weight percent, demonstration of compliance with criticality safety requirements, and prohibits the licensee from implementing changes in enrichment until the NRC approves those changes. Therefore, product withdrawal above 5 weight percent ^{235}U will require prior NRC approval.

The 60-day period is to allow the NRC time to assess the changes and determine if approval should be granted. This will also allow the NRC to assess whether other regulatory action is necessary.

Changes to the facility and operations are addressed in the NRC staff's response to SER Question 6.

SER Question No. 6: *Clarify the scope of the authorization request and license condition in section 1.2.3.7.2. Does this mean that a process within the facility could be modified without prior approval as long as it does not degrade safety? If so, how is this safety determination made, and how does the NRC Staff ensure its accuracy? (SER, 1-12)*

Response No. 6 (T.C. Johnson): Section 1.2.3.7.2 of the SER describes the NRC staff's evaluation of GLE's request to be able to make certain changes to its License Application without prior NRC approval. These changes include modifications to GLE's commitments as well as changes to a process within the facility described in the License Application. Under this change process, GLE could make these changes without prior NRC approval if the changes do not degrade safety. The change process is needed because the regulations do not contain provisions governing such changes.

Under 10 CFR 70.72(a), fuel cycle facility licensees must establish a configuration management system to evaluate, implement, and track each change to the site, structures, processes, systems, equipment, components, computer programs, and activities of personnel. Licensees may make changes to these aspects of the facility without prior approval of the NRC unless the changes fall within the criteria in 10 CFR 70.72(c). Changes that fall within the 10 CFR 70.72(c) criteria (and therefore requiring a license amendment) include changes that create new types of accident sequences that would exceed the 10 CFR 70.61 performance requirements unless mitigated or prevented; use of new processes, technologies, or control systems for which a licensee has no prior experience; changes that remove, without at least an equivalent replacement of the safety function, an item relied on for safety that is listed in the integrated safety analysis summary and is necessary for compliance with the performance requirements of 10 CFR 70.61; and changes that alter an item relied on for safety, listed in the integrated safety analysis summary, that is the sole item preventing or mitigating an accident sequence that exceeds the performance requirements of 10 CFR 70.61. Changes that fall outside of those criteria do not require NRC approval unless they are otherwise prohibited by license condition or order (*see* 10 CFR 70.72(c)(4)). However, some changes that fall outside of the 10 CFR 70.72(c) criteria, and thus do not require NRC approval under that regulation, could nonetheless decrease the safety commitments stated in the License Application.

In addition, although the regulations contain provisions governing changes to several licensing basis documents, including the Fundamental Nuclear Material Control Plan (10 CFR 70.32(c)), Transportation Security Plan (10 CFR 70.32(d)), Physical Security Plan (10 CFR 70.32(e)), and Emergency Plan (10 CFR 70.32(i)), and the Standard Practices Procedures Plan (10 CFR 95.19), there are no such provisions governing changes to the License Application. As a result, any changes to the License Application would require a license amendment. The change process in the license condition would allow changes to the License Application corresponding to changes in the facility that fall within the scope of the license condition, as described above. Under the license condition, changes to the License Application would be evaluated consistent with the decrease in effectiveness standard that is applied to changes made in other licensing basis documents in 10 CFR 70.32 and 95.19. Without a change process for the License Application, all changes that affect, for example, GLE's organization or radiation safety program, would require a license amendment request even if the changes are routine and do not affect the overall safety of the facility.

In July, 2011, the NRC staff issued Draft Regulatory Guide DG-3037, "Guidance for Fuel Cycle Facility Change Processes." Section C.5.b of this document stated that the NRC would consider a license condition to allow changes to licensing basis documents, such as the license application or supporting documents referenced in the license, without prior NRC approval. GLE requested this authorization based on early discussions between the NRC and the fuel cycle industry prior to the issuance of guidance in the draft regulatory guide. In January 2012, NRC staff issued this guidance in final form as Regulatory Guide 3.74, “Guide for Fuel Cycle Facility Change Processes.” Section C.5.b of Regulatory Guide 3.74 contains essentially the same language as that found in the corresponding section of DG-3037. GLE’s proposed change is consistent with this guidance.

With regard to changes to processes, any changes that fall within the criteria of 10 CFR 70.72(c) would require NRC approval prior to use. GLE would have to submit a license amendment request under 10 CFR 70.72(d)(1), and any corresponding changes to the License Application could be requested at that time. Under the proposed change process, GLE could make changes without prior NRC approval to processes that affect safety commitments described in its License Application that fall outside of the 70.72(c) criteria if the changes do not result in degradation to the safety commitments in the License or if the change, test, or activity does not conflict with any condition specifically stated in the License. GLE could also make corresponding revisions to the License Application reflecting those changes. GLE would make the safety determination by evaluating the technical and regulatory aspects of the proposed change to determine if a decrease in the level of its safety commitments would result from the change. Changes to the License Application that would not require prior NRC approval would generally be administrative changes such as the following:

1. Modifications of facility and process descriptions
2. Enhancements or clarifications of text
3. Grammatical corrections
4. Reformatting of text.

Changes to the License Application that would require NRC approval would generally be for the following types of changes:

1. Reduction in the effectiveness of commitments
2. Modifications in methods and associated assumptions used in developing the safety basis, such as the integrated safety analysis and criticality methodologies that decrease the effectiveness of commitments
3. Modifications to the NRC-approved safety bases that decrease the effectiveness of commitments
4. Changes that conflict with an existing license condition.

For example, GLE could propose an organization change that moves management functions within the organization, but does not eliminate them. This change, therefore, would not result in a decrease in its safety commitments and could be made without prior NRC approval.

GLE would also be required to document changes under the process for review by NRC inspectors and submit a report of the changes within 3 months of implementing the change. Therefore, under this change process, NRC would receive notification of any changes and would be able to review them to determine that the change process is being implemented in a manner that ensures that the changes do not result in a decrease in the effectiveness of its safety commitments. The NRC review would include evaluating the implementation of the change process and a sample of the changes to ensure the process is being properly conducted.

References

U.S. Nuclear Regulatory Commission (NRC). Regulatory Guide 3.74, “Guide for Fuel Cycle Facility Change Processes,” January 2012. ADAMS Accession No. ML100890016.

U.S. Nuclear Regulatory Commission (NRC), Draft Regulatory Guide DR-3037, “Guide for Fuel Cycle Facility Change Processes,” July 2011. ADAMS Accession No. ML 110960051.

SER Question No. 7: *Does the exemption that allows incremental decommissioning funding and the associated license condition differ from the arrangements that the NRC Staff approved with respect to the Eagle Rock Enrichment Facility? If so, explain how they differ and the NRC Staff's reasoning. (SER, 1-14 to 1-16)*

Response No. 7 (K. Kline, C. Dean): The exemption GLE is seeking for the proposed facility regarding incremental decommissioning funding is not the same as the exemption granted to AREVA Enrichment Services (AES) for its Eagle Rock Enrichment Facility (EREF). The difference between the two is primarily in the amount of initial (first incremental funding amount) funding. AES will provide incremental funding for both the decontamination of the facility and the disposition of depleted uranium (DU). This will be compatible with AES's plans to construct its separations buildings using a modular approach. Although GLE will build its cascades in phases, it will place all its cascades in a single building; therefore, GLE will provide funding for the entire facility upfront and provide incremental funding for DU disposition only. The amount of GLE's first increment will cover the decontamination of the entire GLE facility and disposition of the first year's generated DU.

AES's approach, discussed in Section 10.3.3.1.1 of NUREG-1951, the Safety Evaluation Report for the EREF, is different in that it initially provides funding to cover the decommissioning and disposition of DU for the portion of the facility that is in calibration and test mode and for the associated feed and test material. Then, because the EREF will be constructed and placed into operation in phases (four phases), the funding is updated at least once a year to include any additional costs and to ramp up funding prior to each new phase of the facility going into operations. AES also provides funding for the estimated cost of the first three years of DU prior to receiving feed material for initial production at the facility.

During facility ramp up, AES will be providing funding updates for DU at least once a year, if not more frequently due to the construction schedule (each time the funding for the facility is ramped up, AES is to revise its funding for DU. Once AES is in full operations, the funding for DU will be updated annually on a forwarding-looking basis. GLE will update its funding for DU annually on a forwarding-looking basis throughout the life of the project.

Once all phases of the EREF are operational, AREVA will update funding for the facility at least once every three years. GLE will update the funding for the GLE facility at least once every three years throughout the life of the project.

The NRC staff finds GLE's approach reasonable as it provides funding for the entire facility upfront, and the facility funding will be updated at least once every three years, which is compliant with NRC's regulations in 10 CFR 40.36(d) and 10 CFR 70.25(e). Additionally, the staff finds GLE's proposed interval to update the DU funding (annually on a forward looking basis throughout the life of the project) acceptable because the forward-looking funding will ensure that disposition costs for DU will always be accounted for before the DU is generated.

<u>Reference</u>:

NUREG-1951, "Safety Evaluation Report for the Eagle Rock Enrichment Facility in Bonneville County, Idaho," Sept. 2010, Section 10.3.3.1.1. ADAMS Accession No. ML102710296.

