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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

THE ATOMIC SAFETY AND LICENSING BOARD

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

In the Matter of:

SHAW AREVA MOX SERVICES, LLC

(Mixed Oxide Fuel Fabrication Facility
Possession and Use License)

January 24, 2012

Docket No. 70-3098-MLA

ASLBP No. 07-856-02-MLA-BD01

SHAW AREVA MOX SERVICES, LLC'S
PREFILED REPLY TESTIMONY ON CONTENTIONS 9-11

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I. Introduction

Q1: Please state your names.

A: My name is Sue King (SK).

My name is Gary Bell (GB).

My name is Gary Clark (GC).

My name is Martha Williams (MW).

Q2: What is your educational background and experience?

A: [All] We have summarized our educational background and experience in response to Question 2 of our Prefiled Direct Testimony (Direct Testimony) (Exhibit APP000014), which was served on the Atomic Safety and Licensing Board (ASLB) and the parties on September 29, 2011. In addition, full copies of our *curriculum vitae* were attached to our Direct Testimony as Exhibits APP000015 to 18.

Q3: What is the purpose of your Reply Testimony?

A: [All] The purpose of our Reply Testimony is to respond to the Prefiled Direct Testimony and Prefiled Rebuttal filings submitted on behalf of the Intervenors and the NRC Staff regarding Contentions 9-11 on October 19, 2011, and December 19 and 20, 2011, respectively. In our Direct Testimony, we explained how Shaw AREVA MOX Services, LLC (MOX Services) provides reasonable assurance that it will comply with the Nuclear Regulatory Commission (NRC) Material Control and Accounting (MC&A) regulations that are the subject of those Contentions. Those regulations are: 10 CFR §§ 74.55(b)(1); 74.57(b); and 74.57(e).

In this Reply Testimony, we specifically address the statements expressed, and positions taken, by the Intervenor's and NRC Staff's witnesses in their Direct and Rebuttal filings, along with the accompanying exhibits as appropriate.

Q4: Could you please provide a summary of your overall conclusions?

A: [All] Yes. We have not changed the conclusions we expressed in response to Question 4 in our Direct Testimony. We respectfully refer the ASLB back to that response. We have found nothing in the Intervenor's or NRC Staff's subsequent filings that calls our conclusions into question. MOX Services has demonstrated that there is reasonable assurance it will comply with the requirements of the NRC MC&A regulations that are the subject of the Contentions.

Q5: Please describe how your Reply Testimony is organized.

A: [All] In Section II, we briefly summarize the NRC Staff witness' overall conclusions on Contentions 9-11 and we provide our views on that testimony. In Section III, we address the Intervenor's testimony on Contention 9. Section IV addresses the Intervenor's Contention 10 testimony, and Section V addresses their Contention 11 testimony. Our overall conclusions are again set forth in Section VI.

II. MOX Services' Reply to NRC Staff Testimony

Q6: What were the NRC Staff's conclusions on Contention 9 and do you agree with them?

A: [All] In the Direct Testimony of Tom Pham (Staff Direct Testimony) (Exhibit NRC000006), the Staff's expert, Mr. Tom Pham, concluded, among other things that:

In my professional opinion, MOX Services has described in its testimony reasonable facility measures and practices for verifying the presence and integrity of SSNM items in vaults and CAAs . . . [and that] MOX Services' FNMCP describes procedures that will meet the requirement of 10 CFR 74.55(b)(1) with respect to item monitoring.

Exhibit NRC000006 at Q16. We agree with Mr. Pham's conclusions.

Q7: What were the Staff's conclusions on Contention 10 and do you agree with them?

A: [All] In the Staff's Direct Testimony, Mr. Pham concluded, among other things, that:

I conclude that the MOX Services' FNMCP details an alarm resolution program that will meet the requirement of 10 CFR § 74.57(b) with respect to alarm response times by providing methods to resolve alarms normally within three days. Therefore, I believe that Contention 10 should be resolved in favor of MOX Services.

Exhibit NRC000006 at Q26. Again, we agree with Mr. Pham's conclusions.

Q8: What were the Staff's conclusions on Contention 11 and do you agree with them?

A: [All] In the Staff's Direct Testimony, Mr. Pham concluded, among other things, that:

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 MOX Services' FNMCP describes a theft resolution program that will meet the requirement of 10 CFR § 74.57(e)....

Exhibit NRC000006 at Q33. Again, we agree with Mr. Pham's conclusions.

Q9: Did Mr. Pham change his conclusions in his Rebuttal Testimony?

[ALL] No. Mr. Pham stated that "[n]othing has changed concerning the testimony I provided earlier I reaffirm the content of my earlier testimony." Staff Rebuttal Testimony (Exhibit NRC000008) at Q1.

III. MOX Services' Reply to Intervenor's Contention 9 Testimony

Q10: Intervenor's rely on the testimony of Dr. Lyman in support of their position on this Contention, which challenges MOX Services' compliance with the NRC item monitoring requirements in 10 CFR § 74.55(b)(1). Please provide an overview of your response to Dr. Lyman's testimony.

A: [All] We have organized our response to Dr. Lyman's testimony to first explain the manner in which Section 74.55(b)(1) is quantitative, and how MOX Services satisfies the quantitative requirements of the rule. Specifically, we explain how MOX Services' item monitoring approach verifies 100% of the SSNM item population, which meets the regulatory requirement for a 99% *power of detection*.

We next address Dr. Lyman's assertions regarding the *accuracy* of MOX Services' methods for verifying the presence and integrity of items, which is an entirely separate concept than *power of detection*. We explain the applicable regulatory requirements and the basis for our confidence in MOX Services' approach.

Finally, we address Dr. Lyman's assertions regarding the application of EURATOM requirements to MELOX, and his assertion that MOX Services is required to provide a verification plan for its item monitoring approach with its License Application.

Q11: At the crux of Dr. Lyman's testimony is his assertion that NRC item monitoring requirements are "fundamentally *quantitative* in nature." Intervenor's Direct Testimony (Exhibit INT000001) at A.5, ¶ 1; *see also id.* at ¶¶ 2, 5, 6, 9, 10, 14, 20. To what extent are the NRC item monitoring requirements in Section 74.55(b)(1) "quantitative"?

A: [All] Recall that the regulation in question, 10 CFR § 74.55(b)(1), states:

(b) The licensee shall verify on a statistical sampling basis, the presence and integrity of SSNM items. The statistical sampling plan must have at least 99 percent power of detecting item losses that total five formula kilograms or more, plant-wide, within:

(1) Thirty calendar days for Category 1A items and 60 calendar days for Category 1B items contained in a vault or in a permanently controlled access area isolated from the rest of the material access area (MAA).

Accordingly, the NRC's item monitoring requirements are quantitative with respect to:

(1) the required power of detection for the licensee's statistical sampling plan (*i.e.*, a 99% power of detecting item losses that total 5 formula kilograms or more, plant-wide); and

(2) the time for detecting such item losses (*i.e.*, 30 or 60 calendar days). In Paragraph 1 of Answer 5 of Dr. Lyman's testimony, Dr. Lyman specifically identifies these same quantitative aspects of the rule, and no others. We agree that the regulation is quantitative in these respects.

Q12: What does "power of detection" mean?

A: [All] 10 CFR § 74.4 defines "power of detection" as "the probability that the critical value of the statistical test will be exceeded when there is an actual loss of a specific SSNM quantity." This means that for a "power of detection" of 99%, there is a 99% chance that a missing item (or collection of items) totaling 5 formula kilograms will be selected to be included in the subset of items to be verified during the item monitoring checks. Conversely, this means that there is a 1% chance that the missing item(s) would not be detected because it would not be in the subset to be verified.

