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Docket No. 70-3098-MLA

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:
Michael C. Farrar, Chairman
Lawrence G. McDade
Dr. Nicolas G. Trikouros

In the Matter of	)	December 20, 2011
SHAW AREVA MOX SERVICES, LLC	)	Docket No. 70-3098-MLA
(Mixed Oxide Fuel Fabrication Facility Possession and Use License)	)	ASLBP No. 07-856-02-MLA-BD01

NRC STAFF'S PREFILED RESPONSE TESTIMONY OF TOM PHAM CONCERNING CONTENTIONS 9, 10, and 11

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Template Secy-027

Secy-02

Q1: You submitted your initial testimony on October 19, 2011 in this proceeding. Has anything changed with respect to the facts or opinions contained in that testimony?

Nothing has changed concerning the testimony I provided earlier in this proceeding. I reaffirm the content of my earlier testimony.

Contention 9:

Q2: 10 C.F.R. § 74.55(b)(1) requires that the licensee's statistical sampling plan "must have at least 99 percent power of detecting item losses . . . ." What is meant, in plain terms, by "99 percent power" of detection?

The term "power of detection" is an expression in statistics. In a statistical test, an error occurs if the material is missing but the test concludes that the material is present. A 99% power of detection means there is a 99% probability that the test will detect a loss of five formula kilograms of material. The term "power of detection" refers only to the missing item or the item(s) missing material being chosen for verification as part of the statistical sample. It does not address the accuracy of the method used to detect if an item is missing or missing material.

Q3: How does MOX Services validate and verify the accuracy of the information stored by the PLCs?

In Section 2.8, Item Verification, of its Fundamental Nuclear Material Control Plan ("FNMCP"), MOX Services describes the item verification procedure (APP000019). The MOX facility uses the Manufacturing Management Information System ("MMIS") and Programmable Logic Controllers ("PLCs") to generate Perpetual Inventory Reports for all items. These reports will be verified periodically by the MMIS Item Verification Procedure. The PLC/MMIS mapping comparisons via Perpetual Inventory Reports will be conducted and reconciled for the facility on a daily basis, and any error in these

mappings would be detected during the daily reconciliations. These mapping comparisons can also be conducted on demand.

Q4: What measures will MOX Services have in place to protect and ensure the integrity of the data stored by the PLCs?

In Section 2.2.2, Falsification Prevention, of its FNMCP, MOX Services describes the control measures and program features to prevent falsification of the data stored in the MMIS/PLC with respect to the identity of items (APP000019). Section 2.2.2 provides 10 examples of these features, including permanently marking container identification, MMIS not allowing duplicate use of container identification, and requiring a witness for manual container filling.

Section 4.6, Accounting, describes a variety of measures (NRC000010). Sections 4.6.2.2 through 4.6.2.7 describe access, redundancy, integrity, periodic review, auditability, and traceability of the MC&A data. In Section 4.9, Human Errors, of its FNMCP, MOX Services provides control measures for the automation of MC&A activities and automated data records (NRC000011). Throughout Section 4.9, measures to prevent human error are discussed, but these measures also serve to reduce the likelihood of data falsification.

Q5: Dr. Lyman asserts that MOX Services provides no quantitative evidence to support its claim that PLC mapping data is at least 99 percent accurate. According to Dr. Lyman, MOX Services instead relies on qualitative reassurance that physical protection measures will ensure accuracy of the PLC mapping data. What is your position regarding these claims made by Dr. Lyman?

The daily MMIS/PLC mapping comparisons, in conjunction with the physical protection features that prevent interference with the automated systems and limit human access, will provide the 99 percent power of detection of item losses as described in MOX

Services' FNMCP Section 2.8.3, Item Monitoring Conditions for Specific Storage Areas, as required by 10 C.F.R. § 74.55(b)(1) (APP000019). In addition, documentation of these inventory reports and mapping verifications are available for MOX Services' internal audits and NRC oversight inspections. There is no regulatory distinction between a quantitative and qualitative approach to meet the statistical sampling provision of 10 C.F.R. § 74.55(b)(1).

Q6: According to Dr. Lyman, in order to provide assurance that the MMIS and PLC mapping system are sufficiently accurate to satisfy the requirements in 10 C.F.R. § 74.55(b)(1), it would be necessary to periodically physically validate the data provided by the system. Do you agree with Dr. Lyman's position?

