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LICENSE NUMBER: SNM-2010

LICENSEE: Louisiana Energy Services, LLC
URENCO USA Enrichment Facility
Eunice, New Mexico

SUBJECT: SAFETY EVALUATION REPORT REGARDING LICENSE AMENDMENT REQUEST FOR CAPACITY EXPANSION OF THE URENCO USA FACILITY (TAC NO. L34228)

1.0 SUMMARY OF LICENSE AMENDMENT REQUEST

Under Special Nuclear Material License No. SNM-2010, Louisiana Energy Services (LES or the licensee) has operated a gas centrifuge uranium enrichment facility (known as URENCO USA or UUSA) in Lea County, New Mexico, since 2010. Pursuant to regulations in Title 10 of *the Code of Federal Regulations* (10 CFR) Parts 30, 40, and 70, the licensee is authorized to possess and use byproduct, source, and special nuclear material (SNM). The licensee is authorized to enrich natural uranium (i.e., source material) up to a maximum of 5 weight percent in the isotope U-235 form, and ship this SNM offsite. The licensee now produces SNM in three separation building modules (SBMs), designated as SBM-1001, SBM-1003, and SBM-1005. The UUSA facility currently has a total production capacity of approximately 3.7 million separative work units (SWUs) per year.

By letter dated November 9, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12319A591)[1], the licensee submitted a license amendment request (LAR), LAR-12-10, to the U.S. Nuclear Regulatory Commission (NRC) seeking to expand its SNM production capacity by adding three new SBMs. These SBMs would be designated SBM-1005, SBM-1007, and SBM-1009. Adding these SBMs would increase the UUSA's total SNM production capacity from 3.7 million SWU to 10 million SWU per year. To accomplish this increase, these additional SBMs and support facilities will be constructed. The newer model TC21 centrifuges (as utilized in SBM-1003) will be used. The use of the model TC21 centrifuges was previously approved by the NRC staff (NRC, 2012a) through review of LAR-11-11 (LES, 2011).

As with the existing SBMs, each of the new SBMs would contain plant support systems such as compressed air, centrifuge cooling water, and electrical distribution systems. Construction of SBM-1007 and SBM-1009 would also be supported by development of a new Cylinder Receipt and Dispatch Building (CRDB-2). As indicated above, SBM-1001 and SBM-1003 are fully operational, and on February 6, 2015 (ADAMS Accession No. ML15037A054), the licensee was authorized to start operations of the first cascade in SBM-1005. SBMs-1007 and 1009 are planned for the future, and construction at UUSA is expected to take place over the next 20 years.

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[1] Enclosure 2 to this LAR is a set of Markups for the Safety Analysis Report (SAR), the Integrated Safety Analysis Summary (ISA Summary), the Emergency Plan (EP), and the Fundamental Nuclear Material Control Plan (FNMCP). These markups reflect the changes that would be made to these documents if the LAR is approved.

On June 17, 2014 (ML14171A092), the licensee supplemented its 2012 LAR, stating in part that the cascades in SBM-1005 were being designed to allow for use of high assay uranium tails ([redacted]) as feed material, instead of using natural uranium which contains approximately 0.7 weight percent U-235. This change [redacted] results in a new potential accident condition that necessitated the introduction of two new "Items Relied On For Safety" (IROFS). The licensee also requested an increase in its authorized possession limits for natural, depleted, and enriched uranium. Specifically, the licensee requested that License Condition 8a of License No. SNM-2010 be modified by increasing the possession mass limit for natural and depleted uranium from 136,120,000 kg to 251,000,000 kg, and that License Condition 8.b be modified by increasing the possession mass limit for enriched U-235 from 545,000 kg to 2,180,000 kg.

Although it was not constructed until recently, the proposed construction and operation of SBM-1005 was included in the licensee's December 2003 original license application (also called the Safety Analysis Report (SAR) by the licensee). The NRC staff documented its review of the license application in a Safety Evaluation Report (SER) (NUREG-1827) and issued the license in June 2006 (ADAMS Accession No. ML061780384). The staff's 2005 Final Environmental Impact Statement (NUREG-1790) similarly addressed the construction and operation of SBM-1005. After its license was issued, LES chose not to construct SBM-1005, and later removed references to it from their SAR and other license basis documents. Within the last several years, LES, using their SAR change process outlined within License Condition 30 and other change processes in the regulations, restored references to SBM-1005.

The NRC staff has determined that NUREG-1827 and NUREG-1790 adequately addressed the construction and operation of SBM-1005. The staff also reviewed the facility and licensing basis document changes made by LES to restore the appropriate references to SBM-1005 and determined that they were made consistent with the regulations and License Condition 30.

Therefore, with the exception of allowing the use of high assay tails (depleted uranium) as feed material for the cascades within SBM-1005, a process that was not included in the original license application, the staff has determined that it is not necessary to review SBM-1005 as part of this amendment request. The use of high assay tails is reviewed in Chapter 5 of this SER.

As part of its expanded facility, the licensee plans to increase the uranium byproduct cylinder (UBC) storage pad area from its existing 2.6 acres to 23 acres. The larger area would increase the facility's cylinder storage capacity from 15,727 to 25,000 cylinders, each of which would hold depleted uranium in approved storage and transportation cylinders in a triple-stack arrangement. Two additional UBC storm water retention basins would also be added to manage storm-water runoff from the expanded UBC storage pad.

This SER focuses on the potential effects to public health, safety, and the environment as a result of the changes proposed in LAR-12-10 and its 2014 supplement. The NRC staff, in this SER, does not re-review previously approved programs for which no changes have been requested by the licensee. Such programs include the licensee's Radiation Protection Program. In this regard, the licensee is and will remain subject to the As Low As Reasonably Achievable (ALARA) requirement that is set forth in 10 CFR 20.1101(b) as follows:

> The licensee shall use, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as is reasonably achievable (ALARA).

Similarly, the licensee did not make any programmatic changes to its facility fire protection program. The current program manages the risk of both fire and explosions and remains acceptable. The application of the fire protection program will continue to be verified by future inspections.

In 2012, the licensee submitted an environmental report (later supplemented) (ADAMS Accession No. ML12262A537), which the NRC staff has used in preparing a separate environmental assessment of the proposed action (ADAMS Accession No. ML15072A016).

Based on the evaluations set forth below in Chapters 2 through 5, the staff finds that there is reasonable assurance that the UUSA facility can and will be operated in a manner that will not be inimical to the common defense and security, and that the health and safety of workers, the public, and the environment will continue to be adequately protected. Thus, license SNM-2010 will be amended as requested.

2.0 EVALUATION OF SBM-1005, SBM-1007, SBM-1009, CRDB-2, URANIUM BYPRODUCT CYLINDER STORAGE PAD EXPANSION

2.1 LICENSEE REQUEST

In LAR-12-10, the licensee requested NRC's authorization to increase the UUSA enrichment facility's production capacity. As a part of the increase in production capacity, the licensee requested NRC's approval and authorization to construct and operate three additional SBMs: SBM–1005 (Phase 3, has recently been constructed); SBM–1007 (Phase 4, future work); and SBM–1009 (Phase 5, future work). SBM–1007 and SBM–1009 are future projects, dependent on market conditions. The licensee is also requesting authorization to construct and operate a second CRDB (CRDB-2), which would be needed to provide additional cylinder handling capability should SBM-1007 and SBM-1009 start producing enriched uranium. An expansion of the current UBC storage pad is proposed to allow for additional storage of depleted uranium hexafluoride (DUF_6) cylinders.

As discussed in Chapter 1, with the exception of allowing the use of high assay tails (depleted uranium) as feed material for the cascades within SBM-1005 (i.e., re-feed capability), a process that was not included in the original license application, the staff has determined that it is not necessary to review SBM-1005 as part of this amendment request. The use of the re-feed capability is reviewed in Chapter 5 of this SER.

In the current license SNM-2010, License Condition 21 limits DUF_6 cylinder storage to 15,727 Model 48Y cylinders (or the equivalent amount of uranium stored in other NRC-accepted and Department of Transportation certified types of DUF_6 cylinders). To accommodate the requested increase in production capacity, LAR-12-10 requests authorization to store up to 25,000 cylinders, which will require expanding the size of the existing UBC storage pad. The proposed expansion would increase the UBC storage pad area from its existing 2.6 acres to 23 acres. The licensee states that this proposed expansion is consistent with the licensee's revised agreement with the State of New Mexico regarding a limitation of the total amount

number of DUF_6 cylinders that will be allowed to be stored at the UUSA facility (ADAMS Accession No. ML14343A797).

2.2 APPLICABLE REGULATORY REQUIREMENTS

The applicable regulatory requirements relevant to the design, construction, and operation of SBM-1007, SBM-1009, CRDB-2, and expanded UBC cylinder pad are: 10 CFR 70.22(a)(7); 10 CFR 70.64(a)(2) and (a)(4); 10 CFR 70.65(b)(1)-(4); 10 CFR 20.1101(d); 10 CFR 20.1201(a)(1); 10 CFR 20.1301; and 40 CFR 190.10(a).

