

**ATTACHMENT B  
NRC STAFF RESPONSES TO THE LICENSING BOARD'S  
INITIAL QUESTIONS REGARDING THE FEIS**

## **NRC STAFF RESPONSES TO THE LICENSING BOARD'S INITIAL QUESTIONS REGARDING THE FEIS**

**FEIS Question No. 1:** *Explain the measures taken to verify the accuracy of GE-Hitachi Global Laser Enrichment LLC's (GLE) 2008 Environmental Report to the extent it has been relied on as a primary source for the NRC Staff's analysis.*

**Response No. 1 (K. Fischer, H. Avci, T. Allison, B. Biwer, Y.-S. Chang, L. Hocking, S.**

**Kamboj, D. O'Rourke, K. Picel, J. Quinn, W. Vinikour):** The NRC staff used a range of measures to verify the accuracy of information and data provided in GLE's Environmental Report (ER). Examples of these verification measures included:

- Independent review of ER references to verify accuracy of information and data cited in the ER, and the appropriateness of data sources.
- Comparison to similar information and data from other sources, such as State monitoring data or reports to the NRC. For example, the NRC staff:
  - compared information in the ER against a New Hanover County natural area inventory report prepared by the North Carolina Natural Heritage Program and a fishery nursery area report prepared by the State of North Carolina's Division of Marine Fisheries.
  - compared GLE's expected occupational injury rates (which are based on occupational injury rates at the nearby Global Nuclear Fuel-Americas facility) against rates for similar industries from the U.S. Bureau of Labor Statistics.
  - compared data in the ER against requested State environmental monitoring data around the Wilmington Site (for the years 1998 – 2007).
  - compared data in the ER against GE's semiannual effluent release reports to the NRC from existing operations at the Wilmington Site.
  - verified on-road mobile emission factors provided in the ER using the MOBILE6.2 model.
- Comparison to relevant information and data from reports on similar facilities, such as the Final Environmental Impact Statements (FEISs) for the Eagle Rock Enrichment Facility

(NUREG-1945), the National Enrichment Facility (NUREG-1790), and the American Centrifuge Plant (NUREG-1834). For example, the NRC staff:

- verified in NUREG-1834 that occupational exposures to gaseous UF<sub>6</sub> emissions from connecting and disconnecting UF<sub>6</sub> cylinders can be controlled with ventilation equipment and maintained within Occupational Safety and Health Administration standards.
  - verified that the anticipated types and frequencies of radioactive shipments (and their respective external dose rates), as well as waste volumes and management, were consistent with the expected throughput of uranium and previous analyses performed for similar facilities (e.g., NUREG-1790 and NUREG-1834).
  - consulted previous analyses performed for similar facilities (e.g., NUREG-1790 and NUREG-1834) to verify the types of Federal and State laws that potentially apply to the facility.
- Identification and use of references and public information that were not cited in the ER to serve as a primary data source in the FEIS or for comparison to information in the ER. For example, the NRC staff:
    - located publicly available information from the U.S. Geological Survey to provide updated information in Section 3.6.1.1 of the FEIS regarding the earthquake in Mineral, Virginia, and tsunamis.
    - based its environmental justice analysis on information obtained from the U.S. Census Bureau.
    - searched North Carolina Natural Heritage Program documents to obtain lists of special status species that occur in New Hanover County, and searched the North Carolina Natural Heritage Program's website for records of special status species observed within the Wilmington Site area.

- used U.S. Bureau of Labor Statistics occupational injury rates for similar industries (which are slightly higher than those anticipated by GLE in its ER) to estimate occupational injuries during construction and operation of the proposed GLE Facility.
- used transportation modeling inputs from the uranium industry and other transportation-related sources.
- reviewed potentially applicable regulations (e.g., North Carolina Administrative Code) and websites related to State of North Carolina's environmental and radiological protection agencies.
- verified ecological resource information in the ER using regional field guides and other publications, compared habitat figures with aerial photography, and compared wetland figures with published wetland maps and evaluations.
- Review of GLE staff and GLE contractor reports to verify data consistency and the reasonableness of conclusions.
- Review of similar impact assessments performed by the NRC. For example, the NRC staff:
  - used NUREG-0713 to estimate radiological exposure to occupational workers from GE's existing Fuel Manufacturing Operations (FMO) facility's operations.
  - used NRC's environmental assessment of license renewal for the GE fuel fabrication facility to estimate doses from existing liquid effluent releases at the Wilmington Site.
- Review of correspondence with Federal, State, and local regulators and permitting agencies, including licensing documentation for existing GE facilities (and waste management systems that would serve the proposed GLE Facility).
- Meetings with (and presentations by) GLE staff, GLE consultants, and GLE contractors, as well as observations made during the 2009 site visit, including a tour of GE's existing FMO facility.

- Teleconferences with GLE staff and GLE consultants. For example, the NRC staff held teleconferences with GLE to review and discuss revised cost information received in response to a request for additional information.
- Consultation with Federal and State regulators. For example, the NRC staff:
  - performed an independent review of archaeological survey files maintained by the North Carolina State Historic Preservation Office (SHPO) to determine the presence and types of historical and cultural resources on and near the project area. These reports were reviewed and accepted for professional adequacy by the SHPO prior to review for the FEIS. The NRC staff also collected information from the SHPO on the historic and prehistoric context for the region.
  - consulted with representatives from the North Carolina Department of Labor on occupational and laser safety regulations, standards, and enforcement.
  - consulted with representatives from the U.S. Fish and Wildlife Service to fulfill the requirements for Endangered Species Act consultation and to obtain and verify information about the presence of threatened and endangered species in the vicinity of the proposed GLE Facility site.
- Confirmation of ecological resource information through photointerpretation comparisons; observation of habitat and wildlife at the Wilmington Site during the site audit; and discussions with GLE staff and GLE consultants and various agency personnel during the site audit.
- Independent modeling of impacts with peer-reviewed models, including AERMOD and MOBILE6.2 (for air quality impacts), WebTRAGIS and RADTRAN (for transportation impacts), and COMPLY, RESRAD, RESRAD-BUILD, CAP88-PC, and GENII (for radiation dose modeling).

- Independent review of inputs and assumptions used for the IMPLAN model (for socioeconomic analysis).
- Application of general scientific principles and principles of operation of facilities and equipment (to the extent possible given that the proposed GLE Facility is first of a kind at commercial scale).
- Professional judgment about the reasonableness and conservativeness of information, data, and assumptions cited from the ER. In exercising its professional judgment, the NRC staff was guided by the following two considerations: (1) if the estimated impacts were very small and well below any applicable regulatory limits or standards, there was less of a need to reduce the uncertainty in the parameters used to estimate the impacts; and (2) the NRC staff's goal was to make sure that the impact estimates presented in the FEIS would not underestimate the actual impacts that would occur during the various phases of the proposed action (i.e., preconstruction, construction, operation, and decommissioning) while at the same not being unreasonably conservative.

**FEIS Question No. 2:** *Why is the Applicant requesting authorization to enrich up to 8% U-235? Has the NRC previously authorized enrichment up to 8% U-235 at another facility? Does GLE, 2009j at 1 indicate that safety has been confidently demonstrated at U-235 enrichment levels of only up to 5%? (EIS, 1-2)*

**Response No. 2 (T. Johnson):** The target production enrichment limit for the proposed GLE Facility would initially be 5 weight percent U-235. GLE is requesting authorization to enrich up to 8 weight percent U-235 because it anticipates that customers might wish to purchase higher burnup fuel at enrichments greater than 5 weight percent U-235 sometime in the foreseeable future.

In April 2007, the NRC licensed the United States Enrichment Corporation (USEC) to produce enriched uranium up to 10 weight percent U-235 at the American Centrifuge Plant.

Both the Louisiana Energy Services (licensed in June 2006) and AREVA Enrichment Services, LLC (licensed in October 2011) enrichment plants were licensed for 5 weight percent U-235.

In response to a request for additional information dated December 28, 2009 (GLE, 2009j), the Applicant stated that the enrichment safety limit of 8 weight percent U-235 would not be exceeded under credible process upset conditions if the target production limit of 5 weight percent U-235 is not exceeded. In other words, the Applicant's response (GLE, 2009j) indicated that safety has been confidently demonstrated at U-235 enrichment levels up to 8 weight percent U-235 only if the target production limit of 5 weight percent U-235 is not exceeded. Because the Applicant has not developed a safety basis for a production limit of 8 weight percent U-235, NRC staff has proposed license conditions as discussed in Sections 1.2.3.5 and 5.3.5.1 of the SER.

#### Reference

(GLE, 2009j) GE-Hitachi Global Laser Enrichment LLC. Letter from A.E. Kennedy (GE-Hitachi Global Laser Enrichment LLC) to B. Smith (U.S. Nuclear Regulatory Commission), dated December 28, 2009. "Subject: Response to Request for Additional Information Dated November 19, 2009 for Global Laser Enrichment License Application – Public Responses." ADAMS Accession Nos. ML093620823 and ML093620841.

**FEIS Question No. 3:** *Does 10 CFR § 50.68(b)(7) limit Part 52 reactor license holders from using fuel assemblies enriched at levels above 5%? Does the NRC Staff expect a change to 10 C.F.R. § 50.68(b)(7)? From where does GLE expect demand for fuel enriched above 5%? (EIS, 1-2)*

**Response No. 3 (J. Davis, T. Johnson):** No, 10 CFR 50.68 does not limit Part 52 reactor license holders from using fuel assemblies enriched at levels above five percent (5%) by weight. 10 CFR 50.68 provides two options. As stated in 10 CFR 50.68(a), holders of a construction permit or operating license issued under Part 50 or a combined license issued under Part 52 for a nuclear power reactor must comply with 10 CFR 70.24 (option 1) or 10 CFR 50.68(b) (option 2). Similarly, 10 CFR 50.68(b) provides that if a licensee does not maintain a monitoring system capable of detecting a criticality as described in 10 CFR 70.24 (option 1), the licensee must

comply with the requirements in § 50.68(b) (option 2). The limitation in 10 CFR 50.68(b)(7)—that maximum nominal U-235 enrichment of the fresh fuel assemblies is limited to 5% by weight—applies only if the licensee chooses to comply with option 2 (10 CFR 50.68(b)), instead of option 1 (10 CFR 70.24). Therefore, as long as the holder of a construction permit, operating license, or combined license for a nuclear power reactor complies with 10 CFR 70.24 by implementing a monitoring system that meets the specific requirements in § 70.24, the licensee would not be limited to a maximum nominal U-235 enrichment of fresh fuel assemblies of 5% by weight.

After conferring with the NRC's Office of Nuclear Reactor Regulation and the Office of New Reactors, the NRC staff is not aware of any rulemaking that would change 10 CFR 50.68(b)(7).

While the nuclear industry has discussed the possibility of using higher burnup fuels with enrichments higher than 5 weight percent U-235, the NRC staff is unaware of any specific plans by nuclear power plants to utilize such fuels in the near future. The Applicant proposed an 8 weight percent U-235 limit in anticipation of potential future demand for such fuels.

**FEIS Question No. 4:** *Why are the forecasts for annual demand for enrichment services based on 2003 projections? Given the economic turmoil of the past few years, does the NRC Staff believe these forecasts are accurate? Does the NRC Staff expect domestic and international demand for low enriched uranium (LEU) to be affected by the Fukushima Daiichi accident and the international economic downturn? (EIS, 1-6 to 1-8)*

**Response No. 4 (J. Davis, D. Diaz-Toro, K. Fischer, H. Avci):** The forecasts for annual demand for enrichment services are based on the 2003 projections because these projections are the best publicly available information that the NRC staff found during the development of the FEIS. Although the NRC staff cited forecasts from the 2003 U.S. Energy Information Administration (EIA) report, the NRC staff's need-for-enriched-uranium analysis did not rely solely on these forecasts. The analysis also considered more recent information found in the 2010 EIA report, "Annual Energy Outlook 2010 with Projections to 2035." This report estimates



that, for the reference case, nuclear capacity and generation in the United States will increase. In addition, the 2010 EIA report notes that, as future demand for electricity increases, the need for enriched uranium to fuel nuclear power plants is also expected to increase (see page 1-6 of the FEIS). The NRC staff also considered the contributions from the different sources that supply the enriched uranium to meet U.S. demand, as discussed in the EIA's May 2011 "Uranium Marketing Annual Report" (see pages 1-6 to 1-8 of the FEIS). As discussed in Section 1.3.1 of the FEIS, the NRC staff's analysis considered an expected decrease in both existing foreign and domestic sources of enriched uranium, resulting in the need for additional sources to fulfill U.S. electricity requirements. Approximately half of U.S. demand for enriched uranium is currently supplied by the Megatons-to-Megawatts Program (a foreign source) and the Paducah Gaseous Diffusion Plant (a domestic source), both of which are expected not to be available within the next several years.

Further, the NRC staff's analysis assumes an increase in the number of newly-licensed nuclear power plants in the United States based on the number of combined license (COL) applications that the NRC staff is actively reviewing as well as expected new COL applications. In addition, on February 10, 2012, the NRC issued the first COLs to Southern Nuclear Operating Company to build and operate two AP1000 reactors at the Vogtle Electric Generating Plant site near Augusta, Georgia. On March 30, 2012, the NRC issued COLs authorizing South Carolina Electric & Gas to build and operate two AP1000 reactors at the Virgil C. Summer site near Columbia, South Carolina. Therefore, although the NRC staff recognizes that the economic downturn has affected the nuclear industry, the NRC staff finds the forecasts of nuclear generation, nuclear capacity, and demand for enriched uranium (discussed in the previous paragraphs and in the FEIS) to be reasonable and still applicable in the FEIS's analysis of need based on (1) the 2010 and 2011 EIA reports, (2) the expected decrease in foreign and domestic sources of enriched uranium to the United States, and (3) the current number of COL

applications submitted to the NRC and expected to be submitted to the NRC in the foreseeable future.

With regard to the Fukushima Daiichi accident, the NRC staff notes that there are many uncertainties regarding the effects of the accident on global nuclear power growth. However, the following information discusses the currently available information regarding the accident, including the currently projected impact of the accident on global nuclear power growth and demand for enriched uranium. The Fukushima Daiichi accident prompted an immediate review of the safety of nuclear energy in the United States, as well as in most countries with commercial nuclear power programs (see “Recommendations for Enhancing Reactor Safety in the 21st Century, The Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident” (July 12, 2011) (ML111861807)). Some countries, like Germany, Switzerland, and Italy, took immediate actions to move away from nuclear energy in response to the Fukushima Daiichi accident, and these decisions could adversely impact global nuclear power growth. For instance, the German government decided to permanently shut down several of its 17 nuclear units and phase out the remaining plants by 2022, while Switzerland’s existing reactors will continue to operate but only until the end of their current licenses. Additionally, the future of the nuclear energy program in Japan could also affect global nuclear power growth; before the Fukushima Daiichi accident, Japan was the third largest producer of electricity from commercial nuclear power, but currently has only two of its 54 commercial reactors in operation, as most of its reactors are shut-down for scheduled maintenance or safety reviews.

In contrast, other countries, which played a significant role in forecasted nuclear growth analyses before the Fukushima Daiichi accident (such as China, India, United States, and France), are maintaining nuclear power as part of their energy portfolio and/or their developmental plans. For example, with regard to the United States, the NRC’s Near-Term Task Force, which examined the Fukushima Daiichi accident for near-term insights, concluded that the continued operation and licensing activities of nuclear power plants in the United States

do not pose an imminent risk to public health and safety (ML111861807). To date, no COL applicant has withdrawn its application or sought suspension of the NRC staff's review of its application in response to the Fukushima events. The actions in these countries could also affect global nuclear power growth and demand for enriched uranium.

Furthermore, the International Atomic Energy Agency (IAEA) publishes annually two projections for the world's nuclear power generating capacity—a low projection and a high projection. The IAEA's August 2011 report takes into consideration the effects of the Fukushima Daiichi accident. This report notes in the low projection that the world's installed nuclear power capacity is expected to grow from 367 gigawatts (GW(e)) today to 501 GW(e) in 2030, down 8% from what was projected in 2010, but still showing expected growth. In the high projection in the 2011 report, the world's installed nuclear power capacity is expected to grow to 746 GW(e) in 2030, down 7% from 2010, but again still showing expected growth. The number of operating nuclear reactors in the world is also expected to increase in both projections in this report (Energy, Electricity and Nuclear Power Estimates for the Period Up To 2050, IAEA, August 2011).

In conclusion, the NRC staff recognizes that the Fukushima Daiichi accident has impacted global nuclear power growth, but, as discussed above, current information suggests that nuclear power will continue to grow globally, though potentially at a slower rate than anticipated before the Fukushima Daiichi accident. Based on this information, the NRC staff continues to find the forecasted nuclear generation, nuclear capacity, and demand for enriched uranium (discussed in this response and in the FEIS) to be reasonable and still applicable in the FEIS's analysis of need.