Mr. Pham of the NRC Staff has stated:

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.

Exhibit NRC000008 at Q2 (emphasis added) (format alteration added). We agree with Mr. Pham and believe we are stating the same concept and principle.

Q13: How do you know when you have achieved a 99% power of detection, as required by the rule?

A: [All] As suggested by NRC guidance (*i.e.*, NUREG-1280), "power of detection" is mathematically related to the sample size, the number of items that comprise a target quantity of SSNM, and the total number of items in the inventory. Simply put, for a known population of items, one can mathematically determine *how many items must be sampled* to achieve a desired power of detection. In this case, it would be a 99% power of detecting item losses totaling five formula kilograms or more (*i.e.*, 2000 g Pu or more, as explained in our Direct Testimony at Question 19).

The NRC guidance document, NUREG-1280, suggests that applicants and licensees may, but are not required to, use the following equation to develop a statistical sampling plan that will achieve the required power of detection:

$$n = (N) (1-\beta^{1/d})$$

Where:

N = the number of items in the inventory population;

d = the minimum number of items to divert 2000 g Pu;

n = the number of items to be verified;

And,

(1-β) = 99%, the desired power of detection.

Exhibit APP000030 § 2.1.8.

Q14: So, in the formula, are these the only variables that affect power of detection?

A: [All] Yes. The only variables that affect power of detection are the minimum number of items to divert 2000 g Pu (d), the number of items in the population (N), and the number of items to be verified (n). And the only variable that can be adjusted for a given storage area (that is, where d and N are fixed), is the number of items to be verified (n). Thus, the only way to increase the power of detection in a given storage area is to increase the number of items to be verified.

Q15: What if you conducted sampling more frequently? Wouldn't that increase your power of detection?

A: [All] No. Testing more often does not change the power of detection for a given statistical test (*e.g.*, verification of a fixed subset of items), which again is defined in 10 CFR § 74.4 as "the probability that the critical values of a statistical test will be exceeded when there is an actual loss of a specific SSNM quantity." Or more simply, the power of detection is the probability that the missing or compromised item will be one of the items selected to be verified. The formula shows that the "power of detection" is not dependent or affected by the frequency with which the test (*i.e.*, verification) is performed. Of course, for any given SSNM item storage area, the periodicity of testing still must be sufficient to meet the 30 and 60 day detection time frames in the rule.

Q16: What about the effectiveness of the item monitoring method? Is that the same as power of detection?

A: [All] No. The formula for power of detection only pertains to the number of items that must be verified. Furthermore, this is consistent with Mr. Pham's testimony that the term

“power of detection” “does not address the accuracy of the method used to detect if an item is missing or missing material.” Exhibit NRC000008 at Q2. (We will be discussing the concept of item monitoring method accuracy in subsequent answers).

Q17: What does Dr. Lyman state about MOX Services’ compliance with the quantitative requirements of Section 74.55(b)(1) described above?

A: [All] In his Direct Testimony, he states that he does not believe that MOX Services complies with the Section 74.55(b)(1) quantitative requirements because: (1) MOX Services uses PLC and MMIS mapping in lieu of the “conventional understanding of item ‘sampling,’ which would normally involve the random selection . . . and physical inspection of . . . ‘item[s]’”; and (2) MOX Services assumes that PLC and MMIS mapping “is at least 99 percent accurate [but] provides no *quantitative* evidence supporting this claim.” Dr. Lyman concludes that MOX Services has provided “no *quantitative* evidence” that it will achieve at least a 99% power of detection as required by the regulation. Exhibit INT000001 at A.5, ¶ 5. Dr. Lyman submitted no Rebuttal Testimony, so he has not extended his opinions beyond the claims in his Direct Testimony.

Q18: Please respond to the first part of Dr. Lyman’s assertion.

A: [All] Dr. Lyman first asserts that MOX Services does not satisfy “the quantitative requirements of 10 CFR § 74.55(b)(1)” because it does not conduct item monitoring via “conventional” item sampling. Exhibit INT000001 at A.5, ¶ 5. Dr. Lyman claims, “[MOX Services] relies on the *qualitative* reassurance that physical protection measures will ensure accuracy of the PLC mapping data. This assertion does not meet the letter nor the intent of the quantitative requirements of 10 CFR § 74.55(b)(1).” *Id.*

A random sample of a subset of items, conducted by way of a “physical inspection,” is no more quantitative than a 100% sample. MOX Services’ approach involves a sample size that is equal to the *entire* population, not just some “random[ly] select[ed]” subset of that population. *Id.* In other words, instead of drawing a statistical inference about the total population from an inspection of a partial subset, MOX Services conducts item monitoring for the entire population. In this regard, MOX Services’ approach meets the 99% power of detection requirement. That approach is better than the partial population sampling Dr. Lyman seems to advocate. At the heart of Dr. Lyman’s testimony on this point is the notion that somehow it is better to sample a subset of an item population by way of physical inspections (which carry no special “guarantees” of accuracy), than it is to sample 100% of the population. We disagree. Verifying the presence and integrity of 100% of the population of items is at least as effective in achieving the requisite power of detection as verification of only a statistical subset of the total population.

Dr. Lyman also states in his testimony that MOX Services “asserts” that its item monitoring approach provides a 100% power of detection. *Id.* ¶ 4. MOX Services did not say that. To the contrary, we testified, “the daily and on demand mapping comparisons, in conjunction with the robust physical protection features [provide] *at least 99% power of detection* of item losses of at least 5 formula kilograms.” Exhibit APP000014 at Q25 (emphasis added).

Q19: How does MOX Services meet the 99% power of detection requirement as it applies to verifying item *integrity*?

A: [All] As it does for presence, MOX Services provides a 99% power of detection with respect to the integrity of items by verifying the integrity of 100% of the items in storage. Again, rather than draw a statistical inference from a subset of the population, MOX Services verifies the integrity of the *entire* population.

For example, consider the PuO₂ Storage Vault (DCM). In our Direct Testimony, we provided the following explanation for the integrity verification plan for DCM:

For DCM (3013 storage vault), the containment boundary consists of the vault walls and vault doors. Each of the doors and access openings will be TID [Tamper-Indicating Device]-sealed or protected equivalent to tamper-safing, so that unauthorized access to the storage location will be immediately obvious. Movement of the material in and out of the vault for normal processing will not require personnel to enter the storage location. Routine inspection of the installed TID seals will be performed as part of the *daily* Operations rounds.

Exhibit APP000014 at Q29.

In other words, rather than verifying the seals of a statistically significant subset of the individual 3013 containers, MOX Services “seals” the entire storage area with tamper indicating devices. Daily verification of the identity and integrity of the TID-seals confirms that the area has not been breached. Therefore, the integrity of *all* of the containers therein is verified on a daily basis, and no subset goes unverified. This approach is superior to one in which the seals of a subset of the individual 3013 containers are verified. The latter approach introduces more opportunity for human error, as well as the possibility that a breach of a container *not* in the sampled subset might go undetected.

We should note that the Intervenor provided no testimony or other evidence on this point.

Q20: Please respond to the second part of Dr. Lyman's assertion about MOX Services' compliance with the quantitative requirements of Section 74.55(b)(1).

A: [All] Dr. Lyman next asserts that MOX Services does not satisfy "the quantitative requirements of 10 CFR § 74.55(b)(1)" because it has not provided any "*quantitative* evidence" to demonstrate that "the PLC mapping data is at least 99 percent accurate." Exhibit INT000001 at A.5, ¶ 5.