2.3 REGULATORY ACCEPTANCE CRITERIA

The NRC staff used the acceptance criteria in NUREG-1520, Revision 1, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," to perform the review documented in this SER Chapter.

Applicable acceptance criteria for the staff to determine compliance with 10 CFR 70.22(a)(7) and 10 CFR 70.65(b)(1)-(2) are set forth in Section 1.1.4 of NUREG-1520.

Applicable acceptance criteria for the staff to determine compliance with 70.65(b)(3)-(4) are set forth in Section 3.4.3.2 of NUREG-1520.

Applicable acceptance criteria for the staff to determine compliance with the baseline design criteria in 10 CFR 70.64(a)(2) and (a)(4) are set forth in Section 3.4.3.2 of NUREG-1520.

Applicable acceptance criteria for the staff to determine compliance with the dose constraint for air emissions in 10 CFR 20.1101(d) are set forth in Section 9.4.3.2.1 of NUREG-1520.

Applicable acceptance criteria for the staff to determine compliance with 10 CFR 20.1201(a)(1) are set forth in Section 4.4.7.3 of NUREG-1520.

Applicable acceptance criteria for the staff to determine compliance with 10 CFR 20.1301 are set forth in Sections 4.4.7.3 and 9.4.3.2.2 of NUREG-1520.

There are no NRC acceptance criteria for compliance determinations with 40 CFR 190.10(a), which requires that the radiological exposure to a member of the public to not exceed the limits of the annual dose equivalent to the whole body, thyroid, or any other organ.

2.4 STAFF TECHNICAL EVALUATION

The NRC staff's evaluation that follows is presented in two subsections: (i) Design Description and (ii) Radiation Impacts.

2.4.1 DESIGN DESCRIPTION

General Description and Design Information

The staff evaluated the licensee's design description and information for SBM-1007, SBM-1009, CRDB-2, and the expanded UBC storage pad against the requirements of 10 CFR 70.65(b)(1)-(2) and 10 CFR 70.22(a)(7). 10 CFR 70.65(b)(1)-(2) requires, in relevant part, that the ISA

summary contain a general description of the site and facility with an emphasis on those areas that could affect safety (i.e., meteorology, seismology), including an identification of the controlled area boundary. 10 CFR 70.22(a)(7) requires, in relevant part, that any license application describe equipment and facilities that will be used to protect health and minimize danger to life.

The licensee provided the facility layout including the site boundary and controlled area boundary in SAR Figure 1.1-4 and ISA Summary Figure 3.3-1 of Enclosure 2 of LAR-12-10. This figure shows the general arrangement of proposed SBM-1007 and SBM-1009 relative to SBM-1005, the existing SBM-1001, SBM-1003, and CRDB-1, and the proposed CRDB-2 and expanded UBC cylinder pad. Additionally, the figure shows the proposed distances between SBM-1007, SBM-1009, CRDB-2, and the expanded UBC cylinder pad to the existing site boundary and controlled area boundary. The overall layouts for SBM-1007 and SBM-1009, including cascade arrangements and UF_6 handling equipment locations, are respectively shown in SAR Figures 1.1-22 through 1.1-24 and ISA Summary Figures 3.3-21 through 3.3-23 (SBM-1007) and SAR Figures 1.1-25 through 1.1-27 and ISA Summary Figures 3.3-24 through 3.3-26 (SBM-1009) of Enclosure 2 of LAR-12-10. The licensee stated that the SBM-1007 and SBM-1009 buildings would be structurally independent from adjacent structures. The licensee provided an overall layout of the proposed CRDB2 in SAR Figure 1.1-28 and ISA Summary Figure 3.3-27 of Enclosure 2 of LAR-12-10.

The licensee stated that similar to the NRC-approved SBM-1001 and SBM-1003, each new SBM would have a total of 24 cascades split into two assays of 12 cascades each. All new SBMs are to be populated with model TC-21 centrifuges, the same centrifuge type used in SBM-1003. All new SBMs would also contain an associated UF_6 handling area, process service corridor, and associated plant support systems, such as compressed air, centrifuge cooling water, and electrical distribution systems, and a link corridor to move the UF6 cylinders to and from the CRDBs. The licensee stated that the future SBM-1007 and SBM-1009 would be constructed in a similar fashion as SBM–1005 (e.g., designed as Type I-B Construction by the New Mexico Commercial Building Code for structural construction and as Type II (222) Construction by National Fire Protection Association 220, "Standard on Types of Building Construction"), except that SBM-1007 and SBM-1009 would not have the re-feed capability (LES, 2012d; 2013c). The staff evaluated the description of the re-feed capability for SBM-1005 and finds that the re-feed capability in SBM-1005 is accomplished with design changes to the cascades that will not alter the design of the SBM-1005 building itself. See Chapter 5 of this SER for the staff's evaluation of the re-feed process.

The CRDB-2 would be located between the proposed SBM-1007 and SBM-1009 and its structure is a standard pre-engineered steel frame building, similar to the approved CRDB-1 structure. It will be designed for its stability to withstand site-specific hazards using American Institute of Steel Construction ASD Manual of Steel Construction and American Concrete Institute 318, and would perform design analyses in accordance with accepted industry standards, including American Society of Civil Engineers (ASCE)-4 and ASCE-7. Application of these codes and standards are the same as those approved for use by the NRC (NRC, 2005) in the design and construction of CRDB-1. Although the UF6 cylinders handled in CRDB-2 would be the same as in CRDB-1, the CRDB-2 would only be used for cylinder handling and not sampling, cleaning, repair, etc., as performed in CRDB-1. As a result, these activities will increase in volume in CRDB-1 as the enrichment capacity is increased.

As shown in the layout figure (SAR Figure 1.1-4 and ISA Summary Figure 3.3-1 of Enclosure 2 of LAR-12-10), the UBC storage pad with the proposed expansion area would continue to be located outside of and detached from the existing and future SBMs and CRDBs. The licensee states, and the NRC staff agrees, that the proposed UBC storage pad expansion would be similar to the existing storage pad, which is simply an open-air concrete pad. The existing UBC storage pad would be added to in sections, as needed (SAR Section 12.2.3 of Enclosure 2 to LAR-12-10). The UBC storage pad is used to: (i) store depleted U-235 in corrosion-resistant American National Standards Institute (ANSI) N14.1 Model 48Y cylinders; (ii) provide limited buffered storage for full and empty feed Model 48Y cylinders; and (iii) provide limited buffered storage for full and clean, empty Model 30B product cylinders (SAR Section 1.1.2 and ISA Summary Section 3.3.1.6 of Enclosure 2 of LAR-12-10 [LES, 2012d] and LAR-12-10 Supplement (LES, 2014a]).

The staff evaluated the information the licensee provided with respect to the description and design of SBM-1007, SBM-1009, CRDB-2, and the expanded UBC cylinder pad. Based on its evaluation, the staff finds that the descriptions for SBM-1007, SBM-1009, CRDB-2, and expanded UBC cylinder pad are adequate because: (i) the descriptions are at a level of detail appropriate for general familiarization and understanding of SBM-1007, SBM-1009, CRDB-2, and expanded UBC cylinder pad; (ii) the descriptions include drawings showing site boundary, controlled area boundary, and their locations relative to the site boundary; (iii) the description includes the overall layouts of SBM-1007, SBM-1009, CRDB-2, and expanded UBC cylinder pad; and (iv) the design information includes the appropriate and applicable codes and standards for structural design. Thus, the staff finds the licensee has met the requirements of 10 CFR 70.65(b)(1)-(2) and 10 CFR 70.22(a)(7).

Applicable Baseline Design Criteria

The staff evaluated the baseline design criteria related to the natural phenomena hazards (10 CFR 70.64(a)(2)) and environmental and dynamic effects (10 CFR 70.64(a)(4)) for SBM–1007, SBM–1009, CRDB-2, and the expanded UBC storage pad. With the exception of soil instability (which is related to seismic hazards) and aircraft crash hazards (which is related to environmental and dynamic effects), previous design criteria for other natural phenomena hazards and environmental and dynamic effects remain applicable to the entire site and have previously been reviewed and approved by the NRC during the licensing of SBM–1001, SBM–1003, SBM-1005, and CRDB-1 (NRC, 2005).

