



Global Nuclear Fuel

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Jonathan Rowley, Project Manager
Fuel Facility Licensing Branch
Division of Fuel Management
Office of Nuclear Materials Safety and Safeguards
US Nuclear Regulatory Commission
Washington, D.C. 20555-0001
Attn: Document Control Desk

Subject: Response to NRC Environmental Protection Request for Supplemental Information Dated October 4, 2022

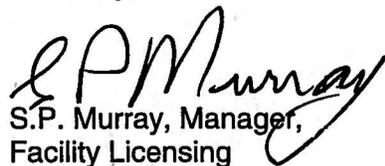
- References:**
- 1) SNM-1097, Docket 70-1113
 - 2) Letter, S.P. Murray to Director, Office of Nuclear Material Safety and Safeguards, GNF-A License Amendment Request for 8 wt. % U235, 6/24/22
 - 3) NRC Environmental Assessment for the Renewal of NRC License No. SNM-1097, 5/14/09 (ML091180239)
 - 4) Letter, J. Rowley (NRC) to S.P. Murray (GNF-A) Request for Supplemental Information, 10/4/22

Dear Mr. Rowley:

The Global Nuclear Fuel – Americas L.L.C. (GNF-A) facility in Wilmington, North Carolina hereby provides the requested information in support of our fuel manufacturing license amendment request (Reference 2). This information is being provided in response to your request dated October 4, 2022 (Reference 4).

Please contact me on (910) 819-5950 if you have any questions or would like to discuss this matter further.

Sincerely,


S.P. Murray, Manager,
Facility Licensing

Attachment: GNF-A Response to NRC Request for Supplemental Information

Cc: J. Rivera, USNRC RII
SPM 22-031

RSI 1

Information Needed:

Provide descriptions with appropriate references to sections of current licensing basis documents (e.g., past license renewal documents) and the June 24, 2022, license amendment request (LAR) documents that requested changes to the 30B cylinder receipt, pad storage, incineration, decontamination facilities, liquid radwaste effluent treatment systems that would occur for uranium fuel fabrication at 8.0 weight percent Uranium-235 (U-235).

Deficiency:

The section entitled "Environmental Protection" of the Global Nuclear Fuel – Americas (GNF-A) LAR submittal dated June 24, 2022 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML22175A070), only steps through each item under Title 10 of the Code of Federal Regulations (10 CFR) Paragraph 51.60(b)(2) and makes general conclusions regarding the categorical exclusions of 10 CFR 51.22(c)(11) and environmental impacts under the submitted LAR. However, no detailed justifications are provided such as referring to the appropriate text in other portions of the LAR application or to the environmental impacts assessed under the prior license renewal to support the statements in the Environmental Protection section. According to other information provided in the LAR, changes are proposed to the criticality safety analysis and controls that may impact the 30B cylinder receipt, pad storage, incineration, decontamination facilities, and liquid radwaste effluent treatment systems.

GNF-A Response

As part of the last SNM-1097 license renewal process, GNF-A provided NRC an Environmental Report Supplement dated March 30, 2007 (ML071000137). NRC Division of Waste Management and Environmental Protection reviewed this information and issued an Environmental Assessment (ML0911180239) on May 14, 2009, in support of the proposed license renewal. This assessment was summarized and published in the Federal Register on May 19, 2009 (Vol. 74, No. 95). The summary stated that all of the environmental impacts were small-to-moderate. The license renewal request does not require altering the site footprint nor does it change the operating processes of the existing facility. Airborne effluents released through stacks and liquid effluents released into the North Cape Fear River are below and are anticipated to remain below regulatory limits in 10 CFR 20 for non-radiological and radiological contaminants. Public and occupational exposures are below the limit established in 10 CFR 20. The staff concluded that the proposed 40-year renewal of license SNM-1097 will not result in a significant impact on the environment.

As indicated in the SNM-1097 license amendment request dated June 24, 2022, GNF-A has re-evaluated and documented criticality safety analyses (CSA's) including CSAs related to 30B cylinder receipt, pad storage, incineration, decontamination facilities, and liquid radwaste effluent treatment systems. The most significant physical modifications will be to the liquid radwaste effluent treatment systems and decontamination facilities. The existing liquid radwaste effluent treatment system is to be replaced by a new system with tanks sized and spaced to meet criticality safety geometry control requirements. The decontamination facilities modifications involve size reductions to a floor trench and collection sump that feeds the liquid radwaste effluent treatment systems. While these

changes are significant in terms of the effort to make the change, the systems functionally remain the same in terms of treatment, filtration, and discharge monitoring.