Dr. Lyman appears to confuse "power of detection" with "accuracy." Indeed, Dr. Lyman appears to use the two concepts interchangeably throughout his testimony. *See id.* ¶¶ 5, 10, 14, 20. These two concepts are not interchangeable. And there is no "quantitative" requirement in 10 CFR § 74.55(b)(1) that MOX Services demonstrate that its item monitoring method is at least 99% accurate. Nor does NUREG-1280 mention any expectation that licensees demonstrate the accuracy of their item monitoring method to any quantifiable standard. Thus, the Intervenor's argument that *accuracy* of the item monitoring method must be quantified is not supported by the regulation or applicable NRC guidance.

Q21: How can that be? Certainly the NRC did not intend to permit licensees to use inaccurate item monitoring methods.

A: [All] Of course not. Section 74.55(b)(1) requires that licensees "verify . . . the presence and integrity of SSNM items." Whatever methods the licensee chooses, those methods must be able to provide reasonable assurance that item losses totaling five formula kilograms will be detected. We are simply clarifying that there is no requirement that the licensee *demonstrate the accuracy* of its method on a *quantitative* basis, and Section 74.55(b)(1) does not even speak to method accuracy.

Q22: Dr. Lyman repeatedly asserts that MOX Services has not demonstrated the accuracy of PLC and MMIS mapping. Please respond to Dr. Lyman's assertions.

A: [All] Dr. Lyman is incorrect. We explained in our Direct Testimony the basis for our conclusion that MOX Services' PLC and MMIS mapping methods used to verify the presence of items provide reasonable assurance that item losses totaling 5 formula kgs of SSNM will be detected. *See* Exhibit APP000014 at Q23 - Q24, Q27.

The MOX Facility is designed to limit physical interaction between humans and SSNM items such that automation must always be involved in the movement of SSNM items. The PLCs control that movement and track the location of each SSNM item—whether in process or in storage. The MMIS tracks expected locations of SSNM items based on PLC messages and manufacturing requirements. *See id.* at Q22 - Q23.

The fundamental architecture of the MMIS-to-PLC interface validates mapping information each time an item is requested from storage for the next process step. *See id.* at Q15. Every item that is moved from a storage location to a process location is subject to identification using a bar-code reader, and under some circumstances, weighing. Thus, every movement of an item confirms the accuracy of the PLC mapping with the actual physical location of the item.

MOX Services has high confidence that PLC records will accurately reflect item storage locations because the PLC places the items in those locations. Operation of the material handling equipment in the MOX Facility must be precise and accurate in order for the manufacturing process to work. To place an item in a storage location, a high degree of accuracy is required. MOX Services' equipment or product could be seriously damaged if placement of an item is "off" by fractions of an inch in any of three spatial

directions.

This accuracy of the PLC data is just as important to the control of the quality of the manufacturing process, as it is to MC&A, and the validation that occurs with each movement provides nearly continuous verification of the PLC's accuracy.

Moreover, the NRC has accepted this type of approach as a legitimate method for item monitoring. Specifically, NUREG-1280, Section 2.1.7 states: "[p]rocess control and accounting, quality control testing, and other production operations routinely generate information that can serve to verify the identity and presence of sealed items." Exhibit APP000030 at 29. Thus, NUREG-1280 recognizes that data from processing and operational systems may be used to meet item monitoring requirements.

MOX Services relies on the design of the Facility—including inaccessible storage areas and robust physical protection elements—to ensure that items remain where the PLC leaves them. *See* Exhibit APP000014 at Q23, Q27. As we described at length in our Direct Testimony, these physical protection elements include many redundant features that in combination, provide "defense in depth," such that the integrity of the facility can be assured even upon failure of one or more security features. Dr. Lyman's testimony that the reliability of MOX Services' automated system depends upon "perfect" performance of its physical protection features, is incorrect. *See* Exhibit INT000001 at A.5, ¶ 14. Based on her extensive expertise, Ms. Williams testified:

The accuracy of PLC mapping is appropriately ensured by the automation of the processing and handling systems and the robust physical protection features, which prevent interference with the automated systems. When taken together, PLC and MMIS mapping, automation, and physical protection features that limit

human access to items enable MOX Services to determine the presence of all SSNM items in storage on a daily basis, and therefore satisfy the regulatory requirement.

Exhibit APP000014, at Q27.

In addition, although Dr. Lyman compares MOX Services' approach with "conventional" sampling methods (Exhibit INT000001 at A.5, ¶ 5), MOX Services' item monitoring methods for presence verification are more accurate than the "conventional" method. By using automated systems, MOX Services is able to significantly reduce the potential for human errors that could adversely affect the accuracy of item monitoring results. Indeed, human error is the single most common cause for item monitoring discrepancies. For this reason, the NRC recommends the use of automation in MC&A. Specifically, NUREG-1280, Section 4.9.3, *Automation of MC&A*, recommends that: "MC&A data are directly collected, inputted, checked, manipulated, reported and audited by computer where it is practical and advantageous to reduce the consequences and frequency of human error in MC&A data as much as practical." Exhibit APP000033 at 95.

Q23: Dr. Lyman concludes that "without independent and periodic verification of the accuracy of the MMIS and PLC mapping functions, the scheme simply affirms that the MMIS and the PLCs are providing consistent data." Exhibit INT000001 at A.5, ¶ 20; Intervenor's Reply Statement at 4. Please address this conclusion.

A: [SK, GB, GC] This conclusion is not correct. As we have stated in our Direct Testimony (Question 15) and previously in this testimony (Question 22), every process request to supply an item from storage verifies the accuracy of the PLC mapping with the actual physical location of the item.

The MMIS provides the "book" record of the location of each item in storage as

well as all material regardless of whether it is in storage or in process. Information concerning the transfer and storage of items automatically by the control system PLCs is sent to the MMIS in real time as the transfers are made. Location information is also updated manually through journal entries when material is moved by plant operations with a PLC in one of the possible manual modes. This “book” record is the perpetual inventory of the facility.

On the other hand, the PLC memory is an accurate reflection of the location of the items. So by confirming the consistency of the data reflected in the PLC mapping with the data reflected in the MMIS mapping, we are confirming that the MMIS data reflects the actual physical location of the item.

The PLC mapping, at any particular instance, is the actual physical location because only the PLC can move an item. Items in storage are either inaccessible to humans, or human access is controlled. As previously stated, all movement of items is accomplished by the PLCs. The PLC energizes the motors and actuators necessary to move an item and receives direct and continuous feedback from sensors as to the position of the item in transit. When the sensors confirm that the item has reached the specific coordinates corresponding to the desired storage location, the PLC memory is updated. As discussed in response to Question 22, these movements are very precise and memory has to be very accurate to avoid damage to equipment or product. The technology employed is mature and is used in manufacturing processes throughout the world, including the MELOX plant.

Therefore, the comparison of the MMIS mapping and the PLC mapping is the

verification of the actual material location (PLC mapping) against the MOX Facility record (MMIS mapping).

Q24: Dr. Lyman states that “[i]n order to provide the required assurance that the PLC mapping is accurate to [the] desired quantitative standard, it would be necessary to periodically physically *validate* the data provided by the system” through the conduct of traditional physical inventories, and that MOX Services has no intention of doing this. Exhibit INT000001 at A.5, ¶ 6. Emphasis in original. Is this correct?

A: [All] No. As discussed in response to Questions 20 to 21 above, there is no quantitative standard for the accuracy of an applicant or licensee’s item monitoring approach.