In Section 2.8.2, Verification of Item Samples, of its FNMCP, MOX Services describes the verification of item samples (APP000019). Item samples refer to those items selected for verification by means of a statistical sampling method at a given time. An item is considered to be verified if it has undergone transactions which verify its location and identity within the test time span, provided the location and identity were confirmed and documented by at least two individuals or performed automatically by MMIS without personnel having access to the item. MOX Services provides a list of transactions that meet these criteria in the second paragraph of Section 2.8.2. In addition to the verification credit by the MMIS/PLC automated system, MOX Services commits to a review of the report of the items for which verification credit is taken.

Items that remain to be verified after the process described above is complete must be physically verified. The combination of practices satisfies the requirements in 10 C.F.R. § 74.55(b)(1). Item verification is a separate requirement from physical inventory, which is described in Section 4.5 of the FNMCP (NRC000009).

Q7: Dr. Lyman states that since MOX Services relies on "robust physical protection features" to support the accuracy of PLCs, the accuracy of PLCs is, in turn, tied to the functionality of the physical protection system. Is Dr. Lyman's statement accurate?

As described in MOX Services' FNMCP Section 2.8.3, Item Monitoring Conditions for Specific Storage areas, the MMIS/PLC mapping comparisons, automated systems, and additional physical protection features together will enable MOX Services to satisfy the item monitoring requirement in 10 C.F.R. § 74.55(b)(1) (APP000019). The NRC Staff ("Staff") believes that both MC&A and physical protection systems complement and support each other to enhance the overall security of the facility, but they are not dependent upon one another. Many physical security measures provide additional levels of protection against loss, theft, or diversion of SNM. For example, an SNM doorway monitor may serve to meet physical security requirements from Part 73 at a specific location. That same doorway monitor also provides an additional level of protection from SNM being removed from an area through that particular entrance/exit point. The doorway monitor would not eliminate the need for MC&A measures to be used inside the area in question, such as records, physical inventory, or item monitoring. Nor would MC&A measures eliminate the Part 73 requirement for the doorway monitor to be in that location. The combination of MC&A and physical security measures would serve to provide increased assurance that SNM could not be removed through that point, but they would not depend on the existence of the other to fulfill the regulatory requirements.

Q8: What is your understanding of the Euratom safeguards requirements referenced by Dr. Lyman? Are these requirements relevant to MOX Services' compliance with 10 C.F.R. § 74.55(b)(1)?

The MOX Services' fuel fabrication facility is only subject to the NRC regulations with respect to material control and accounting requirements stipulated in 10 C.F.R. Part 74,

including the item monitoring requirement in 10 C.F.R. § 74.55(b)(1). Based on discussions with colleagues in Europe, the Staff understands that Euratom regulations do not have a specific safeguards requirement for an item monitoring program. Therefore, the Staff believes the Euratom requirements are not relevant to MOX Services' compliance with 10 C.F.R. § 74.55(b)(1).

Q9: In light of the Euratom safeguards requirements, Dr. Lyman concludes the following: "MOX Services' assertion that it can meet a quantitative requirement for item monitoring with the use of operating data but no plan for interim sampling and validation of the computer data is not defensible." What is your position regarding Dr. Lyman's claim?

With respect to the MOX Services' item monitoring program, the Staff's December 2010 Safety Evaluation Report ("SER") stated that: "[t]he staff has reviewed the elements of this item monitoring program and found that the applicant's program is capable of providing timely plantwide detection of the loss of items and verifying the presence and integrity of nuclear material items at a required frequency. The staff also found that the applicant provided an adequate item monitoring program with real-time status of nuclear materials, a system of item identification and classification, tamper-safing procedures, material accessibility, item accounting and control procedures, item measurements, sample items, and item verification tests, as required in 10 C.F.R. § 74.55, 'Item Monitoring'" (APP000021 at Section 13.2.3.2).

Q10: Is it your understanding that MOX Services has committed to perform bi-annual 100% inventories?