Therefore, the staff's evaluation of LAR-12-10 focuses only on the licensee's assessment of: (i) stability of soils beneath the proposed SBM-1007, SBM-1009, and CRDB-2, and (ii) aircraft crash hazards for SBM-1007, SBM-1009, CRDB-2, and the expanded UBC storage pad. With respect to soil instability, two failure mechanisms are liquefaction and settlement. When liquefaction and settlement occurs, it can lead to deformation of structures. This deformation can cause failure of structures which can lead to potential releases of materials within the structures. Because the expanded UBC storage pad is a structure that consists only of a concrete pad, cylinders stored on the pad would not be subject to any falling building debris should a liquefaction or settlement event occur, and due to the robust nature of the storage cylinders, pad deformation alone would not be expected to cause a significant release of radioactive materials. Thus, any deformation due to liquefaction and/or settlement would not lead to a significant release of radioactive materials from the expanded UBC storage pad.

In Section 3.2.7 of its ISA Summary, submitted in support of its initial license application (LES, 2005c), the licensee discussed stability of soils (liquefaction and settlement) at the facility site. The licensee determined that there was no potential for liquefaction at the site and that the site was stable. Additionally, in Section 3.2.7 of Enclosure 2 (ISA Summary mark-up pages) of LAR-12-10 and in its response (LES, 2013c) to an NRC staff request for additional information (RAI), the licensee provided confirmatory evaluations based on the results of previously conducted additional, detailed, geotechnical investigations (Nuclear Technology Solutions, LLC; 2006). This evaluation was applicable to an area of the site that includes SBM-1005 but does not include SBM-1007, SBM-1009, and CRDB-2. The evaluation verified that liquefaction is not a safety concern to this investigated area of the site. The assessment of soil liquefaction potential of collected soil information was performed by the licensee using the applicable sections of Regulatory Guide 1.198, "Procedures and Criteria for Assessing Seismic Soil Liquefaction at Nuclear Power Plant Sites."

The licensee stated (LES, 2013c) that, once it decides to construct additional structures, confirmatory evaluations for the stability of materials beneath SBM-1007, SBM-1009, and CRDB-2 will be accomplished by either performing additional geotechnical investigations or providing technical bases to justify that the existing geotechnical investigation results bound the soil properties beneath these proposed facilities. Because the licensee committed (LES, 2013c) to perform additional geotechnical investigations at the site to confirm the initial finding (LES, 2005c) that liquefaction is not a safety concern for the proposed new construction at the facility, the staff finds that the requirements of 10 CFR 70.64(a)(2) are met.

As discussed in NUREG-1827 evaluating the initial license application in 2005 (NRC, 2005), in order to meet the requirements of 10 CFR 70.64(a)(4), the licensee identified a low level Federal airway passing within 9 km (about 6 statute miles) northeast of the UUSA facility as constituting an aircraft crash hazard at the facility. For the original proposed footprint, the probability of an aircraft crashing onto the proposed facility was estimated to be $3.4 \times 10{-}7$ (Yeung, 2003). The proposed additions to the UUSA facility requested in LAR 12-10 have negligible impact on the probability of an aircraft crash at the facility, which remains an incredible event or safety hazard[2]. This was due to the fact that the original estimates were based on a total target area (for the site) of approximately 50 acres, 40 acres for the site plus 10 acres of margin. The total area of the proposed expanded facility (i.e., an area which encompasses new SBM-1007, new SBM-1009, the new CRDB-2, and the expanded UBC storage pad) is still within the previously evaluated total target area of approximately 50 acres. The increased margin (10 acres) along with an allowance for increased flights in the future was previously reviewed and approved by NRC in NUREG-1827. Thus, the staff finds that even with the proposed facility expansion, which encompasses the area for the construction of SBM-1007, SBM-1009, CRDB-2, and expanded UBC storage pad, the original aircraft crash hazards analysis remains acceptable and the requirements of 10 CFR 70.64(a)(4) are met.

IROFS

The staff evaluated the licensee's compliance with 10 CFR 70.65(b)(3) and (4) which requires, in general, the ISA Summary to include a general description of processes, hazards involved

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[2] LES, in Section 3.1.3.2 of its original license application, defined a "not credible" event as an external event, the frequency of which can conservatively be estimated as less than once in a million years. Events that are not credible do not require IROFS to prevent or mitigate the event.

with those processes, a general description of the types of accident sequences, and information that demonstrates compliance with the performance requirements of 10 CFR 70.61. The licensee provides a description of the processes and related hazards in Sections 3.3, 3.4, 3.5, and 3.6 of the ISA Summary. The licensee also provides a listing of accident sequences and information that demonstrates compliance with the performance requirements of 10 CFR 70.61 in Section 3.7. The staff evaluated the proposed revisions to these sections and determined that they adequately address the new SBMs, CRDB-2, and expanded UBC storage pad. Because the processes have not changed (except for the re-feed process in SBM-1005, reviewed in Chapter 5), the licensee identified no new processes, hazards, or accident sequences. Thus, the staff finds that the licensee is appropriately applying the previously reviewed and approved IROFS, such as IROFS27e, and still demonstrates compliance with the performance requirements of 10 CFR 70.61. All new construction is designed for the same external events as was used for the previously approved SBMs and CRDB-1. The staff notes that the licensee has committed to construct the proposed SBMs, CRDB-2, and expanded UBC storage pad in accordance with the same codes and standards that were found acceptable in past licensing reviews. The staff finds that the licensee has met the requirements of 10 CFR 70.65(b)(3)-(4).

2.4.2 RADIATION IMPACTS

Worker Radiation Exposure from Operation of New Facilities

The occupational dose requirements of 10 CFR 20.1201 state that the annual total effective dose equivalent (TEDE) to workers must not exceed 5 rem (0.05 Sv). The licensee presented its estimates of the annual dose equivalent rates and projected dose impact for different areas of the site (Table 4.12-14; LES, 2012e). In Enclosure 1 to LAR-12-10, the licensee reported that the maximum projected annual TEDE for workers is 157 mrem (1.57 mSv) for the current facility capacity (3.7 MSWU), and LES estimated this TEDE would increase to 377 mrem (3.77 mSv) for the expanded capacity (10 MSWU). The staff questioned why the increase in dose was not in direct proportion to the increase in SWU. In its response (LES, 2013b), the licensee clarified that unnecessary conservatisms in the calculation for 3.7 MSWU were reduced in the calculations for 10 MSWU. In addition, the licensee considered occupational dose increases resulting from elevated feed rates and cylinder operations, which are anticipated with the re-feed design because natural feed and tails feed rates influence the throughput of cylinder operations and handling. However, based on operating experience, the licensee does not expect annual occupational doses to any individual to exceed 150 mrem (1.50 mSv).

The staff finds that the projected dose impacts are acceptable because: (i) the method used is consistent with the standard engineering practices for radiation dose estimation; (ii) assumptions used in the calculations and the magnitude of the reduced conservatism are reasonable; and (iii) the estimates are consistent with the licensees historical dose records. The staff finds that the estimated maximum annual TEDE of 377 mrem (3.77 mSv) for any individual performing work in either CRDB would still be well below the annual allowable limit of 5 rem (0.05 Sv) as stated in 10 CFR 20.1201(a)(1) as well as the licensee's 500 mrem (5.00 mSv) annual administrative limit. These conclusions are also valid given the reduced set of operations planned at the CRDB-2 because LES assessed the highest doses to workers for the entire site.

Based on the staff's evaluation of worker exposure in the SBMs, the staff agrees that individuals performing work in the SBMs would receive annual TEDE less than those handling cylinders in the CRDBs. Dose rates in the UF6 handling area, process services corridor, and cascade halls of an SBM are lower than the dose rates of up to 1 mrem/hr (0.01 mSv/hr) at 1 meter from a single full or empty UF6 cylinder (Table 4.1 2; LES, 2013h). Accordingly, the staff finds that the TEDE for individuals in the SBMs (assuming operation of 5 SBMs with a production capacity of 10 MSWU) would be well below the annual allowable limit of 5 rem (0.05 Sv) stated in 10 CFR 20.1201(a)(1) and is therefore acceptable.

In Table 4.1-2 of LAR-12-10 (Section 4.1; LES, 2012d), the licensee indicated a dose rate of less than 0.01 mrem/hr (0.1 μSv/hr) for the plant general area excluding the SBMs. During its review, the NRC staff requested the licensee to estimate dose rates in occupied areas close to the expanded UBC storage pad and to describe the considerations given to these dose rates in the assessment of expanded facility operations (NRC, 2013c). In response to this request, the licensee provided an assessment of worker doses for site expansion activities (LES, 2013e). Calculations for the assessment were performed with the widely accepted radiation transport code, the Monte Carlo computer code, MCNP5 Version 1.40. As expected, dose rates decreased rapidly with distance from the UBC storage pad. The highest calculated dose rates were 1.2 to 1.5 mrem/hr (12 to15 μSv/hr) on the pad edges. At distances greater than 50 meters from the storage pad edges, LES calculated dose rates of approximately 0.1 mrem/hr (1μSv/hr) or less. The licensee utilized flux-to-dose-rate conversion factors from an older national standard in the worker dose assessment (ANSI/ANS-6.1.1-1977 rather than the latest version, ANSI/ANS-6.1.1-1991). The NRC staff finds that use of the older national standard is acceptable because it will overestimate dose rates compared to using dose conversion factors from the latest standard.