Primary high efficiency filters in some areas will be replaced with filters having a reduced filter depth to meet reduced geometry control requirements; however, the efficiency of the filter remains the same and meets the existing SNM-1097 license application requirement (i.e., 99.97% efficient on 0.3-micron particles).

Minor physical, software, and administrative changes will also be required in other process areas to implement reduced limits on criticality controls. Most of these changes relate to implementation of reduced mass limits for individual stations, processes, or containers. Details of the changes are described in applicable safety analysis that supported development of the ISAS Summary modifications provided in the LAR. Such changes will have negligible impact on air or liquid effluent releases.

In addition, as a part of the SNM-1097 amendment request Integrated Safety Analysis (ISA) reviews, process hazard analyses (PHA's) and quantitative risk assessments (QRA's) were performed, and an updated draft Integrated Safety Analysis Summary (ISAS) was documented for existing operations at the requested enrichment limit of 8 wt. % U 235. A copy of the updated ISAS pursuant to 10 CFR 70.65(b) was provided as Attachment 7 to the June 24, 2022, amendment request. A summary of the ISA and control changes begins on page 12 of this file. There were no changes to the consequence severity rankings for events related to air or liquid effluent releases or associated Items Relied on For Safety (IROFS).

As a result, conclusions from the NRC May 2009 assessment remain valid or are bounding and the requested license amendment does not significantly alter the previously evaluated environmental impacts associated with the licensed operation and does not affect the scope or nature of the licensed activity.

RSI 2

Information Needed:

The NRC staff needs additional information to complete its environmental review of the LAR. Pages 3-3 through 3-7 of NUREG-1748, "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs," provide a discussion of the information that is needed for the development of an environmental assessment (EA) for a simple licensing action. Additionally, Chapter 6 of NUREG-1748 provides a detailed discussion of the information needed for each of the resource areas to include in your environmental report (ER).

The ER for the GNF-A license renewal application should be supplemented in accordance with the guidance in NUREG-1748. Specifically, the ER should include relevant information regarding changes that have occurred since the March 30, 2007, GNF-A Wilmington Environmental Report Supplement (ML071000137), provided with GNF-A's 2007 license renewal application. Additionally, the ER should include any details on how the nuclear fuel conversion, fuel fabrication facility, and fuel support activities will be impacted due to the increased enrichment. This should include the impact on the 30B cylinder receipt, pad storage, incineration, decontamination facilities, and liquid radwaste effluent treatment systems as indicated in your letter dated June 24,

2022. In this discussion, please provide details on the changes to receive shipments of higher enriched U-235, modifications to store the higher enriched materials onsite, specific impacts to air and water due to effluents, and specific estimated values of increases in public and occupational dose, such that the NRC can complete an assessment of these impacts.

Deficiency:

In the LAR, GNF-A indicates that its request can be categorically excluded under 10 CFR 51.22(c)(11). However, the considerations noted by GNF-A include topics that the NRC staff must evaluate during the safety review. The NRC staff has not yet been provided sufficient information to conclude that this action can be categorically excluded.

GNF-A Response

The impacts to 30B cylinder receipt, pad storage, incineration, decontamination facilities and liquid effluent treatment systems are discussed in the GNF-A response to RSI 1.

Information provided in the GNF-A license renewal Environmental Report supplement dated March 30, 2007, and NRC Environmental Assessment dated May 14, 2009, regarding public and occupational dose remain valid or are bounding. Over the past decade there have been additional reductions in many of these results.

Per 10 CFR 70.59, GNF-A is required to send NRC semi-annual effluent monitoring reports for public dose. A review of these reports from 2012 through the first half 2022 indicates that the highest calculated potential radiological dose to the public from GNF-A effluents ranged from 0.021 to 0.149 mRem. The NRC annual public dose limit is 100 mRem with constraint limits of 25 mRem from all operations and 10 mRem from air emissions.

Occupational doses are recorded using two methods. Worker internal dose is calculated from air sampling results and is recorded as committed effective dose equivalent (CEDE). Worker external dose is measured using personnel dosimetry and is recorded as deep dose equivalent (DDE). Radioactive emissions from U 234 cause the majority of the CEDE while radioactive emissions from U 238 and decay daughter isotopes cause most of the DDE.