Yes. MOX Services provided a detailed physical inventory program in Section 4.5 of its FNMCP, including the required 6-month frequency (NRC000009). The inventory of storage areas is described in Section 4.5.2.1 of its FNMCP. The Staff's December 2010 SER determined that MOX Services' physical inventory program satisfies 10 C.F.R. §

74.59(f) (APP000021 at Section 13.2.3.4). A physical inventory is a security or MC&A function.

Q11: Are you familiar with any request by MOX Services that the NRC eliminate the requirement / commitment to perform bi-annual inventories? If so, what effect did the request have on your review of MOX Services' license application?

The Staff is not aware of any request to deviate from the required 6-month inventory frequency. The currently approved MOX Services' FNMCP clearly has an affirmation to conduct a physical inventory every six calendar months.

Q12: Dr. Lyman raises two concerns regarding the security of the MMIS and PLCs: (1) that malicious code could be used to provide an adversary with Strategic Special Nuclear Material ("SSNM") target information for the purpose of theft and (2) that malicious code could be used to hide a diversion or to simulate a diversion for the purpose of blackmail. What measures has MOX Services committed to implement to protect against these dangers?

In Section 4.6, Accounting, and Section 4.9, Human Errors, of its FNMCP, MOX Services provides adequate control measures for the automation of MC&A activities and automated data records to meet the requirements of 10 C.F.R. §§ 74.59(g) and 74.59(h)(3) (APP000021 at Section 13.2.3.4). Section 4.6, Accounting, describes a variety of measures (NRC000010). Sections 4.6.2.2 through 4.6.2.7 describe access, redundancy, integrity, periodic review, auditability, and traceability of the MC&A data. Section 4.9, Human Errors, of its FNMCP, MOX Services provides control measures for the automation of MC&A activities and automated data records (NRC000011). Throughout Section 4.9, measures to prevent human error are discussed, but these measures also serve to reduce the likelihood of data falsification.

Q13: In paragraphs 18 and 19 of his testimony regarding Contention 9, Dr. Lyman states that MOX Services could potentially meet the timelines specified in 10 C.F.R. § 74.55(b)(1) using in-vault means of item identification? What is your understanding of this possibility? Why has MOX Services not adopted this verification approach to comply with 10 C.F.R. § 74.55(b)(1)?

In Section 2.2, Item Identification, and Section 2.8, Item Verification, of its FNMCP, MOX Services provides adequate procedures and practices (APP000019). These program descriptions are consistent with the acceptance criteria in Chapter 2.0, Item Monitoring, of the NRC guidance document, NUREG-1280 (APP000030). The Staff's December 2010 SER, in part, concludes that the item identification system and item verification method satisfy the requirements of 10 C.F.R. § 74.55(b)(1) (APP000021 at Section 13.2.3.2).

Part 74 is a performance-based regulation. The Staff reviews the methods proposed by licensees to meet specific regulatory requirements in order to determine if the licensee's proposal meets the regulations. NRC does not require licensees to explain why one particular method was chosen over another. There are usually multiple means of meeting any given requirement in 10 C.F.R. Part 74. Therefore, the Staff only evaluates the method the licensee proposes to determine whether or not that method is acceptable.

Contention 10:

Q14: In paragraph 3 of his testimony regarding Contention 10, Dr. Lyman asserts that so "long as the possibility exists that an inventory may be needed (and there is surely such a circumstance in the broad universe encompassing "any" MC&A alarm), then MOX Services needs to show that it can be completed within the approved time period." What is your response to Dr. Lyman's assertion?

In Section 3.1.3, Response Time, of its FNMCP, MOX Services commits that the alarm resolution procedure for an item alarm and a destroyed item will be normally completed within three calendar days after an item is declared missing (APP000020). This commitment is consistent with Chapter 3.1.3, Response Time, in the NRC guidance document, NUREG-1280, to meet the requirement of 10 C.F.R. § 74.57(b)

(APP000030). MOX Services can use any method, or multiple methods, to resolve any alarm within this approved time period. A physical inventory of a storage vault is not the sole method for resolving an item alarm.

Q15: Dr. Lyman notes that the list of alarm resolution procedures contained in the FNMCP and referenced by MOX Services in its testimony does not appear to contain any such reviews of MMIS code, nor any estimates for the timeline for reviewing such code. What is your response to Dr. Lyman's statement?