The staff also reviewed the LES calculations of dose to cylinder handlers, and the staff finds that the licensee has properly calculated the increase in exposure to the workers. The staff finds that due to increased storage and handling operations, the handlers are only expected to be exposed to a maximum increase of 30 mrem/yr (300 μSv/yr). Thus, the total calculated direct dose to cylinder handlers would increase to a maximum of 150 mrem/yr. The staff finds this to be a properly conservative estimate, and it remains well below both the LES administrative limit of 500 mrem/yr and the NRC's occupational dose limit of 5 rem/yr (0.05 Sv/yr) as stated in 10 CFR 20.1201(a)(1).

Therefore, on the basis of accepted methods, appropriate input values, and conservatism used by the licensee in its occupational dose calculations, the NRC staff finds that workers involved with SBM, CRDB, and UBC storage operations (assuming the requested operation of a facility with a production capacity of 10 MSWU) would not be exposed to annual TEDE dose levels above those allowed under 10 CFR 20.1201(a)(1).

Radiation Exposure of Members of the Public

The requirements of 10 CFR 20.1301(a)(1) state that the annual TEDE to individual members of the public from an NRC-licensed operation must not exceed 100 mrem (1 mSv). To verify that it will remain in compliance with this requirement, the licensee performed new modeling, which included extrapolations to update the projected site boundary dose from gaseous and liquid effluents that would result if the facility capacity is expanded as requested (Enclosure 1; LES, 2012d). The licensee determined, and the NRC staff agrees, that the most significant increase

in exposure during normal operations to members of the public would be due to greater gaseous and liquid effluent release rates associated with expanded, routine operations in the SBMs and CRDB-1. The licensee calculated that the annual TEDE to the maximally exposed individual members of the public located at the site boundary from such effluents would increase fractionally—from 0.0097 mrem to 0.0345 mrem, which is well below the 100 mrem (1 mSv) limit in 10 CFR 20.1301(a)(1).

The staff evaluated the licensee's projected site boundary dose from the anticipated increased release rates of gaseous and liquid effluents that would result from the expanded facility capacity. Because the value of 0.0345 mrem/yr (345 nSv/yr) was determined using the previously NRC-approved method for estimating the site boundary dose and represents a conservative value for the facility capacity increase from 3.7 MSWU to 10 MSWU, the staff finds that the licensee's projected site boundary dose calculation from gaseous and liquid effluents is acceptable. Because the new site boundary dose is a very small fraction of the dose limits specified in: (i) 10 CFR 20.1301 and (ii) 40 CFR 190.10(a) to the whole body, thyroid, and any other organ (25 mrem/yr (0.25 mSv/yr), 75 mrem/yr (0.75 mSv/yr) and 25 mrem/yr (0.25 mSv/yr), respectively), the staff concludes that the projected site boundary dose from gaseous and liquid effluents resulting from increased facility capacity meets the regulatory limits. These projected doses are also well below the annual dose constraint of 10 mrem (0.1 mSv) to members of the public from air emissions of radioactive material to the environment (excluding 222Rn and its decay progeny), as specified in 10 CFR 20.1101(d).

The staff also evaluated the potential radiological effects from the operation of CRDB–2 on members of the public against the annual TEDE dose limit of 100 mrem (1 mSv). The staff determined, because of the similarity of the proposed CRDB–2 with the existing, approved CRDB–1, that the annual TEDE contribution from both CRDBs to the members of the public will be similar and may be roughly extrapolated from 2004 data submitted by the licensee in support of its initial license application (Figures 3.3.2, 3.3.3, and 3.3.4 of "Dose Equivalent Contribution from UF6 Storage Inside the Cylinder Receipt and Dispatch Building (CRDB)") (LES, 2004). The staff estimated the annual dose equivalent contribution from a CRBD to be: (i) less than 0.4 mrem (0.004 mSv) to the members of the public located at eastern-western site boundaries, and (ii) 0.1 mrem (0.001 mSv) at the northern or southern site boundary. These estimated dose contributions are small fractions of the 100 mrem (1 mSv) public dose limit set forth in 10 CFR 20.1301, as well as the applicable dose limits specified in 40 CFR 190.10(a) to the whole body, thyroid, and any other organ (25 mrem/yr (0.25 mSv/yr), 75 mrem/yr (0.75 mSv/yr), and 25 mrem/yr (0.25 mSv/yr), respectively). Compared to the full set of operations at CRDB-1, the reduced set of operations planned at CRDB-2 would not result in any significant increases to estimated public doses for the requested increase in production capacity.

To account for the proposed expansion of the UBC storage pad, the licensee performed a review of calculated public doses at the existing site boundary locations by conducting a new modeling calculation (LES, 2012k). The licensee used the Monte Carlo computer code, MCNP5, with conservative flux-to-dose rate conversion factors from ANSI/ANS–6.1.1–1977 instead of the 1991 revision of the standard in its radiation transport and direct radiation dose calculations. The licensee performed its dose calculations using an assumption that the minimum distances from an expanded storage pad would be approximately 1,000 feet (ft) to the northern site boundary and approximately 500 ft to the eastern and western site boundaries. However, the actual distances from the expanded storage pad are 1,585 ft to the north fence line and 900 ft to the west fence line (SAR Figure 1.1-4 of Enclosure 2 to LAR-12-10 [LES,

2012d]) adding a large amount of conservatism to the calculations. The licensee estimated the greatest annual dose equivalent due to external radiation from the expanded UBC storage pad would be approximately 9.3 mrem (0.093 mSv) for the maximally exposed person (2,000 hours/yr) at the northern site boundary. The 9.3 mrem (0.093 mSv) estimate assumes storage of 25,000 UBC cylinders (LES, 2012k; and Section 4.12.6, LES, 2013h), and is well below the annual public 100 mrem dose limit (1 mSv) stated in 10 CFR 20.1301(a)(1).

The staff evaluated the licensee's estimation of public doses at site boundary locations from the UBC storage pad. On the basis of the staff's evaluation, the staff finds that the calculated doses are acceptable because: (i) the doses are determined using the Monte Carlo computer code, MCNP5, that is a standard computer code used in the nuclear industry for radiation transport and direct radiation dose calculations; and (ii) the calculated doses are conservative because the flux-to-dose rate conversion factors the licensee used from ANSI/ANS-6.1.1-1977, an older national standard in the worker dose assessment, are more conservative than the ones recommended in the latest version, ANSI/ANS-6.1.1-1991.

In its response (LES, 2013e) to NRC RAI (B) 1 (NRC, 2013c) to consider organ doses and the summation of internal and external doses, the licensee stated that the external and internal exposures to any member of the public have been considered in its environmental report supporting LAR 12-10 (LES, 2013g). In response (LES, 2013c) to an NRC RAI (B) 1 follow-up (NRC, 2013b), in addition to stating that the external dose to the critical organ is the same as the dose to the whole body, the licensee explained that the internal dose contribution to the critical organ (lung) is less than 2 mrem/yr (0.02 mSv/yr). Summing up the internal and external contributions, the licensee estimated that the total dose to the critical organ of an individual at the site boundary would be 21 mrem/yr (0.21 mSv/yr). This estimated dose to the critical organ is less than the annual dose standard of 25 mrem (0.25 mSv) specified in 40 CFR 190.10(a) for any organ other than the thyroid.

Since both the whole body and organ doses to members of the public at the site boundary are expected to be below their respective dose limits, and actual dose rates will continue to be verified by survey, the NRC finds that the licensee's information provides reasonable assurance that the dose limits specified in 40 CFR 191.10(a) and 10 CFR 20.1301 will continue to be met.

2.5 CONCLUSION

The staff evaluated the information the licensee provided with respect to the description and design of SBM-1007, SBM-1009, CRDB-2, and expanded UBC storage pad and determined that that the licensee updated its ISA summary to contain an adequate general description of the site and facility with an emphasis on those areas that could affect safety, including the identification of the controlled area boundary, and updated its SAR to describe the equipment and facilities that will be used to protect health and minimize danger to life. Thus, the staff finds the licensee has met the requirements of 10 CFR 70.65(b)(1)-(2) and 10 CFR 70.22(a)(7).

The staff evaluated the baseline design criteria related to the natural phenomena hazards (10 CFR 70.64(a)(2)) and environmental and dynamic effects (10 CFR 70.64(a)(4)) for SBM-1007, SBM-1009, CRDB-2, and the expanded UBC storage pad and determined that the licensee has made sufficient commitments to adequately evaluate the stability of soils beneath the proposed SBM-1007, SBM-1009, and CRDB-2 (not required for the expanded UBC storage pad) and has adequately evaluated aircraft crash hazards for SBM–1007, SBM–1009, CRDB-2,

and the expanded UBC storage pad. Therefore, the staff finds the licensee has met the requirements of 10 CFR 70.64(a)(2) and (a)(4).