SER Question No. 8: *Did the NRC Staff approve Standard Practice Procedures Plan (SPPP)-03, or is it to be approved when SP-01 and SPPP-03 are combined? (SER, 1-24)*

Response No. 8 (J.K. Everly): As documented in Section 1.2.3.8 of the SER, the NRC staff found SPPP-03 acceptable during its safety review. While the NRC staff approved SPPP-03 (through its finding of acceptability), this approval is for the plan only since the commercial facility identified in the application has not been built yet. Approval to actually begin using classified matter at the commercial facility is contingent upon an NRC staff initial inspection of the facility to confirm that conditions are in compliance with the approved plan. The question of combining SP-01 and SPPP-03 will be addressed when the commercial facility becomes ready to begin using classified matter. As noted in Section 1.2.3.8 of the SER, combining the two plans would require NRC approval under the change process presented in SPPP-03.

Question No. 9, SER: *How has the potential impact of tornado winds on the proposed facility been assessed in the absence of a final plant design? Preliminary plans call for large surface areas on the facility. What design evaluations have been done for wind? (SER, 1-34 to 1-35)*

Response No. 9 (A. H. Chowdhury): The Applicant provided historical tornado data in the area surrounding the proposed facility site in Wilmington, North Carolina, in Section 2.5.6 of the Integrated Safety Analysis (ISA) Summary and Section 1.3.3.3.6 of the License Application. The NRC staff reviewed and evaluated these historical tornado records in Section 3.3.4.1 of the SER. The NRC staff agreed with the Applicant's determination that an F2 tornado estimate with a 3-second gust speed equivalent of 135 miles per hour (mph) has an annual probability of less than 10^{-5} and is, therefore, "highly unlikely." The staff arrived at this conclusion because the Applicant appropriately used historical data from NOAA (NOAA, 2011) to estimate tornado hazards for the proposed facility and used an analytical approach consistent with the guidance in NUREG/CR-4461, "Tornado Climatology of the Contiguous United States." Moreover, the 135 mph estimate is comparable with the 140 mph tornado wind speed with an annual probability of 10^{-5} provided in NUREG/CR-4461 for the Wilmington area.

The Applicant also provided historical hurricane data in Section 2.5.5 of the ISA Summary and in Section 1.3.3.3.7 of the LA that was evaluated by the NRC staff in Section 3.3.4.2 of the SER. The NRC staff found that the 10^{-5} annual probability tornado wind speed of 135 mph is bounded by the "highly unlikely" hurricane wind speed of 157.5 mph, which the Applicant will use as the design basis for the facility.

The Applicant proposed to use the American Society of Civil Engineers (ASCE) 7-05, "Minimum Design Loads for Buildings and Other Structures," method to design the structures for the design basis wind speed of 157.5 mph. This industry-accepted method is well-suited to design facilities with large surface areas and is acceptable to the NRC staff as documented in Section 3.3.12.1 of SER. The staff agrees with the Applicant's determination that the tornado missiles are "highly unlikely" for the Applicant's proposed site near Wilmington because the

Applicant appropriately considered the tornado-generated missiles using Regulatory Guide 1.76, “Design Basis Tornado and Tornado Missiles for Nuclear Power Plants.”

The NRC staff will review the final wind load analysis and the final detailed design of the facility when it performs the design and construction inspection.

References

(NOAA, 2011) National Oceanic and Atmospheric Administration (NOAA). “Severe Weather Database Files (1950-2010).” http://www.spc.noaa.gov/wcm/#data (Accessed September 2011).

U.S. Nuclear Regulatory Commission (NRC). NUREG/CR-4461, “Tornado Climatology of the Contiguous United States,” Rev. 2, February 2007. ADAMS Accession No. ML070810400.

U.S. Nuclear Regulatory Commission (NRC). Regulatory Guide 1.76, “Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants,” Rev. 1, March 2007. ADAMS Accession No. ML070360253.

American Society of Civil Engineers (ASCE). ASCE 7–05, “Minimum Design Loads for Buildings and Other Structures,” 2006.

SER Question No. 10: *Expand on the rationale that a hurricane surge could not reach the site. Does the Regulatory Guide 1.59 methodology consider topographical features? Does the stated surge prediction include significant conservatism? (SER, 1-35, ISAS, 2-26)*

Response No. 10 (S. Hsiung): The method in Appendix C of Regulatory Guide 1.59, “Design Basis Floods for Nuclear Power Plants” does not consider topography over land because this method estimates only the probable maximum hurricane storm surges at open-coast shore lines. The probable maximum hurricane storm surge determined by the Applicant using Appendix C of Regulatory Guide 1.59 includes conservatism.

As discussed in the Applicant’s Integrated Safety Analysis (ISA) Summary, historically, two Category 3 hurricanes made landfall in the New Hanover County coastal area where the proposed facility is located: Hurricane Hazel in 1954 and Hurricane Fran in 1996. No Category 4 hurricanes have ever been reported for the area. Based on this information, the Applicant selected a Category 4 hurricane with a wind speed of 253.5 km/hour (157.5 mph) as the deterministically identified “Highly Unlikely” event for the facility site.

The Applicant estimated the probable maximum storm surge resulting along the North Carolina coast from hurricanes to be as high as 6.7 m (21.9 ft). This 6.7 m (21.9 ft) surge was determined based on the surge estimate developed for the open-coast shore line at Brunswick, North Carolina, shown in Figure C.2 and listed in Table C.1 of Regulatory Guide 1.59. The Applicant assumed this level of hurricane-generated storm surge could reach the site, which is located approximately 32 km (20 mi) upstream from the estuary of Cape Fear River and is more than 16 km (10 mi) away from the nearest coastline. Because the proposed facility horizon is at an elevation of 7.6 m (25 ft) above sea level, the Applicant concluded that it is highly unlikely for a hurricane storm surge to affect the safety of the facility. The staff concluded that using the probable maximum hurricane storm surge of 6.7 m (21.9 ft) at the open-coast shore line estimated using Regulatory Guide 1.59 Appendix C is conservative because it does not consider surge dissipation as the surge travels inland and no Category 4 or 5 hurricanes have ever been reported for the area.

Figure C.2 and Table C.1 of Regulatory Guide 1.59 also show that the probable maximum surge is 5.37 m (17.63 ft) at Raleigh Bay, North Carolina. Because the coastline near the proposed facility is situated between Brunswick and Raleigh Bay, the estimated probable maximum surge water level falls between 5.37 m (17.63 ft) and 6.7 m (21.9 ft). Therefore, using the surge level of 6.7 m (21.9 ft) to assess potential hurricane surge impact provides an upper bound.

Regulatory Guide 1.59, Table C.1, presents an acceptable method for estimating still-water level of the probable maximum surge from hurricanes at open-coast sites on the Atlantic Ocean and Gulf of Mexico. This method uses parameters such as an ocean bottom topography/bathymetry map from shoreline down to a depth of 183 m (600 ft) mean low water obtained from the National Oceanic and Atmospheric Administration (NOAA); characteristics of the probable maximum hurricane, seabed friction, initial water level, and wind speed correction factor to estimate water levels from storm surges. The hurricane storm surges estimated in Regulatory Guide 1.59 Figure C2 and Table C1 are the maximum surges at open-coast shore lines. Therefore, no over land topographies were considered in the estimating the probable maximum hurricane surge.

Reference

U.S. Nuclear Regulatory Commission (NRC). Regulatory Guide 1.59, "Design Basis Floods for Nuclear Power Plants," Rev. 2, August 1977. ADAMS Accession No. ML003740388.

SER Question No. 11: *Given recent events at Fukushima Daiichi, did the NRC Staff use an increased level of conservatism in evaluating the potential impact of a tsunami on site safety? (SER, 1-39)*

Response No. 11 (S. Hsiung, J. Stamatakos): The Fukushima-Daiichi tsunami did not cause the NRC staff to be more conservative in its assessment of potential tsunami impacts. However, the NRC staff was well aware of the tsunami and its impacts at the Fukushima-Daiichi facility and the staff's tsunami review was informed by those events.

The Fukushima Daiichi tsunami was triggered by a 9.0 M_w earthquake that occurred off the Pacific coast of Tohoku, Honshu Island, Japan. This tsunami travelled inland with a maximum inundation distance of approximately 7.9 km (4.9 mi) (NOAA, 2012a). The tsunami triggered by the December 26, 2004, 9.1 M_w earthquake that occurred off the west coast of Sumatra, Indonesia, had a maximum inland inundation distance of approximately 5 km (3.1 mi) (NOAA, 2012b).

Large tsunamis are most often triggered by tectonic activity resulting from subduction zone earthquakes or submarine volcanic activities. The plate tectonic conditions at the proposed site are not favorable for such tsunami activity. The Atlantic coast of North Carolina is not a subduction zone (Dunbar, 2008 at 3-4) and there are no large submarine volcanoes offshore. There are some seismic and volcanic activities related to subduction zones in the

Caribbean and at the Scotia island arc chain (South Sandwich Islands) near Antarctica (Maine Geological Survey, 2012). The majority of tsunamis in the Caribbean produce run-ups less than 1 m (3 ft) and result in only localized flooding (Maine Geological Survey, 2012; USGS, 2011). Tsunami events in the Caribbean or the South Atlantic are too distant to significantly impact the North Carolina coast.