Part 74 does not require the licensee to use any particular method of alarm resolution. The Staff determined that MOX Services' FNMCP Section 3.1.1.4, Item Alarm, provides an adequate list of typical steps to resolve item alarms (APP000021 at Section 13.2.3.3). This list is similar to the guidance provided in NUREG-1280. These steps include a review of item generation records and process records and a check of logical locations for material type. These records are generated by the MMIS and those records are controlled by MOX Services' recordkeeping and human error programs. A review of MMIS codes is not required for MOX Services to adopt.

Q16: In MOX Services' FNMCP 3.1.3, Response Time, MOX Services states that its alarm resolution procedures "will normally be completed within three calendar days after an item is declared missing." What is your understanding of the term "normally" in this context?

In light of the performance-based regulations, the term "normally" should be interpreted to indicate the circumstances in which a licensee is allotted to resolve each alarm type within a typical and reasonable length of time. The acceptance criteria in the NRC guidance, NUREG-1280, Section 3.1.3, provides guidance, stating that "[t]he maximum time for completion of the resolution procedure for alarms indicating a possible abrupt loss of items that were tamper-safed, encapsulated, or retained in a vault that provided protection equivalent to tamper-safing should normally not exceed 3 calendar days" (APP000030).

In the event that a licensee requires more than 3 days to resolve an alarm, MOX Services' response would be evaluated by the NRC MC&A inspectors either during the next routine inspection or during a special inspection in response to the event. The inspectors would determine whether the licensee's response met the requirements of 10 C.F.R. Part 74 and the site FNMCP. The inspectors would review the reason(s) the resolution took more than 3 days and determine whether or not that was acceptable and justified under the circumstances unique to that particular event.

Q17: Regarding alarm resolution, Dr. Lyman distinguishes between "normal" and "abnormal" circumstances. It is his position that it must not have been the intent of the NRC when approving the time period for alarm resolution that such would be, essentially, open-ended in "abnormal" circumstances. What is your position regarding Dr. Lyman's distinction between "normal" and "abnormal" as relevant to 10 C.F.R. § 74.57(b)?

An MC&A alarm is defined in 10 C.F.R. § 74.4. With respect to the item monitoring context of 10 C.F.R. § 74.57(b), NUREG-1280 states: "For item monitoring, an MC&A alarm exist whenever an item monitoring test results in (1) one or more item discrepancies (i.e., items not in their designated locations) which are not resolved within 8 hours for IA items, and 24 hours for IB items; or (2) one or more items being found defective (i.e., with some or all of their SSNM contents missing)" (APP000030). Abnormal events such as fires, earthquakes, hurricanes, and other accidents, whether caused by man or nature, are outside the scope of 10 C.F.R. Part 74. As discussed in the response to the previous question, MC&A inspectors would evaluate the licensee's response to an MC&A alarm and determine whether or not the licensee's response was performed in a timely manner. Any consideration of abnormal circumstances existing at or around the time of the MC&A alarm would be considered at that time. Such consideration is not part of the MC&A licensing review.

Contention 11:

Q18: Regarding 10 C.F.R. § 74.57(e), Dr. Lyman asserts that "MOX Services' approach of relying solely on computer data to resolve any alleged theft falls far short of what is necessary to demonstrate compliance with the regulations, and does not compensate for its inability to conduct a rapid inventory of the DCM vault." Do you agree with Dr. Lyman's position?

In its December 2010 SER, the NRC Staff found that MOX Services' FNMCP provides adequate information on program description and affirmations for establishing and maintaining the ability to respond rapidly to alleged thefts, including response capabilities associated with the item control system, and record maintenance (APP000021 at Section 13.2.3.3). The use of the MMIS and PLC to confirm the presence of an individual item and the presence of all items in a vault is acceptable. The ability to conduct this verification in a very short time frame (a few minutes) meets the requirement to complete the verification within 8 hours for an individual item and 72 hours for all items in a vault. The conduct of a rapid inventory of a storage vault is not the sole method to respond to alleged thefts. The Staff found the MOX Services' FNMCP meets the requirement of 10 C.F.R. § 74.57(e) and the acceptance criteria in NUREG-1280, Section 3.3, with respect to a program to establish and maintain ability to respond rapidly to alleged thefts.

I declare under penalty of perjury that the foregoing is true and correct, to the best of my knowledge and belief. Executed on December 16, 2011.

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