#### References

Energy Information Administration. U.S. Department of Energy. "Annual Energy Outlook 2010 with Projections to 2035." DOE/EIA-0383(2010). April 2010.  
<<http://infousa.state.gov/economy/technology/docs/0383.pdf>> ADAMS Accession No. ML103480627.

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International Atomic Energy Agency. "Energy, Electricity and Nuclear Power Estimates for the Period Up To 2050," August 2011. <[http://www-pub.iaea.org/MTCD/Publications/PDF/RDS1\\_31.pdf](http://www-pub.iaea.org/MTCD/Publications/PDF/RDS1_31.pdf)>

U.S. Nuclear Regulatory Commission. "Recommendations for Enhancing Reactor Safety in the 21st Century, The Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," July 12, 2011. ADAMS Accession No. ML111861807.

U.S. Nuclear Regulatory Commission. Letter from David B. Matthews (NRC) to Joseph A. "Buzz" Miller (Southern Nuclear Operating Company). "Subject: Issuance of Combined Licenses and Limited Work Authorizations for Vogtle Electric Generating Plant (VEGP, Units 3 and 4)," February 10, 2012. ADAMS Accession No. ML113360395.

U.S. Nuclear Regulatory Commission. Letter from David B. Matthews (NRC) to Ronald B. Clary (South Carolina Electric & Gas Company). "Subject: Issuance of Combined Licenses for V.C. Summer Nuclear Station (VCSNS) Units 2 and 3," March 30, 2012. ADAMS Accession No. ML113360467.

**FEIS Question No. 5:** *Provide any updated information the NRC Staff has on the status of the National Enrichment Facility, American Centrifuge Plant, and Eagle Rock Enrichment Facility. How would any updated output projections impact the NRC Staff's needs analysis and Table 1-1? (EIS, 1-7 to 1-8)*

**Response No. 5 (J. Davis, D. Diaz-Toro, T. Johnson):** An update regarding the status of these three licensed enrichment facilities is provided below.

Louisiana Energy Services (LES) National Enrichment Facility (NEF)

The NEF in Lea County, New Mexico, began operations in June 2010. Construction activities continue and operations are expanding as additional cascades become operational. As of the beginning of April 2012, the NEF is operating 16 cascades with a capacity of approximately 1 million separative work units (SWU) per year. As noted in the NEF FEIS (NUREG-1790), the facility is expected to be operating at its full NRC-licensed capacity of 3 million SWU per year by October 2013. As noted on page 1-7 of the FEIS, LES is also considering plans to expand its total capacity at NEF to 5.9 million SWU per year (see NRC

Authorization to Introduce Uranium Hexafluoride into Cascades). However, LES has not announced when it will request a license amendment from the NRC authorizing this expansion.

United States Enrichment Corporation, Inc. (USEC) American Centrifuge Plant (ACP)

USEC will need significant additional financing to complete the ACP. As noted in USEC's U.S. Securities and Exchange Commission Form 10-K submittal dated March 14, 2012, USEC applied for a \$2 billion loan guarantee under the DOE Loan Guarantee Program in July 2008. Thereafter, USEC focused its efforts on obtaining a conditional commitment so that it could move forward with commercialization of the American Centrifuge technology. However, DOE raised concerns regarding the financial and project execution, and USEC was not able to address these concerns to DOE's satisfaction during 2011. Instead of moving forward with a conditional commitment for a loan guarantee, in the fall of 2011, DOE proposed a two-year cost-share research, development, and demonstration (RD&D) program to enhance the technical and financial readiness of the centrifuge technology for commercialization. DOE indicated that USEC's application for a DOE loan guarantee would remain pending during the RD&D program, but DOE has given USEC no assurance that a successful RD&D program will result in a loan guarantee (Securities Exchange Commission Form 10-K).

The RD&D program would involve manufacturing and operating additional production-design machines so that key systems can be tested as they would actually operate at the scale necessary for full commercialization. The proposed program scope is to construct and operate at least one complete demonstration cascade of 120 commercial centrifuge machines. USEC is working with DOE and Congress to secure DOE funding for the RD&D program. However, DOE's share of funding for the program has not yet been provided and the source for such funding is uncertain (Securities Exchange Commission Form 10-K).

Continuation of the RD&D program through and beyond 2012 will require additional funding. As described above, USEC is working with DOE and Congress to obtain funding for Fiscal Year (FY) 2012. Even if DOE funding were provided for the RD&D program for FY 2012,

funding for the RD&D program beyond FY 2012 would be subject to future appropriations. President Obama's FY 2013 budget proposal includes \$150 million for the RD&D program. However, USEC has no assurance that the President's FY 2013 budget will be passed in its current form (or at all). In addition, USEC has no assurance that it will be able to reach agreement with DOE regarding any phase of the RD&D program or that any funding will be provided. USEC also has no assurance that it will ultimately be able to obtain a DOE loan guarantee or any indication regarding when it might receive a DOE loan guarantee (Securities Exchange Commission Form 10-K).

Based on this information, the construction and operating schedule for the ACP is uncertain at this time.

AREVA Enrichment Services, LLC (AES) Eagle Rock Enrichment Facility (EREF)

On October 12, 2011, the NRC issued a license to AES for construction and operation of a gas centrifuge uranium enrichment facility in Bonneville County, Idaho. On December 13, 2011, AES announced that it was putting construction of the facility on hold due to financing issues.

Based on this updated information regarding these three licensed enrichment facilities, which focuses on the construction and operation schedule for these facilities, no revisions are needed to Table 1-1 of the FEIS. The needs analysis in the FEIS considers the sources that currently fulfill the domestic demand for enriched uranium as well as future domestic sources (i.e., the NEF, ACP, and EREF). Specifically, the needs analysis considers the production capacity of these licensed enrichment facilities, rather than the construction and operation schedule. Assuming that all three enrichment facilities are operated and reach their licensed production capacity, the updated information contained in this response does not impact the NRC staff's needs analysis in the FEIS.

## References

AREVA Presentation: Action 2016, Improving the group's performance in nuclear and renewable energies. Luc Oursel, Chief Executive Officer, Pierre Aubouin, Chief Financial Executive Officer, Benjamin Fremaux, SEVP, Strategy, Mergers and Acquisitions, Secretary to the Executive Board. December 13, 2011.

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U.S. Nuclear Regulatory Commission. Letter from L. Reyes, Regional Administrator, Region II, NRC, to D. Sexton, Chief Nuclear Officer and Vice President of Operations, National Enrichment Facility, LES. Authorization to Introduce Uranium Hexafluoride into Cascade Number 1." June 10, 2010. ADAMS Accession No. ML101610767.

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U.S. Nuclear Regulatory Commission. Letter from A. Gody, Director, Division of Fuel Facility Inspection, Region II, NRC, to D. Sexton, Chief Nuclear Officer and Vice President of Operations, National Enrichment Facility, LES. Authorization to Introduce Uranium Hexafluoride into Cascades 3 and 4. August 23, 2011. ADAMS Accession No. ML112351133)

U.S. Nuclear Regulatory Commission. Letter from A. Gody, Director, Division of Fuel Facility Inspection, Region II, NRC, to D. Sexton, Chief Nuclear Officer and Vice President of Operations, National Enrichment Facility, LES. Authorization to Introduce Uranium Hexafluoride into Cascades 1.5. November 15, 2011. ADAMS Accession No. ML11319A020.

U.S. Nuclear Regulatory Commission. Letter from A. Gody, Director, Division of Fuel Facility Inspection, Region II, NRC, to G. Laughton, Chief Nuclear Officer and Head of Technical Services, LES. Authorization to Introduce Uranium Hexafluoride into Cascades 1.6. December 21, 2011. ADAMS Accession No. ML11355A147.

U.S. Nuclear Regulatory Commission. Letter from A. Gody, Director, Division of Fuel Facility Inspection, Region II, NRC, to G. Laughton, Chief Nuclear Officer and Head of Technical Services, LES. Authorization to Introduce Uranium Hexafluoride into Cascades 1.7. January 23, 2012. ADAMS Accession No. ML12024A283.

U.S. Nuclear Regulatory Commission. Letter from A. Gody, Director, Division of Fuel Facility Inspection, Region II, NRC, to G. Laughton, Chief Nuclear Officer and Head of Technical Services, LES. Authorization to Introduce Uranium Hexafluoride into Cascades 1.8, 2.1, and 2.4. March 1, 2012. ADAMS Accession No. ML12061A069.

U.S. Nuclear Regulatory Commission. Letter from A. Gody, Director, Division of Fuel Facility Inspection, Region II, NRC, to G. Laughton, Chief Nuclear Officer and Head of Technical Services, LES. Authorization to Introduce Uranium Hexafluoride into Cascades 2.2, 2.3, and 2.5. March 14, 2012. ADAMS Accession No. ML12074A089.

U.S. Nuclear Regulatory Commission. Letter from A. Gody, Director, Division of Fuel Facility Inspection, Region II, NRC, to G. Laughton, Chief Nuclear Officer and Head of Technical Services, LES. Authorization to Introduce Uranium Hexafluoride into Cascades 2.6. March 19, 2012. ADAMS Accession No. ML12081A063.

U.S. Nuclear Regulatory Commission. Letter from A. Gody, Director, Division of Fuel Facility Inspection, Region II, NRC, to G. Laughton, Chief Nuclear Officer and Head of Technical Services, LES. Authorization to Introduce Uranium Hexafluoride into Cascades 2.7, and 2.8. March 27, 2012. ADAMS Accession No. ML12088A061.

United States Enrichment Corporation (USEC). U.S. Securities and Exchange Commission Form 10-K, "Annual Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934," March 14, 2012.

**FEIS Question No. 6:** *Under what conditions and timeline could the levels of LEU supplied to United States Enrichment Corporation under the TENEX agreement equal current levels under the Megatons-to-Megawatts Program? (EIS, 1-7) Does the NRC Staff expect other LEU imports to remain constant in future years? (EIS, 1-7) What are the relative costs of domestic production at currently operating and projected facilities (including GLE) versus importation? (EIS, 1-7 to 1-8) If domestic production were to increase, would foreign suppliers be able to undercut domestic prices?*

**Response No. 6 (J. Davis, D. Diaz-Toro):** As discussed on page 1-7 of the FEIS, the supply of low enriched uranium (LEU) to the United States Enrichment Corporation (USEC) under the TENEX agreement will begin in 2013, and will increase until it reaches a level, in 2015, that includes a quantity of separative working units (SWU) equal to approximately one-half the level currently supplied to USEC under the Megatons-to-Megawatts program. In USEC Inc.'s U.S. Securities and Exchange Commission Form 10-K submittal, dated March 14, 2012, it stated that "[b]eginning in 2015, TENEX and USEC also may mutually agree to increase the purchases and sales of SWU by certain additional optional quantities of SWU up to an amount equal to the amount USEC now purchases each year under the Megatons to Megawatts program" (page 13). However, both parties would need to agree to the options discussed in the previous sentence before USEC could begin receiving additional quantities of LEU under the TENEX



agreement. Further, USEC Inc. stated in its Form 10-K submittal that imports of LEU and other uranium products produced in the Russian Federation (other than LEU imported under the Megatons-to-Megawatts program) into the U.S. are subject to quotas imposed under legislation enacted into law in September 2008 and under the 1992 Russian Suspension Agreement, as amended (page 28). According to USEC Inc.'s Form 10-K submittal (page 52), "[u]nder the new Russian Supply Agreement, [USEC] ha[s] the right to use a portion of the import quotas to support [its] sales in the United States of SWU purchased under the Russian Supply Agreement beginning in 2014. These quotas are subject to timely completion of the Megatons to Megawatts program by the end of 2013. Further, prior to the expiration of the quotas at the end of 2020, [USEC] will not be able to import for consumption in the United States LEU delivered to [it] under the Russian Supply Agreement in excess of the portion of the quotas available to [it]. This restriction does not apply to imports that are not subject to the quotas (e.g., for use in initial fuel cores for any U.S. nuclear reactors entering service for the first time)."

Regarding other LEU imports, the NRC staff assumes that the phrase "other LEU imports" (as referenced in the second question in Question 6) refers to those coming from sources other than the Megatons-to-Megawatts program or the USEC-TENEX agreement. As discussed on page 1-7 of the FEIS, other countries that produce and export enriched uranium to the United States include China, France, Germany, the Netherlands, and the United Kingdom. These countries supply approximately 47% of the current U.S. demand for LEU.

The NRC staff has no information that would lead the staff to believe that the future level of these other LEU imports would differ from current levels. However, the U.S. Energy Information Administration (EIA) forecasts that the expansion in installed nuclear power capacity between 2008 and 2035 predominantly will occur in China, Russia, and India (U.S. EIA, International Energy Outlook). This additional capacity will require enrichment services that could be supplied by the international market, and thus could potentially affect the levels of the U.S.'s other LEU imports from foreign sources.

## References

United States Enrichment Corporation (USEC). U.S. Securities and Exchange Commission Form 10-K, "Annual Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934," March 14, 2012.

Energy Information Administration, U.S. Department of Energy. "International Energy Outlook 2011." DOE/EIA-0484(2011). September 2011.  
<[http://205.254.135.7/forecasts/ieo/pdf/0484\(2011\).pdf](http://205.254.135.7/forecasts/ieo/pdf/0484(2011).pdf)>

**FEIS Question No. 7:** *As support for the need for a domestic supply of LEU, the FEIS offers evidence from 2002 and 2010 that a domestic supply of LEU is an issue of national energy security. Is there more recent support for the proposition that a domestic supply of LEU is a priority as a matter of public policy? (EIS, 1-8 to 1-9)*

**Response No. 7 (K. Fischer, E. Hocking):** Yes, there is more recent evidence that supports the proposition that a domestic supply of LEU remains a priority as a matter of public policy.

This more recent evidence, which demonstrates that domestic uranium enrichment is important to U.S. national energy security, includes the following:

- In a response letter to Senator Sherrod Brown dated January 13, 2012, U.S. Department of Energy (DOE) Secretary Steven Chu stated that "I continue to believe ACP [the American Centrifuge Plant] offers an innovative technology approach to uranium enrichment that offers both national security and economic benefits."
- In response to a question from Senator Rob Portman during a hearing of the Senate Committee on Energy and Natural Resources on February 16, 2012, Secretary Chu stated that "We have international treaties which we want to abide by, nonproliferation treaties which say[] that the uranium used in nuclear security – for nuclear security purposes actually has to be indigenous to that country."
- In response to a question from Representative John Olver during a hearing of the Energy and Water Development Subcommittee of the House Committee on Appropriations on March 6, 2012, the Under Secretary for Nuclear Security and Administrator of the National Nuclear Security Administration, Thomas D'Agostino, stated the following: "What we believe

is that it's very important for the United States to maintain an indigenous U.S. capability to enrich fissile material. It's important on a number of fronts. One of the fronts, ultimately, is to provide the materials that . . . the Naval Reactors program will absolutely need in order to keep our submarines and aircraft carriers operating. Because . . . the other reason it's important is, in order . . . to have unencumbered, domestically produced, low-enriched uranium, so that I can continue to have tritium for our nuclear stockpile. But it's important on other fronts as well. Particularly, we believe that in order to . . . discourage the unnecessary spread of enrichment technology, that other countries need to have confidence in the uranium enrichment market to be able to supply its needs; and that having a domestic U.S. capability . . . is absolutely important to market stability.”

#### References

U.S. Department of Energy. Letter from Steven Chu, Secretary, U.S. Department of Energy, to Senator Sherrod Brown, January 13, 2012.

U.S. Senate. Committee on Energy and Natural Resources. Hearing on the U.S. Department of Energy's Fiscal Year 2013 Budget Request. February 16, 2012.

U.S. House of Representatives. Committee on Appropriations. Energy and Water Development Subcommittee. Hearing on “The Budget for the National Nuclear Security Administration (NNSA), Nuclear Nonproliferation & Naval Reactors.” March 6, 2012.

**FEIS Question No. 8:** *Except as already discussed in the FEIS, 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 No. 8 (K. Fischer, S. Kamboj):** Per the clarification in the Board's order dated April 13, 2012, “regulatory guides” refers to all NRC regulatory guidance documents, including Regulatory Guides (RGs) and NUREG documents. Beyond the NRC guidance documents identified in the FEIS, there were no other NRC guidance documents that were applied in or adapted to the NRC staff's environmental review under the National Environmental Policy Act (NEPA).