Furthermore, the physical inventory requirements of 10 CFR §§ 74.51(d) and 74.59(f) are separate from the item monitoring requirement of 10 CFR § 74.55(b)(1) (which is the subject of this Contention) and there is no requirement in the item monitoring regulation that requires physical inventories in order to meet that regulation. In any event, as stated in Section 4.5 of the FNMCP, MOX Services has committed to comply with the physical inventory requirements of Sections 74.51(d) and 74.59(f). See Exhibit NRC000009. The NRC Staff has determined that MOX Services’ physical inventory program satisfies applicable regulatory requirements. See Exhibit APP000021 § 13.2.3.4. Importantly, Intervenor has not proffered a contention challenging MOX Services’ compliance with Sections 74.51(d) or 74.59(f).

Q25: Dr. Lyman seems to base his assertion that MOX Services must perform conventional sampling in order to have the required assurance of detecting losses on: (1) his reference to the similar systems in AREVA’s French MELOX plant and his understanding of the EURATOM safeguards activities conducted at that plant; and (2) statements by MOX Services’ personnel in various e-mails. See Exhibit INT000001, at A.5, ¶¶ 7-9, 11-16. Please begin by addressing Dr. Lyman’s claims with respect to EURATOM requirements.

A: [All] The MOX Facility is not subject to EURATOM requirements. It is subject to NRC requirements. Dr. Lyman himself admits that the EURATOM requirements “are not

required by NRC item monitoring regulations.” Exhibit INT000001, at A.5, ¶¶ 7-8. The question of Contention 9 is whether MOX Services meets NRC requirements for item monitoring, not whether it meets EURATOM requirements.

Q26: In support of his assertion that the application of EURATOM requirements to MELOX indicates that MOX Services’ automated system is insufficient, Dr. Lyman quotes Exhibit INT000004, as follows:

Although the highly automated systems cover the most important part of the facility . . . branching onto balances is insufficient to attain *Safeguards Goals*. Therefore, manual verifications are made on a weekly basis.”

Exhibit INT000001 at A.5, ¶ 8 (emphasis added). Please address this reference and Exhibit INT000004.

A: [All] The article cited by Dr. Lyman is irrelevant to his argument about compliance with MC&A requirements. The authors of the article are not saying that the MELOX automated systems are insufficient by themselves to detect losses, much less insufficient to meet U.S. NRC requirements. Instead the article is saying that the automated systems are insufficient to meet the separate and distinct EURATOM international "Safeguards Goals."

Furthermore, the referenced passage from Exhibit INT000004 makes no mention of PLC mapping or mapping comparisons. Rather, it refers to obtaining independent material *measurements* to verify the nuclear content of items. The insufficiency is not lack of data, but rather a lack of independence from the facility's data. In addition, the data referred to is measurement (of nuclear material) data, not location of items data.

In fact, another of Intervenor’s exhibits (Exhibit INT000003) states:

As the operating data defined in the case of M[ELOX] cover the totality of the nuclear material present in the installation at all time, any anomaly in

the nuclear material accountancy or any nuclear material diversion scenario would result in a departure between the actual physical situation and the situation reflected by the operating data.

The large amount of verifications performed on the operating data every day, are able *by themselves* to catch a departure which would violate any of the internal or time consistency rules which are checked for.

Exhibit INT000003 at 205. As this article points out, there is an abundance of data generated to detect a nuclear material diversion. The "verifications performed on the operating data every day" are in part the MMIS to PLC mapping comparisons. *Id.*

Contrary to Dr. Lyman's implication that EURATOM activities verify the accuracy of the item verification at MELOX, EURATOM only requires that every other week:

- One randomly selected jar from the Jar Handling and Storage Unit (NTM) or processing is sampled. The jar is weighed and a sample removed and sent to the lab for independent analysis.
- Two or three pellets from one randomly selected boat or scrap box that may be in process or in storage are weighed and sent to the lab for analysis.
- Four randomly selected rod trays are sent to SEK (gamma scan) where they are measured to determine the Pu content of the rods.
- One randomly selected, reusable Pu can from the PuO₂ Buffer Storage Area (DCE) is weighed.

Under the EURATOM program:

- No samples are required from pellet trays in storage or in process.
- No independent verification or sampling of assemblies is performed.
- No samples are required from DCM at MELOX.

The pattern of what is selected by EURATOM for independent verification does not reflect a concern about the adequacy of the automated system for verification of presence of items. For example, for DCM, the largest item storage location with the Pu that is

most attractive for diversion, EURATOM performs no periodic independent verifications.

Q27: Dr. Lyman cites several internal documents authored by MOX Services' personnel for his assertion that even MOX Services believes physical verification is necessary to ensure the accuracy of the automated systems. See Exhibit INT000001 at A.5, ¶¶ 11, 12, 13, 15. He concludes that these documents demonstrate that MOX Services believes that it must develop a plan to verify the "reliability, functionality and security of MMIS" in order to satisfy NRC item monitoring requirements. Exhibit INT000001 at A.5, ¶ 13.

In their Rebuttal Statement of Position, the Intervenor state: "[w]ithout providing detailed procedures to periodically verify the performance of the PLCs, MOX Services has simply failed to demonstrate the system can operate with this astonishingly high level of accuracy." Intervenor's Rebuttal Statement at 4. Are Intervenor and Dr. Lyman correct that MOX Services must provide "detailed procedures" or a verification plan with its license application?

A: [GB] No. Neither Intervenor nor Dr. Lyman has cited an NRC requirement that MOX Services develop a plan to verify the functionality of MMIS or the PLCs as a part of its license application. Nevertheless, the FNMCP commits to having in place an item verification procedure, described in the FNMCP as follows:

The MC&A department will verify the reliability of the MMIS to conduct these item monitoring tests. This verification will be proceduralized; it will initially rely on the verification of item monitoring tests during start up activities followed by verification of MMIS' item monitoring reliability according to the MMIS Item Verification Procedure.

Exhibit APP000019 at 127. The MOX Project Quality Assurance Plan governs the development of these procedures.

Furthermore, the NRC Staff witness, Mr. Pham, in his Rebuttal Testimony, correctly points to specific measures set forth in MOX Services' FNMCP that will "protect and ensure the integrity of the data stored by the PLCs." Exhibit NRC000008 at Q4. These are found in Sections 2.2.2, 4.6 and 4.9 of the FNMCP relating, respectively,

to "Falsification Prevention," "Accounting" and "Human Errors." Exhibit NRC000008 at Q4.

Q28: Dr. Lyman cites another internal MOX Services email to support his assertion that MOX Services will not, and perhaps cannot, conduct the physical inventories required by regulation. Exhibit INT000001 at A.5, ¶ 16. Is this concern credible?

A: [All] No it is not. Let us clarify again that the physical inventory requirements of 10 CFR § 74.51(d) are separate from the item monitoring requirement of 10 CFR § 74.55(b)(1), which is the subject of this Contention. As indicated in the response to Question 24 above, MOX Services has committed to comply with Section 74.51(d).

Regardless of relevancy, this assertion that MOX Services may seek some relief from the NRC is entirely speculative. No such request has been submitted to the NRC and no such decision has been made to do so.

Q29: Dr. Lyman suggests that the software was developed by foreign nationals and therefore could include malicious code. In support, he references a 2003 white paper on the subject authored by Mr. Bell. Exhibit INT000001 at A.5, ¶ 16. Mr. Bell, are Dr. Lyman's concerns warranted and if so, what has MOX Services done to protect against these threats?