Tsunamis triggered by submarine landslides are rare events but possible because of the fractures discovered along a 40-km (25-mi) stretch of the continental shelf, off the Virginia and North Carolina coastlines (Driscoll, 2000 at 407). Driscoll, et. al. (Driscoll, 2000 at 410) suggests that this landslide could generate a tsunami with a wave size similar to a storm surge resulting from Category 3 or 4 hurricanes. There is some evidence to suggest that a large undersea landslide at this continental shelf occurred approximately 18,000 years ago. However, there are no historical records of tsunamis along the North Carolina coastal area since colonial settlement about 1690 (González, 2007 at 10).

Thus, the NRC staff concluded that the probability for the North Carolina coastal area to experience a tsunami with a magnitude and inundation similar to the 2011 Fukushima, Japan, and 2004 Indonesia tsunamis is very small. Moreover, even if Fukushima-like tsunamis were to strike the North Carolina coast, the risk for the site to be affected by these tsunamis is also low. This is because the facility site is more than 16 km (10 mi) away from the coastline and at an elevation of 7.6 m (25 ft) above sea level surrounded by level terrain.

Under favorable hydraulic conditions, tsunamis may generate tidal bores that travel upstream from the estuary. However, except for extreme events, tsunami-induced bores do not travel more than a few tens of miles (km) upstream from the mouth of a river (NRC, 2009). The proposed GLE facility is located 32 km (20 mi) upstream from the estuary and is situated 7.6 m (25 ft) above sea level. This elevation is, in general, the highest elevation east of the Northeast Cape Fear River. The east side of the Northeast Cape Fear River extends all the way to the coast. Furthermore, the proposed facility site and the surrounding area is relatively flat with gently sloping surfaces at gradients less than 2 percent and with little relief. This generally level terrain around the Northeast Cape Fear River would dissipate tidal bores as the bores travel upstream. If the tidal bores were to travel upstream for more than 32 km (20 mi) from the estuary to reach the proposed site, the NRC staff determines that the tidal bores may result in local flooding of the site. This tidal bore flooding effect is bounded by the design basis water level for the probable maximum flood which is 8.5 m (28 ft) above sea level.

References

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(González, 2007) González, F.I., E. Bernard, P. Dunbar, E. Geist, B. Jaffe, U. Kânoğlu, J. Locat, H. Mofjeld, A. Moore, C. Synolakis, V. Titov, and R. Weiss. "Scientific and technical issues in tsunami hazard assessment of nuclear power plant sites." NOAA Technical Memorandum OAR PMEL-136. Prepared by Pacific Marine Environmental Laboratory, Seattle, WA.

(Maine Geological Survey, 2012) Maine Geological Survey, Department of Conservation. "Tsunamis in the Atlantic Ocean." <http://www.maine.gov/doc/nrimc/mgs/explore/hazards/tsunami/jan05.htm> April 11, 2012.

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(NRC, 2009) U.S. Nuclear Regulatory Commission (NRC). NUREG/CR-6966, "Tsunami Hazard Assessment at Nuclear Power Plant Sites in the United States of America – Final Report," March 2009. ADAMS Accession No. 091590103.

(USGS, 2011) U.S. Geological Survey. "Could a tsunami such as the one that affected the Indian Ocean on December, 26, 2004 happen in the United States?" <http://earthquake.usgs.gov/learn/topics/canit.php#east_coast> October 31, 2011.

(Dunbar, 2008) Dunbar, P.K. and C.S. Weaver. "U.S. States and Territories National Tsunami Hazard Assessment: Historical Record and Sources for Waves." Prepared for the National Tsunami Hazard Mitigation Program. National Oceanic and Atmospheric Administration and U.S. Geological Survey. 2008, pp. 3-4.

SER Question No. 13: *The FSER states that the Nuclear Criticality Safety Manager, at a minimum, will have "experience in the understanding, application, and direction of NCS programs." This appears to require no specific education, training or firsthand experience with criticality safety methods, previous criticality events, or performing criticality safety analyses. Explain how the NRC Staff determined this to be an adequate level of qualification. (SER, 2-6)*

Response 13 (C. Tripp, B. Purnell): The required "experience in the understanding, application, and direction of NCS programs" would necessarily involve familiarity with criticality safety methods, previous criticality events, and performing criticality safety analyses to the extent necessary to manage an NCS Program. In addition, an NCS Manager who performs criticality analyses in addition to performing managerial functions would have to meet the qualifications of an NCS Engineer or Senior Engineer, which include direct experience in NCS (SER page 2-15 and 2-16). An NCS Manager who performs the independent review of criticality analyses would have to meet the qualifications of a Senior NCS Engineer, which include at least three years experience in NCS. If the NCS Manager does not perform this function, it must be performed by another individual with the qualifications of a Senior NCS Engineer (Section 5.4.5 of the License Application). In addition, the Applicant commits to an NCS Engineer Training and Qualification Program in accordance with ANSI/ANS-8.26-2007, "Criticality Safety Engineering Training and Qualification Program." This is a national consensus standard describing the standard industry practices for the training of NCS Engineers, which has been endorsed by the NRC in Regulatory Guide 3.71. "Nuclear Criticality Safety Standards for Fuels and Material Facilities." There is therefore reasonable assurance that the NCS Manager will have the necessary qualifications to perform his duties.

<u>References</u>

American National Standards Institute/American Nuclear Society (ANSI/ANS). ANSI/ANS 8.26, "Criticality Safety Engineering Training and Qualification Program," 2007.

U.S. Nuclear Regulatory Commission (NRC), Regulatory Guide 3.71, "Nuclear Criticality Safety Standards for Fuels and Material Facilities," Revision 2, December 2010. ADAMS Accession No. ML103210345.

SER Question No. 14: *Will the Industrial Safety manager be required to have specific training and experience in laser safety? (SER, 2-6)*

Response No. 14 (M. Baker): The Industrial Safety Manager is not required to have specific training and experience in laser safety. The North Carolina Department of Labor (NCDOL) has jurisdiction to enforce the Occupational Safety and Health Act of North Carolina (OSHANC), N.C. GEN. STAT. § 95-126 *et seq.* (2011). OSHANC requires that employers follow NCDOL workplace safety standards and otherwise provide their employees with workplaces that are free from recognized hazards. NCDOL has jurisdiction to investigate and enforce OSHANC with regard to workplaces where lasers present recognized hazards to employees. In determining whether lasers present recognized hazards to employees, NCDOL will look to American National Standards Institute (ANSI) standards (such as ANSI Z136.1-2007, "American National Standard for Safe Use of Lasers") or other industry standards regarding workplace laser safety.

NCDOL also has jurisdiction to enforce employer compliance with certain OSHANC standards promulgated by NCDOL, such as standards that require employees to use or wear personal protective equipment when necessary to prevent injury from hazards, including laser hazards. Other existing OSHANC standards may also apply to workplaces where lasers present hazards to employees.

Because NCDOL has the regulatory jurisdiction over this area, NRC did not review the Applicant's program for laser safety.

SER Question 15: *Did NUREG-1520 provide an adequate basis for the NRC Staff to review all aspects of this laser-based facility? Are there areas where the guidance needed to be supplemented? As a specific example, is the guidance adequate to form the basis for reviewing the Applicant's laser safety program? (SER, 3-3)*

Response No. 15 (M. Baker, T.C. Johnson): NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," is a generic guidance document intended to be applicable to a wide range of fuel cycle facilities except the Mixed Oxide Fuel Fabrication Facility, for which a separate standard review plan was developed. For the areas under NRC jurisdiction, NUREG-1520 provides an adequate basis for the NRC staff review of the proposed laser-based facility, as supplemented by interim staff guidance in the areas of nuclear criticality safety and building design to withstand the effects of natural phenomena events. NUREG-1520 was also supplemented by other NRC staff guidance in the areas of materials control and accounting, physical security, transportation security, human factors engineering, and electrical and instrumentation and controls. NUREG-1520 addresses the review of a fuel cycle facility in the following areas:

a. General Information;

b. Organization and Administration;

c. Integrated Safety Analysis and Integrated Safety Analysis Summary;

d. Radiation Protection;

e. Nuclear Criticality Safety;

f. Chemical Process Safety;

g. Fire Safety;

h. Emergency Management;

i. Environmental Protection;

j. Decommissioning; and

k. Management Measures.

The above areas address the principal safety and security concerns at a laser-based uranium enrichment plant as well as the programmatic and management information needed to meet the regulatory requirements.

The NRC staff also used the following interim staff guidance documents to supplement the information in NUREG-1520:

a. Interim Staff Guidance (ISG), FCSS-ISG-03, "Nuclear Criticality Safety Performance Requirements and Double Contingency Principle;"

b. ISG FCSS-ISG-08, "Natural Phenomena Hazards;" and

c. ISG FCSS-ISG-10, “Justification for Minimum Margin of Subcriticality for Safety.” Interim staff guidance provides current staff review guidance that has been developed subsequent to the publication of NUREG-1520. These ISGs were applied in the areas of nuclear criticality safety and building design to withstand natural phenomena hazards.