The staff evaluated the licensee's compliance with 10 CFR 70.65(b)(3)-(4) and determined that the licensee adequately updated its ISA Summary by including a general description of processes, hazards involved with those processes, a general description of the types of accident sequences, and information that demonstrated compliance with the performance requirements of 10 CFR 70.61 for SBM-1007, SBM-1009, CRDB-2, and the expanded UBC storage pad. Thus, the staff finds that the licensee has met the requirements of 10 CFR 70.65(b)(3)-(4).

On the basis of the staff's evaluation in Section 2.4.2, the staff finds, with reasonable assurance, that the licensee satisfies the regulatory requirements in 10 CFR 20.1201(a)(1) regarding operations within SBM-1007, SBM-1009, CRDB-2, and the expanded UBC cylinder storage pad. The NRC staff finds that the annual exposures for workers, as estimated by LES, are conservative, and notes that they are a small fraction of the annual allowable TEDE limit of 5 rem (50 mSv), as stated in 10 CFR 20.1201(a)(1).

On the basis of the staff's evaluation in Section 2.4.2, the staff finds, with reasonable assurance, that the licensee satisfies the regulatory requirements in 10 CFR 20.1101(d), 10 CFR 20.1301, and 40 CFR 190.10(a). The NRC staff finds that LES has conservatively estimated doses at the projected site boundary from external exposure and gaseous and liquid effluents resulting from the expanded facility capacity, and notes that these doses are a very small fraction of the applicable dose limits and below the dose constraint for air effluents.

3.0 EVALUATION OF THE PROPOSED URANIUM BYPRODUCT CYLINDER STORAGE PAD STORM-WATER RETENTION BASINS

3.1 LICENSEE REQUEST

In LAR-12-10, LES requested the NRC's authorization to increase the production capacity of its enrichment facility. As part of its request, the licensee requested NRC's approval and authorization to construct two additional UBC storage pad storm-water retention basins to manage storm-water runoff from the expanded UBC storage pad.

3.2 APPLICABLE REGULATORY REQUIREMENTS

The applicable regulatory requirements relevant to the design and construction of two additional UBC storage pad storm-water retention basins are 10 CFR 70.22(a)(7) and 10 CFR Part 20, Appendix B, Table 2, as referenced by 10 CFR 20.1302.

3.3 REGULATORY ACCEPTANCE CRITERIA

Applicable acceptance criteria for the staff to determine compliance with effluent requirements in Table 2 of Appendix B to 10 CFR Part 20 are set forth in Section 9.4.3.2.2 of NUREG-1520.

Applicable acceptance criteria for the staff to determine compliance with 10 CFR 70.22(a)(7) and are set forth in Section 1.1.4.3.1 of NUREG-1520.

3.4 STAFF TECHNICAL EVALUATION

The NRC staff's evaluation that follows is presented in two subsections: (i) Design Description and (ii) Effluent Release Impacts.

3.4.1 DESIGN DESCRIPTION

The staff evaluated the licensee's design description for the storm-water retention basins and information for the UBC storage pad area against the requirements of 10 CFR 70.22(a)(7), which states, in relevant part, that any license application must describe facilities (here, the storm-water retention basins for the expanded UBC storage pad) that will be used to protect health and minimize danger to life or property.

The licensee requested the NRC's authorization to construct two additional UBC storage pad storm-water retention basins to manage storm-water runoff from the proposed expanded UBC storage pad. Similar to the existing NRC-licensed retention basin at the site, the two proposed retention basins would collect: (i) storm-water runoff from the paved, outdoor, expanded UBC storage pad (Section 3.4.1.1, LES, 2012e), and (ii) cooling tower blowdown-water discharge (Section 1.2 of Emergency Plan, LES, 2012d). As with the existing storm-water retention basin, the two proposed retention basins would be single-lined to prevent infiltration of uranium effluent in runoff water, and would be capable of retaining a volume of runoff water slightly more than twice that produced during a 24-hour duration, 100-year frequency storm (Sections 3.4.1.1 and 4.4.2, LES, 2012e). Each of the single liners for the two retention basins would consist of a synthetic fabric, and would be covered with enough soil to prevent surface damage and ultraviolet degradation of the synthetic fabric (Section 4.4.3, LES, 2012e). According to the licensee, the proposed UBC storage pad storm-water retention basins would have no flow outlet (Section 4.4.2, LES, 2012e). Similar to the existing retention basin, all discharge from the proposed basins would be through evaporation (Section 4.4.2, LES, 2012e). Additionally, similar techniques would be used to construct the proposed UBC storage pad storm-water retention basins as were used to construct the existing retention basin (Section 4.4.2, LES, 2012e).

The staff evaluated the licensee's information regarding its two proposed UBC storage pad storm-water retention basins against the requirements of 10 CFR 70.22(a)(7), and finds that the licensee provided an adequate description of the proposed retention basins. The description includes the layouts and locations of the two basins along with drawings. The synthetic fabric liner is to be covered with soil which is consistent with standard engineering practices for retention of contaminated water runoff, and is similar to the currently installed and approved basin.

3.4.2 EFFLUENT RELEASE IMPACTS

Because the UBC storage pad storm-water retention basins would be used to collect the storm-water runoff from the expanded UBC storage pad, the licensee calculated a potential annual average runoff concentration of 32 picocuries per liter (pCi/L) of natural uranium in runoff water from the expanded UBC storage pad, assuming a facility capacity of 10 MSWU. The licensee stated in its supplement to LAR-12-10 (LES, 2013j), dated October 3, 2013 (ADAMS Accession No. ML13281A198), that no significant changes in the types of effluent or effluent amounts are anticipated, and that no liquids from the UBC storage pad storm-water retention

basins would be discharged outside the owner controlled area (Section 3.11.4.2, LES, 2012e). In accordance with 10 CFR Part 20, Appendix B, Table 2, the applicable concentration limit for natural uranium in water effluent for average annual concentration at the boundary of the unrestricted area is 300 pCi/L.

As part of the review of the supplement to LAR-12-10, dated October 3, 2013 (LES, 2013j), the staff issued RAI D3 (NRC, 2013a), and its follow-up (NRC, 2014), requesting the licensee to describe: (i) the influence of enriched uranium storage on the UBC pad on anticipated radioactivity levels of uranium in runoff waters, and (ii) minimum uranium concentrations capable of being detected by analytical process. In the responses to RAI D3 and its follow-up (LES, 2013b; 2014), the licensee furnished laboratory analyses (LES, 2014b) of runoff water, and minimum detectable uranium concentrations to support related statements in the supplemental environmental report (Table 6.1-2, LES, 2012e). The laboratory analyses (LES, 2014b) indicated non-detectable levels of uranium in pad runoff water from natural and depleted uranium stored on the UBC storage pad.

The staff evaluated the licensee's laboratory analyses of pad runoff water and its information regarding minimum uranium concentrations capable of being detected. In the licensee's response, a more sensitive laboratory analysis was proposed to surpass minimum detectable concentrations of 3 pCi/L for U-234, U-235, and U-238. The NRC staff finds the licensee's estimate of the minimum detectable concentration of uranium in storm-water effluent to be acceptable because it is less than 1 percent of the effluent concentration limit of 300 pCi/L (10 CFR Part 20, Appendix B, Table 2), as stated in the supplemental environmental report (Table 6.1-2, LES, 2012e). In light of the proposed laboratory analyses of storm water, the NRC staff also finds that the calculated effluent concentration of 32 pCi/L would be detectable. The staff acknowledges that current storm-water runoff analyses from the existing UBC storage pad have indicated even lower, mostly non-detectable levels of uranium. These analyses were made available to the NRC staff for inspection, and were found to be acceptable. Additionally, the staff finds that the storm-water runoff from the UBC storage pad expansion would not form a significant exposure pathway because the two proposed UBC storage pad storm-water retention basins would: (i) be lined to prevent infiltration of natural uranium effluent in runoff water; (ii) have sufficient collection capacity; (iii) have no flow outlet; and (iv) discharge water only through evaporation.

3.5 CONCLUSION

On the basis of evaluation discussed in Section 4.4, the staff finds, with reasonable assurance, that the description and design information related to the proposed UBC storage pad storm-water retention basins satisfies the regulatory requirements of 10 CFR 70.22(a)(7). In this regard, the staff finds that the licensee's information: (i) is at a level of detail that gives the staff a general familiarization and understanding of the proposed UBC storage pad storm-water retention basins; (ii) shows the layouts and location of the proposed UBC storage pad storm-water retention basins and includes drawings; (iii) shows that the design and construction of the two proposed UBC storage pad storm-water retention basins are consistent with those of the NRC-licensed UBC storage pad storm-water retention pad; and (iv) demonstrates that the liner material, and the damage and degradation preventions, are consistent with the standard engineering practice for retention of contaminated water runoff. The staff further finds that the proposed basins are similar in design to the currently installed and approved basin.