A: [GB] Software security and computer security are, and always have been, a significant focus of MOX Services' efforts. As demonstrated by the referenced 2003 white paper, MOX Services was working with DOE very early in the process to resolve any issues that would impede the certification and accreditation of the MOX Facility process control system.

MOX Facility Software Security will meet the requirements of:

- NNSA Policy Letter NAP 14.1-C, NNSA Baseline Cyber Security Program;

- NNSA Policy Letter NAP 14.2-C, NNSA Certification And Accreditation (C&A) Process For Information Systems; and
- NNSA Policy Letter NAP 14.3-B, Transmission of Restricted Data Over Secret Internet Protocol Router Network (SIPRNet).

The FNMCP commits to comply with the requirements of these documents in section G.3.4.12. Exhibit APP000034 at 15.

The MOX Facility process control software is currently under development on a computer network that is certified and accredited to these same standards, which assures protection while under development and validates that the software will function properly with all of the required security controls in place. The required security controls are sufficiently stringent to protect the MOX Facility process control system.

Furthermore, the MMIS servers that will be installed in the MOX Facility will *not* come from France. The MMIS servers that are discussed in the email from Robert Harivel to Mark D. Whittingham (Exhibit INT000010) were for testing only, and will not be installed in the MOX Facility. All of the *hardware* used for the MMIS, whether for the servers used in the development and test platform or for the final hardware installed in the MOX Facility, are and will be products from a U.S. supplier (Hewlett-Packard).

With respect to *software*, MOX Services does use as much of the MELOX software as practicable in developing the MOX Facility software. MOX Services does this because the process equipment to make the MOX fuel is based on the MELOX facility and the MELOX software has been used successfully for over 15 years. Using similar software helps assure that both the equipment and software work properly, and takes advantage of the operational experience gained at MELOX. Obviously, when the

MELOX software was first developed, there was no knowledge that the MOX Facility would ever be built. Accordingly, MOX Services has high confidence that no malicious software was built into MELOX to target the MOX Facility.

Furthermore, all changes to the MELOX plant software and all new software is developed under the MOX Facility software life cycle process. The process is based on ASME NQA-1 subpart 2.7 requirements for software development and includes: software quality assurance processes, definition of software requirements, development of software design, implementation of software, formal software Verification and Validation, and configuration management. The software life cycle processes for the development of the MMIS and PLC software are controlled by MOX Services - approved procedures and guidelines that implement appropriate requirements of the MOX Project Quality Assurance Plan for software development.

The MMIS hardware architecture includes two redundant servers, each with its own disk array. The servers are located in separate buildings and electrically fed by separate sources of uninterruptable power. Data networks connecting the PLCs to the MMIS will be redundant, such that failure of any one network device will not prevent communication with either MMIS server. This architecture provides for a high level of availability of the MMIS communications.

After release to the MOX Facility for installation and startup, the Process and Utility Control System, including the MMIS and PLCs (*see* Exhibit APP000014 at Q12), will undergo additional testing conducted by the MOX Services' Startup Test Group, which is independent of the Software Design Group.

The combination of this level of verification and validation and the establishment of security controls minimizes the risk of introducing malicious software during the development process.

Q30: Is MOX Services' item monitoring approach "novel, poorly documented, untested and vague," or "experimental or unproven" as Intervenor and Dr. Lyman suggest? Intervenor's Initial Statement of Position at 6; Exhibit INT000001, at A.5, ¶ 18.

A: [All] Not at all. MOX Services' item monitoring approach was described at length in pages 18-57 of our Direct Testimony. See Exhibit APP000014 at Q9 - Q31. And the mapping software principles, requirements, and design are well documented in the MOX Facility PLC software coding standards and in the Software Requirements Specifications and Software Design Descriptions for the MMIS and each PLC.

MOX Services' item monitoring approach is documented as required for this stage of licensing in the FNMCP. The NRC SER supports this conclusion. Additional, more detailed documentation is being developed as the item monitoring program continues to develop. The hierarchy of the item monitoring program definition documents begins with the FNMCP, flows down through various layers of program documents, and ends ultimately in the facility procedures.

Furthermore, as Dr. Lyman himself admits (Exhibit INT000001 at A.5, ¶ 7), the MMIS is closely based on the MELOX SIGP system in France. The MELOX SIGP has been performing this same comparison of its (SIGP) mapping to PLC mapping, daily, for at least 15 years. The MOX Facility uses the same software standards and principles that have been in use at MELOX. The software is tested thoroughly on the software development test platform prior to release for installation in the MOX Facility, and then

tested again with MOX Facility equipment prior to being placed in service. The MOX Services' program draws on the operating experience of MELOX and La Hague and is in that way, well tested.

Q31: In their Rebuttal Statement of Position, Intervenors claim that MOX Services' approach for verification of item integrity would render certain portions of Section 74.55 "superfluous," including Section 74.55(a)(1) and Section 74.55(b). Intervenors' Rebuttal Statement at 5. Please address this assertion.

A: [All] Intervenors' assertion is inaccurate. Section 74.55 is not rendered "superfluous" by a reading that verifying the integrity of a storage area boundary will suffice to verify the integrity of the items contained therein. Other facilities, to which these regulations also apply, have item storage locations that are regularly accessed by humans. In those cases, items may still be sealed in accordance with Section 74.55(a)(1), which provides:

Licensees subject to § 74.51 shall provide the detection capability described in paragraph (b) of this section for . . . any uniquely identified items of SSNM that have been quantitatively measured, the validity of that measurement independently confirmed, and that additionally have been . . . tamper-safed or placed in a vault or controlled access area that provides protection at least equivalent to tamper-safing[.]

But because there is regular, albeit controlled, human access to item storage areas at these facilities, to the best of our knowledge, such licensees have not taken credit for the containment boundary of the storage area for item verification.

As we explained in our Direct Testimony, access to storage areas in the MOX Facility is controlled by a combination of very robust design and security features, material movements are executed and recorded by computer, and tamper-safing is employed. *See* Exhibit APP000014 at Q28. Accordingly, daily confirmation that the established containment boundary for each storage area has not been breached verifies

the integrity of the items contained therein.

The use of Tamper-Indicating Devices (TIDs) and reliance on robust protective boundaries (and other robust physical protection elements) merely takes the tamper-safing concept one step further. This is consistent with common practice in usage of TIDs and reliance on them to ensure integrity. An example of a similar application is the use of TIDs on a container for shipping fuel assemblies to ensure the integrity of the SSNM contained in the rods that are bundled together to make the fuel assembly. Instead of opening the shipping container and inspecting the integrity of the rods in the bundles, the shipping container itself and the TIDs used on it are inspected. The integrity of the contained SSNM (*i.e.*, the SSNM in the bundles) is verified by verifying that the shipping container and its TIDs are intact. In a similar manner, for the MOX Facility, the integrity of SSNM in a storage area is verified by confirming daily the integrity of the storage area boundaries and any TIDs .

In summary, verifying the “integrity” of SSNM items at the MOX Facility involves physically verifying that the SSNM item storage area containment boundaries enclosing the particular, uniquely identified SSNM items have not been breached, so that it is apparent that the discrete, identified, and previously measured SSNM contained within those items has not changed from the measured value. Because access to these storage locations by personnel is controlled by design or security features or both, and material movements are executed and recorded by computer rather than by human access, MOX Services can protect these areas with TIDs or methods equivalent to tamper-safing. Physical confirmation that the designated containment boundary (and the associated seals and TIDs) has not been breached verifies the integrity of all of the items contained

therein. MOX Services has identified these specific containment boundaries in its Direct Testimony, along with its item integrity verification methods. MOX Services will perform *daily* checks of the containment boundaries, seals and TIDs. This satisfies the requirement for the verification of the integrity of SSNM items.