The guidance in NUREG-1520 was also supplemented in the areas of materials control and accounting, physical security, transportation security, human factors engineering, and electrical and instrumentation and controls. These areas are not specifically addressed in NUREG-1520, but were needed to ensure a complete review of the proposed laser-based uranium enrichment facility. NRC guidance used in these areas includes published regulatory guides and pertinent NUREG documents as cited in the SER.

As discussed in the NRC staff’s response to SER Question 14, the North Carolina Department of Labor (NCDOL) has jurisdiction to enforce the Occupational Safety and Health Act of North Carolina (OSHANC). Because NCDOL has the regulatory jurisdiction over this area, NRC did not review the Applicant’s program for laser safety.

The NRC staff concludes that, for the areas under NRC jurisdiction, the guidance in NUREG-1520, as supplemented by interim staff guidance and other applicable NRC guidance documents (e.g., regulatory guides, NUREGs) for the areas of materials control and accounting, physical security, transportation security, human factors engineering, and electrical and instrumentation and controls, provides an adequate safety and security basis for the review of a laser-based uranium enrichment facility.

References

U.S. Nuclear Regulatory Commission. NUREG-1520, “Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility,” Rev. 0, March 2002. ADAMS Accession No. ML020930033.

U.S. Nuclear Regulatory Commission (NRC). Interim Staff Guidance FCSS-ISG-03, “Nuclear Criticality Safety Performance Requirements and Double Contingency Principle,” Rev. 0, February 2005. ADAMS Accession No. ML050690302.

U.S. Nuclear Regulatory Commission (NRC). Interim Staff Guidance (ISG) FCSS-ISG-08, “Natural Phenomena Hazards,” October 2005. ADAMS Accession No. ML052650305.

U.S. Nuclear Regulatory Commission (NRC). Interim Staff Guidance FCSS-ISG-10, “Justification for Minimum Margin of Subcriticality for Safety,” 2006. ADAMS Accession No. ML061650370.

SER Question No. 17: *Given that one of the two borings showed at least a marginal risk for liquefaction, why were additional borings not done to test this issue? How do the borings' locations compare to the proposed plant location? How will the Applicant's more detailed evaluation of liquefaction potential alleviate any concerns raised by the borings*? (*SER, 3-21 to 3-22)*

Response No. 17 (S. Hsiung): The Applicant's study showed a marginal risk for soil liquefaction in one of the 10 borings drilled in and surround the proposed site area (GLE, 2008, Appendix G, Section G6). As the staff stated in Sections 1.3.3.4.3 and 3.3.4.12 of the SER, the Applicant committed to conduct, as part of a geotechnical design investigation, a detailed liquefaction potential analysis at the final structure location using the information to be collected from additional borings to support design of the proposed facility.

As discussed in Sections 3.3.5.2 and 3.3.5.3 of the Applicant's Environmental Report (ER) (GLE, 2008), the Applicant drilled six widely spaced borings in the proposed facility site area for a preliminary study of the site geotechnical conditions in 2007. These borings are supplemented by an additional four borings drilled in 1980 in the region for a different purpose. Among the 10 borings, 3 borings are located in the proposed facility site and the rest of the borings are outside the site. Actual locations of these borings are shown in Figure 3.3-25 of the Applicant's Environmental Report. In Appendix G (Section G6) of the ER, the Applicant analyzed liquefaction potentials for the soils in these 10 borings using a simplified screening method (GLE, 2008). Soils in only one boring (G-6) show a marginal risk of localized liquefactions at depths of 8 and 12 m (25 and 40 ft) and this boring in located near the center of the proposed facility site area. Soils in the rest of borings do not show liquefaction potential.

The more detailed evaluation of liquefaction potential the Applicant proposed at the final structure location will not alleviate any concerns raised by the borings. Instead, the evaluation will provide necessary information for the designer to include design features that would mitigate the effects of localized liquefaction. Design mitigations of localized liquefaction potential effects could include use of deep foundation support (piles) as suggested by the Applicant. The NRC staff will review the detailed liquefaction analysis and the associated final design of the facility when it performs the design and construction inspections.

Reference

(GLE, 2008) General Electric-Hitachi Global Laser Enrichment (GLE). "Environmental Report for the GLE Commercial Facility," 2008, Sections 3.3.5.2 and 3.3.5.3; and Appendix G, Section G6.

SER Question No. 19: *In the absence of the geotechnical report needed to assess problems with settlement and soil capacity, why did the NRC Staff conclude the Applicant's analysis of hazards from seismic events was acceptable? (SER, 3-22 to 3-23)*

Response No. 19 (S. Hsiung): In its review of the Applicant's settlement and bearing capacity information (Section 3.3.4.13 of the SER), the NRC staff's conclusion incorrectly states that the Applicant's analysis of hazards from seismic events was acceptable. Instead, the NRC staff should have stated that the Applicant's analysis of hazards from settlement and bearing capacity was acceptable. The staff's seismic hazard evaluation is discussed in Section 3.3.4.10.4 of the SER, and the staff's evaluation of the liquefaction hazard resulting from seismic events is discussed in Section 3.3.4.12. The NRC staff's conclusions with respect to those hazards are stated in the identified SER sections.

SER Question No. 21: *What is the definition for extremely unlikely in Item 2 in Section 3.3.16.1? (SER, 3-43)*

Response No. 21 (M. Baker): The term "extremely unlikely" refers to process deviations for which there is a convincing argument, given physical laws, that the deviations are not possible, or are unquestionably unlikely. The term is used in Section 3.4.3.2(9)(c) of NUREG-1520 to describe qualities that could define an event as not credible.

Reference

U.S. Nuclear Regulatory Commission. NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," Rev. 0, March 2002. ADAMS Accession No. ML020930033.

SER Question No. 22: *How did the NRC Staff assure itself that the analytical methods used to evaluate the criticality hazard associated with the cascade region met regulatory requirements in terms of their experimental validation? Does the NRC Staff retain a copy of the Applicant's Validation Report? (SER, 5-18)*

Response No. 22 (C. Tripp, B. Purnell): The licensing review described in Section 5.3.5.1 of the public version of the SER and the Appendix to Chapter 5 of the non-public version of the SER addresses the Applicant's validation report. The review determined that the Applicant's commitments with regard to validation of its analytical methods were adequate, based on the guidance in Chapter 5 of NUREG-1520. The license application included committing to ANSI/ANS-8.24-2007, "Validation of Neutron Transport Methods for Nuclear Criticality Safety Calculations," which has been endorsed with exceptions by the NRC in Regulatory Guide 3.71, "Nuclear Criticality Safety Standards for Fuels and Material Facilities." Verification that analytical methods comply with commitments in the license application is an inspection function. The NRC inspection program includes sampling of NCS analyses and calculations to ensure they comply with the applicable regulatory requirements.

The Applicant's validation report was submitted as part of the licensing review. The report is proprietary, but is available in non-public ADAMS under accession number ML100550587. It will also be maintained in the Applicant's document control system and will be available for inspection upon request. In addition, as discussed on page 5-17 of the SER, the staff has proposed a license condition requiring prior NRC approval for non-conservative changes to the validation report.

References

U.S. Nuclear Regulatory Commission. NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," Rev. 0, March 2002. ADAMS Accession No. ML020930033.

U.S. Nuclear Regulatory Commission (NRC), Regulatory Guide 3.71, "Nuclear Criticality Safety Standards for Fuels and Material Facilities," Revision 2, December 2010. ADAMS Accession No. ML103210345.

American National Standards Institute/American Nuclear Society (ANSI/ANS). ANSI/ANS 8.24, "Validation of Neutron Transport Methods for Nuclear Criticality Safety Calculations," 2007.

SER Question No. 23: *With respect to the Applicant's Criticality Accident Alarm System (CAAS) exemption request: (SER, 5-32 to 5-33)*

a. Do other enrichment facilities licensed in the United States have CAAS coverage in the areas that are included in this exemption?

b. What is the basis for the statement in the fourth full paragraph on page 5-32 that "a criticality accident is highly unlikely?"

c. While the possibility of heavy rainfall in conjunction with a tank breach was discussed in the fifth full paragraph on page 5-32, was the possibility of a flood also considered?

d. Part of the argument supporting the CAAS exemption is that maintenance personnel could be subjected to criticality accident doses. Could not the presence of a CAAS help other employees avoid exposure from a criticality accident? Expand on how the NRC Staff balanced the advantages and disadvantages in granting this exemption.

Response No. 23 (C. Tripp, B. Purnell):

a. The portions of the facility subject to the CAAS exemption consist of the UF_6 Cylinder Storage Pads, the Trailer Storage Area, and the UF_6 Cylinder Staging Area. These areas involve the storage of cylinders containing solid UF_6 only, which is an operation similar to those at the other licensed enrichment facilities as well as several licensed fuel fabrication facilities.

The Gaseous Diffusion Plants (GDPs) were certified under 10 CFR Part 76, rather than being licensed under 10 CFR Part 70. Pursuant to 10 CFR 76.89, the GDPs are required to maintain and operate a CAAS.