The following are NRC guidance documents that are potentially applicable to the proposed facility, but were not identified or applied in the FEIS:

<b>Guidance</b>	<b>Application in FEIS</b>
<p>RG 4.9, "Preparation of Environmental Reports for Commercial Uranium Enrichment Facilities" (ML003739926).</p>	<p>The NRC staff did not directly or indirectly use RG 4.9 in its NEPA review, even though this RG is potentially applicable to the proposed facility, because RG 4.9 applies to preparation of environmental reports for license applicants.</p>
<p>RG 4.20, "Constraint on Releases of Airborne Radioactive Materials to the Environment for Licensees other than Power Reactors" (ML110120299).</p>	<p>The NRC staff did not directly or indirectly use RG 4.20 in its NEPA review. RG 4.20 provides guidance on methods that are acceptable for meeting the 10 CFR 20.1101(d) airborne emission constraint (i.e., 10 mrem/y Total Effective Dose Equivalent [TEDE] to members of the public). Although RG 4.20 is not explicitly referenced in the FEIS, the NRC staff evaluated, in the FEIS, compliance with the same dose constraint discussed in RG 4.20 by assessing compliance with the National Emission Standards for Hazardous Air Pollutants (NESHAPs), which also uses a 10 mrem/y dose constraint (see pages 3-97 and 4-81). Furthermore, while the method in RG 4.20 was not directly used in the FEIS's impact analysis, the NRC staff used the COMPLY code—a code that was developed by the U.S. Environmental Protection Agency and that is listed in RG 4.20 as an acceptable method for demonstrating compliance with 10 CFR 20.1101(d)—to estimate the dose from Fuel Manufacturing Operation (FMO) air effluent releases.</p>
<p>RG 8.37, "ALARA Levels for Effluents from Materials Facilities" (ML003739553).</p>	<p>The NRC staff did not directly or indirectly use RG 8.37 in its NEPA review. RG 8.37 deals with the application of the As Low As Reasonably Achievable (ALARA) requirement for controlling gaseous and liquid effluents from materials facilities. Licensees must implement a radiation protection program that controls dose rates in unrestricted areas to maintain overall doses to workers and members of the public ALARA and below the limits in 10 CFR Part 20. The purpose of the environmental review under NEPA is to</p>

	assess the environmental impacts of the proposed facility, including projected effluents, as opposed to a review of the applicant's ALARA program. Therefore, the NRC staff did not directly or indirectly use RG 8.37 in its review, even though this RG is potentially applicable to the proposed facility.
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**FEIS Question No. 9:** *Identify any significant issues to which the NRC Staff determined that no regulatory guide applied, and explain how the NRC Staff addressed such issues.*

**Response No. 9 (J. Davis, Y.-S. Chang):** There is only one significant issue to which the NRC staff determined during its environmental review under the National Environmental Policy Act (NEPA) that no NRC guidance document (e.g., Regulatory Guide or NUREG document) applied. This issue is the analysis of impacts related to climate change (e.g., the effect of greenhouse gas [GHG] emissions) potentially caused by the proposed facility.

The U.S. Nuclear Regulatory Commission stated in CLI-09-21, an order issued in two Combined License (COL) proceedings, that the Commission “expect[s] the Staff to include consideration of carbon dioxide and other greenhouse gas emissions in its environmental reviews for major licensing actions under the National Environmental Policy Act[, and that t]he Staff’s analysis for reactor applications should encompass emissions from the uranium fuel cycle as well as from construction and operation of the facility to be licensed.” *Duke Energy Carolinas, LLC* (William States Lee III Nuclear Station, Units 1 and 2), CLI-09-21, 70 NRC 927, 931 (2009). The Commission also indicated in CLI-09-21 that “[t]he Staff should ensure that these issues are addressed consistently in agency NEPA evaluations and, as appropriate, update Staff guidance documents to address greenhouse gas emissions.” *Id.*

In response to these statements in CLI-09-21, a Senior Project Manager in the Office of New Reactors (NRO) issued a memorandum, entitled “Supplemental Staff Guidance to NUREG 1555, ‘Environmental Standard Review Plan,’ (ESRP) for Consideration of the Effects of Greenhouse Gases and of Climate Change” (ML100990185), to the Branch Chief for the

Environmental and Technical Support Branch within NRO's Division of Site and Environmental Reviews.<sup>1</sup> This NRO memorandum clarifies how GHG emissions and climate change should be considered in the review of COL applications for new reactors.

There is, however, no NRC guidance document regarding the consideration of GHG emissions and the treatment of climate change in the review of applications for materials facilities, such as the proposed GLE Facility. In the absence of an NRC guidance document on this issue, the NRC staff used guidance from the Council on Environmental Quality (CEQ) to perform the GHG emissions analysis in Section 4.2.18 of the FEIS. Specifically, the NRC staff consulted CEQ's draft guidance, "Consideration of the Effects of Climate Change and Greenhouse Gas Emissions," in its preparation of Section 4.2.18 of the FEIS. The NRC staff also applied parts of the NRO memorandum during its preparation of the FEIS, as further explained in response to FEIS Questions 13 and 15.

### References

Council on Environmental Quality. Draft Guidance, "Consideration of the Effects of Climate Change and Greenhouse Gas Emissions." February 23, 2010.

*Duke Energy Carolinas, LLC* (William States Lee III Nuclear Station, Units 1 and 2), CLI-09-21, 70 NRC 927 (2009). ADAMS Accession No. ML093070690.

U.S. Nuclear Regulatory Commission. Memorandum from Barry Zalzman, Senior Project Manager, to H. Brent Clayton, Branch Chief, "Subject: Supplemental Staff Guidance to NUREG 1555, 'Environmental Standard Review Plan,' (ESRP) for Consideration of the Effects of Greenhouse Gases and of Climate Change." April 8, 2010. ADAMS Accession No. ML100990185.

U.S. Nuclear Regulatory Commission. Memorandum from Brent Clayton, Branch Chief, to Scott C. Flanders, Division Director. "Subject: Revision 1 – Addressing the Construction and Preconstruction Activities, Greenhouse Gas Issues, General Conformity Determinations, Environmental Justice, the Need for Power, Cumulative Impact Analysis and Cultural/Historical Resources Analysis Issues in Environmental Impact Statements." March 4, 2011. ADAMS Accession No. ML110380369.

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<sup>1</sup> On March 4, 2011, NRO revised its memorandum based upon staff experience in issuing environmental impact statements. No significant changes were made in the revised memorandum.

**FEIS Question No. 10:** *On page 2-3, in the last paragraph, the FEIS states, “The primary facilities include...six cylinder storage pads...” On page 2-7, the FEIS states, “There would be three UF6 Cylinder Pads at the proposed GLE Facility...” What are the three other cylinder pads referred to on page 2-3?*

**Response No. 10 (K. Fischer):** The reference to six cylinder storage pads on page 2-3 is an isolated error. As described in Section 1.1.2.2 of the GLE license application, the proposed GLE Facility would have three outdoor cylinder pads (the Product Pad, In-Process Pad, and Tails Pad). Except for the isolated error on page 2-3, the FEIS consistently refers to the correct number of cylinder storage pads (three), and all associated conclusions in the FEIS are based on the correct number of cylinder pads.

**FEIS Question No. 11:** *Is the fresh water that could be potentially needed for cooling tower make up, as discussed on page 2-11, included in the 75,000 gal/day mentioned on page 4-27? If not, where is the impact of this make up water evaluated (if it is ultimately needed)?*

**Response No. 11 (J. Quinn):** As noted in Section 4.2.7.2 of the FEIS (on page 4-27), the proposed GLE Facility would require approximately 11,000 gallons per day (gpd) and 75,000 gpd from existing groundwater production wells to meet its potable and process water needs, respectively. The 75,000 gpd mentioned on page 4-27 (that would be required to meet the proposed GLE Facility’s process water needs) includes some of the water that might be needed to make up for water loss in the cooling tower discussed on page 2-11. The rest of the cooling tower makeup water that might be required for the proposed GLE Facility would come from treated sanitary discharge; as noted in Section 4.2.7.3 of the FEIS, treated sanitary wastewater effluent would be reused in site cooling towers.

The NRC staff concluded in the FEIS that the potentially-needed cooling tower makeup water would have a minimal impact because (1) as discussed on page 4-27, the estimated increase in drawdown resulting from the withdrawal of additional groundwater for use as process water by the proposed GLE Facility would be low in offsite areas, and the overall water needs would be less than in the 1990s, during which no water supply issues occurred; and (2)

obtaining cooling tower makeup water from the treated sanitary wastewater effluent would reduce the overall withdrawal from groundwater resources.

**FEIS Question No. 13:** *In evaluating the No-Action Alternative, the impacts in Table 2-3 do not appear to include electricity consumption. Did the NRC Staff consider the impact of electrical energy consumption (with its associated environmental impact)? In particular, if the separative work units were produced at other gas centrifuge facilities in the no-action case, was the potential difference in electrical energy usage considered? (EIS, 2-20 to 2-41)*

**Response No. 13 (J. Davis, H. Avci, K. Fischer):** The NRC Staff considered but did not discuss in the FEIS the impacts of electrical energy consumption (including its associated environmental impacts), and the potential difference in electricity usage, if enrichment were to occur under the no-action alternative at gas centrifuge facilities, for the following reasons. As discussed below, the NRC staff believes that the assessment in Table 2-3 is sufficient and that the impacts of electrical energy consumption are not significant enough to change the FEIS's conclusions. Moreover, as further discussed in response to FEIS Questions 9 and 15, a memorandum issued by the NRC's NRO, entitled "Supplemental Staff Guidance to NUREG 1555, 'Environmental Standard Review Plan,' (ESRP) for Consideration of the Effects of Greenhouse Gases and of Climate Change" (ML100990185),<sup>2</sup> and the NRC staff's analysis both support a conclusion that the impacts from direct and indirect consumption of electric energy for fuel cycle operations, like the proposed GLE Facility, would be small.

The NRC staff analyzed GHG emissions impacts in both regional and national contexts in the FEIS while attempting to focus on the most meaningful aspects of the proposed GLE Facility's operation. In determining which aspects of the proposed GLE Facility would be included in the FEIS's impact analysis, the staff reviewed available historical data on North Carolina and national GHG emissions. Although it might not be possible to specify the relative contributions from North Carolina electricity generation sources, it would be possible to calculate

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<sup>2</sup> On March 4, 2011, NRO revised its memorandum based upon staff experience in issuing environmental impact statements. No significant changes were made in the revised memorandum.



a hypothetical bounding condition for GHG emissions from electricity production by assuming all required power is generated by coal-fired power plants (the largest source of carbon dioxide emissions per unit of power produced among any of the existing utility-scale thermoelectric technologies).

As noted on page 1-2 of the FEIS, approximately 100,000 SWU per year of enriched uranium is required to fuel a typical 1000-megawatt commercial nuclear reactor; this equates to approximately 4 million SWUs over a 40-year operating lifetime of a commercial nuclear reactor. This required amount of enriched uranium, if produced by a gaseous diffusion plant (with a capacity of 6 million SWU per year) that was powered solely by coal-fired electricity (rather than gas centrifuge technology using any other source of electricity production) could produce approximately 25.5 million metric tons of GHGs annually (see NRC Staff's Responses to the Board's Third Set of Questions Regarding Environmental Matters in the AREVA Proceeding, pages 10-12 (ML111470598)). Because both gas centrifuge technology and the proposed GLE Facility's laser-based technology are expected to be less energy-intensive than gaseous diffusion, this is considered to be a bounding estimate.

#### References

U.S. Nuclear Regulatory Commission. Memorandum from Barry Zalzman, Senior Project Manager, to H. Brent Clayton, Branch Chief, "Subject: Supplemental Staff Guidance to NUREG 1555, 'Environmental Standard Review Plan,' (ESRP) for Consideration of the Effects of Greenhouse Gases and of Climate Change." April 8, 2010. ADAMS Accession No. ML100990185.

U.S. Nuclear Regulatory Commission. "NRC Prefiled Exhibit NRC000176, NRC Staff Responses to Licensing Board's Third Set of Questions Regarding Environmental Matters." May 27, 2011. ADAMS Accession No. ML111470598.

U.S. Nuclear Regulatory Commission. Memorandum from Brent Clayton, Branch Chief, to Scott C. Flanders, Division Director. "Subject: Revision 1 – Addressing the Construction and Preconstruction Activities, Greenhouse Gas Issues, General Conformity Determinations, Environmental Justice, the Need for Power, Cumulative Impact Analysis and Cultural/Historical Resources Analysis Issues in Environmental Impact Statements." March 4, 2011. ADAMS Accession No. ML110380369.

**FEIS Question No. 15:** *Why did the NRC Staff not consider electrical energy consumption in its comparisons between the laser-based and centrifuge technologies on Table 2-6 (or in another appropriate location)? (EIS, 2-55 to 2-64)*

**Response No. 15 (J. Davis, H. Avci, K. Fischer, Y.-S. Chang):** Table 2-6 of the FEIS (on pages 2-55 to 2-64) provides a qualitative comparison of the environmental impacts of the proposed GLE Facility's laser-based technology and gas centrifuge technology. The NRC staff did not discuss the electrical energy consumption of the proposed GLE Facility and gas centrifuge technology in Table 2-6 or elsewhere in the FEIS for the reasons discussed below in this response. Moreover, for the responses stated below, the NRC staff believes that the assessment in Table 2-6 and Section 4.2.18 of the FEIS is sufficient and that the comparative differences of energy consumption between the two technologies would not be significant enough to change the NRC staff's conclusions in the FEIS.

In the absence of NRC guidance specific to the issue of climate change as it relates to materials facilities, the NRC staff used guidance from the Council on Environmental Quality (CEQ) to perform the greenhouse gas (GHG) emissions analysis in Section 4.2.18 of the FEIS;<sup>3</sup> Section 4.2.18 provides an assessment of the effects that construction, operations, and decommissioning of the proposed GLE Facility are expected to have on emissions of carbon dioxide and other GHGs, and discusses how climate change would impact the operation of the GLE Facility. The NRC staff also consulted an Office of New Reactors (NRO) memorandum entitled "Supplemental Staff Guidance to NUREG 1555, "Environmental Standard Review Plan," (ESRP) for Consideration of the Effects of Greenhouse Gases and of Climate Change" (ML100990185), which clarifies how GHG emissions and climate change should be considered in the review of applications for Combined Licenses (COLs) for new reactors.<sup>4</sup> Further, the

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<sup>3</sup> Specifically, the NRC staff consulted CEQ's February 2010 draft guidance, "Consideration of the Effects of Climate Change and Greenhouse Gas Emissions," in its preparation of Section 4.2.18.

<sup>4</sup> On March 4, 2011, NRO revised its memorandum based upon staff experience in issuing environmental impact statements. No significant changes were made in the revised memorandum.

NRC staff used EPA-developed algorithms to develop the calculations supporting the analysis in Section 4.2.18.

The NRO memorandum estimates the carbon footprint of the fuel cycle to support a reference 1000 MW(e) light water reactor for a 40-year commercial nuclear power plant life. The NRO memorandum states that the largest use of electricity in the fuel cycle is associated with the enrichment process. However, this statement is based on an assumption in the NRO memorandum that the gaseous diffusion (GD) process will be used to enrich the uranium used in commercial reactors (see 10 CFR 51.51, “Table S-3 – Table of Uranium Fuel Cycle Environmental Data”). The NRO memorandum further states that gas centrifuge (GC) technology is likely to replace GD technology for uranium enrichment in the United States, and the same amount of enrichment from a GC facility uses less electricity, which would result in lower air emissions, including GHGs, than a GD facility. Despite assuming that GD technology will be used for enrichment, the NRO memorandum concludes that the fossil fuel impacts, including GHG emissions, from the direct and indirect consumption of electric energy for fuel cycle operations would be small. The NRO memorandum’s conclusion—that the fossil fuel impacts from the direct and indirect consumption of electric energy for fuel cycle operations, like the proposed GLE Facility, would be small even if GD technology, which uses more electricity than the proposed GLE Facility and GC technology, is used—is one of the bases for the NRC staff’s decision not to consider electrical energy consumption in Table 2-6 in the FEIS.

In addition, the NRC staff assumed that one of the contributors to the lower operating cost of the proposed GLE Facility would be lower energy consumption and that the energy requirements for the proposed laser-based GLE Facility would also be less than those of GD. These assumptions were based on information available to the NRC staff about the proposed GLE Facility offering certain advantages over both GD and GC technologies and having lower operating costs than GC technology (see page 1-9 of the FEIS).

Furthermore, the following analysis provides an additional basis for the NRC staff's decision not to consider electrical energy consumption in Table 2-6, by describing the potential GHG emissions from sources that would provide power to the proposed GLE Facility during operations. The power demand for the Eagle Rock Enrichment Facility (EREF), a 6.6 million separative work units (SWU) GC facility, is given as 78 Megawatts (MW) (see Response No. 22 in NRC Staff Responses to Licensing Board's Third Set of Questions Regarding Environmental Matters in the AREVA Proceeding). If it is assumed that the proposed GLE Facility would have similar power requirements per SWU as the EREF and the power demand would scale linearly with SWU, the power required for the proposed GLE Facility (6 million SWUs) would be about 70.9 MW. If one further assumes that (1) the power needed at the proposed GLE Facility would come from one or more coal power plants, (2) the proposed GLE Facility would run continuously for the entire year (8,760 hours), and (3) there was a 10% loss in transmitting electricity from the power plant(s) to the proposed GLE Facility, the electrical energy generated by the power plants for the proposed GLE Facility would be approximately 690,000 MW-h. A typical coal power plant produces about 2,135 pounds or 1 metric ton (MT) of CO<sub>2</sub> per MW-h of electrical energy that it generates (see page 4-141 of the EREF FEIS, NUREG-1945). As a result, the GHG gas emissions from the coal power plant(s) that would provide power to the proposed GLE Facility over one year would be approximately 690,000 MT CO<sub>2</sub> equivalent. The CO<sub>2</sub> equivalent gross emissions in North Carolina in 2005 and in the United States in 2007 were 192 teragrams CO<sub>2</sub> equivalent and 7,150 teragrams CO<sub>2</sub> equivalent, respectively (see pages 4-128 and 4-129 of the FEIS). Given that 1 teragram is equivalent to 1 million MT, the percent increase in the amount of GHG emissions in North Carolina and in the United States, due to the potential power needed at the proposed GLE Facility, would be about 0.36% and 0.0097%, respectively. This analysis suggests that, as concluded in the NRO memorandum, impacts from the proposed GLE Facility's electrical energy consumption would be small.