Q32: Intervenor assert that “[i]f it is possible to satisfy the requirement for verifying the *integrity* of items containing SSNM by verifying the integrity of storage area boundaries, then it follows logically that it should be possible to verify the *presence* of an item the same way.” Intervenor’s Rebuttal Statement at 5. Is this correct?

A: [All] No. As we explained in our Direct Testimony, movement of SSNM items throughout the MOX Facility is controlled by automation. Exhibit APP000014 at Q12. Thus, even if a containment boundary is not breached, items will move in and out of the storage area (and through portals that are not accessible to humans under normal operation). Accordingly, confirmation of the integrity of the containment boundary of an item storage area will not provide any information about which items are contained therein. PLCs and the MMIS control and track the automated movement of items. *See id.* at Q15. Mapping data provided by PLCs and MMIS therefore are required for verification of the presence of items.

Q33: Intervenor also claim that NRC guidance at NUREG-1280 suggests that item verification includes “quantitative measurements” of items. Intervenor’s Rebuttal Statement at 6. Intervenor seem to read aspects of NUREG-1280 that pertain to alarm resolution to suggest that item monitoring includes measurement of the contents of items. *See id.* at 6-7. Intervenor state:

NUREG-1280 contains language demonstrating that item integrity checks constitute more than simply monitoring the integrity of vault boundaries, and instead involve quantitative measurements of item contents. NUREG-1280 states an alarm ‘exist (sic) whenever an item monitoring test results in . . . one or more items being found defective (i.e., with some or all of their SSNM item contents missing.)’ NUREG-1280 thus anticipates that discrete containers

of SSNM are items that will be measured in the course of item integrity verification.

Id. at 6. Is Intervenor's conclusion correct?

A: [All] No. Intervenor's reading is overly narrow and incorrect.

First, once a storage area boundary is found breached, an "alarm" condition exists. That is the subject of Contention 10. In fact, the NUREG-1280 quotation used by the Intervenor is taken from the Alarm Resolution section and has no application to the item monitoring verification procedure requirements found in section 2.1.7.

Second, a more careful reading of the regulations reveals that item monitoring assumes a tamper-safed measured value for all items covered under this section of the regulations, and does not require or "anticipate" that additional quantitative measurements will be conducted during performance of routine item monitoring activities. For example, 10 CFR § 74.4 defines an "Item" as a "discrete quantity . . . of special nuclear material . . . not undergoing processing, having an assigned element and isotope quantity." Notice that the definition of an item requires that it has a measured value. In addition, 10 CFR § 74.55(a) requires compliance with the detection capability set forth in 10 CFR § 74.55(b) for "items of SSNM that have been quantitatively measured, the validity of that measurement independently confirmed, and that additionally have been either: (1) Tamper-safed or placed in a vault or controlled access area that provides protection at least equivalent to tamper-safing; or (2) Sealed such that removal of SSNM would be readily and permanently apparent (e.g., encapsulated)." Thus, the regulations require that an item have a measured value and that that measured value be ensured through some protective features. This is to allow the value to be used

with assurance and to not require re-measurement of the item in storage as part of an item monitoring test. As a further example, Section 2.1.3 of NUREG-1280 states: "tamper-safing . . . [is] . . . employed to ensure the continuing validity of previously measured and attested to SSNM values assigned to unique items." Exhibit APP000030 at 23.

Therefore since the material subject to item monitoring has a measured value and that measured value is preserved, the item monitoring program only requires verification of "the presence and integrity of selected SSNM items on a periodic basis" in order to detect material diversion. *Id.* at 21.

It should be noted that the quotation used by the Intervenor and repeated in the question above refers to the case where the integrity item monitoring check fails. In that case, an MC&A alarm condition exists and Alarm Resolution actions are initiated. As MOX Services has indicated in previous testimony, re-measurement of an item that fails the item monitoring integrity parameter is one of the alarm resolution actions that may be used to resolve the alarm condition. However, a quantitative re-measurement is not required as part of the routine item monitoring integrity test.

Q34: Please summarize your conclusions regarding Dr. Lyman's testimony on Contention 9.

A: [All] Dr. Lyman claims that MOX Services has not demonstrated that its item monitoring approach is at least "99% accurate." As we have explained, there is no regulatory requirement that MOX Services demonstrate the accuracy of its item monitoring approach to any quantifiable standard. Furthermore, we have demonstrated that MOX Services meets the quantitative power of detection standards of Section 74.55(b)(1) and satisfies the regulations.

Moreover, Dr. Lyman has not provided any legitimate bases for his testimony that

MOX Services must conduct physical inventories to verify the accuracy of PLC mapping. Although he references the physical inventory activities of the EURATOM safeguards program, the MOX Facility is not subject to EURATOM requirements. And although Dr. Lyman calls for a verification plan for MMIS and PLCs, no such plan is required as part of MOX Services' license application. Nevertheless, the FNMCP commits to having in place provisions to verify the reliability of the MMIS and includes specific commitments to protect and ensure the integrity of the data stored by the PLCs.

We have found nothing in Dr. Lyman's testimony that calls into question our conclusions on this Contention. MOX Services has demonstrated that there is reasonable assurance it will comply with the requirements of 10 CFR § 74.55(b)(1).

Q35: Ms. Williams, Dr. Lyman claims that MOX Services' approach "does not meet the letter nor the intent of the quantitative requirements of 10 CFR § 74.55(b)(1)." Exhibit INT000001 at A.5, ¶ 5. In your experience as a Senior MC&A Inspector for the NRC, does MOX Services' approach meet the letter *and* intent of 10 CFR § 74.55(b)(1)?

A: [MW] Yes. As I previously testified, based on my 31 years of MC&A experience, I believe that MOX Services' approach meets the regulatory requirement. Exhibit APP000014 at Q30.

IV. MOX Services' Reply to Intervenors' Contention 10 Testimony

Q36: In A.6, paragraph 2 of the Intervenors' Direct Testimony, Dr. Lyman states:

[MOX Services] claims that *the regulations do not require it to specify any particular method to resolve an alarm*, so the fact that it could not conduct an item verification, much less a full quantitative inventory, within three calendar days is irrelevant.

Exhibit INT000001 at A.6, ¶ 2 (emphasis added). Please respond.

A: [All] Again, Dr. Lyman has mischaracterized our testimony. We did not claim that

MOX Services is “not require[d] to specify any particular method to resolve an alarm.”

This implies that we stated that MOX Services did not have to identify or “specify” its planned alarm resolution methods. It also implies that those methods, in fact, were not identified.

On the contrary, our precise testimony in response to Question 39 of our Direct Testimony was:

[10 CFR § 74.57(b)] does *not* [(emphasis in original)] require MOX Services to demonstrate that it can resolve the nature and cause of any MC&A alarm within the approved time period *by any one particular means, such as an “inventory”* [(emphasis added)] There are multiple tools available to a licensee to meet its approved timing commitment.

Exhibit APP000014 at Q39. What we were clearly trying to say was, simply, that the regulations do not require a demonstration that the alarm resolution timing commitments can be met with any single, particular method. Furthermore, again, we specifically identified multiple, anticipated alarm resolution methods and the expected time frames in which those methods could be completed. *See id.* at Q42, Q46 - Q47. Dr. Lyman’s statement about the “fact” that MOX Services “could not conduct an item verification . . . within three calendar days” is also factually incorrect. Exhibit INT000001 at A.6, ¶ 2. As we discussed above, MOX Services has multiple means at its disposal to resolve an alarm in accordance with its three day commitment.