The other enrichment facilities licensed under 10 CFR Part 70 are USEC's American Centrifuge Plant (ACP), Louisiana Energy Services' (LES) National Enrichment Facility (NEF), and AREVA's Eagle Rock Enrichment Facility (EREF). The ACP was licensed with a CAAS exemption for its UF_6 cylinder storage yards, based in part on a similar exemption from 10 CFR 76.89 then in effect for the GDPs (as discussed on page 5-27 of NUREG-1851, "Safety Evaluation Report for the American Centrifuge Plant in Piketon, Ohio"). Neither the NEF nor the EREF was licensed with such an exemption (NUREG-1827, "Safety Evaluation Report for the National Enrichment Facility in Lea County, New Mexico," and NUREG-1951, "Safety Evaluation Report for the Eagle Rock Enrichment Facility in Bonneville County, Idaho").

b. The statement the Board refers to is just an observation that the cylinders will be required to comply with all of the regulatory requirements applicable to NCS. These requirements include ensuring that criticality, as a high-consequence event, is highly unlikely, as required by 10 CFR 70.61(b). The basis for the staff's concluding that this requirement will be met is its review of the Applicant's ISA Summary (documented in Chapter 3 of the SER, and more specifically for NCS, in Section 5.3.8 of the SER).

c. Yes, the possibility of a flood was considered. As stated in the fifth full paragraph on page 5-32 of the SER, "as discussed in Section 1.1.2.2.1 through 1.1.2.2.3 of the [License Application] … the storage pads are designed to preclude the buildup of rainwater on the outside of the cylinders." As stated in those sections of the License Application, storage pads are designed to provide for rainwater drainage. In addition, the cylinders are stored on saddles, elevating them above the ground. Cylinders are designed to be leak-tight, to prevent moderator from entering them. To ensure this, they are designed in accordance with ANSI N14.1, “Nuclear Materials—Uranium Hexafluoride—Packaging for Transport,” and are subject to periodic testing and inspection. (Because of the stringent regulatory requirements for transportation packages, many licensees have a CAAS exemption for materials stored in sealed shipping containers.) The frequent use and short residence time for 30B cylinders on the storage pads means that the occurrence of a breach is at least unlikely. Intrusion of flood waters into a cylinder would require the failure of several passive barriers—(1) there would have to be a flood sufficient to defeat the drainage capacity of the storage pads and sufficient to rise above the level of the saddles; (2) there would have to be a large breach on the underside of the cylinder that went unnoticed despite periodic testing and inspection; and (3) these two events would have to occur concurrently during the short time period in which the cylinder is in storage.

Even if a large flood occurred while there was a breach on the underside of the cylinder, inside the breach the flood water would encounter solid UF_6. Industry experience is that the UF_6 will tend to react with the water to form a variety of uranium compounds (most notably UF_4 and UO_2F_2 hydrates) and corrosion products that will self-seal a small breach. (Barber, 1991). A larger breach may not necessarily be self-sealing, but is more unlikely to be undetected. Even if the breach did not self-seal, any bound water would be largely confined to hydrates forming near the surface in contact with the water. The slow intrusion of flood water could also cause UO_2F_2 to deliquesce and form a solution, which would be diluted upon exiting the cylinder. While criticality cannot be dismissed in such a situation, it is also not a foregone conclusion.

Section 1.3.3.3.7 of the SER discusses flooding in general, due to its potential impact on other parts of the facility. The SER concluded, based largely on the location and elevation of the site above the 500-year flood plain, that flooding is not a significant safety concern. While flooding was not specifically considered as a criticality scenario in these areas, the Applicant evaluated the likelihood of criticality resulting from the damage of a 30B UF_6 cylinder by a forklift, followed by sufficient rainfall to attain criticality, to be ~5×10^{-7}/yr. The robust cylinder design contributing to this is identified as an IROFS for an accident sequence in product sampling. The rainfall scenario was considered by the staff to be similar to what would occur in the event of a flood, as they both involve the same likelihood of a cylinder breach and only differ in the means and the likelihood of water getting into the cylinder. Lastly, the Applicant has committed to providing for the safe shutdown of the facility in the event of a flood. Flooding is expected to be a slow process, so that it is very unlikely that there would be workers present, especially outdoors in the not normally occupied cylinder storage pads, and available to receive a criticality dose, during such an event.

d. Page 5-32 of the SER states: "The maintenance requirements for the CAAS would increase vehicular traffic and, therefore, the likelihood of a cylinder breach…Installation of criticality monitors would also increase the likelihood that an individual would be present in the area and susceptible to both routine radiation and criticality accident doses." This is part of a net risk argument. If the installation of a CAAS increases the net risk to workers, then it should not be installed. As stated above, due to the design of the storage pads and cylinders, and properties of solid UF_6, the risk of criticality on the pads is extremely low. Thus, there is little safety benefit to having a CAAS.

Conversely, extensive maintenance requirements are needed to comply with ANSI/ANS-8.3-1997, "Criticality Accident Alarm System." This will increase the number of individuals in the area, who will be available to receive occupational and accidental doses. The storage pads will not normally be occupied, as now the only reason to be there is to add, remove, or move cylinders, and perform occasional inspections of the area. Because the likelihood of criticality is very small, the main impact on these individuals would be an increase in routine occupational doses. Another consideration is that the increased activity in the area increases the likelihood of a mishap that could affect the cylinders, such as a vehicular collision or fire, dropping of heavy equipment onto cylinders, etc. Based on these considerations, the staff concluded that the installation of a CAAS did not have any net benefit, but did increase the risk of a cylinder breach and the likelihood of individuals receiving doses. Therefore, the installation of a CAAS was judged to result in a net increase in risk to workers.

References

Barber et al., "Investigation of Breached Depleted UF6 Cylinders," POEF-2086, ORNL/TM-11988, ORNL, 1991.

U.S. Nuclear Regulatory Commission (NRC). "Safety Evaluation Report for the American Centrifuge Plant in Piketon, Ohio," NUREG-1851, Sept. 2006. ADAMS Accession No. ML062700087.

U.S. Nuclear Regulatory Commission (NRC). "Safety Evaluation Report for the National Enrichment Facility in Lea County, New Mexico," NUREG-1827, June 2005. ADAMS Accession No. ML051780290.

U.S. Nuclear Regulatory Commission (NRC). "Safety Evaluation Report for the Eagle Rock Enrichment Facility in Bonneville County, Idaho," NUREG-1951, Sept. 2010. ADAMS Accession No. ML102710296.

American National Standards Institute (ANSI). ANSI N14.1, "Nuclear Materials—Uranium Hexafluoride—Packaging for Transport," 2001.

American National Standards Institute/American Nuclear Society (ANSI/ANS). ANSI/ANS 8.3, "Criticality Accident Alarm System," 1997.

SER Question No. 24: *The NRC Staff points out that the safety evaluation it carried out "was based on the current facility design." (SER, 5-37, 11-6, 11.A-8)*

a. *Are there areas in the proposed facility design, such as the separations cascade, where the design is still evolving? If so, how can the NRC Staff assert that the design can and will meet regulatory requirements while important process steps are still changing? Has a baseline cascade design been established that is subject to the formal change control process?*

b. *The NRC Staff states in the last paragraph of page 1-3 that the Applicant provided adequate information to understand the processes at the facility. Does the NRC Staff consider the product collection process in the cascade region as something that needs to be understood? If yes, what are the sources of information used by the NRC Staff, and what criteria are used to judge the adequacy of the information?*

Response No. 24 (C. Tripp, B. Purnell, T.C. Johnson):

a. The Applicant's baseline design is the current facility design defined in the ISA. The Applicant has not completed the final design of the facility and there are areas of the facility where the design is evolving. The NRC staff's approach was to review baseline design as described in the ISA Summary and the codes and standards to be applied to the design. By reviewing the Applicant's proposed codes and standards, the NRC review ensures that the Applicant will apply basic engineering principles in developing its final designs needed to ensure containment of hazardous components and nuclear criticality safety. In addition, changes to this baseline design would be governed by the change process in 10 CFR 70.72. Therefore, NRC has reasonable assurance of safety based on its review of the Applicant's safety programs, including the Applicant's proposed methods, technical practices, and commitments to codes and standards, and as verified by the sampling review of hazards and scenarios as part of its ISA review.

The NRC staff also notes that the Applicant submitted design information based on a design to produce up to 5 weight percent ^{235}U, although it requested a higher enrichment limit. Staff based its review on a design at 5 weight percent ^{235}U, and did not review a facility designed to produce enriched uranium up to 8 weight percent ^{235}U. During the onsite review, the Applicant mentioned the possibility of future design changes, but stated that for the purposes of licensing, the design was fixed. The licensee would need to submit a license amendment request to produce an enriched product greater than 5 weight percent ^{235}U as discussed in Section 5.3.5.1 of the SER. Other changes to the baseline design would be required to be made under the change provisions of 10 CFR 70.72 and the authorization discussed in Section 1.2.3.7.2 of the SER.

b. The statement the Board refers to is a general conclusion concerning the facility and process description section of the License Application. As stated on pages 1-3 and 1-4 of the SER: “the applicant provided information at a level of detail that is <u>appropriate for general familiarization and understanding</u> of the proposed facility and processes,” “the application <u>summarizes</u> the facility information contained in the ISA Summary,” and “major chemical and mechanical processes involving licensed materials are <u>described in summary form</u>.” These statements are not meant to imply that the staff reviewed the detailed workings of each process; only those aspects of the design that constitute safety hazards or protect against such hazards are of regulatory interest. The NCS reviewer reviewed the product collection process in the cascade region, which was described in the ISA Summary and onsite documents listed as references in the SER. As with all processes, the staff verified that adequate controls were identified to ensure that a criticality accident was at least highly unlikely. In addition, the staff noted during the onsite review that the licensee made conservative assumptions about the product collections systems potential impacts on enrichment control.