Based on these considerations, the information presented in this response and in response to FEIS Question 13 shows that neither the laser-based enrichment technology nor GC technology is obviously superior to the other, and that there would be no significant impacts from the electricity consumption from either of the two technologies. Therefore, the NRC staff believes that including a more detailed analysis of the proposed facility's carbon footprint for comparison to the carbon footprints of alternative technologies, like GC technology, would not have changed the NRC staff's conclusions in the FEIS, and the analysis in the FEIS was sufficient.

### References

Council on Environmental Quality. Draft Guidance, "Consideration of the Effects of Climate Change and Greenhouse Gas Emissions." February 23, 2010.

U.S. Nuclear Regulatory Commission. Memorandum from Barry Zalzman, Senior Project Manager, to H. Brent Clayton, Branch Chief, "Subject: Supplemental Staff Guidance to NUREG 1555, 'Environmental Standard Review Plan,' (ESRP) for Consideration of the Effects of Greenhouse Gases and of Climate Change." April 8, 2010. ADAMS Accession No. ML100990185.

U.S. Nuclear Regulatory Commission. Memorandum from Brent Clayton, Branch Chief, to Scott C. Flanders, Division Director. "Subject: Revision 1 – Addressing the Construction and Preconstruction Activities, Greenhouse Gas Issues, General Conformity Determinations, Environmental Justice, the Need for Power, Cumulative Impact Analysis and Cultural/Historical Resources Analysis Issues in Environmental Impact Statements." March 4, 2011. ADAMS Accession No. ML110380369.

U.S. Nuclear Regulatory Commission. "Environmental Impact Statement for the Proposed Eagle Rock Enrichment Facility in Bonneville County, Idaho, Final Report" NUREG-1945. February 2011. ADAMS Accession Nos. Vol. 1 ML11014A005, Vol. 2 ML11014A006.

U.S. Nuclear Regulatory Commission. "NRC Prefiled Exhibit NRC000176, NRC Staff Responses to Licensing Board's Third Set of Questions Regarding Environmental Matters." May 27, 2011. ADAMS Accession No. ML111470598.

**FEIS Question No. 16:** *In the Waste Management area of Table 2-6, the FEIS states “the amount of waste generated by a gas centrifuge facility during operations is estimated to be considerably less than the proposed GLE Facility. The potential difference could be on the order of a factor of two for LLW [low-level waste] and hazardous waste, and a factor of five or six for solid non-radioactive/nonhazardous waste.” What are the primary reasons for the increased generation of waste in the GLE facility as compared to a gas centrifuge facility? (EIS, 2-62)*

**Response No. 16 (H. Avci):** As stated in Table 2-6 on page 2-62 of the FEIS, the NRC staff concluded that the amount of waste generated by a gas centrifuge facility during operations is estimated to be considerably less than the proposed laser-based GLE Facility. In order to determine the differences between laser-based enrichment technology and gas centrifuge technology with regard to waste generation and management, the NRC staff compared the anticipated waste generation rates provided in GLE’s Environmental Report to those provided by recent applicants for gas centrifuge facilities (i.e., United States Enrichment Corporation, Louisiana Energy Services, and AREVA Enrichment Services, LLC). Based on this comparison, the NRC staff concluded that the estimated annual waste generation rates for the proposed GLE Facility would not be less than those for gas centrifuge facilities with comparable capacity (i.e., in terms of equivalent amount of SWUs). As shown in Tables 1 and 2 following this response, the waste generation rates appear to be greater for the proposed GLE Facility in comparison to these gas centrifuge facilities.

The NRC staff is not, however, aware of the technological reasons that could explain why laser-based enrichment technology, such as the proposed GLE Facility, would result in increased generation of waste as compared to a gas centrifuge facility. The NRC staff did not investigate the potential technological reasons that could explain this increased generation of waste for several reasons discussed below. Even though the estimated waste generation rates at all of these facilities (i.e., the proposed GLE Facility and the gas centrifuge facilities identified in the attached tables) were different, they were not large enough to have more than a small impact on the available waste management systems. Furthermore, the technological reasons responsible for the different waste generation rates among the facilities did not seem to be

critical to the NRC staff's National Environmental Policy Act (NEPA) review; rather, the environmental impacts from the proposed GLE Facility and the significance of these impacts were the focus of the NRC staff's NEPA review. As discussed in Section 4.2.12 of the FEIS, the NRC staff concluded that the waste-related impacts from the proposed GLE Facility would be SMALL.

#### References

AREVA Enrichment Services, LLC. "Eagle Rock Enrichment Facility Environmental Report, Rev. 2." Bethesda, Maryland. April 2010. ADAMS Accession No. ML101610549.

GE-Hitachi Global Laser Enrichment LLC. "Environmental Report for the GLE Commercial Facility, Revision 0." December 2008. ADAMS Accession No. ML090910573.

U.S. Nuclear Regulatory Commission. "Environmental Impact Statement for the Proposed Eagle Rock Enrichment Facility in Bonneville County, Idaho, Final Report," NUREG-1945. February 2011. ADAMS Accession Nos. Vol. 1 ML11014A005, Vol. 2 ML11014A006.

U.S. Nuclear Regulatory Commission. "Environmental Impact Statement for the Proposed American Centrifuge Plant in Piketon, Ohio, Final Report," NUREG-1834. April, 2006. ADAMS Accession Nos. Vol. 1 ML061250131, Vol. 2 ML061250101.

U.S. Nuclear Regulatory Commission. "Environmental Impact Statement for the Proposed National Enrichment Facility in Lea County, New Mexico, Final Report," NUREG-1790. June 2005. ADAMS Accession Nos. Vol. 1 ML051730238, Vol. 2 ML051730292.

**Table 1  
Estimated Annual Waste Generation Rates in GLE Facility and EREF (MT/yr)**

<b>Waste Type</b>	<b>GLE (6 Million SWUs)</b>	<b>EREF (6.6 Million SWUs)</b>	<b>EREF (Scaled<sup>(a)</sup> to 6 Million SWUs)</b>
Municipal Solid Waste	345	Not specifically provided <sup>(b)</sup>	
Nonhazardous Industrial Waste	97	70.3	63.9
RCRA Hazardous Waste	11	5.1	4.6
Low-level Radioactive Waste	313	146.5	133.2

Sources:

GLE: GLE Environmental Report, Table 4.13-3 and GLE EIS Table 4-25

EREF: AREVA Enrichment Services (AES) ER, Section 3.12.2 and EREF FEIS Section 4.2.11.2

(a) The waste generation numbers have been scaled linearly with SWUs. It is not clear that the waste generation rate would scale exactly linearly with the SWU capacity, but for the purposes of this analysis, the assumption is believed to be reasonable.

(b) The EREF EIS (NUREG-1945) mentions only solid nonradioactive waste and gives the annual generation rate as 75.369 MT/yr, including 5.062 MT/yr of hazardous waste. The AES ER states “approximately 70.3 MT/yr of industrial waste including miscellaneous trash, filters, resins, and paper will be generated by EREF.” The AES ER separately lists the Resource Conservation and Recovery Act (RCRA) hazardous waste generation rate as 5.062 MT/yr.



**Table 2  
Estimated Annual Waste Generation Rates in GLE and  
NEF and ACP Enrichment Facilities**

<b>Waste Type</b>	<b>GLE (6 Million SWUs)</b>	<b>NEF (3 Million SWUs)</b>	<b>NEF (Scaled to 6 Million SWUs)</b>	<b>ACP (3.8 Million SWUs)</b>	<b>ACP (Scaled to 6 Million SWUs)</b>
Municipal Solid Waste	345 MT	Not specifically provided		Not specifically provided	
Nonhazardous Industrial Waste	97 MT	170	340	250-300 MT (including 9- 11 m <sup>3</sup> of classified waste )	400-470 MT (including classified waste)
RCRA Hazardous Waste	11 MT	1,900 L Liquid	3,800 L Liquid	2-3 m <sup>3</sup>	3-5 m <sup>3</sup>
Low-level Radioactive Waste	313 MT	87 MT	174 MT	190-370 m <sup>3</sup> (including 12-15 m <sup>3</sup> of classified waste and 9- 11 m <sup>3</sup> of mixed waste)	300-580 m <sup>3</sup> (including classified waste and mixed waste)

Sources:

NEF: NEF FEIS (NUREG-1790), Section 4.2.14.2

ACP: ACP FEIS (NUREG-1834), Table 2-6

**FEIS Question No. 17:** *On page 4-99 under the first bullet under “Mitigation Measures Identified by GLE,” the FEIS states, “Select the laser enrichment process over . . . gas centrifuge technologies, which would reduce the amount of waste generated for production of the same amount of enriched product.” This seems to contradict the statement on page 2-62 referred to in the previous question. Explain this apparent conflict. (EIS, 2-62, 4-99)*

**Response No. 17 (H. Avci):** The NRC staff stated on page 2-62 of the FEIS (in Table 2-6) that the amount of waste generated by a gas centrifuge facility during operations is estimated to be considerably less than the proposed laser-based GLE Facility. As explained in response to the previous question (FEIS Question 16), in order to assess the differences between laser-based enrichment technology and gas centrifuge technology with regard to waste generation and management, the NRC staff compared the anticipated waste generation rates provided in GLE’s Environmental Report to those provided by recent applicants for gas centrifuge facilities (i.e., United States Enrichment Corporation, Louisiana Energy Services, and AREVA Enrichment Services, LLC). Based on this comparison, the NRC staff found that the estimated annual waste generation rates for the proposed GLE Facility would not be less than those of gas centrifuge facilities with comparable capacity (i.e., in terms of equivalent amount of SWUs). As shown in the tables that follow the response to FEIS Question 16, the waste generation rates appear to be greater for the proposed GLE Facility in comparison to gas centrifuge facilities.

This conclusion on page 2-62 (in Table 2-6) is not contradicted by the first bullet on page 4-99 because the FEIS on page 4-99 (and in Table 5-1) lists the mitigation measures that GLE proposed in its Environmental Report with regard to waste generation and management, and describes those mitigation measures as proposed by GLE. The first bullet on page 4-99 states that GLE proposes to “[s]elect the laser enrichment process over . . . gas centrifuge technologies, which would reduce the amount of waste generated for production of the same amount of enriched product.” The mitigation measure identified in this first bullet on page 4-99 is described as it was proposed by GLE, and thus the portion regarding laser-based enrichment technology resulting in less waste than gas centrifuge technology is an observation noted by GLE in the context of this proposed mitigation measure and is not an observation necessarily

endorsed by the NRC staff. Accordingly, there is no contradiction between the statements on page 2-62 and page 4-99 of the FEIS.

**FEIS Question No. 18:** *Downblended highly enriched uranium (HEU) is eliminated in the NRC Staff's analysis as a source of enrichment services for reasons of viability, reliability, and competition. In the Shaw AREVA MOX Services (Mixed Oxide Fuel Fabrication Facility) case, the NRC Staff supported an application for a facility producing downblended HEU. Explain why downblending HEU is not considered a viable or reliable alternative and is not considered in the alternatives analysis. (EIS, 2-50)*

**Response No. 18 (H. Avci):** The reasons for eliminating the downblending of highly enriched uranium (HEU) as a viable or reliable alternative source of low-enriched uranium (LEU) for commercial nuclear power reactors are the following: (1) this alternative would not satisfy the U.S. national energy security policy objective of having a domestic supply of enriched uranium; and (2) sufficient quantities of HEU are not available for the commercial nuclear power reactors in the U.S., as discussed in the next paragraph.

As discussed in Section 1.3.1 of the FEIS, the Megatons-to-Megawatts Program, which uses foreign-origin HEU for downblending and provides about 37 percent of U.S. demand for enriched uranium, is expected to expire by 2013. In addition, the quantities of domestic-origin HEU for downblending are determined by the National Nuclear Security Administration (NNSA). Recent NNSA estimates indicate that a total of 209 metric tons (MT) of U.S.-origin HEU has been declared surplus to U.S. defense needs and designated for downblending. To date, more than half of this HEU has been downblended. If one assumes that approximately 100 MT of HEU remains for downblending in the U.S., and that the enrichment level of the HEU is 90%, the equivalent quantity of LEU with an enrichment level of 5% would be approximately 1,800 MT. A typical commercial reactor uses approximately 20 MT of LEU per year for fuel (p. 14 of the Blue Ribbon Commission on America's Nuclear Future Report). At that rate, the LEU requirement for a commercial reactor over a 40-year lifetime would be 800 MT. If the reactor is granted a license renewal, the amount of LEU needed to operate one reactor over a 60-year

lifetime would be about 1,200 MT. Therefore, the currently available surplus HEU in the U.S. (an equivalent of approximately 1,800 MT of LEU) could provide enough fuel for only one or two commercial reactors, depending on the lifetime of the reactors.

The Mixed Oxide Fuel Fabrication Facility (MOX FFF) uses surplus plutonium and depleted uranium dioxide to make MOX fuel that could be used at commercial nuclear power reactors authorized to use such fuel. The MOX FFF does not downblend HEU. Also, the MOX FFF was intended only to fulfill U.S. non-proliferation objectives—in particular, as part of DOE's strategy to address the U.S. stockpile of surplus plutonium to make sure that it is not able to be used in nuclear weapons. The MOX FFF was not intended to have commercially viable operations outside of its DOE non-proliferation objectives.

Further, the amount of surplus plutonium that was considered within the scope of the FEIS for the MOX FFF was 34 MT. The final blend for the MOX fuel would have a plutonium content of 2.3% to 4.8%. As a result, the total amount of MOX fuel produced by the MOX FFF would be approximately 700 – 1500 MT. In light of these quantities, and because the majority of the commercial reactors operating in the U.S. (and all of the current designs for new commercial reactors) are not proposing to use MOX fuel, the NRC staff concluded that using MOX fuel, instead of LEU, for commercial reactors was not a viable or reliable alternative, and thus the NRC staff did not analyze it in the FEIS's alternatives analysis.

### References

National Nuclear Security Administration. "Surplus U.S. Highly Enriched Uranium (HEU) Disposition." <http://nnsa.energy.gov/aboutus/ourprograms/nonproliferation/programoffices/fissilematerialsdisposition/surplusheudispositio>.

U.S. Nuclear Regulatory Commission, "Environmental Impact Statement on the Construction of a Proposed Mixed Oxide Fuel Fabrication Facility at the Savannah River Site, South Carolina." NUREG-1767. January 2005. ADAMS Accession Nos. Vol. 1 (ML050240233), Vol. 2 (ML050240250).

Blue Ribbon Commission on America's Nuclear Future, Report to the Secretary of Energy, January 2012. <http://brc.gov/>.

**FEIS Question No. 19:** *Regarding the groundwater contamination discussed on pages 3-41 to 3-43, what was the most recent discovery of contamination on the site? Have contamination levels of all compounds declined since monitoring began? Are there any concerns about undiscovered groundwater contamination? In what ways could GLE construction and operation exacerbate existing problems? Specifically, what will be the effects of increased groundwater usage on groundwater quality? Will greater groundwater use affect the natural attenuation that is helping to clean up existing groundwater contamination? (EIS, 3-41 to 3-43)*

**Response No. 19 (J. Quinn):** The NRC staff is not aware of any new discoveries of groundwater contamination that have occurred since the 1990s, as discussed on pages 3-41 to 3-43 of the FEIS. The most recent discovery of groundwater contamination was the 1996 acid tank containment breach at the Fuel Components Operation (FCO) Cleanroom Area.

As described on pages 3-41 to 3-43, concentrations of groundwater contaminants have generally been stable or decreasing since monitoring began. The reference (RTI, 2008b) cited in the FEIS attributes the increases in the concentrations of groundwater contaminants observed in some wells to movement of a plume toward particular monitoring wells as a result of the drawdown caused by extraction wells. The extraction wells are used both for hydraulic containment of contaminated groundwater and as a means of supplying process water for the Wilmington Site's operations.

Although an industrial facility, such as those on the Wilmington Site, has the potential to contaminate groundwater due to a leak or spill, the NRC staff does not have any basis for suspecting undiscovered groundwater contamination.