Q37: Dr. Lyman next states that “[MOX Services] claims that the statement that it can ‘normally’ complete alarm resolution within three days absolves it from the responsibility to resolve alarms in a timely fashion under any conditions that they believe are abnormal or atypical.” Exhibit INT000001 at A.6, ¶ 2. Dr. Lyman challenges MOX Services’ “interpretation of the word ‘normally’ . . . [as] far too narrow to meet the letter of the intent [sic] of the regulations.” *Id.* at ¶ 7. Please address Dr. Lyman’s allegation with respect to MOX Services’ interpretation of the term “normally”?

A: [All] First, Dr. Lyman has provided no reference to anything in the regulations or the

regulatory history of the regulations that supports his statement that MOX Services' interpretation does not satisfy the regulation. Dr. Lyman's position is that MOX Services has defined the term "normally" in such a narrow way that it will rarely be required to resolve an alarm in three days. That is not correct.

In our answer to Question 45 in our Direct Testimony, we stated, among other things, that "in most cases, MOX Services expects to resolve an alarm within three days" and that "[t]he MOX Facility design and accounting structure have been developed to provide the capability to expeditiously resolve MC&A alarms. . . . Time frames in excess of three calendar days would be considered unusual, and represent an 'abnormal' situation."

We then went on to explain, in response to Question 46 of our Direct Testimony, why we believe that in almost all cases, alarm resolution can be completed well within three days. We made clear that there are multiple methods for alarm resolution, all of which take less than three days and many of which can be pursued in parallel, and we described why we believe these methods are very likely to be effective in resolving virtually all alarms. Dr. Lyman did not challenge either the effectiveness of those methods or our estimates of the time it would take to complete those methods.

In short, our interpretation is not at all too narrow.

Q38: Intervenors dispute MOX Services' characterization of "normally" as including, among other things, the anticipated inventory in any one area at any one time. Intervenors claim that "the regulations do not distinguish between 'normal' and 'unusual circumstances.'" Intervenors' Rebuttal Statement at 8. Please address Intervenors' assertion regarding treatment of the term "normally" in NRC regulations.

A: [All] Intervenors are correct that the regulations do not distinguish between "normal" and "unusual" circumstances. In fact, the regulations do not provide any specific timing

requirements for alarm resolution. As we explained in our Direct Testimony, Section 74.57(b) provides, in its entirety: "Licensees shall resolve the nature and cause of any MC&A alarm within approved time periods." Exhibit APP000014 at Q34. As we explained in our previous answer, we committed – and the NRC approved – to normally resolve MC&A alarms within three days. "Normal" circumstances do not necessarily include the maximum inventory *capacity* of the storage areas in question.

Q39: Ms. Williams, in your experience, does MOX Services appropriately interpret the word "normally"?

A: [MW] Yes. Licensees *cannot* commit to *always* resolve alarms within a certain time frame. Indeed, NRC guidance in NUREG-1280, Section 3.1.3, explicitly recognizes this and uses the term "normally":

The 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*. The maximum time for completion of the resolution procedure for alarms indicating a possible abrupt, loss of SSNM in any form or container that was not tamper-safed, encapsulated, or stored in a vault equivalent to tamper-safing *should not normally exceed 3 working days*.

Exhibit APP000030 at 43.

Q40: In response to Question 6 under Contention 10, paragraph 3 of Dr. Lyman's Direct Testimony (Exhibit INT000001) (emphasis added), he states:

The regulations require resolution of "any MC&A alarm" within the approved time period. Therefore, a licensee must be prepared to use any methods that it has identified . . . and this means establishing that *each and every method it has identified can be completed within the approved time period*.

What is your view of this testimony?

A: [All] We agree that a “licensee must be prepared to use any methods that it has identified.” MOX Services is prepared to use any or all of the methods it has specifically identified, including records checks, access control checks, exit monitor checks, verification of specific items, and inventory/verification of material presence. *See* Exhibit APP000014 at Q46. Dr. Lyman has not explained why MOX Services would not be prepared to use any or all of those methods.

Dr. Lyman then states that “this means establishing that each and every method it has identified can be completed within the approved time period.” Our Direct Testimony identified the time it is expected to take to complete these methods, and in all cases but an inventory, these would be completed in far less time than three days. In the case in which an inventory of any of the four item storage areas in question may be needed, it will be completed within three days under normal conditions (*i.e.*, anticipated maximum number of stored items). Dr. Lyman has said nothing in his Direct Testimony that calls our testimony in this regard into question.

Q41: Ms. Williams, although MOX Services has testified that all of the individual, identified alarm resolution methods can, in fact, be completed in a timely manner, do you agree with Dr. Lyman that there is a *requirement* to demonstrate that “each and every method...can be completed within the approved time period” (*i.e.*, in a timely manner)? Exhibit INT000001 at A.6, ¶ 3.

A: [MW] No, I do not. As I previously stated in my Direct Testimony (answer to Question 41), “[s]o long as MOX Services can show that there is reasonable assurance it normally can meet its timing commitment through an available alarm resolution method, *or combination of methods*, it would satisfy the rule and its commitment.” Exhibit APP000014 at Q41 (emphasis added).

Q42: Please comment on Dr. Lyman’s next statement (Exhibit INT000001 at A.6, ¶ 3) that:

If MOX Services maintains that some vague combination of other methods would enable it to resolve “any MC&A alarm” without ever having to undertake a complete item inventory . . . then it should take item inventories off the list of available methods.

A: [All] It is not fair to characterize our testimony as presenting only a “vague combination” of methods. MOX Services has provided a specific description of anticipated alarm resolution methods.

MOX Services has not maintained that it will be able to resolve “any MC&A alarm” (*i.e., all MC&A alarms*) without an inventory. This is not the requirement. 10 CFR § 74.57(b) states that “[l]icensees shall resolve the nature and cause of any MC&A alarm within approved time periods.” The approved time period, again, is normally within three days. MOX Services simply anticipates that, in most cases, other methods will be effective in resolving an alarm. And MOX Services has testified that, even in the unusual circumstance where an inventory may be required (for the four storage areas that are within the scope of the Contention), it expects to complete the inventory within three days. MOX Services does not intend to take “item inventories off the list of available methods” as Dr. Lyman suggests.

Q43: Please comment on Dr. Lyman’s next statement that:

[A]s 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. Otherwise, it simply does not comply with the regulation.

Exhibit INT000001 at A.6, ¶ 3.

A: [All] Again, MOX Services *has* shown that an inventory of the four storage areas within the scope of this Contention can be completed within the approved time period.

See Exhibit APP000014 at Q47 - Q48. But, as MOX Services has also made clear, it simply does not need to show that it can complete an inventory in all possible circumstances within three days to meet the requirements of the regulation. *See id.* at Q36 - Q41.

Q44: Dr. Lyman also references an internal MOX Services email, authored by J. Coleman, that suggests that a review of MOX Services' computer code might become a necessary component of its alarm resolution methods. Exhibit INT000001 at A.6, ¶ 5. Please address this aspect of Dr. Lyman's testimony and the referenced email.

A: [GB] MOX Services has identified review of MMIS records, including logs and journals, as part of "record review" in the FNMCP alarm resolution methods. Alarm resolution involves reconciliation of the physical situation with the MC&A records and possibly other production records and data as needed. Inspection of the software code would not provide any insight into the alarm resolution. The software has undergone extensive review and testing during its development. All changes to the software will be controlled under a software life cycle process, that includes approval of changes prior to their implementation, and review and testing of changes before software is released to the facility. A software error would be revealed by corrupted or errant data identified during the records review without a review of the code. A code review would likely be part of the corrective action, not the alarm resolution. Mr. Coleman was not aware of the level of records, logs and journals created by individual transactions in the MMIS, nor was he familiar with the software configuration management practices that are in place.