The licensee estimated annual average runoff radioactivity concentration from the UBC storage pad with the expanded capacity of 10 MSWU would be 32 pCi/L or less. The staff verified that this radioactivity concentration estimate is consistent with past release levels, which have been at concentrations below those that are capable of being detected. Routine sampling and analysis of storm-water runoff will continue to be performed by the licensee, and the sampling results will be available for NRC staff inspection and verification. For these reasons, the staff concludes that the licensee has demonstrated that liquid effluents from the UBC storage pad runoff water would be substantially below the effluent limit of 300 pCi/L for uranium in water, as specified in 10 CFR Part 20, Appendix B, Table 2. The licensee has provided reasonable assurance that, because there is no release of the material outside the owner controlled area, the 300 pCi/L limit will not be exceeded as a result of granting authorization to conduct expanded operations as requested. Based on the review of the licensee's information regarding the proposed UBC storage pad storm-water retention basins, the staff has concluded that the relevant regulatory requirements of 10 CFR Part 20, Appendix B, Table 2, of 300 pCi/L will continue to be met.

4.0 EVALUATION OF POSSESSION LIMIT INCREASE

4.1 LICENSEE REQUEST

In its June 17, 2014, supplement to LAR-12-10 (LES, 2014a), LES requested that SNM-2010 be amended to increase the amount of licensed material it is authorized to possess and use. License Condition 8.A now authorizes possession of up to 136,120,000 kg of natural and depleted uranium, including any daughter products. LES seeks authorization to possess up to 251,000,000 kg of natural and depleted uranium, in the same chemical and physical form now authorized. The 251,000,000 kg amount corresponds to the total number of cylinders (25,000) that would be allowed to be stored on the expanded UBC storage pad, as discussed in Chapter 3 of this SER.

License Condition 8.B now authorizes possession of up to 545,000 kg of enriched uranium and daughter products. LES seeks authorization to possess up to 2,180,000 kg of enriched uranium, in the same chemical and physical form now authorized. LES stated that this increased possession limit is necessary to gain greater flexibility to store enriched uranium at its licensed site, before shipment to its customers. LES stated that prior to shipment, cylinders containing enriched uranium would be stored within its existing CRDB-1, and within CRDB-2 after the latter is constructed.

4.2 APPLICABLE REGULATORY REQUIREMENTS

The regulations applicable to the review of source and SNM possession limits are 10 CFR 40.31 and 10 CFR 70.22(a)(4), respectively. 10 CFR 40.31 requires, in relevant part, that each application for a source material license include the name, chemical and physical form, and maximum amount of source material that will be possessed. 10 CFR 70.22(a)(4) requires, in relevant part, that any license application regarding SNM contain the amount of SNM the applicant proposes to use or produce, including its chemical and physical form.

4.3 REGULATORY ACCEPTANCE CRITERIA

Applicable acceptance criteria for the staff to determine compliance with Section 70.22(a)(4) are set forth in NUREG-1520 Section 1.2.4.3.

Applicable acceptance criteria for the staff to determine compliance with 10 CFR 40.31 is the receipt of an updated Form 313 "Application for Material License."

4.4 STAFF TECHNICAL EVALUATION

The change to possession limits involves changes to License Conditions 8.A, and 8.B, and to License Conditions 21 and 23. As stated above, LES is requesting increases in the amounts of source and SNM that it is allowed to hold on its licensed site. As discussed below, changes to License Conditions 21 and 23 pertain to the on-site storage of DUF_6, and regard agreements entered into between LES and the State of New Mexico. The NRC staff has performed an evaluation of the licensee request to modify License Conditions 8a and 8b. The staff finds that LES has adequately described the amount, and the chemical and physical form of the increased amounts of material it seeks authorization to possess, in accordance with 10 CFR 70.22(a)(4). In accordance with 10 CFR 40.31, on January 7, 2015, the licensee submitted an updated Form 313 (ADAMS Accession No. ML15055A407) to the NRC identifying the proposed increase in source and SNM possession limits. A safety and compliance evaluation of the potential consequences to onsite workers, to the general public health and safety, and to the environment from the requested increase in the storage and use of source and SNM on the UUSA site is documented in preceding Sections of this SER. An Environmental Assessment of the proposed action was published in the *Federal Register* on March 19, 2015 (80 FR 14416) in support of LAR-12-10 and its June 2014 supplement.

As documented in Chapters 2 and 3 of this SER, the NRC staff did not find any significant effects that would be detrimental to workers, the public or the environment from the possession increase requested in the change to License Conditions 8.A and 8.B. Operational aspects of facility operation that are required to support possession of licensed material on the UUSA site, such as security, remain adequate. Therefore, the NRC staff finds that LES can safely possess and use the requested increased amounts of licensed material. The staff notes that there have been no programmatic changes made to facility license basis documents in connection with LAR-12-10 and its June 2014 supplement, and that only editorial changes to these documents would be needed to reflect the new possession limits. Thus, the currently approved Fundamental Nuclear Material Control Plan and other license basis documents that support possession of licensed material at the UUSA site remain in effect.

In support of this review, the staff took into consideration that the requested increase in source material and SNM possession limits will take place over many years, and will be the subject of the NRC's on-going inspection program at the site. The staff also notes that the licensee has a 5 year safe operating and compliance history, as documented in ongoing inspections by the NRC staff.

Therefore, the NRC staff finds that there will be no adverse effect on public health and safety by granting the request to increase the source material and SNM possession limits by amending License Conditions 8A and 8B.

As indicated above, the requested changes to License Conditions 21 and 23 pertain to agreements entered into between LES and the State of New Mexico. In this regard, on July 27, 2005 (ADAMS Accession No. ML052150056), LES entered into a settlement agreement with the State of New Mexico related to certain matters raised by the State in a hearing on the initial LES license application for the UUSA facility (National Enrichment Facility [NEF] at the time). In relevant part, this agreement placed a limit on the onsite storage of DUF_6 generated at the UUSA site. The limit was 5,016 48Y cylinders (or the equivalent amount of uranium stored in other NRC-accepted and DOT-certified cylinder types). LES and the State of New Mexico agreed that the generation of any additional DUF_6 to be stored onsite beyond the limit would constitute noncompliance with the NRC license. In that event, the licensee agreed to suspend the production of any additional DUF_6 for onsite storage until the noncompliance was remedied. The licensee further agreed not to store in New Mexico any DUF_6 generated at UUSA, other than at the UUSA site. These aspects of the agreement were incorporated into license SNM-2010 as License Condition 21.

The 2005 agreement with the State of New Mexico also limited the time that any one cylinder of DUF_6 generated at the UUSA site could be stored there to a maximum of 15 years, beginning from the date that each cylinder is filled in accordance with the licensee's standard procedures. This aspect of the agreement was incorporated into license SNM-2010 as License Condition 22.

In relevant part, the 2005 agreement with the State of New Mexico further required the licensee to provide financial assurance for the offsite disposal of DUF_6 from the UUSA site using a minimum contingency factor of twenty-five percent (25%). Upon reaching 4,000 cylinders of DUF_6 in 48Y cylinders at the UUSA site, the licensee agreed to immediately increase the financial assurance to provide a fifty percent (50%) contingency factor for disposition of DUF_6 stored at the UUSA site. Additionally, the licensee agreed that this contingency factor would remain at 50 percent until the number of cylinders stored onsite is reduced to ninety-eight percent (98%) of the 5,016 cylinder limit. These aspects of the agreement were incorporated into license SNM-2010 as License Condition 23.

On June 16, 2009 (ADAMS Accession No. ML092300094), LES entered into a revised settlement agreement with the State of New Mexico. This revised 2009 agreement placed a maximum total amount of DUF_6 that could be stored at the UUSA facility of 25,000 cylinders (the equivalent of 251,000,000 kg of DUF_6) in 48Y cylinders (or the equivalent amount of uranium stored in other NRC-accepted and DOT-certified cylinder types) in onsite storage and increased the time limit for onsite storage of any one cylinder of DUF_6 to 25 years. The 2009 agreement was incorporated into SNM-2010 as revised License Conditions 21, 22, and 23 when the NRC license was amended in 2010. However, because the expected production of DUF_6 from the plant at the 3 MSWU/year operational level was a total of 15,727 cylinders, License Conditions 21 and 23 were revised using this number.

On September 29, 2011 (ADAMS Accession No. ML14343A797), LES and the State of New Mexico modified their 2009 settlement agreement. However, these changes in the agreement have little impact on the License Conditions. The significant change in the agreement was the removal of a prohibition on LES to construct and operate a deconversion facility in the State of New Mexico.