For all areas, including the product collection process, the NRC staff considers that sufficient information has been provided in the classified ISA Summary node description and accident analyses to understand the process and assess the safety hazards and the means proposed by the application to ensure safe operations. The NRC staff’s approach to the review of this system was the same as other areas of the facility; that is, the staff reviewed technical practices (including the codes and standards) to be applied to ensure that the Applicant uses basic engineering principles to ensure containment of hazardous components and nuclear criticality safety.

SER Question No. 25:. *Does the statement in the second paragraph on page 5-38, "Any increase in reflection conditions due to flooding is already accounted for since the CSAs [criticality safety analyses] use conservative reflection conditions" mean there are no arrangements of intact product tanks that if flooded would lead to criticality? If not, how are flooding and snow accumulation considered in the criticality evaluation of the product handling and storage areas? (SER, 5-38)*

Response No. 25 (C. Tripp, B. Purnell): The statement that "[a]ny increase in reflection conditions due to flooding is already accounted for since the CSAs use conservative reflection conditions" is based ultimately on the Applicant's commitments to technical practices associated with evaluation of reflection, and not on the review of any particular CSA. Section 5.4.4.4 of the License Application states that most systems are evaluated assuming 12 inches of water or optimum reflection conditions. Where less than optimum reflection is assumed, controls limiting reflection are established. This agrees with standard industry practice, and with the acceptance criteria in NUREG-1520, as discussed in the SER. "Optimum" reflection conditions refer to the fact that in arrangements of multiple units, surrounding each unit with full-density water does not necessarily produce the highest neutron multiplication (k_{eff}). This is because water absorbs neutrons traveling between units, and can therefore result in isolation between units in addition to reflecting individual units. Thus, an array of equipment such as tanks or cylinders may have a higher k_{eff} with low-density water or even air between pieces of equipment than when fully flooded. This would be evaluated in CSAs on a case-by-case basis. The NRC staff did not necessarily review the specific calculations for the product handling and storage areas, but they may be reviewed during subsequent inspections. This scenario would not have been selected for review because external flooding that completely surrounds a cylinder would be very low likelihood, and even if it occurred, the staff does not consider it likely that criticality could occur only as a result of external reflection.

<u>Reference</u>

U.S. Nuclear Regulatory Commission. NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," Rev. 0, March 2002. ADAMS Accession No. ML020930033.

SER Question No. 26: *With respect to the unique Cascade/Gas Handling (Node 4600) area, how did the NRC Staff ensure that all of the significant accident sequences had been identified and their probabilities of occurrence were conservatively estimated (given the lack of operational experience to draw upon)? (SER, 5-37 to 5-38, A-10)*

Response No. 26 (C. Tripp, B. Purnell, M. Baker): The NRC staff reviewed Node 4600 in the same manner as all the other nodes, by reviewing the ISA method and performing a sampling review. Node 4600 was selected for the vertical slice review, where the main concern was the scenario of over-enriching the product. The vertical slice was done by performing an independent review of assumptions and modeling (consequence) as well as reliability (likelihood of failure) of the controls using the available ISA documentation, including Process Hazard Analyses (PHAs), Criticality Safety Analyses (CSAs), Quantitative Risk Analyses (QRAs), and the ISA Summary. The PHAs identified hazards using the "What-If" methodology, and the CSAs demonstrated that identified scenarios would be subcritical under normal and credible abnormal conditions by complying with the double contingency principle. The QRAs identified items relied on for safety (IROFS) and determined the likelihood of their failure to show that criticality scenarios are highly unlikely. The failure likelihoods were based, in part, on guidance in NUREG-1520, Appendix A, and NUREG/CR-1278, "Handbook of Human Reliability Analysis with Emphasis on Nuclear Power Plant Applications" (Technique for Human Error Rate Prediction, or THERP). This is guidance that the NRC staff considers an acceptable way to demonstrate compliance with NRC regulations, and that is recognized as being generally conservative. In this vertical slice review, the reviewers evaluated the progression of initiating event and equipment failures that may lead to an unacceptable risk.

The conservative nature of the likelihood values from these sources is judged to compensate for the lack of operational experience. In addition, the more risk-significant parts of the process (for criticality) are product withdrawal and enriched cylinder handling, both of which are routinely undertaken in the nuclear industry, including for many years at the co-located GNF-A site. The hazards associated with them are, therefore, well-understood. The enrichment process is new, but with regard to criticality safety, it too is similar to that of other licensed enrichment facilities. For instance, UF_6 is used throughout the process, and as in other enrichment processes, it is necessary to keep moderator out of the process. The issues associated with a moderator controlled process are well-known in the industry. The only unique aspect relevant to NCS is enrichment control, which is discussed in Section 3.3.8.1.3 of the staff's non-public SER.

In addition, 10 CFR 70.62(a)(3) requires maintaining records of failures of IROFS, and that these records be available for inspection, so that if the QRAs prove to be non-conservative in some respects, this will become apparent as operational experience is gained.

<u>References</u>

U.S. Nuclear Regulatory Commission. NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," Rev. 0, March 2002. ADAMS Accession No. ML020930033.

U.S. Nuclear Regulatory Commission (NRC). NUREG/CR-1278, "Handbook of Human Reliability Analysis with Emphasis on Nuclear Power Plant Applications," August 1983. ADAMS Accession No. ML071210299.

SER Question No. 28: *Aside from the Cascade/Gas Handling (Node 4600) and the Laser System (Node 5500) areas, are there any operations or design approaches that differ significantly from those found at existing enrichment facilities? If yes, what parts of the facility or operations are significantly different? In particular, are there significant differences in those nodes that involve transferring UF_6 to and from storage tanks? (SER 6-8, A-10)*

Response No. 28 (M. Baker):

Hazards associated with the storage and transfer of UF_6 are no different than the hazards at other types of enrichment facilities. Feed, product withdrawal, tails withdrawal, sampling, and blending systems are similar in approach to those used by LES (National Enrichment Facility) and USEC (American Centrifuge Plant), and those proposed to be used by AREVA (Eagle Rock Enrichment Facility). In general, UF_6 handling and storage approaches are also similar.

SER Question No. 29: *Expand on how the Applicant will ensure that off-site fire departments (especially those using volunteers) will not use water-based fire suppression in areas that are inappropriate from a criticality safety viewpoint. (SER, 7-7 to 7-10)*

Response No. 29 (C. Tripp, B. Purnell, J. Downs): In Section 7.6.2 of the License Application, the Applicant committed to develop agreements with offsite responders. Pre-fire plans will be developed in accordance with National Fire Protection Association (NFPA) 801, "Standard for Fire Protection for Facilities Handling Radioactive Materials," and NFPA 1620, "Recommended Practice for Pre-Incident Planning," and will be available to both onsite and offsite responders. Firefighting methods will be documented in approved procedures, which will ensure they will be subject to review by nuclear criticality staff. These commitments provide the NRC staff with reasonable assurance of safety in regard to firefighting by offsite fire departments. However, the development of these plans and procedures will likely only be completed closer to operation of the facility, and will be available for inspection upon demand.

SER Question No. 31: *What was the basis for choosing the wind speed assumed in the consequence assessment described in the first paragraph of page A-16?*

Response No. 31 (M. Bartlett): The basis for choosing the wind speed is that atmospheric stability Class F with a wind speed of 2 meters/second (m/s) produces the most conservative dose estimates for releases involving UF_6 and Hydrogen Fluoride (HF) (see NUREG-1140-, "A Regulatory Analysis on Emergency Preparedness for Fuel Cycle and Other Radioactive Material Licensees," and NUREG/CR-6410, "Nuclear Fuel Cycle Facility Accident Analysis Handbook").

Atmospheric stability Class D with wind speed of 4-6 m/s and atmospheric stability Class F with wind speed of 1-2 m/s are the most common weather conditions, see NUREG/CR-6410, page D-73, Section, "Weather Conditions." Atmospheric stability Class D represents a neutral weather condition with a heavy, overcast day or night. Class F represents a stable weather condition with a cloudy night. Although Class D stability is more common, Class F produces more conservative results for calculations involving UF_6 and HF. This is due to the fact that Class F weather conditions transport the plume with less dispersion over a longer period of time, increasing the local concentration and potential exposure. This is further illustrated in NUREG-1140, Section 2.2.3.3, “Calculations of Doses,” which provides direct comparisons between doses modeled using Class D stability verses Class F stability. Since stability Class F with wind speed of 2 m/s produces doses that are bounding, additional wind speeds were not displayed in the accident analysis summary.