Q45: Intervenors conclude, in their Rebuttal Statement of Position, that if MOX Services intends to verify item integrity by verifying a storage area boundary, "then resolution of alarms triggered by storage area boundary breaches would necessarily require inventories of the contents of the entire storage area." Intervenors' Rebuttal Statement at 8. Please address this assertion.

A: [All] Intervenors' assertion is incorrect. If MOX Services received an alarm that a storage area boundary was breached, MOX Services would have several alarm resolution methods available to address that breach, in addition to a physical inventory. As we described in our Direct Testimony and in response to Question 33 above, MOX Services could conduct the steps related to an access control check or an exit monitor check, in addition to those related to a physical inventory. See Exhibit APP000014 at Q46. As we have explained, MOX Services would employ any combination of these methods to resolve the alarm in the most efficient manner possible. Thus a full inventory would not "necessarily" be required. If one was, it could be completed within three days.

Q46: Please summarize your conclusions regarding Dr. Lyman's testimony on Contention 10 and Intervenors' Rebuttal Statement of Position with respect to Contention 10.

A: [All] Our view is that Dr. Lyman has mischaracterized both the applicable regulatory requirement and our prior testimony, erroneously argued that each and every alarm resolution method must be completed within the approved time frame, and ignored the fact that MOX Services' can normally complete even a full inventory, if necessary, of the four storage areas that are the subject of the Contention within three days.

V. MOX Services' Reply to Intervenors' Contention 11 Testimony

Q47: Dr. Lyman states in his Direct Testimony on Contention 11 (ability to rapidly assess alleged thefts) as follows:

Again, as in its testimony on Contention 9, [MOX Services] equates PLC mapping data with the actual physical state of all items in the MFFF, i.e., the system is 100 percent accurate and completely invulnerable to any type of cyberthreat, and hence implies that no physical inventory is necessary, even in the face of an alleged theft.

Exhibit INT000001 at A.7, ¶ 4. Please provide your views on this statement.

A: [All] As explained in the response to Question 20 above, MOX Services has not asserted that its PLC mapping data is "100 percent accurate" or "completely invulnerable to cyberthreat," nor is it required to do so. These characterizations are not grounded in any representation made by MOX Services. Rather, MOX Services' item monitoring program relies on multiple, redundant methods to provide reasonable assurance of the accuracy and integrity of the MMIS and PLCs, and to verify discrepancies, should they arise.

Q48: Dr. Lyman also states:

However, one can easily contemplate threats that would nullify MOX Services' compliance approach. For example, suppose the threat was from an individual who asserted that he or she had diverted a formula quantity of plutonium and had infiltrated and corrupted the MMIS and PLC systems in order to conceal the theft. Such a threat would be plausible, for instance, because of the uncertainties regarding the integrity of the foreign-supplied MMIS servers. This would immediately render all data suspect and trigger time-consuming audits. Ultimately, there would be no way to assess the validity of the threat without conducting a complete inventory of the facility, including an inventory of the DCM vault. As discussed above, this inventory could not be conducted rapidly or within the timelines that MOX Services committed to in the FNMCP. MOX Services simply has no backup plan should its novel "virtual inventory" concept fail.

Exhibit INT000001 at A.7, ¶ 5. Please provide your views on this statement.

A: [All] First, no one person working at the MOX Facility will have both access to SSNM and responsibility for PLCs and MMIS. This is in accordance with 10 CFR § 74.59(b)(1), which requires licensees to "[e]stablish and maintain a management structure that includes clear overall responsibility for planning, coordinating, and administering material control and accounting functions, independence of material control and accounting functions from production responsibilities, and separation of functions such that the activities of one individual or organizational unit serve as controls

over and checks of the activities of others.” NUREG-1280 states further in Chapter 4.0 that key MC&A functions should be separated “from each other in order to provide cross-checks that increase MC&A system reliability and counter defeat of the system through neglect, deceit, or falsification.” Exhibit APP000035 at 51. It also states that the management structure should provide for separation of computer (*i.e.*, PLCs and MMIS) program maintenance from the program user function (*i.e.*, those with access to SSNM), and should ensure that only authorized persons have hands-on access to SSNM. MOX Services affirms this in the FNMCP, Chapter 4.1.1: “The assignment of MC&A functions in the MFFF organization provides a separation of functions so that the activities of one individual or organizational unit serve as controls over and checks of the activities of other individuals or organizational units.” Exhibit APP000032 at 209.

Second, as discussed at Question 29 above, the MMIS servers are not foreign-supplied, thus there is no issue with respect to the “integrity of the foreign-supplied MMIS servers.”

Third, the regulations require only that “[t]he licensee shall provide an ability to rapidly assess the validity of alleged thefts.” 10 CFR § 74.57(e). As we explained in our Direct Testimony, MOX Services has committed, consistent with NRC guidance, to locate all items within *a vault* within 72 hours. *See* Exhibit APP000014 at Q54 - Q55. Thus, Dr. Lyman’s assertion that MOX Services is required to conduct “a complete inventory of the facility” in order to assess the validity of alleged thefts, is inconsistent with NRC rules and guidance.

Q49: Please summarize your conclusions regarding Dr. Lyman’s testimony and Intervenors’ position on Contention 11.

A: [All] Again, we have found nothing in Dr. Lyman’s Direct Testimony or Intervenors’

Rebuttal Statement of Position that calls into question our conclusions on this Contention.

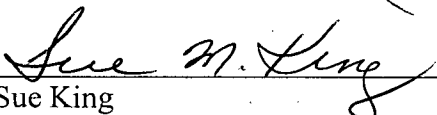
MOX Services has demonstrated that there is reasonable assurance it will comply with the requirements of 10 CFR §74.57(e).

VI. Conclusions

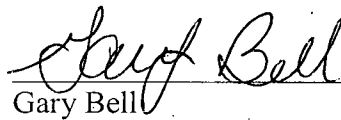
Q50: Please provide your overall conclusions with respect to Contentions 9-11 and the Direct and Rebuttal Testimony filed by the Intervenors and NRC Staff.

A: [All] The NRC Staff continues to concur with MOX Services' position on all of the Contentions. The Intervenors' testimony has not called into question MOX Services' testimony or its approaches to compliance. We continue to believe that Contentions 9-11 should be resolved in MOX Services' favor.

I declare under penalty of perjury that the foregoing is true and correct, to the best of my knowledge and belief. Executed on January 23, 2012.

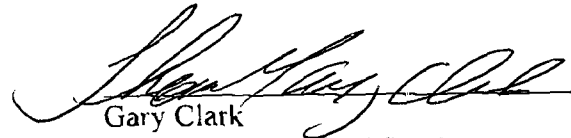

Sue King
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(803) 819-2020
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I declare under penalty of perjury that the foregoing is true and correct, to the best of my knowledge and belief. Executed on January 23, 2012.

A handwritten signature in cursive script, reading "Gary Bell", written over a horizontal line.

Gary Bell
Shaw AREVA MOX Services
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gabell@moxproject.com

I declare under penalty of perjury that the foregoing is true and correct, to the best of my knowledge and belief. Executed on January 23 2012.



Gary Clark
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I declare under penalty of perjury that the foregoing is true and correct, to the best of my knowledge and belief. Executed on January 20, 2012.



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