Because LES has requested to expand the plant's operational capacity and to increase the possession limits for source material, the increased limits that are allowed for in the revised

settlement agreements are now applicable to LES. Thus, in a letter dated December 15, 2014 (ADAMS Accession No. 14351A079), LES notified the NRC staff of the 2011 revision to its settlement agreement with the State of New Mexico and requested that License Conditions 21 and 23 be revised consistent with the provisions in the agreement. In accordance with the terms of the September 29, 2011, agreement, the licensee requested the following changes to License Conditions 21 and 23:

> License Condition 21 - Change "15,727 48Y cylinders" to "25,000[3] 48Y cylinders";
>
> License Condition 23 - Change "15,727 cylinders" to "24,000 cylinders" in the second paragraph;
>
> License Condition 23 - Change "15,727 cylinders" to "25,000 cylinders" in the third paragraph;
>
> License Condition 23 - Change "15,727 limit" to "25,000 cylinder limit" in the third paragraph.

No change to License Condition 22 was requested. In accordance with the terms of the September 29, 2011, agreement, these proposed changes would be reflected in License Conditions 21 and 23, which would be revised to state:

21. *Onsite storage of DUF_6 generated at the NEF shall be limited to a maximum of 25,000 48Y cylinders (or the equivalent amount of uranium stored in other NRC accepted and Department of Transportation ["DOT"] certified cylinder types) of DUF_6. The generation of any additional DUF_6 to be stored onsite by the licensee beyond this limit shall constitute noncompliance with the license. The licensee shall suspend production of any additional DUF_6 for onsite storage until this noncompliance is remedied. In no event shall the licensee store DUF_6 generated at the NEF in New Mexico other than at the NEF.*

23. *The licensee shall provide financial assurance for the offsite disposal of DUF_6 from the NEF using a minimum contingency factor of twenty-five percent (25%).*

    Upon reaching 24,000 cylinders of DUF_6 in 48Y cylinders (or the equivalent amount of uranium stored in other NRC accepted and DOT certified cylinder types) in onsite storage, the licensee shall immediately increase the financial assurance to provide a fifty percent (50%) contingency factor for disposition of DUF_6 stored at the NEF unless: (a) an application to construct and operate a de-conversion facility outside of New Mexico that is specifically designated to de-convert the DUF_6 stored onsite at the NEF has been docketed by the agency responsible for reviewing the application; (b) an application for such a facility has been approved by the agency responsible for reviewing the application; or (c) the licensee is using another alternate method for removing the DUF_6 stored onsite.

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[3] The limit of 25,000 48Y cylinders corresponds to the licensee's request for authorization to possess up to 251,000,000 kg of uranium.

In addition, upon reaching the limit of 25,000 cylinders of DUF_6 in 48Y cylinders (or the equivalent amount of uranium stored in other NRC accepted and DOT certified cylinder types) in onsite storage, the licensee shall immediately increase the financial assurance to provide fifty percent (50%) contingency factor for disposition of DUF_6 stored at the NEF if the contingency factor has not already been increased to fifty percent (50%). The contingency factor shall remain at fifty percent (50%) until the number of cylinders stored onsite is reduced to ninety-eight percent (98%) of the 25,000 cylinder limit and either: (a) an application to construct and operate a de-conversion facility outside of New Mexico that is specifically designated to de-convert the DUF_6 stored onsite at the NEF has been docketed by the agency responsible for reviewing the application; (b) an application for such a facility has been approved by the agency responsible for reviewing the application; or (c) the licensee is using another alternate method for removing the DUF_6 from New Mexico.

Nothing herein shall release the licensee from other financial assurance obligations set forth in applicable laws and regulations.

For the reasons discussed above, the NRC staff finds that the requested changes to the NRC license are acceptable. The changes properly reflect the terms of the September 29, 2011, agreement between LES and the State of New Mexico, and are in accordance with 10 CFR 70.22(a)(4).

4.5 CONCLUSION

On the basis of its safety review documented in previous chapters of this SER, the findings documented above, and the receipt of an updated Form 313, the NRC staff finds that the licensee has provided adequate information to meet the requirements of 10 CFR 70.22(a)(4) and 40.31. Furthermore, the staff determined that there would be no significant increase in risk to the workers, the environment, or public health and safety from granting the increase in possession limits.

Therefore, the possession limits of License Conditions 8.A and 8.B will be increased to 251,000,000 kg and 2,180,000 kg, respectively.

In accordance with the 2011 agreement between LES and the State of New Mexico, License Conditions 21 and 23 will each be modified as requested.

5.0 EVALUATION OF THE LES RE-FEED PROCESS

5.1 LICENSEE REQUEST

The licensee has designed, and requests authorization to operate, two assays within SBM-1005 (consisting of Assay Unit (AU) AU1005 and AU1006) that would use high-assay tails of [redacted]. The standard feed material is natural uranium, which contains approximately 0.7 wt percent U-235. Use of high-assay tails as feed involves [redacted]. The introduction of high-assay tails feed results in a new accident sequence that the licensee has designated EC7-1, [redacted],

resulting in over-enrichment. To limit the risk of this postulated accident, the licensee identified preventive IROFS53a and IROFS53b, which consist of [redacted] prior to the feed cylinder being fed to the cascade. The licensee's submittal includes a summary of results of its calculation for the maximum assay allowed for a feed cylinder. The licensee stated that various methods may be used to implement these IROFS, [redacted]. While the licensee stated that it has not decided on the specific methods, the methods for IROFS53a and IROFS53b will meet the independence criteria specified in UUSA SAR Section 3.4.4. The [redacted] is identified as the placement of a feed cylinder with higher than expected enrichment into a feed station when the cascade is configured in [redacted]. The licensee assigned a failure frequency index of -2 to this event, based on the lack of any observed failures of this type in similarly-designed URENCO plants in Europe with a combined operating history of more than 30 years (consistent with guidance in Table A-9 of Appendix A to Chapter 3 of NUREG-1520 [NRC, 2010]). The licensee assigned failure probability indices of -2 to both IROFS53a and 53b, resulting in a total likelihood index of 10^{-6}.

5.2 APPLICABLE REGULATORY REQUIREMENTS

The relevant regulatory requirements for this review are:

10 CFR 70.61(b), which states that the risk of a credible high-consequence event must be limited;

10 CFR 70.61(d), which states that under both normal and credible abnormal conditions all nuclear processes remain subcritical;

10 CFR 70.64(a)(8), which requires that the design of IROFS allow for adequate inspection, testing and maintenance to ensure their availability and reliability; and

10 CFR 70.64(a)(9), which requires criticality control that adheres to the double contingency principle.

5.3 REGULATORY ACCEPTANCE CRITERIA

The acceptance criteria for 10 CFR 70.61(b) is that the licensee must provide adequate assurance that the risk of each credible high-consequence event is limited so that the consequences of the event do not exceed the limits imposed by 10 CFR 70.61(b)(1-4). The acceptance criteria for 10 CFR 70.61(d) is that the licensee must demonstrate that the risk of nuclear criticality accidents are limited by assuring that under both normal and credible abnormal conditions, all nuclear processes remain subcritical.

Requirements for New Facilities or New Processes at Existing Facilities

The baseline design criteria specified in 10 CFR 70.64 must be used, as applicable, for new facilities and new processes at existing facilities. If the application involves such new facilities or processes, the ISA Summary should explain how the design of the facility addresses each baseline design criterion. For deterministic design criteria such as double contingency, the process-specific information may be provided, along with the other process information in the

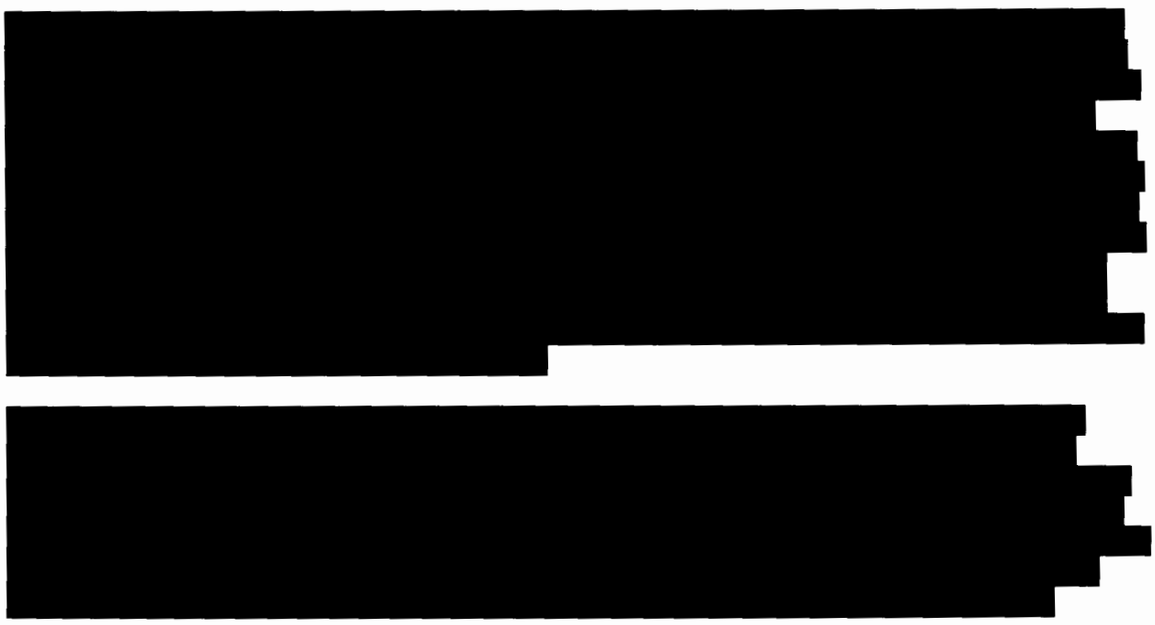
ISA Summary. The application should also describe the design basis events and safety parameter limits. In addition, the application should provide methods, data, and results of analysis showing compliance with these design bases for individual processes and facilities.