References

U.S. Nuclear Regulatory Commission (NRC). NUREG-1140, “A Regulatory Analysis on Emergency Preparedness for Fuel Cycle and Other Radioactive Material Licensees,” January 1988. ADAMS Accession No. ML062020791.

U.S. Nuclear Regulatory Commission (NRC). NUREG/CR-6410, “Nuclear Fuel Cycle Facility Accident Analysis Handbook,” March 1998. ADAMS Accession No. ML072000468.

ATTACHMENT C
AFFIDAVITS FOR NRC STAFF RESPONSES TO THE LICENSING BOARD'S INITIAL QUESTIONS REGARDING THE SER

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket No. 70-7016-ML
	)	
GE-HITACHI GLOBAL LASER ENRICHMENT LLC	)	ASLBP No. 10-901-03-ML-BD01
	)	
	)	April 25, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF MERRITT N. BAKER CONCERNING
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S
INITIAL QUESTIONS REGARDING THE SER

I, Merritt N. Baker, do hereby state as follows:

1. I am employed as a Senior Project Manager in the Division of Fuel Cycle Safety and Safeguards in the U.S. Nuclear Regulatory Commission's ("NRC") Office of Nuclear Material Safety and Safeguards. A statement of my professional qualifications is attached.

2. As part of the NRC staff's safety review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Safety Evaluation Report for the Proposed General Electric-Hitachi Global Laser Enrichment, LLC Laser-Based Uranium Enrichment Facility in Wilmington, North Carolina (NUREG-2120)," February 2012, I reviewed the aspects of the application that concerned the Integrated Safety Analysis (ISA) and chemical safety.

3. I am responsible for those responses to the License Board questions (or portions of questions) in "NRC Staff Responses to the Licensing Board's Initial Questions Regarding the SER," for which I am listed as the author.

Attachment C

4. I attest to the accuracy of those statements, support them on my own, and endorse their introduction into the record of this proceeding. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.

[Executed in Accord with
10 C.F.R. § 2.304(d)]

____
Merritt N. Baker

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket No. 70-7016-ML
	)	
GE-HITACHI GLOBAL LASER ENRICHMENT LLC	)	ASLBP No. 10-901-03-ML-BD01
	)	
	)	April 24, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF MATTHEW BARTLETT CONCERNING
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S
INITIAL QUESTIONS REGARDING THE SER

I, Matthew Bartlett, do hereby state as follows:

1. I am employed as a Health Physics Reviewer and Project Manager in the Division of Fuel Cycle Safety and Safeguards in the U.S. Nuclear Regulatory Commission's ("NRC") Office of Nuclear Materials Safety and Safeguards. A statement of my professional qualifications is attached.

2. Although I did not participate in the NRC staff's safety review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Safety Evaluation Report for the Proposed General Electric-Hitachi Global Laser Enrichment, LLC Laser-Based Uranium Enrichment Facility in Wilmington, North Carolina (NUREG-2120)," February 2012, I have reviewed the staff's accident analysis (Appendix A of NUREG-2120) and the portions of the license application that pertain to the accident analysis.

3. I am responsible for those responses to the License Board questions (or portions of questions) in "NRC Staff Responses to the Licensing Board's Initial Questions Regarding the SER," for which I am listed as the author.

Attachment C

4. I attest to the accuracy of those statements, support them on my own, and endorse their introduction into the record of this proceeding. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.

[Executed in Accord with
10 C.F.R. § 2.304(d)]

____
Matthew Bartlett

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket No. 70-7016-ML
	)	
GE-HITACHI GLOBAL LASER ENRICHMENT LLC	)	ASLBP No. 10-901-03-ML-BD01
	)	
	)	April 24, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF ASADUL H. CHOWDHURY CONCERNING
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S
QUESTIONS REGARDING THE SER

I, ASADUL H. CHOWDHURY, do hereby state as follows:

1. I am employed as a Staff Engineer at Southwest Research Institute. I am providing responses to the Licensing Board's questions under a technical assistance contract with the staff of the U.S. Nuclear Regulatory Commission ("NRC"). A statement of my professional qualifications is attached.

2. As part of the NRC staff's safety review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Safety Evaluation Report for the Proposed General Electric-Hitachi Global Laser Enrichment, LLC Laser-Based Uranium Enrichment Facility in Wilmington, North Carolina (NUREG-2120)," February 2012, I assisted the NRC staff in its review and analysis of aspects of the application that concerned structural analysis and design of the GE-Hitachi Laser Enrichment facility.

3. I am responsible for those responses to the License Board questions (or portions of questions) in "NRC Staff Responses to the Licensing Board's Initial Questions Regarding the SER," for which I am listed as the author.

4. I attest to the accuracy of those statements, support them on my own, and endorse their introduction into the record of this proceeding. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.

[Executed in Accord with
10 C.F.R. § 2.304(d)]

Asadul H. Chowdhury

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket No. 70-7016-ML
	)	
GE-HITACHI GLOBAL LASER ENRICHMENT LLC	)	ASLBP No. 10-901-03-ML-BD01
	)	
	)	April 25, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF CRAIG M. DEAN CONCERNING
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S
QUESTIONS REGARDING THE SER

I, Craig M. Dean, do hereby state as follows:

1. I am employed as a Senior Technical/Regulatory Specialist at ICF International Incorporated, LLC. I am providing responses to the Licensing Board's questions under a technical assistance contract with the staff of the U.S. Nuclear Regulatory Commission ("NRC"). A statement of my professional qualifications is attached.

2. As part of the NRC staff's safety review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Safety Evaluation Report for the Proposed General Electric-Hitachi Global Laser Enrichment, LLC Laser-Based Uranium Enrichment Facility in Wilmington, North Carolina (NUREG-2120)," February 2012, I assisted the NRC staff in its review and analysis of aspects of the application that concerned financial assurance for decommissioning.

3. I am responsible for those responses to the License Board questions (or portions of questions) in "NRC Staff Responses to the Licensing Board's Initial Questions Regarding the SER," for which I am listed as the author.

4. I attest to the accuracy of those statements, support them on my own, and endorse their introduction into the record of this proceeding. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.

[Executed in Accord with
10 C.F.R. § 2.304(d)]

____

Craig M. Dean

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket No. 70-7016-ML
	)	
GE-HITACHI GLOBAL LASER ENRICHMENT LLC	)	ASLBP No. 10-901-03-ML-BD01
	)	
	)	April 24, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF JAMES R. DOWNS CONCERNING
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S
INITIAL QUESTIONS REGARDING THE SER

I, James R. Downs, do hereby state as follows:

1. I am employed as a Fire Protection Engineer in the Division of Fuel Cycle Safety and Safeguards in the U.S. Nuclear Regulatory Commission's ("NRC") Office of Nuclear Materials Safety and Safeguards. A statement of my professional qualifications is attached.

2. Although I did not participate in the NRC staff's safety review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Safety Evaluation Report for the Proposed General Electric-Hitachi Global Laser Enrichment, LLC Laser-Based Uranium Enrichment Facility in Wilmington, North Carolina (NUREG-2120)," February 2012, I have reviewed the portions of the license application and other applicant documents, and the chapters of NUREG-2120, that pertain to fire safety.

3. I am responsible for those responses to the License Board questions (or portions of questions) in "NRC Staff Responses to the Licensing Board's Initial Questions Regarding the SER," for which I am listed as the author.

Attachment C

4. I attest to the accuracy of those statements, support them on my own, and endorse their introduction into the record of this proceeding. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.

[Executed in Accord with 10 C.F.R. § 2.304(d)]

____
James R. Downs

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket No. 70-7016-ML
	)	
GE-HITACHI GLOBAL LASER ENRICHMENT LLC	)	ASLBP No. 10-901-03-ML-BD01
	)	
	)	May 2, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF J. KEITH EVERLY CONCERNING
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S
INITIAL QUESTIONS REGARDING THE SER

I, J. Keith Everly, do hereby state as follows:

1. I am employed as a Senior Program Manager in the Division of Security Operations in the U.S. Nuclear Regulatory Commission's ("NRC") Office of Nuclear Security and Incident Response. A statement of my professional qualifications is attached.

2. As part of the NRC staff's safety review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Safety Evaluation Report for the Proposed General Electric-Hitachi Global Laser Enrichment, LLC Laser-Based Uranium Enrichment Facility in Wilmington, North Carolina (NUREG-2120)," February 2012, I reviewed the aspects of the application that concerned the protection of classified matter.

3. I am responsible for those responses to the License Board questions (or portions of questions) in "NRC Staff Response to the Licensing Board's Initial Questions Regarding the SER," for which I am listed as the author.

4. I attest to the accuracy of those statements, support them on my own, and endorse their introduction into the record of this proceeding. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.