The NRC staff has considered the increased groundwater use expected during the construction and operation of the proposed GLE Facility at the Wilmington Site and has concluded that the impacts on water use and water quality would be SMALL. Construction and operation of the proposed GLE Facility are not expected to have a significant effect on groundwater quality or natural attenuation. As described on pages 3-40 and 3-41 of the FEIS, the Wilmington Site's potable supply wells are located east of Castle Hayne Road (NC Route

133). Because of the distance and the orientation of hydraulic gradients, increased pumping of the potable supply wells for the proposed GLE Facility would not have a significant effect on water levels at the remediation sites. As described on page 3-41, the extraction wells currently withdraw 565,000 gallons per day at the remediation sites, and the extracted groundwater is treated and used as process water at the Wilmington Site. As described on page 4-27, to support the proposed GLE Facility, the extraction wells would increase their withdrawal by 75,000 gallons per day to satisfy the proposed GLE Facility's process water needs. Increased withdrawal at the remediation sites could be expected to increase the flushing of particular contaminants, thereby promoting one aspect (dilution) of natural attenuation while satisfying site operation requirements. In conclusion, the increased groundwater pumping for potable and process water associated with the proposed GLE Facility is not expected to result in groundwater quality issues, and increased groundwater use has the potential to increase natural attenuation processes.

#### Reference

Research Triangle Institute. "2006-2007 Report of Organic Compounds in Groundwater, General Electric/Global Nuclear Fuel Site Wilmington, North Carolina." RTI Project No. 0600002.000.003. December 2008. ADAMS Accession No. ML091820023.

**FEIS Question No. 20:** *Explain how the NRC Staff derived the assumption that the contributions to impacts are 50 percent during preconstruction and 50 percent during construction. (EIS, 4-3 to 4-4)*

**Response No. 20 (D. O'Rourke):** The rationale for concluding in Section 4.2.1.1 of the FEIS that the distribution of impacts between preconstruction and construction activities would be 50/50 is primarily based on the following considerations. Preconstruction activities would alter the land cover and construction would introduce new structures in the project area. In both instances, the land use would be affected but would remain within the approved zoning for the area, which is the primary metric for determining land use impacts. Because both activities

would have an effect but neither effect would be significant, the NRC staff determined, based on its professional judgment, the distribution of effects to be 50/50.

**FEIS Question No. 21:** *The assumption that a licensing decision will be made by June 2012 is no longer realistic. Discuss what, if any, consequences result from a later licensing decision. (EIS, 4-2)*

**Response No. 21 (K. Fischer, Y.-S. Chang):** As noted in Section 4.1 (page 4-2), Section 4.2.4 (page 4-8), Section 4.2.13.1 (page 4-103), and Section 7.1 (page 7-2), any changes in the licensing and construction schedule for the proposed GLE Facility could cause slight changes to certain analyses in the FEIS, but would not affect the FEIS's overall conclusions regarding impacts on the affected resource areas. On October 5, 2011, the Atomic Safety and Licensing Board issued its Fourth Revised Scheduling Order indicating that it will issue a licensing decision by August 28, 2012, not by June 2012 as assumed in the FEIS based on the Commission's Notice of Hearing (75 Fed. Reg. 1,819 (Jan. 13, 2010)). The NRC staff believes that such a delay would not affect the overall impact conclusions reached in the FEIS. The impacts in the resource areas discussed in the FEIS would simply be delayed.

Because the modeling of air quality impacts during preconstruction and construction includes conservative assumptions about the duration and timing of certain activities (see Section 4.1, pages 4-8 to 4-16, of the FEIS), a delay in the licensing decision or project schedule could affect the FEIS's air impacts analysis, as such delay could result in preconstruction and construction activities being performed during a different part of the calendar year. For the air quality impact analysis, road construction (a preconstruction activity) is assumed to occur during the two consecutive months of the year that result in the highest annual average air quality impacts (i.e., January and February); this assumption represents a bounding condition in the FEIS's analysis. If road construction activities are performed at any other time of the calendar year (i.e., other than during those two months), it would likely reduce the level of air quality impacts.

**FEIS Question No. 22:** *Twenty-four hour concentrations of particulate matter are predicted to exceed air quality standards during preconstruction and construction phases. How widespread will this decrease in air quality be? What effects are expected on the residents of the Wooden Shoe residential subdivision? (EIS 4-13)*

**Response No. 22 (Y.-S. Chang):** The worst-case concentrations of 24-hour total (background plus contribution from the proposed GLE Facility) particulate matter (PM), including coarse particulate matter (PM<sub>10</sub>) and fine particles (PM<sub>2.5</sub>), associated with land clearing activities are predicted to exceed the respective National Ambient Air Quality Standards (NAAQS) at the proximate northern boundary of the Wilmington Site near the proposed GLE Facility (less than 50 meters [164 feet] from the boundary). Comparably high PM concentrations are also predicted at the northern site boundary near the Wooden Shoe residential subdivision, close to which the North access road would be located (about 25 meters [82 feet] from the boundary). The high PM concentrations at the Wooden Shoe residential subdivision would result primarily from fugitive dust emissions during vehicle traffic on unpaved roads during the land clearing phase. On average, up to 2 and 3 days per year are predicted to have NAAQS exceedances for PM<sub>10</sub> and PM<sub>2.5</sub>, respectively, at residences adjacent to the North access road in the Wooden Shoe subdivision during the land clearing phase. As shown in Figure 1a (following this response), worst-case 24-hour total PM<sub>10</sub> concentrations (background plus *highest* concentrations from emissions related to the proposed action) over the NAAQS level during land clearing could reach approximately 0.6 mile (1.0 kilometer) from the Wilmington Site boundary near the proposed GLE Facility and about 0.3 mile (0.5 kilometer) from the northern site boundary near the Wooden Shoe residential subdivision. The concentration contours in Figure 1 represent the highest concentrations at each receptor over the modeling period, not an instantaneous 24-hour average for any single day. The worst-case total 24-hour concentration contours for PM<sub>2.5</sub> are wider than for PM<sub>10</sub>, but distances to the 24-hour NAAQS level are similar to that for PM<sub>10</sub>.



During building construction, predicted 24-hour total PM concentrations would exceed their respective NAAQS beyond the site boundary, mostly to the north of the proposed GLE Facility. However, an average of less than one exceedance per year is anticipated to occur in the Wooden Shoe residential subdivision because the subdivision is about 0.8 mile (1.3 kilometer) east of the proposed GLE Facility site, just off the prevailing southwesterly winds, and because the North access road would be paved at the conclusion of the land clearing phase. As shown in Figure 1b (following this response), the worst-case 24-hour total concentration contours for PM<sub>10</sub> during building construction are smaller than during land clearing, but the distances to the NAAQS level are similar. The same is true for PM<sub>2.5</sub> during land clearing and building construction.

PM<sub>10</sub> and PM<sub>2.5</sub>, which are particles with aerodynamic diameters of 10 µm or less and 2.5 µm or less, respectively, are likely responsible for adverse health effects because of their ability to reach the lower regions of the respiratory tract and to penetrate deep into the lung. Frequent and prolonged exposure to higher PM concentrations (e.g., over the NAAQS) could result in increased hospital admissions for respiratory and cardiovascular diseases, decreased lung function, premature death with heart and lung disease, and other health impacts (EPA, 2012a). The elderly, children, and people with chronic lung disease, influenza, or asthma are especially sensitive to the effects of particulate matter.

To link total PM concentration levels to potential health effects, the U.S. Environmental Protection Agency (EPA) established the air quality index (AQI) to characterize short-term air quality for a given area (EPA 2012b). The AQI, which is determined with respect to the NAAQS, ranges from 0 to 500. An AQI value of 100 generally corresponds to the NAAQS levels for major air pollutants that EPA has established to protect public health with an adequate margin of safety. A higher AQI value indicates a greater level of air pollution and potential health concern.

PM<sub>10</sub>: During land clearing, one occurrence per year would fall within an AQI of 101-150 (unhealthy for sensitive groups; people with heart or lung disease, older adults, and children should reduce prolonged or heavy exertion); one occurrence every other year would fall within an AQI of 151-200 (unhealthy; people with heart or lung disease, older adults, and children should avoid prolonged or heavy exertion; everyone else should reduce prolonged or heavy exertion); one occurrence every four years would fall within an AQI of 201-300 (very unhealthy; people with heart or lung disease, older adults, and children should avoid all physical activity outdoors; everyone else should avoid prolonged or heavy exertion); and no higher AQIs are anticipated. During building construction, one occurrence every four years would fall within an AQI of 101-150 (unhealthy for sensitive groups), and higher AQIs (over 151) are predicted to occur only at residences adjacent to the site boundary.

PM<sub>2.5</sub>: During land clearing, 1.25 occurrences per year would fall within an AQI of 101-150 (unhealthy for sensitive groups), but no higher AQIs are anticipated. During building construction, one occurrence every four years would fall within an AQI of 101-150 (unhealthy for sensitive groups), and no higher AQIs are anticipated.

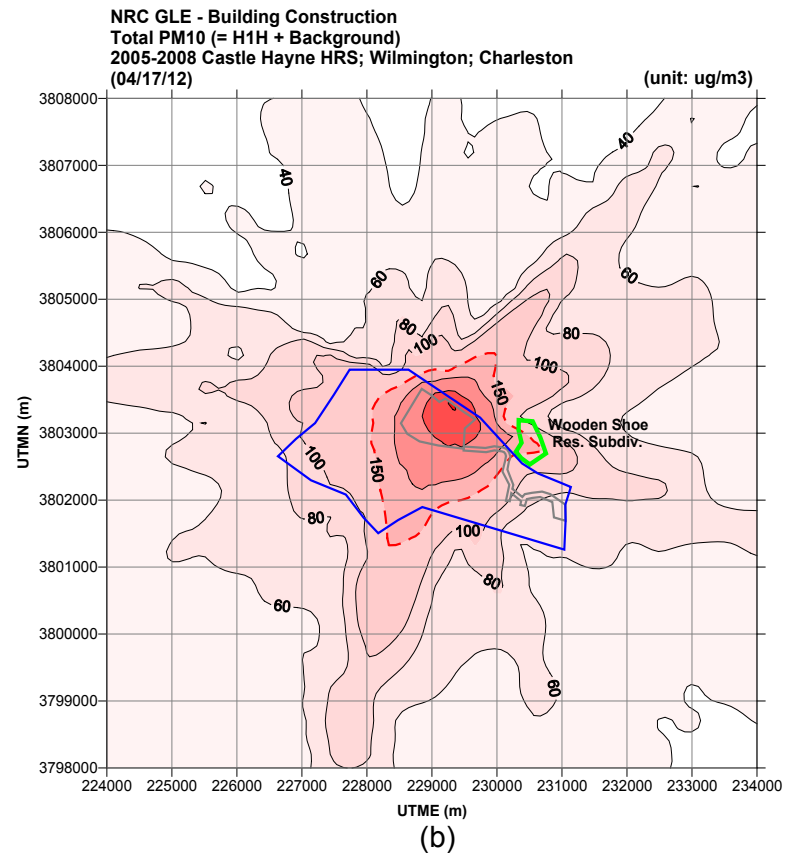
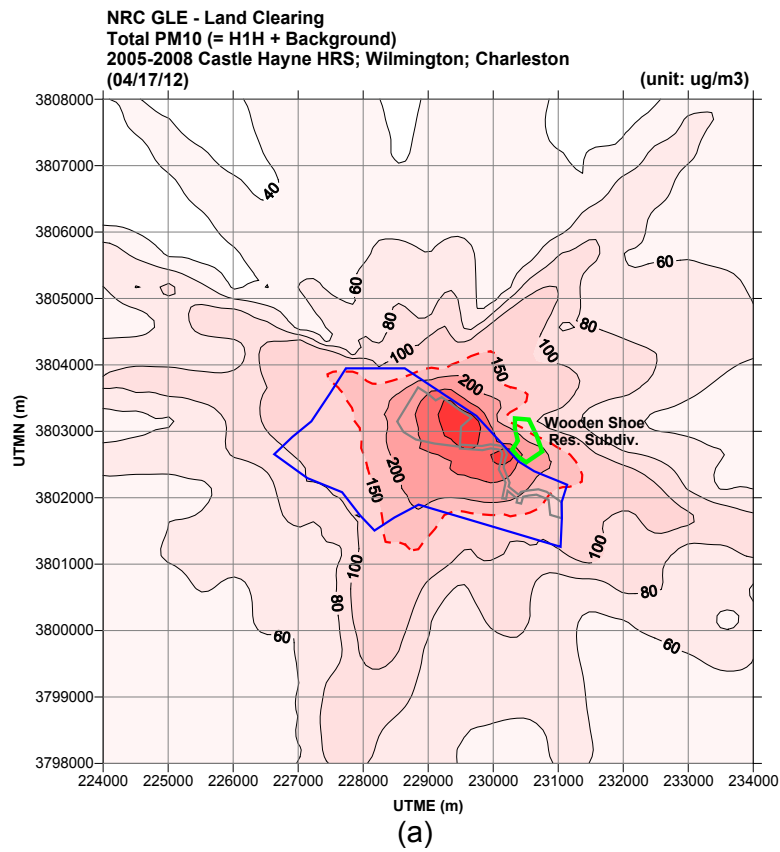
It should be noted that exceedances of NAAQS from construction activities are common at construction sites and surrounding areas. Actual PM concentration levels for residents in the Wooden Shoe residential subdivision would be lower than those presented in the FEIS due to the conservative modeling assumptions used in the FEIS, such as the assumption that the entire 149 acres (60 hectares) and 117 acres (47 hectares) would be continuously disturbed during land clearing and building construction, respectively. In addition, these 24-hour PM NAAQS exceedances are predicted to occur infrequently, as discussed above. Exceedances are predicted to occur from late fall to early spring because of the high concentrations during the early morning hours (which typically feature low winds, stable atmosphere, and relatively low mixing heights). High PM concentration levels could be reduced through implementation of

mitigation measures, including those proposed by GLE and those identified by the NRC staff in Section 4.2.4.3 of the FEIS.

### References

(EPA, 2012a) U.S. Environmental Protection Agency. *Particulate Matter (PM) -- Fact Sheet: Proposal to Revise the National Ambient Air Quality Standards for Particulate Matter*. <<http://www.epa.gov/airquality/particlepollution/fs20051220pm.html>> (Accessed April 16, 2012; last updated March 23, 2012).

(EPA, 2012b) U.S. Environmental Protection Agency. *Air Quality Index (AQI) - A Guide to Air Quality and Your Health*. <<http://www.airnow.gov/index.cfm?action=aqibasics.aqi>> (Accessed April 17, 2012; last updated December 9, 2011).



**Figure 1**  
**Worst-Case 24-hour Total PM<sub>10</sub> Concentrations (Background plus *Highest* Concentrations from Emissions Related to the Proposed Action) during (a) Land Clearing Phase and (b) Building Construction Phase**

**FEIS Question No. 23:** *On page 4-18, the NRC Staff recommends that “best available practices should be implemented” in order “to minimize potential air quality impacts.” What are these practices? What will the impacts be if GLE does not institute these practices? (EIS, 4-18)*

**Response No. 23 (Y.-S. Chang):** The term “best available practices” (as used on page 4-18 of the FEIS) was intended to be a general term referring to the many currently-available standard air emission control practices and devices that can be used to reduce air emissions. This general term was intended to include GLE’s proposed mitigation measures and the NRC’s identified mitigation measures that could reduce air quality impacts, any other mitigation measures that could be required by other regulatory agencies, as well as any other standard practices and devices that could reduce air emissions. As noted in Section 4.2.4.3 of the FEIS, GLE proposed to use emission control practices that are widely used in industrial projects. By stating in the FEIS that “best available practices should be implemented,” the NRC staff intended to encourage, in general terms, GLE to implement standard air emission control practices and devices to reduce air emissions.

The following paragraph discusses the impacts that could occur if GLE does not institute the “best available practices” referenced on page 4-18. The air impacts analysis in the FEIS assumes that all mitigation measures proposed by GLE would be implemented. Therefore, if GLE does not institute these proposed mitigation measures, ambient air concentrations could be higher than estimated in the FEIS and could exceed the National Ambient Air Quality Standards (NAAQS) more frequently at the site boundary and neighboring areas than predicted in the FEIS (mostly due to fugitive particulate matter emissions). As noted in the NRC staff’s response to FEIS Question 22, ambient air concentrations exceeding the NAAQS have the potential to cause adverse impacts on human health and the environment. In contrast, the ambient air concentrations estimated in the FEIS would not be impacted if GLE does not implement any best available practices other than its proposed mitigation measures (i.e., the NRC’s identified mitigation measures that could reduce air quality impacts, other mitigation measures that could be required by other regulatory agencies, or any other standard practices

and devices that could reduce air emissions) because the impact analysis in the FEIS does not presume that GLE would implement any mitigation measures other than the ones that it proposed in its Environmental Report.