The radioactivity produced from unirradiated uranium varies with the U 235 enrichment. Naturally occurring uranium has a specific activity (SA) of 1.5 disintegrations per minute per microgram or 0.67 uCi/g. The isotopes of U 238 and U 234 each contribute about half of this activity. As the enrichment in U 235 is increased, the activity from U 234, which enriches faster than U 235, increases rapidly with the U 238 activity remaining constant.

While the exact SA of enriched uranium depends on several factors in the enrichment process, the SA may be approximated using the following equation:

$$SA = (0.4 + 0.38E + 0.0034E^2) \text{ uCi/g}$$

Where E = weight % of U 235
(Ref: NRC Reg Guide 8.11, Revision 0, Figure 11)

Using the above formula and a very conservative assumption that all uranium processed by GNF-A in a year is enriched to 8 wt.% U 235, the specific activity increase from enrichments increasing from 5 to 8 wt. % would be about 63% due to the U 234.

$$SA = (0.4 + 0.38(5) + 0.0034(5^2)) = 2.025 \text{ uCi/g}$$

$$SA = (0.4 + 0.38(8) + 0.0034(8^2)) = 3.298 \text{ uCi/g}$$

The most recent GNF-A semi-annual effluent monitoring report dated August 15, 2022 (ML22227A048) reported the highest public dose due to air emissions was calculated to be 0.026 mRem. If this result was doubled to estimate the full year, it is approximately 0.5 % of the NRC constraint value of 10 mRem. If this was conservatively increased by 63%, the public dose due to air emissions would increase to approximately 0.84 % of the NRC constraint value. Similarly, the highest reported calculated public dose due to air emissions in past ten years was 0.149 mRem during the first half of 2016. If this result was doubled to estimate the full year, it is approximately 3 % of the NRC constraint value. If this was conservatively increased by 63%, the highest calculated public dose due to air emissions in the past ten years would increase to approximately 4.9 % of the NRC constraint value.

The highest annual public DDE from environmental fence line dosimetry during 2021 was approximately 22 mRem. While this is below the 25 mRem constraint level, facility changes have already been made to significantly reduce this dose (e.g., a Model 30B cylinder storage pad has been physically relocated away from the fence line).

Specific estimated increases in occupational dose are more difficult to quantify. For example, occupational worker dose is dependent on many factors in the GNF-A fuel manufacturing process. In addition to average facility enrichment, these include impurities in the uranium feed material, fuel processing times, finished goods storage inventory and re-work. However, based on experience with previous incremental enrichment increases over the last two decades, the worker DDE is expected to increase between 10 to 20 %.

In 2021, the highest worker dose was 554 mRem external DDE or approximately 11% of the NRC annual worker dose limit of 5000 mRem. Using a very conservative assumption that all uranium processed in a year is enriched to 8 wt. % U 235, the highest worker DDE could potentially increase to approximately 13% of the NRC limit¹.

In 2021, the highest worker internal CEDE was 326 mRem or approximately 6% of the NRC annual limit. Again, using a very conservative assumption that all uranium processed in a year is enriched to 8 wt. % U 235, the highest worker CEDE could potentially increase to approximately 11 % of the NRC limit².

No additional environmental resources (e.g., land or water) are affected by the proposed change (e.g., the construction of a building, change in the amount of water taken in by the facility, record keeping or reporting requirements, etc.). As stated above, effluent

¹ 554 mRem * 1.20 = 664 mRem; 664 mRem/5000 mRem * 100 = 13.28%.

² 326 mRem * 1.63 = 547.68 mRem; 547.68 mRem / 5000 mRem * 100 = 10.95%.

environmental resources will be minimally affected by releases of radioactivity from facility effluents. These environmental effects will be so minor that they will not destabilize nor noticeably alter any important resource attribute or are sufficient to noticeably alter but not destabilize any important attributes since the affected radiological doses remain a small fraction of the regulatory limits.

Likewise, nonradiological impacts to resources including ecological, aesthetic, historical, cultural, socioeconomic, health, threatened and endangered species or critical habitat will not be affected by the proposed action. These include:

- Degradation of water quality or water supply
- Habitat destruction
- Increased air or liquid emissions
- Increased noise
- Damage or reduced access to cultural resources
- Changes to local or regional socioeconomic conditions
- Increased traffic or other transportation effects
- Increased competition for available resources, or
- Additional population or changing demographics

As a result, the prior conclusion that the potential environmental impacts are small-to-moderate as defined in NUREG-1748 remains valid.