[Executed in Accord with
10 C.F.R. § 2.304(d)]

____
J. Keith Everly

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket No. 70-7016-ML
	)	
GE-HITACHI GLOBAL LASER ENRICHMENT LLC	)	ASLBP No. 10-901-03-ML-BD01
	)	
	)	April 25, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF SUI-MIN (SIMON) HSIUNG CONCERNING
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S
QUESTIONS REGARDING THE SER

I, Sui-Min (Simon) Hsiung, do hereby state as follows:

1. I am employed as a staff engineer at Southwest Research Institute. I am providing responses to the Licensing Board's questions under a technical assistance contract with the staff of the U.S. Nuclear Regulatory Commission ("NRC"). A statement of my professional qualifications is attached.

2. As part of the NRC staff's safety review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Safety Evaluation Report for the Proposed General Electric-Hitachi Global Laser Enrichment, LLC Laser-Based Uranium Enrichment Facility in Wilmington, North Carolina (NUREG-2120)," February 2012, I assisted the NRC staff in its review and analysis of aspects of the application that concerned natural except seismic and human-induced external hazards that may affect facility safety.

3. I am responsible for those responses to the License Board questions (or portions of questions) in "NRC Staff Responses to the Licensing Board's Initial Questions Regarding the SER," for which I am listed as the author.

4. I attest to the accuracy of those statements, support them on my own, and endorse their introduction into the record of this proceeding. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.

[Executed in Accord with
10 C.F.R. § 2.304(d)]

____
Sui-Min Hsiung

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket No. 70-7016-ML
	)	
GE-HITACHI GLOBAL LASER ENRICHMENT LLC	)	ASLBP No. 10-901-03-ML-BD01
	)	
	)	April 24, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF TIMOTHY C. JOHNSON CONCERNING
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S
INITIAL QUESTIONS REGARDING THE SER

I, Timothy C. Johnson, do hereby state as follows:

1. I am employed as a Senior Project Manager in the Division of Division of Fuel Cycle Safety and Safeguards in the U.S. Nuclear Regulatory Commission's ("NRC") Office of Nuclear Material Safety and Safeguards. A statement of my professional qualifications is attached.

2. As part of the NRC staff's safety review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Safety Evaluation Report for the Proposed General Electric-Hitachi Global Laser Enrichment, LLC Laser-Based Uranium Enrichment Facility in Wilmington, North Carolina (NUREG-2120)," February 2012, I reviewed the aspects of the application that concerned general information and organization and administration.

3. I am responsible for those responses to the License Board questions (or portions of questions) in "NRC Staff Responses to the Licensing Board's Initial Questions Regarding the SER," for which I am listed as the author.

4. I attest to the accuracy of those statements, support them on my own, and endorse their introduction into the record of this proceeding. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.

[Executed in Accord with
10 C.F.R. § 2.304(d)]

____
Timothy C. Johnson

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket No. 70-7016-ML
	)	
GE-HITACHI GLOBAL LASER ENRICHMENT LLC	)	ASLBP No. 10-901-03-ML-BD01
	)	
	)	April 26, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF KENNETH KLINE CONCERNING
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S
INITIAL QUESTIONS REGARDING THE SER

I, Kenneth Kline, do hereby state as follows:

1. I am employed as a Project Manager in the Division of Waste Management and Environmental Protection in the U.S. Nuclear Regulatory Commission's ("NRC") Office of Federal and State Materials and Environmental Management Programs. A statement of my professional qualifications is attached.

2. As part of the NRC staff's safety review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Safety Evaluation Report for the Proposed General Electric-Hitachi Global Laser Enrichment, LLC Laser-Based Uranium Enrichment Facility in Wilmington, North Carolina (NUREG-2120)," February 2012, I reviewed the aspects of the application that concerned decommissioning financial assurance.

3. I am responsible for those responses to the License Board questions (or portions of questions) in "NRC Staff Responses to the Licensing Board's Initial Questions Regarding the SER," for which I am listed as the author.

4. I attest to the accuracy of those statements, support them on my own, and endorse their introduction into the record of this proceeding. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.

[Executed in Accord with
10 C.F.R. § 2.304(d)]

____
Kenneth Kline

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket No. 70-7016-ML
	)	
GE-HITACHI GLOBAL LASER ENRICHMENT LLC	)	ASLBP No. 10-901-03-ML-BD01
	)	
	)	April 30, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF BLAKE A. PURNELL CONCERNING
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S
INITIAL QUESTIONS REGARDING THE SER

I, Blake A. Purnell, do hereby state as follows:

1. I am employed as a Project Manager in the Division of Policy and Rulemaking in the U.S. Nuclear Regulatory Commission's ("NRC") Office of Nuclear Reactor Regulation. A statement of my professional qualifications is attached.

2. As part of the NRC staff's safety review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Safety Evaluation Report for the Proposed General Electric-Hitachi Global Laser Enrichment, LLC Laser-Based Uranium Enrichment Facility in Wilmington, North Carolina (NUREG-2120)," February 2012, I reviewed certain aspects of the application that concerned nuclear criticality safety.

3. I am responsible for those responses to the License Board questions (or portions of questions) in "NRC Staff Responses to the Licensing Board's Initial Questions Regarding the SER," for which I am listed as the author.

Attachment C

4. I attest to the accuracy of those statements, support them on my own, and endorse their introduction into the record of this proceeding. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.

[Executed in Accord with
10 C.F.R. § 2.304(d)]

____
Blake A. Purnell

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket No. 70-7016-ML
	)	
GE-HITACHI GLOBAL LASER ENRICHMENT LLC	)	ASLBP No. 10-901-03-ML-BD01
	)	
	)	April 26, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF DEBORAH SEYMOUR CONCERNING
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S
INITIAL QUESTIONS REGARDING THE SER

I, Deborah Seymour, do hereby state as follows:

1. I am employed as a Branch Chief in the Division of Construction Projects in the U.S. Nuclear Regulatory Commission's ("NRC") Office of Region II. A statement of my professional qualifications is attached.

2. As part of the NRC staff's safety review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Safety Evaluation Report for the Proposed General Electric-Hitachi Global Laser Enrichment, LLC Laser-Based Uranium Enrichment Facility in Wilmington, North Carolina (NUREG-2120)," February 2012, I reviewed the aspects of the application that concerned license application commitments.

3. I am responsible for those responses to the License Board questions (or portions of questions) in "NRC Staff Responses to the Licensing Board's Initial Questions Regarding the SER," for which I am listed as the author.

4. I attest to the accuracy of those statements, support them on my own, and endorse their introduction into the record of this proceeding. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.

[Executed in Accord with
10 C.F.R. § 2.304(d)]

____

Deborah Seymour

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket No. 70-7016-ML
	)	
GE-HITACHI GLOBAL LASER ENRICHMENT LLC	)	ASLBP No. 10-901-03-ML-BD01
	)	
	)	April 24, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF JOHN A. STAMATAKOS CONCERNING
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S
QUESTIONS REGARDING THE SER

I, John A. Stamatakos, do hereby state as follows:

1. I am employed as Director of Technical Programs at the Center for Nuclear Waste Regulatory Analyses, Southwest Research Institute. I am providing responses to the Licensing Board's questions under a technical assistance contract with the staff of the U.S. Nuclear Regulatory Commission ("NRC"). A statement of my professional qualifications is attached.

2. As part of the NRC staff's safety review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Safety Evaluation Report for the Proposed General Electric-Hitachi Global Laser Enrichment, LLC Laser-Based Uranium Enrichment Facility in Wilmington, North Carolina (NUREG-2120)," February 2012, I assisted the NRC staff in its review and analysis of aspects of the application that concerned tectonics, seismology, seismic hazard assessment, and tsunami hazard assessment.

3. I am responsible for those responses to the License Board questions (or portions of questions) in "NRC Staff's Responses to the Licensing Board's Initial Questions Regarding the SER," for which I am listed as the author.

Attachment C

4. I attest to the accuracy of those statements, support them on my own, and endorse their introduction into the record of this proceeding. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.

[Executed in Accord with
10 C.F.R. § 2.304(d)]

____
John A. Stamatakos

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket No. 70-7016-ML
	)	
GE-HITACHI GLOBAL LASER ENRICHMENT LLC	)	ASLBP No. 10-901-03-ML-BD01
	)	
	)	April 24, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF CHRISTOPHER S. TRIPP CONCERNING
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S
INITIAL QUESTIONS REGARDING THE SER

I, Christopher S. Tripp, do hereby state as follows:

1. I am employed as a Senior Nuclear Process Engineer (Criticality) in the Division of Fuel Cycle Safety and Safeguards in the U.S. Nuclear Regulatory Commission's ("NRC") Office of Nuclear Material Safety and Safeguards. A statement of my professional qualifications is attached.

2. As part of the NRC staff's safety review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Safety Evaluation Report for the Proposed General Electric-Hitachi Global Laser Enrichment, LLC Laser-Based Uranium Enrichment Facility in Wilmington, North Carolina (NUREG-2120)," February 2012, I reviewed certain aspects of the application that concerned nuclear criticality safety.

3. I am responsible for those responses to the License Board questions (or portions of questions) in "NRC Staff Responses to the Licensing Board's Initial Questions Regarding the SER," for which I am the author.

4. I attest to the accuracy of those statements, support them to the best of my knowledge, and endorse their introduction into the record of this proceeding. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.

[Executed in Accord with
10 C.F.R. § 2.304(d)]

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Christopher S. Tripp