**FEIS Question No. 25:** *Clarify in more detail the significance of Table 4-5. In particular, explain the relationships of the columns with one another. (EIS, 4-31)*

**Response No. 25 (W. Vinikour):** Table 4-5 of the FEIS presents the acreage (i.e., total number of acres) of various types of habitats (also referred to as plant communities) that could be potentially impacted by preconstruction and construction activities planned for the proposed GLE Facility and associated facilities (i.e., the proposed North access road and various utility structures). The column labeled “Proposed Action” lists the three categories of preconstruction and construction activities: those planned for the proposed GLE Facility, those planned for the proposed North access road, and those planned for the proposed utility structures, which are described in footnote D in Table 4-5.

The column labeled “Plant Community” identifies the types of habitats that could be impacted by each category of preconstruction and construction activities. For instance, the types of habitats that could be impacted by the preconstruction and construction activities planned for the proposed GLE Facility include the operations area, pine forest, pine-hardwood forest, and pine plantation. Table 3-12 on page 3-48 of the FEIS describes the characteristic plant species that occur in the plant communities.

The “Area” column in Table 4-5 lists the total number of acres of each habitat listed in the “Plant Community” column that could potentially be impacted by each category of preconstruction and construction activities. The “Percent of Plant Community on Wilmington Site” column provides the percent of the total acreage of that type of habitat that exists within the entire Wilmington Site that could be potentially impacted. For example, the second row of Table 4-5 indicates that 51 acres of pine forest could be potentially impacted by the

preconstruction and construction activities planned for the proposed GLE Facility and this acreage (the 51 potentially-affected acres) represents 17 percent of all the pine forest habitat that exists within the Wilmington Site.

Finally, the “Plant Community” column includes a “Subtotal” row, which indicates the total number of acres (for all the plant communities) that could be impacted by each category of preconstruction and construction activities. The last row in Table 4-5 contains the total number of acres that could be impacted by preconstruction and construction activities.

**FEIS Question No. 26:** *Was there any investigation of how GLE construction and operation may affect active nearby red-cockaded woodpecker (RCW) groups beyond habitat protection? For example, will they be harmed by noise, dust, and other increased human activity in the area? How would the generalized discussion of dust impacts to wildlife translate to the woodpecker groups neighboring the site and the well-documented responses of birds to disturbances generally? (EIS, 4-35 to 4-36) If so, can anything be done to mitigate impacts?*

**Response No. 26 (W. Vinikour):** Yes, the NRC staff did investigate how construction and operation of the proposed GLE Facility could potentially impact the active red-cockaded woodpecker (RCW) groups, including considering whether the RCWs would be harmed by the increased noise, dust, and other disturbances caused by construction and operation of the proposed GLE Facility. Potential impacts to RCWs are addressed in Section 4.2.8.1, pages 4-46 through 4-47, of the FEIS. Dust, noise, and other disturbances (i.e., those not discussed in Section 4.2.8.1 of the FEIS) associated with the proposed GLE Facility, including those caused by preconstruction and construction activities and by operation of the proposed facility, would not occur at the closest active RCW colony site, which is located 8 km (5 mi) northeast of the Wilmington Site. Noise and dust impacts are generally limited to within about 1 kilometer of a source. Standard mitigation to control dust and noise would ensure that noise and dust impacts are localized (see Sections 4.2.4.3 and 4.2.8.3 of the FEIS). Therefore, the NRC staff concluded that the increased dust, noise, and other disturbances associated with the proposed GLE Facility would not impact the nearby RCWs, and thus did not discuss specific impacts from

noise, dust, and other disturbances on RCWs in the FEIS. The NRC staff concluded that the generalized discussion of dust, noise, and other impacts to wildlife associated with increased human activities, including the responses of birds to such disturbances, would not apply to the RCWs as they are too spatially removed from the proposed GLE Facility site to be impacted.

**FEIS Question No. 27:** *Did the NRC Staff consider how noise from preconstruction and construction activities may impact the threatened, endangered, and other special status species relevant to this site? (EIS, 4-36 to 4-37, 4-40 to 4-48)*

**Response No. 27 (W. Vinikour):** The NRC staff did consider the potential impacts of noise from preconstruction and construction activities on special status species, including both Federally- and State-listed threatened and endangered species. The potential impacts of noise on wildlife, including special status species, would be limited to several hundred meters from the location of preconstruction and construction activities. Additionally, standard mitigation to control noise would ensure that noise impacts on wildlife, including special status species, are localized (see Sections 4.2.4.3 and 4.2.8.3 of the FEIS). Noise impacts to the Federally-endangered red-cockaded woodpecker (the only Federally-listed threatened or endangered animal species observed within 3.2 kilometers of the Wilmington Site) would be negligible because this species does not occur close to the proposed GLE Facility site. For instance, the closest active red-cockaded woodpecker family group is 8 kilometers northeast of the Wilmington Site, and individual red-cockaded woodpecker birds have been observed within 3.2 kilometers of the western border of the Wilmington Site (more than several hundred meters from the proposed GLE Facility). The only State-listed threatened or endangered wildlife species expected to potentially occur close to the proposed GLE Facility site are several snake species (see Table 3-15, pages 3-74 through 3-84, of the FEIS). Because snakes do not hear, they are not directly affected by noise. Most of the other special status species do not occur near the site of the proposed GLE Facility. The few species that may occur near the proposed GLE Facility (e.g., several bat species and the Eastern fox squirrel) would either forage near the site



when noise is not an issue (e.g., the bats at night) or are adapted to human activities (e.g., the fox squirrel). Therefore, the NRC staff concluded that noise from preconstruction and construction activities for the proposed GLE Facility would not impact special status species, and thus did not discuss specific impacts from noise on special status species in the FEIS.

**FEIS Question No. 29:** *The FEIS discusses noise level impacts in terms of decibels above ambient levels. Is there any machinery anticipated to be used during the construction or operation of GLE likely to produce an impact of sound in frequencies outside the range of human hearing such that it would cause discomfort/disruption to humans and/or wildlife? (EIS, 4-57 to 4-62)*

**Response No. 29 (Y.-S. Chang, W. Vinikour):** At this time, the NRC staff does not anticipate that there is any machinery that would be used during the construction or operation of the proposed GLE Facility that is likely to produce sound in frequencies outside the range of human hearing such that it would cause discomfort or disruption to humans or wildlife. However, the NRC staff does not have specific information at this time regarding the types of heavy equipment or machinery that would be used during the life of the proposed GLE Facility, including the construction, operation, and decommissioning phases. Even without this specific information, the NRC staff does not anticipate that there is any machinery that would likely produce sound in frequencies outside the range of human hearing at the proposed GLE Facility, such that it would cause discomfort or disruption to humans or wildlife, for the following reasons. In general, heavy equipment and machinery typically used in industrial facilities and during construction (e.g., excavators, front end loaders, and caterpillar scrapers) have spectra of broadband noises ranging from infrasonic to ultrasonic, but the sound energy from this equipment and machinery is mostly concentrated in the human-hearing range when adjusted to the human-hearing sensitivity. In most cases, 1/1 or 1/3 octave-band level data from heavy equipment or on- and off-road vehicles are available for frequency ranges from 20 Hz to 20 kHz, which corresponds to the human-hearing range. Therefore, most noise impacts on terrestrial

resources can be evaluated based on sound pressure impacts (i.e., decibel [dB] levels) without special concern to frequency ranges.

Most wildlife have hearing at frequencies within the range of human hearing (20 Hz to 20 kHz), although some mammals can hear within a frequency range of <10 Hz to 150 kHz. Humans are insensitive to frequencies outside of the human hearing range, and the NRC staff found no studies suggesting that noise in the infra- or ultra-frequency range would cause adverse impacts to wildlife species in the vicinity of the Wilmington Site. Most studies on wildlife that demonstrate impacts, such as reduced diversity and avoidance, related to noise from traffic or construction report frequencies mostly within the range of human hearing. Therefore, the NRC staff does not have reason to believe that there would likely be sound in frequencies outside the range of human hearing produced by machinery at the proposed GLE Facility, such that it would cause discomfort or disruption to humans or wildlife.

**FEIS Question No. 30:** *Page 4-68 refers to “empty cylinders with tails . . .” Elsewhere in the FEIS, “tails” refers to the depleted UF<sub>6</sub> from the separations process. Is it correct to assume in this case that the FEIS is referring to empty cylinders with the residual feed (natural UF<sub>6</sub>) not removed when the tanks were emptied? (EIS, 4-68)*

**Response No. 30 (B. Biber):** It is correct that the reference to “empty cylinders with tails” on page 4-68 of the FEIS is referring to empty cylinders with the residual feed (natural UF<sub>6</sub>) not removed when the tanks were emptied (known as “heels”). The first paragraph on page 4-68 should have referred to “empty cylinders with heels” instead of “empty cylinders with tails,” as was properly done in Table 4-12 and the second paragraph on page 4-68.

**FEIS Question No. 31:** *In evaluating worker radiological safety, the NRC Staff accepts General Electric-Hitachi's assumption that the new GLE facility will have UF<sub>6</sub> release levels similar to a gas centrifuge plant. Part of this assumption is that releases in the separations area will be much smaller than those associated with connecting and disconnecting UF<sub>6</sub> tanks. Did the NRC Staff attempt to validate (even qualitatively) whether or not the releases from the laser-based separations process will indeed be similar to those in a gas centrifuge process? If yes, what is the logic that supported the validity of the assumption? (EIS, 4-77)*

**Response No. 31 (K. Picel, S. Kamboj):** Yes, the NRC staff did qualitatively, but not quantitatively, assess whether the releases from the laser-based separations process would be similar to those from a gas centrifuge process. The NRC staff elected to do a qualitative, instead of a quantitative, analysis of this issue because of the very limited availability of data regarding actual releases from laser-based enrichment technology, and because, as discussed in the next paragraph, this qualitative analysis was sufficient to provide reasonable support for the NRC staff's conclusions in the FEIS. The proposed GLE Facility's laser-based technology is a first-of-its-kind technology. No release data exists for a laser-based enrichment facility operating on a commercial scale (i.e., at full or partial capacity).

The NRC staff's qualitative analysis of the potential occupational exposures to UF<sub>6</sub> within the proposed GLE Facility in comparison to those from a gas centrifuge process is described in this paragraph. As noted in the response to FEIS Question 33, GLE stated that the proposed laser-based enrichment is a closed process, so releases are expected to be less than those associated with non-enrichment processes that involve opening process lines and, as a result, require workplace venting. Connecting and disconnecting UF<sub>6</sub> cylinders has been identified as presenting the greatest potential occupational exposure in gas centrifuge facilities, and is assumed to present the greatest potential occupational exposure to UF<sub>6</sub> in the proposed GLE Facility because the proposed GLE Facility would employ the same connecting and disconnecting operations (NUREG-1834, page 4-61). Small releases of UF<sub>6</sub> occur when UF<sub>6</sub> cylinders and lines are opened, requiring the use of ventilation equipment to prevent worker exposure. In Section 4.2.11.2 of the FEIS (on page 4-77), the NRC staff assumed that releases from the proposed GLE Facility would be similar to those from a gas centrifuge facility of similar

capacity. The same section notes that the impacts are very low compared to the applicable guidance and federal standards, so any uncertainties introduced by this assumption would not change the FEIS's impact conclusions.

#### Reference

U.S. Nuclear Regulatory Commission. "Environmental Impact Statement for the Proposed American Centrifuge Plant in Piketon, Ohio, Final Report," NUREG-1834. April, 2006. ADAMS Accession Nos. Vol. 1 ML061250131, Vol. 2 ML061250101.

**FEIS Question No. 33:** *What is the logic behind using the data from the FMO (Fuel Manufacturing Operation) vents to approximate what would be expected for the GLE facility? Did the NRC Staff compare this data with that from an operating gas centrifuge facility? (EIS, 4-81)*

**Response No. 33 (S. Kamboj):** GLE proposed using actual air effluent releases from the Fuel Manufacturing Operation (FMO) facility air emission control system to approximate releases from the proposed GLE Facility because the selected FMO stack has characteristics that are similar to the stack for the proposed GLE Facility (GLE Environmental Report, Table S-1), and because the selected FMO stack has one of the highest release rates out of the stacks within the FMO complex (GLE Environmental Report, Table S-2). Additionally, GLE indicated that it would be appropriate to use FMO facility vents to approximate releases from the proposed GLE Facility because the proposed laser-based enrichment is a closed process (GLE Environmental Report, Section 4.6.2.2.1.1), and the FMO facility includes processes that would not be conducted in the proposed GLE Facility (e.g., conversion of UF<sub>6</sub> to uranium dioxide [UO<sub>2</sub>]). Therefore, the "individual uranium isotope emissions from the proposed GLE facility operations are expected to be lower than the levels measured for the FMO facility vents" (GLE Environmental Report, Section 4.6.2.2.1.1). Furthermore, the postulated air effluent releases (based on the FMO facility vents) are low enough that, even if they underestimate actual releases by an order of magnitude, the resulting air effluent releases from the proposed GLE

Facility would still be within regulatory limits and would not change the FEIS's overall impact conclusion.

With regard to the second question in Question 33, the FEIS does not include an explicit comparison of anticipated air effluent releases from the proposed GLE Facility to those of an operating gas centrifuge facility. At the time when the FEIS was prepared, the only operating gas centrifuge facility in the United States was the National Enrichment Facility, which is licensed for half of the production capacity requested for the proposed GLE Facility (and will not reach its licensed capacity until 2013). Therefore, Table 2-6 in the FEIS (on pages 2-60 and 2-61) provides a qualitative comparison of the potential environmental impacts (e.g., air emissions) from the proposed GLE Facility to those of a gas centrifuge facility (primarily the Eagle Rock Enrichment Facility [EREF], which is a planned gas centrifuge facility with a licensed production capacity [6.6 million SWU per year] that is similar to that requested for the proposed GLE Facility). As explained in Table 2-6, the estimated air effluent emissions from a gas centrifuge facility could be an order of magnitude higher than those from the proposed GLE Facility. The estimated release of gaseous uranium from the EREF would be less than 20 grams (page 4-80 of the EREF FEIS), compared to the 2.4 grams anticipated from the proposed GLE Facility (estimated from the yearly uranium air emissions listed in Table 4-19 on page 4-82 of the FEIS).

#### References

GE-Hitachi Global Laser Enrichment LLC. "Environmental Report for the GLE Commercial Facility, Revision 0." December 2008. ADAMS Accession No. ML090910573.

AREVA Enrichment Services, LLC. "Eagle Rock Enrichment Facility Environmental Report, Rev. 2." Bethesda, Maryland. April 2010. ADAMS Accession No. ML101610549.

U.S. Nuclear Regulatory Commission. "Environmental Impact Statement for the Proposed Eagle Rock Enrichment Facility in Bonneville County, Idaho, Final Report," NUREG-1945. February 2011. ADAMS Accession Nos. Vol. 1 ML11014A005, Vol. 2 ML11014A006.

**FEIS Question No. 34:** *Why was the wind speed data used to calculate potential radiation emissions/dosages to the public from 1988 to 1992? Has the NRC Staff ascertained the availability of more recent data? Have there been any changes in local weather patterns in recent years that could influence results? (EIS, 4-82)*

**Response No. 34 (S. Kamboj, Y.-S. Chang):** The NRC staff used meteorological data from 1988-1992 to calculate potential radiation doses to the public because the NRC staff used U.S. Environmental Protection Agency (EPA) air modeling code CAP88-PC (Version 3) to calculate radiation doses to the public, and the most recent meteorological data set available in the code (for the Wilmington International Airport) is from 1988-1992. There is not a more recent meteorological data file available in the EPA air modeling code, which was last updated in 2007. In addition, GLE performed air dispersion modeling with the XOQDOQ model using the joint frequency distributions for wind speed and direction by stability class for the years 1988-1992. Even though more recent meteorological data is available, the NRC staff did not attempt to convert it into a usable data file for the EPA air modeling code for several reasons. The NRC staff preferred to perform independent modeling with the same input (weather) data used by GLE, and the differences between the wind data from 1988-1992 and 2005-2009 are not significant (as explained below). Moreover, the radiation doses for members of the public from airborne emissions, as calculated in the FEIS (using wind data from 1988-1992), are low enough that, even if subsequent changes in weather conditions result in an underestimate of actual doses by a factor of 2, the resulting doses would still be within regulatory limits and would not change the FEIS's overall impact conclusion.

Wind speed and direction, and atmospheric stability (which is determined by solar insolation, cloud cover, and wind speed) are the primary parameters in local weather patterns that influence atmospheric dispersion and the resulting dose calculations. Changes in the frequency distributions of these wind-related parameters could affect the calculated doses to the public from airborne emissions from the proposed GLE Facility. Figures 2 and 3 (following this response) present wind roses (which include wind speed, direction, and frequency data) for the

Wilmington International Airport for the periods 1988-1992 and 2005-2009. As observed in these figures, the difference in the average wind speed for these time periods is not significant—3.47 meters per second for 1988-1992 compared with 3.31 meters per second for 2005-2009. Additionally, there are only minor differences in the maximum observed wind frequency in the directions of the nearest site boundary and the location of the nearest resident. Such minor differences (between the wind data from 1988-1992 and 2005-2009) have the potential to affect calculated doses to the maximally exposed individual at the site boundary and residents in other wind sectors, but any changes in the calculated doses due to these minor differences are not expected to be significant because, in general, only major differences in weather patterns result in significant changes to calculated doses.