The regulations in 10 CFR 70.64 state that the design process must be founded on defense-in-depth principles and must incorporate, to the extent practicable, preference for engineered controls over administrative controls and reduction of challenges to IROFS. Accordingly, new facilities with system safety designs lacking defense-in-depth practices, consisting of purely administrative controls, or relying on IROFS that are frequently or continuously challenged, are not acceptable, unless the application provides a justification showing that alternatives to achieve the design criteria are not feasible.

The regulation at 10 CFR 70.64(a)(8) requires that IROFS for new facilities or new processes at existing facilities receive adequate inspection, testing, and maintenance to ensure their availability and reliability when needed. The application is considered acceptable if it includes the following information: descriptions of corrective maintenance, preventative maintenance, surveillance, monitoring, and functional testing. The application should also contain a description of how the maintenance function will be designed to ensure that the objective of preventing failures through maintenance is appropriately balanced against the objective of minimizing unavailability of IROFS due to such monitoring or preventative maintenance. Lastly, it should include a discussion of how the maintenance function uses, interfaces with, or is linked to the various management measures.

The terms of 10 CFR 70.64(a)(9) state that the licensee must demonstrate that the design of the process provides for criticality control that includes adherence to the double-contingency principle.

5.4 STAFF TECHNICAL EVALUATION



The staff concluded that the licensee had derived a conservative acceptance criterion using the time-tested CASCAL code, but questioned whether the methods for verifying enrichment were sufficiently accurate to implement the acceptance criterion. The licensee stated that, although it had not yet determined the exact methods to be used, two methods were being considered: [redacted]. The observed accuracy of each instrument was provided. [redacted]

[redacted]

The staff determined that the criteria for independence of IROFS53a and 53b will be sufficient to meet the double contingency principle. The IROFS will be performed by two different operators, using two different methods. One approach may be to use two different physical means, [redacted] as discussed above. If two methods requiring sampling are used, the criteria for independence in Section 3.4.4 of the SAR will be used, to the extent practical. The four criteria from this SAR section are: (i) different methods/techniques used for sample analysis; (ii) samples obtained from different locations; (iii) samples obtained at different times; and (iv) samples obtained by different personnel. The licensee stated in its response to the staff's RAIs that if two samples are used, they will be analyzed on separate [redacted], which is what it means by "different methods/techniques." As the samples must be drawn from the same cylinder, they cannot meet Section 3.4.4 SAR criterion (ii) set forth above. The licensee stated that it will adhere to Section 3.4.4 SAR criteria (iii) and (iv) set forth above. The licensee further clarified that if only one sample is used, the criteria of this SAR section will not be met, as they only apply when crediting dual independent sampling. If diverse physical means are used, the measurements will be performed by different operators and should due to their diversity not be subject to common mode failure. If redundant samples are taken, they will be taken by different operators and analyzed on different equipment, which are separately calibrated.

[redacted]

[redacted]

Based on the discussions above, the staff therefore considers IROFS53a and 53b to be sufficiently independent to provide for double contingency and justify adding the likelihood scores in sequence EC7-1. The likelihood scores themselves are appropriate for the type of control and consistent with the licensee's approved ISA methodology; together with the historical support for the initiating event frequency, they provide for an overall likelihood index of -6, which is sufficient under the licensee's approved methodology to demonstrate that this sequence will be "highly unlikely." Thus, the failure of both IROFS53a and 53b is beyond what must be considered to show compliance with the double contingency principle, and the licensee's approach has been to prevent the enrichment upset rather than demonstrating adequate safety should one occur. Nevertheless, the staff noted that many of the control systems that will detect enrichment upset due to other causes as in the existing accident sequence EC3-1 will also detect an enrichment upset due to sequence EC7-1. The PCS continuously monitors conditions within the cascade, and should readily detect any abnormalities that could indicate operating in the wrong mode. Daily mass spectrometry provides a direct measurement of product enrichment. These systems, while not credited as IROFS for either EC3-1 or EC7-1, provide for defense-in-depth and give additional assurance that any deviation of concern will be promptly detected and corrected. While IROFSC22, which is credited for sequence EC3-1, will still be performed for AU1005 and 1006, the licensee stated that it cannot be credited to prevent EC7-1 because it involves [redacted]. Those assumptions would not be met in the event of sequence EC7-1. Also, because the sufficiency [redacted] has not been confirmed, it cannot be credited with providing defense-in-depth for this new accident sequence.

The licensee's analysis CALC-S-0144, besides deriving the acceptance criterion for IROFS53a and 53b, also estimated the maximum enrichment that could result from sequence EC7-1. The acceptance criterion represents the maximum allowed enrichment that could result in exceeding the analyzed enrichment of 6 wt percent U-235, but if the feed enrichment exceeds this maximum, an even higher product enrichment could result. Without specifying the cascade conditions that may result in such an upset, the licensee estimated the maximum product enrichment resulting from it [redacted]. The result of this is a product enrichment that is less than that for other postulated enrichment upsets. While the staff did not evaluate the rate of enrichment increase, the magnitude is bounded by that considered in existing scenarios. In any case, the measures discussed above providing defense-in-depth will detect a rise in enrichment from whatever cause long before it reaches its maximum value.

In its RAI response dated February 5, 2014 (ADAMS Accession No. ML15076A298), the licensee stated that the measurement equipment to be used for IROFS53a and 53b will be designated in SAR Table 3.4-1 as Other Equipment, and the [redacted] will be designated as Operated Support Equipment. While not within the boundary of the IROFS, management measures are applied to the identified attributes of these categories of equipment as described in SAR Section 3.4.45. Additionally, [redacted] will meet the requirements of QL-2AC as defined in the URENCO USA Quality Assurance Program

Description. This satisfies the 10 CFR 70.64(a)(8) requirements with regard to inspection, testing, and maintenance of these IROFS. Note that these IROFS are administrative controls. The measurement equipment being considered will use one of two methods: [redacted] No additional instrumentation and control for these IROFS will be needed in performing the measurements, and thus the 10 CFR 70.64(a)(10) requirements do not apply. The staff reviewed the description of the IROFS and associated equipment in SAR Table 3.4-1 and determined it appropriate due to their importance to the safety function to be performed. Because the new SBM's and support buildings are substantially the same as what has been previously evaluated, the staff concludes that the design bases of the IROFS evaluated in the original SER Section 3.3.3.2.4 (NRC, 2005) and those introduced within the supplement to LAR-12-10 (LES, 2014a), continue to provide reasonable assurance of protection against natural phenomena and the consequences of potential accidents.

5.5 CONCLUSION

The NRC staff has determined that IROFS 53a and 53b provide for reasonable assurance of safety regarding the proposed re-feed of high-assay tails in AU1005 and 1006. The initiation of such re-feed does introduce a new accident sequence which could lead to over-enrichment. This sequence, which is analyzed above, [redacted] However, the staff determined that IROFS53a and 53b will be sufficient to ensure that exceeding the analyzed enrichment of 6 wt percent U-235 (license limit of 5 wt percent U-235) will be highly unlikely and, in accordance with the double contingency principle, would require at least two unlikely, independent, and concurrent failures.

Thus, the NRC staff review of all available information as documented in Enclosure 1 of LAR 12-10 (LES, 2102d) and its Supplement (LES, 2014a) has found that: (i) the performance requirements of 10 CFR 70.61 will continue to be met; and (ii) adherence to the double contingency principle will be maintained pursuant to 10 CFR 70.64(a)(9). Thus, this process is approved.

The staff therefore concludes there is reasonable assurance that the facility can and will be operated in a manner that will not be inimical to the common defense and security, and will continue to adequately protect the health and safety of workers, the public, and the environment. Thus, License SNM-2010 will be amended as requested, based on the analyses discussed above and in the preceding SER chapters.

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