Figure 2

### Wind Rose for New Hanover County Airport (KILM) 1988-01-01 to 1992-12-31

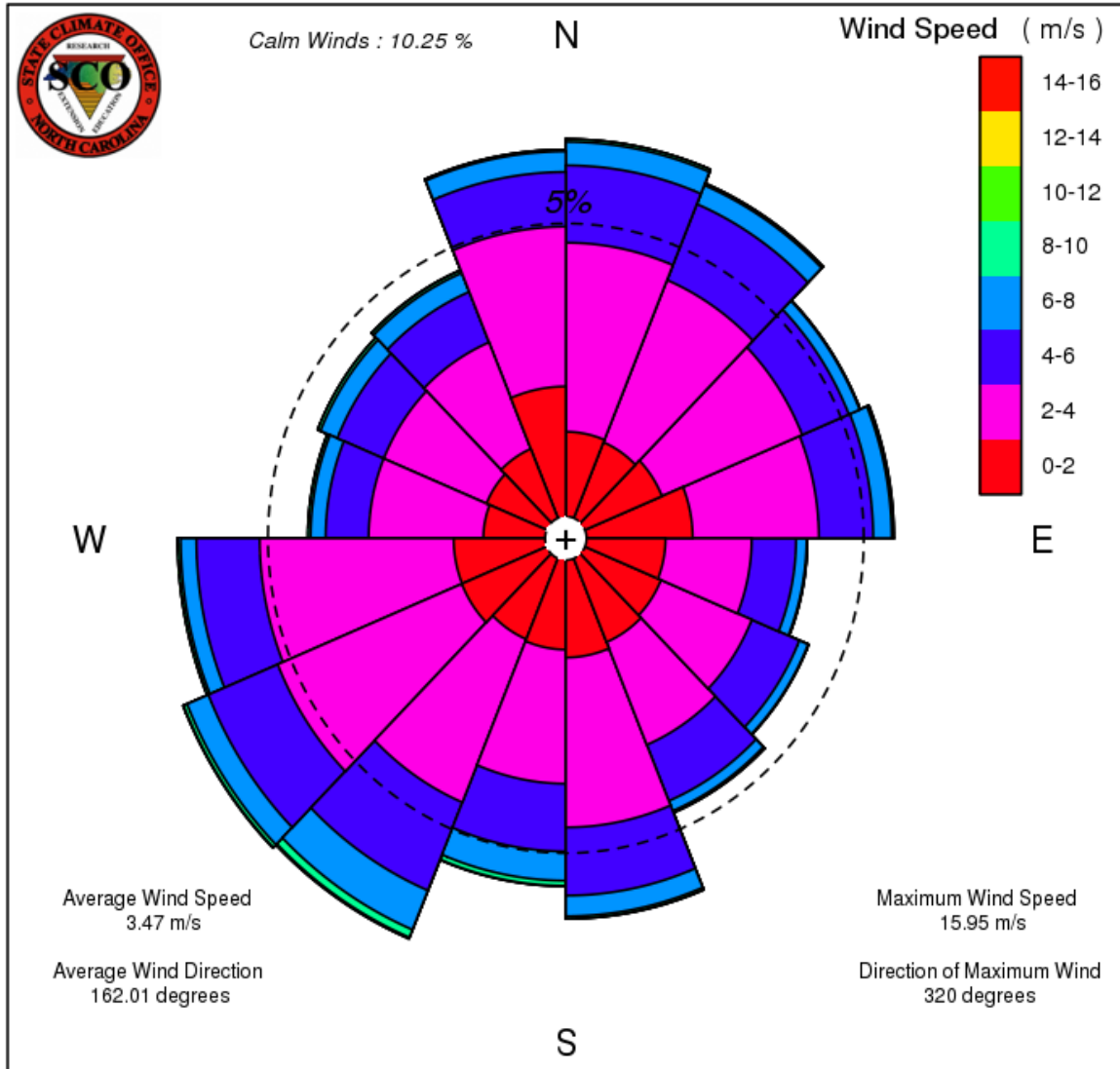
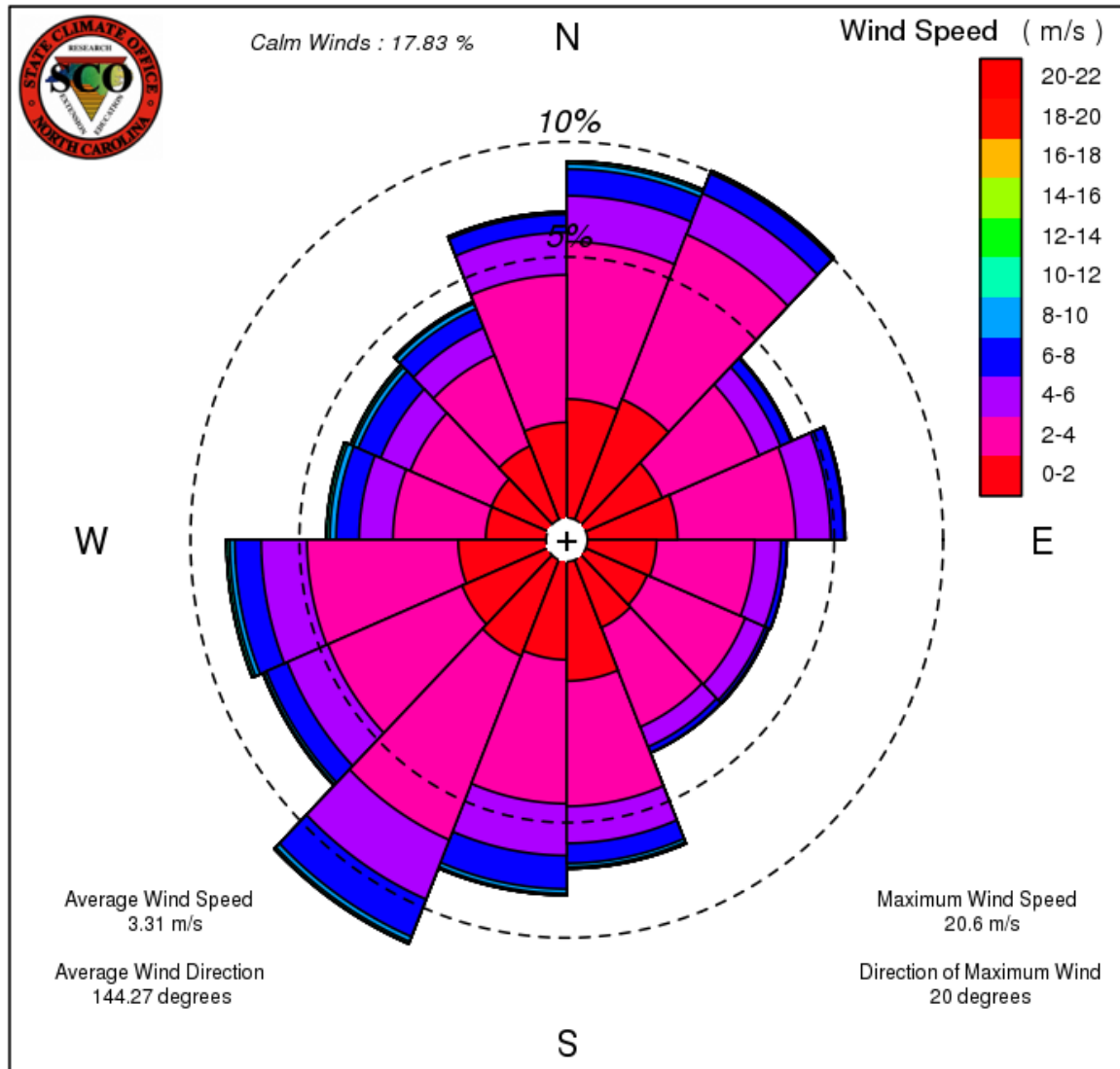




Figure 3

### Wind Rose for New Hanover County Airport (KILM) 2005-01-01 to 2009-12-31



#### Reference

North Carolina State Climate Office. 2012. *Wind Rose for New Hanover County Airport (KILM): 1988-01-01 to 1992-12-31 and 2005-01-01 to 2009-12-31*. <[http://www.nc-climate.ncsu.edu/dynamic\\_scripts/windrose/generate\\_windrose.php](http://www.nc-climate.ncsu.edu/dynamic_scripts/windrose/generate_windrose.php)> (Accessed April 6, 2012).

**FEIS Question No. 35:** *On page 4-86, the FEIS states that the public dose estimates are based on conservative assumptions. What is the basis for the NRC Staff's understanding that using the FMO source terms is indeed conservative?*

**Response to No. 35 (S. Kamboj):** The NRC staff should clarify that the FEIS does not state that using the Fuel Manufacturing Operation (FMO) facility source terms is necessarily conservative, but rather that the assumptions that the NRC staff used to estimate doses to the public from facility releases are conservative. As noted in the response to FEIS Question 33, GLE indicated that it would be appropriate to use actual air effluent releases from the FMO facility air emission control system to approximate releases from the proposed GLE Facility for multiple reasons. For instance, the Environmental Report stated that "individual uranium isotope emissions from the proposed GLE facility operations are expected to be lower than the levels measured for the FMO facility vents" (GLE Environmental Report, Section 4.6.2.2.1.1), which suggests that FMO emissions conservatively approximate those from the proposed GLE Facility. Further, the NRC staff noted in response to FEIS Question 33 that the postulated air effluent releases (based on FMO facility releases) are low enough that, even if they underestimate actual releases by an order of magnitude, the resulting air effluent releases from the proposed GLE Facility would still be within regulatory limits and would not change the FEIS's overall impact conclusion.

The following paragraphs describe the basis for the NRC staff's statement in the FEIS that the public dose estimates in the FEIS are based on conservative assumptions. The two potential pathways of concern that would result in intake of uranium would be airborne releases and liquid releases (see page 4-81 of the FEIS).

U.S. Environmental Protection Agency (EPA) air modeling code CAP88-PC (Version 3) was used to assess the impacts of air emissions from the proposed GLE Facility (as discussed on page 4-82 of the FEIS). This code calculates radiation dose from many exposure pathways, including inhalation, submersion, groundshine, and ingestion of contaminated food following uranium deposition on the ground. Because no actual data for GLE laser-based enrichment

technology was available during the NRC staff's analysis or at the time of the FEIS's publication, GLE proposed that stack monitoring data from the FMO facility could provide a conservative approximation of airborne releases from operation of the proposed GLE Facility. When analyzing the proposed release values (based on the FMO facility), the NRC staff used several assumptions that contribute to a conservative estimate of the impact on human health from potential air emissions:

- The staff calculated doses from air effluent releases to the nearest onsite member of the public (at 250 meters from the proposed GLE Facility in the direction that would result in maximum dose), at the site boundary in each of the 16 wind sectors, and at the location of the nearest resident. Onsite members of the public could be located at distances greater than 250 meters from the release point and could also be located not in the direction of maximum dose. Therefore, this assumption is considered to be conservative.
- For dose estimation, the staff assumed that a hypothetical member of the public at the site boundary or at the location of the nearest resident would be present for the entire year (i.e., 24 hours per day, 365 days per year), which is a very conservative assumption.

For the onsite member of the public, the staff assumed that 100% of the individual's diet would be from the foodstuff produced within a 50-mile radius of the proposed GLE Facility (there is no food grown onsite). For the individual at the site boundary or at the location of the nearest resident, the staff further assumed that a large percentage of the individual's diet (70% vegetables, 40% milk, and 44% meat) would be produced at the point of exposure and the remainder would be produced within a 50-mile radius (see page 4-83 of the FEIS). These assumptions are conservative because few members of the public consume 100% of their diet from foodstuffs produced within 50 miles of their residence, and few members of the public produce large percentages of their diet at their residence (which also happens to be the location of maximum exposure).

For liquid effluent releases, the staff used the GENII code (Version 2.06) to assess the impacts from the proposed GLE Facility. Although liquid effluent discharge concentrations would likely be much less, the staff assumed that liquid discharges would be equal to the proposed GLE Facility's maximum administrative limit (80% of the 10 CFR Part 20 limit for uranium) for the operation of the radioactive liquid effluent system. The Northeast Cape Fear River would receive the liquid effluent discharges from the proposed GLE Facility (see page 4-86 of the FEIS). Potential exposure pathways for liquid effluent discharges include external exposure from swimming, boating, and contaminated shoreline sediment; inadvertent ingestion of contaminated surface water during swimming; and ingestion of fish grown in contaminated surface water. The NRC staff used two primary assumptions that contribute to a conservative estimate of the resulting impact on human health from liquid effluent discharges:

- The staff calculated the radionuclide concentration in surface water at the three nearest potential exposure locations, even though these exposure locations are not readily accessible to the public.
- The member of the public was assumed to be involved in all the recreational activities at the point of maximum radionuclide concentration.

#### Reference

GE-Hitachi Global Laser Enrichment LLC. "Environmental Report for the GLE Commercial Facility, Revision 0." December 2008. ADAMS Accession No. ML090910573.

**FEIS Question No. 36:** *Will all of the mitigation measures proposed by GLE in Table 5-1 be implemented? What processes will GLE use to decide which of the NRC-recommended mitigation measures in Table 5-2 will ultimately be implemented? Will the NRC Staff have any ongoing role in monitoring implementation?*

**Response No. 36 (J. Davis, D. Diaz-Toro):** In GLE's Environmental Report (ER) (GLE, 2008), GLE proposed measures that it would implement to mitigate potential environmental impacts of the proposed action. Most of GLE's proposed measures include best management practices commonly used in the industry and requirements imposed by other permitting agencies. The

NRC staff expects that GLE would implement all of its proposed mitigation measures. With regard to requirements imposed by other permitting agencies, GLE must comply with all applicable laws and regulations, including obtaining all appropriate construction and operating permits.

The NRC staff cannot attest to the process that GLE plans to use to decide which of the mitigation measures recommended by the NRC staff in the FEIS GLE will implement. As stated in Sections 5.0, 5.1, and 5.2 of the FEIS, the NRC staff reviewed the mitigation measures proposed by the Applicant and found that these measures are sufficiently protective of human health and the environment. As part of the NRC staff's review under the National Environmental Policy Act (NEPA), the NRC staff recommended additional mitigation measures (summarized in Table 5-2 of the FEIS) that GLE could implement to potentially reduce or avoid environmental effects of the proposed GLE Facility. However, because the NRC cannot impose mitigation outside its regulatory authority under the Atomic Energy Act (AEA), these recommended mitigation measures are not requirements that will be imposed upon GLE, but rather are non-binding recommendations and would not become conditions of any future license.

The NRC staff will have an ongoing role in inspecting and monitoring GLE's implementation of the mitigation measures listed in Table 5-1 that are within the purview of the NRC's regulatory authority under 10 CFR Parts 20, 30, 40, and 70. The NRC staff's ability to enforce mitigation measures is limited to those activities that have a reasonable nexus to the NRC's regulatory authority under the AEA. For instance, the mitigation measures within the NRC's regulatory authority would include the proposed mitigation measures that are discussed under the following impact areas in Table 5-1: "Public and Occupational Health," "Waste Management," and "Accidents" (see pages 5-9, 5-10, 5-11, 5-12, and 5-13 of the FEIS).

In addition, if a license is issued to GLE for the proposed facility, the NRC staff would engage in Operational Readiness Reviews, during which the NRC staff would inspect, among other things, the readiness of GLE's Operations Procedures, Radiation Protection plan,

Monitoring plan, Emergency Plan, and Training and Qualification plan. Thereafter, if the proposed GLE Facility were to commence operation, the NRC staff would engage in continuous monitoring as described in Inspection Manual Chapter 2600, Appendix B: Table 1.

### References

GE-Hitachi Global Laser Enrichment LLC. "Environmental Report for the GLE Commercial Facility, Revision 0." December 2008. ADAMS Accession No. ML090910573.

U.S. Nuclear Regulatory Commission. "Inspection Manual Chapter 2600, Fuel Cycle Facility Operational Safety and Safeguards Inspection Program, Appendix B." November 7, 2011. ADAMS Accession No. ML112720197.

**FEIS Question No. 37:** *Explain how the NRC Staff's overall assessment that environmental impacts are SMALL would be impacted if GLE only implemented the mitigation measures proposed in Table 5-1. How would overall impacts change if GLE only implemented mandatory mitigation measures? (EIS, 2-65, Table 5-1, Table 5-2)*

**Response No. 37 (J. Davis, D. Diaz-Toro, K. Fischer, H. Avci):** Mitigation measures discussed in the FEIS include those proposed by GLE in its Environmental Report and additional mitigation measures identified by the NRC staff as discussed in Table 5-1 and Table 5-2 of the FEIS, respectively.

The NRC staff identified additional mitigation measures (discussed in Table 5-2 of the FEIS) as recommendations because, even though the NRC cannot require mitigation outside its regulatory authority under the Atomic Energy Act (AEA), these additional measures have the potential to further reduce the impacts of the proposed action. These recommended mitigation measures are not requirements that would be imposed upon GLE, but rather are non-binding recommendations and are not required to be conditions of any future license. The NRC staff's impact analysis in the FEIS assumes that all of GLE's proposed mitigation measures would be implemented, and does not presume that GLE would implement any of the NRC's identified mitigation measures. Therefore, the NRC staff's assessment of the environmental impacts

(including the overall impact conclusions) in the FEIS would not change if GLE implements only its proposed mitigation measures (which are identified in Table 5-1).

The Board clarified in its order issued on April 13, 2012, that the phrase “mandatory mitigation measures” refers to those mitigation measures required to comply with applicable laws and regulations and those mitigation measures required by other permitting agencies. As discussed in the NRC staff’s response to FEIS Question 36, most of GLE’s proposed measures include best management practices commonly used during the construction and operation of similar industrial facilities to limit or avoid impacts in each environmental resource area, as well as requirements imposed by other permitting agencies. With regard to the requirements imposed by other permitting agencies, GLE must comply with all applicable laws and regulations, including obtaining all appropriate construction and operating permits. A discussion of the applicable laws and regulations is included in Section 1.5 of the FEIS. As the licensing agency, the NRC staff has the responsibility to evaluate the license application for compliance with the NRC’s regulations associated with uranium enrichment facilities in 10 CFR Parts 30, 40, and 70 that would authorize GLE to possess and use by-product material, source material, and special nuclear material, respectively, as well as standards for protection against radiation in 10 CFR Part 20 at the proposed GLE Facility. In addition, the NRC staff relies on other permitting agencies that require an applicant to meet applicable permitting requirements in evaluating the potential environmental impacts. Accordingly, the NRC staff finds that compliance with the NRC’s regulatory requirements and other permitting agencies’ requirements is sufficient to be protective of human health and the environment. If GLE implements only mitigation measures mandated by applicable regulations, laws, and permits, the impacts in some resource areas could be incrementally higher than estimated in the FEIS, but the NRC staff’s overall impact conclusions in the FEIS would not change.

**FEIS Question No. 39:** *Will all gaseous diffusion enrichment operations in the United States have ceased operation by the end of 2012? (EIS, 7-13)*

**Response No. 39 (J. Davis, D. Diaz-Toro):** As noted in Section 7.2.3.2 of the FEIS, in 2007, DOE projected that all gaseous diffusion enrichment operations in the United States would cease in 2012. The United States Enrichment Corporation (USEC), which operates the Paducah Gaseous Diffusion Plant (GDP) in Paducah, Kentucky (which is the only gaseous diffusion enrichment plant in operation in the U.S.), is currently evaluating whether it is economically feasible to continue operations at the Paducah GDP. On page 4 of USEC Inc.'s most recent U.S. Securities and Exchange Commission Form 10-K submittal, dated March 14, 2012, USEC Inc. stated the following:

We expect to make an important decision regarding the continued operation of the Paducah GDP by May 2012. A decision to shut down Paducah would result in our ceasing, for at least a period of time, commercial enrichment of uranium. Although we are working hard to identify a way to keep this plant open, we do not currently believe the factors are in place to support continued operation.

#### Reference

United States Enrichment Corporation (USEC). U.S. Securities and Exchange Commission Form 10-K, "Annual Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934," March 14, 2012.

**FEIS Question No. 40:** *The NRC Staff comments on the laser-based separations technology by stating "GE-Hitachi expects it to offer certain advantages over both the gaseous diffusion and gas centrifuge processes." From an environmental perspective, what are the advantages that are expected over the gas centrifuge process? (EIS, 7-13)*

**Response No. 40 (H. Avci):** Table 2-6 of the FEIS (on pages 2-55 to 2-64) provides a comparison of the environmental impacts of the GLE laser-based technology and gas centrifuge technology. Based on the information in this table, from an environmental perspective, most of the advantages of the GLE laser-based technology appear to be attributable to the smaller footprint that a laser-based facility, such as the proposed GLE Facility, would have (i.e., the smaller area to be disturbed by preconstruction and construction activities for the proposed GLE



Facility). Because of the smaller footprint, impacts in the following resource areas are estimated to be less for the proposed GLE Facility than for a gas centrifuge facility with the same enrichment capacity: land use, historic and cultural resources, air quality, geology and soil resources, and ecological resources. Another resource area in which the impacts appear to be less for the laser-based process is groundwater use because the operational water requirements of a gas centrifuge facility with the same production capacity appear to be greater than those of the proposed GLE Facility, as discussed in Table 2-6 in the FEIS (on page 2-58). However, none of these differences appear to be so significant that the laser-based technology would be considered obviously superior from an environmental perspective to the gas centrifuge technology.

**Question 41:** *Explain why no surveys of the project area associated with the site security fence have been conducted. (H-7)*

**Response No. 41 (D. O'Rourke):** Section 106 of the National Historic Preservation Act requires that all historic properties be identified within the area of potential effect (APE) for an undertaking (see 36 CFR 800.4). The APE for this specific undertaking (i.e., construction of the site security fence) has not been defined because the Applicant's plans regarding the site security fence have not yet been finalized. Therefore, because the APE for this specific undertaking has yet to be defined, no surveys have been conducted for the project area associated with the site security fence. Once the APE is defined for this specific undertaking, the Applicant would need to consult with the North Carolina State Historic Preservation Office per the proposed license condition on page 4-6 of the FEIS. Through the consultation process required by this license condition, the need to conduct surveys would be determined.

**FEIS Question No. 42:** *Why does the proposed license condition identified in Section 4.2.2.2 only require consultation regarding mitigation rather than the implementation of any mitigation measures given the likelihood that known archaeological sites may be impacted? (H-7 to H-8, EIS 4-6)*

**Response No. 42 (D. O'Rourke):** As stated in Section 4.2.2.2 of the FEIS, facility operations and maintenance activities at the proposed GLE Facility have the potential to affect historic and cultural resources because the proposed GLE Facility would be located in close proximity to historic and cultural resources. As part of the NRC's compliance with Section 106 of the National Historic Preservation Act (NHPA), the NRC staff, through consultation with GLE and the North Carolina State Historic Preservation Office (SHPO), developed the proposed license condition (identified in Section 4.2.2.2). This proposed license condition is intended to ensure compliance with Section 106 of the NHPA. Before GLE can engage in any activity that was not previously assessed by the NRC staff in the FEIS and would physically disrupt or disturb certain historic or cultural resources (i.e., those that have been designated eligible for the National Register of Historic Places), GLE must engage in consultation regarding the activity per this proposed license condition. Through consultation, the appropriate process for considering the effects on historic and cultural resources (i.e., mitigation, implementation, and reporting requirements) would be developed for the activity. For instance, during the consultation process required by this proposed license condition, GLE and the North Carolina SHPO could agree that GLE is allowed to proceed with the activity only if certain mitigation measures will be implemented.

**ATTACHMENT D**  
**AFFIDAVITS FOR NRC STAFF RESPONSES TO THE**  
**LICENSING BOARD'S INITIAL QUESTIONS REGARDING THE FEIS**

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	)	ASLBP No. 10-901-03-ML-BD01
LLC	)	
	)	May 2, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF TIM ALLISON CONCERNING  
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S  
INITIAL QUESTIONS REGARDING THE FEIS

I, Tim Allison, do hereby state as follows:

1. I am employed as an Economist at Argonne National Laboratory. 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 environmental review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Environmental Impact Statement for the Proposed GE-Hitachi Global Laser Enrichment, LLC Facility in Wilmington, North Carolina (NUREG-1938)," February 2012, I assisted the NRC staff in its review and analysis of aspects of the application that concerned socioeconomics and environmental justice.
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 FEIS," 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)]**

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Tim Allison

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	)	ASLBP No. 10-901-03-ML-BD01
LLC	)	
	)	May 2, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF HALIL AVCI CONCERNING  
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S  
INITIAL QUESTIONS REGARDING THE FEIS

I, Halil Avci, do hereby state as follows:

1. I am employed as a Team Lead at Argonne National Laboratory. 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 environmental review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Environmental Impact Statement for the Proposed GE-Hitachi Global Laser Enrichment, LLC Facility in Wilmington, North Carolina (NUREG-1938)," February 2012, I was responsible as Team Lead for overseeing the technical assistance provided by the Argonne National Laboratory to the NRC staff in its review and analysis of the application.
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 FEIS," 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)]**

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Halil Avci

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	)	ASLBP No. 10-901-03-ML-BD01
LLC	)	
	)	May 2, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF BRUCE M. BIWER CONCERNING  
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S  
INITIAL QUESTIONS REGARDING THE FEIS

I, Bruce M. Biwer, do hereby state as follows:

1. I am employed as an Environmental Chemist at Argonne National Laboratory. 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 environmental review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Environmental Impact Statement for the Proposed GE-Hitachi Global Laser Enrichment, LLC Facility in Wilmington, North Carolina (NUREG-1938)," February 2012, I assisted the NRC staff in its review and analysis of aspects of the application that concerned transportation and waste management.
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 FEIS," 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)]**

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Bruce M. Biwer

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	)	ASLBP No. 10-901-03-ML-BD01
LLC	)	
	)	May 2, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF YOUNG-SOO CHANG CONCERNING  
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S  
INITIAL QUESTIONS REGARDING THE FEIS

I, Young-Soo Chang, do hereby state as follows:

1. I am employed as an Environmental Systems Engineer at Argonne National Laboratory. 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 environmental review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Environmental Impact Statement for the Proposed GE-Hitachi Global Laser Enrichment, LLC Facility in Wilmington, North Carolina (NUREG-1938)," February 2012, I assisted the NRC staff in its review and analysis of aspects of the application that concerned meteorology, air quality, and noise.
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 FEIS," 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)]**

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Young-Soo Chang

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	)	ASLBP No. 10-901-03-ML-BD01
LLC	)	
	)	May 02, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF JENNIFER A. DAVIS CONCERNING  
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S  
INITIAL QUESTIONS REGARDING THE FEIS

I, Jennifer A. Davis, do hereby state as follows:

1. I am employed as a Senior Project Manager in the Division of Waste Management and Environmental Protection at 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 environmental review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Environmental Impact Statement for the Proposed GE-Hitachi Global Laser Enrichment, LLC Facility in Wilmington, North Carolina (NUREG-1938)," February 2012, I coordinated the review team, managed all aspects of the environmental review, and reviewed the entire Environmental Impact Statement.
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 FEIS," 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)]**

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Jennifer A. Davis

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	)	ASLBP No. 10-901-03-ML-BD01
LLC	)	
	)	May 02, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF DIANA DIAZ-TORO CONCERNING  
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S  
INITIAL QUESTIONS REGARDING THE FEIS

I, Diana Diaz-Toro, do hereby state as follows:

1. I am employed as a Project Manager in the Division of Waste Management and Environmental Protection at 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 a Project Manager, I assisted the staff in the preparation of the responses to the Licensing Board's initial questions regarding the FEIS that concerned the low-enriched uranium, the status of other enrichment facilities licensed by the NRC, and mitigation measures.
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 FEIS," 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)]**

\_\_\_\_\_  
Diana Diaz-Toro

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	)	ASLBP No. 10-901-03-ML-BD01
LLC	)	
	)	May 02, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF KARL FISCHER CONCERNING  
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S  
INITIAL QUESTIONS REGARDING THE FEIS

I, Karl Fischer, do hereby state as follows:

1. I am employed as an Environmental Systems Engineer at Argonne National Laboratory. 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 environmental review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Environmental Impact Statement for the Proposed GE-Hitachi Global Laser Enrichment, LLC Facility in Wilmington, North Carolina (NUREG-1938)," February 2012, I was responsible as Deputy Team Lead and Document Manager for overseeing the technical assistance provided by the Argonne National Laboratory to the NRC staff in its review and analysis of the application.
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 FEIS," 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)]**

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Karl Fischer



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	)	ASLBP No. 10-901-03-ML-BD01
LLC	)	
	)	May 2, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF ELIZABETH K. HOCKING CONCERNING  
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S  
INITIAL QUESTIONS REGARDING THE FEIS

I, Elizabeth K. Hocking, do hereby state as follows:

1. I am employed as a Policy Analyst at Argonne National Laboratory. 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 environmental review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Environmental Impact Statement for the Proposed GE-Hitachi Global Laser Enrichment, LLC Facility in Wilmington, North Carolina (NUREG-1938)," February 2012, I assisted the NRC staff in its review and analysis of aspects of the application that concerned regulatory issues.
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 FEIS," 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)]**

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Elizabeth K. Hocking

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	)	ASLBP No. 10-901-03-ML-BD01
LLC	)	
	)	May 2, 2012
(GLE Commercial Facility)	)	

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

I, Timothy C. Johnson, 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 a Senior Project Manager, I assisted the staff in the preparation of the responses to the Licensing Board's initial questions regarding the FEIS that concerned the licensing of the proposed facility and the status of other enrichment facilities licensed by the NRC.
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 FEIS," 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)]**

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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	)	ASLBP No. 10-901-03-ML-BD01
LLC	)	
	)	May 2, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF SUNITA KAMBOJ CONCERNING  
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S  
INITIAL QUESTIONS REGARDING THE FEIS

I, Sunita Kamboj, do hereby state as follows:

1. I am employed as an Environmental Systems Engineer at Argonne National Laboratory. 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 environmental review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Environmental Impact Statement for the Proposed GE-Hitachi Global Laser Enrichment, LLC Facility in Wilmington, North Carolina (NUREG-1938)," February 2012, I assisted the NRC staff in its review and analysis of aspects of the application that concerned public and occupational health impacts from radiation.
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 FEIS," 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)]**

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Sunita Kamboj

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	)	ASLBP No. 10-901-03-ML-BD01
LLC	)	
	)	May 2, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF KURT PICEL CONCERNING  
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S  
INITIAL QUESTIONS REGARDING THE FEIS

I, Kurt Picel, do hereby state as follows:

1. I am employed as an Environmental Scientist at Argonne National Laboratory. 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 environmental review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Environmental Impact Statement for the Proposed GE-Hitachi Global Laser Enrichment, LLC Facility in Wilmington, North Carolina (NUREG-1938)," February 2012, I assisted the NRC staff in its review and analysis of aspects of the application that concerned public and occupational health effects from non-radiological exposures, accidents, and cumulative impacts.
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 FEIS," 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)]**

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Kurt Picel

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	)	ASLBP No. 10-901-03-ML-BD01
LLC	)	
	)	May 2, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF DANIEL O'ROURKE CONCERNING  
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S  
INITIAL QUESTIONS REGARDING THE FEIS

I, Daniel O'Rourke, do hereby state as follows:

1. I am employed as a Principal Cultural Resources Specialist at Argonne National Laboratory. 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 environmental review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Environmental Impact Statement for the Proposed GE-Hitachi Global Laser Enrichment, LLC Facility in Wilmington, North Carolina (NUREG-1938)," February 2012, I assisted the NRC staff in its review and analysis of aspects of the application that concerned land use, visual resources, and historic and cultural resources.
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 FEIS," 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)]**

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Daniel O'Rourke

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	)	ASLBP No. 10-901-03-ML-BD01
LLC	)	
	)	May 2, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF JOHN QUINN CONCERNING  
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S  
INITIAL QUESTIONS REGARDING THE FEIS

I, John Quinn, do hereby state as follows:

1. I am employed as a Principal Hydrogeologist at Argonne National Laboratory. 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 environmental review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Environmental Impact Statement for the Proposed GE-Hitachi Global Laser Enrichment, LLC Facility in Wilmington, North Carolina (NUREG-1938)," February 2012, I assisted the NRC staff in its review and analysis of aspects of the application that concerned geology and hydrology.
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 FEIS," 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)]**

---

John Quinn

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	)	ASLBP No. 10-901-03-ML-BD01
LLC	)	
	)	May 2, 2012
(GLE Commercial Facility)	)	

AFFIDAVIT OF WILLIAM S. VINIKOUR CONCERNING  
THE NRC STAFF RESPONSES TO THE LICENSING BOARD'S  
INITIAL QUESTIONS REGARDING THE FEIS

I, William S. Vinikour, do hereby state as follows:

1. I am employed as an Environmental Scientist at Argonne National Laboratory. 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 environmental review of the GE-Hitachi Global Laser Enrichment, LLC ("GLE") Facility, LLC license application, documented in the "Environmental Impact Statement for the Proposed GE-Hitachi Global Laser Enrichment, LLC Facility in Wilmington, North Carolina (NUREG-1938)," February 2012, I assisted the NRC staff in its review and analysis of aspects of the application that concerned ecological resources.
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 FEIS," 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)]**

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William S. Vinikour