

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

THE ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:  
Michael C. Farrar, Chairman  
Dr. Paul B. Abramson  
Nicholas G. Trikouros

In the Matter of

SHAW AREVA MOX SERVICES, LLC

(Mixed Oxide Fuel Fabrication Facility  
Possession and Use License)

Docket No. 70-3098-MLA

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

May 21, 2014

ORDER

(Public Release of Initial Decision)

On February 27, 2014, this Board issued a non-public Initial Decision (LBP-14-01) concerning the application of Shaw AREVA MOX Services, LLC for a license to possess and use strategic special nuclear material at a Mixed Oxide Fuel Fabrication Facility currently being constructed by Applicant at the U.S. Department of Energy's Savannah River Site. In an accompanying notice, the Board instructed the parties to identify material in the decision that should be redacted before public release.<sup>1</sup>

Guided by the resulting input from the parties, each of whom we commend for their respective thoughtful approaches to achieving a substantial level of openness at this point, we hereby issue the attached public version of the Initial Decision that varies from the original version in that (1) it contains limited redactions that all parties have agreed to; (2) the header

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<sup>1</sup> Notice (Regarding Issuance of Initial Decision) (Feb. 27, 2014) at 2 (unpublished). See also Order (Requesting Response to Intervenors' Comments on Proposed Redactions) (Apr. 11, 2014) (unpublished) (instructing NRC Staff and Applicant to respond to Intervenors' comments on the proposed redactions in order to "make available to the public as much of LBP-14-01 as possible consistent with security needs").

and footer designating the decision as non-public have been stricken; and (3) in the Separate Statement, the third sentence in the second paragraph on page 100 has been deleted to eliminate reference to extra-record material. In place thereof, the period at the end of the second sentence has been changed to a comma, and the following has been added: "if those eventually obtaining access to the material had the resources and wherewithal to create devices that, if used for nefarious purposes, could have widespread devastating impact."

The Office of the Secretary is authorized to place a copy of this decision in the agency's ADAMS electronic record keeping system as a publicly-available document.

It is so ORDERED.

FOR THE ATOMIC SAFETY  
AND LICENSING BOARD  
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Michael C. Farrar, Chairman  
ADMINISTRATIVE JUDGE

Rockville, Maryland  
May 21, 2014<sup>2</sup>

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<sup>2</sup> Copies of this Order were sent this date to counsel for (1) Applicant Shaw AREVA MOX Services, LLC, (2) the NRC Staff, and (3) Intervenors.

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Possession and Use License)

Docket No. 70-3098-MLA

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

February 27, 2014  
(as redacted per Order of May 21, 2014)

Initial Decision  
(Ruling on Contentions 9, 10, and 11)

Memorandum and Order of the Board by its majority, Judges Trikouros and Abramson\*

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\* Judge Farrar is filing a separate statement indicating that, except in certain limited respects about which he dissents, he is in essential agreement with the substance of his colleagues' determinations (even if not with the manner of their expression), but that he believes certain matters deserve the additional discussion that he provides. That separate statement appears after the Board's decision.

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## I. Introduction and Overview

This proceeding arises out of a challenge to the application of Shaw AREVA MOX Services (“Applicant”) for a Nuclear Regulatory Commission (“NRC”) license to possess and use strategic special nuclear material (“SSNM”).<sup>1</sup> Applicant plans to use this material at a Mixed Oxide Fuel Fabrication Facility (“MOX Facility”) currently being constructed by Applicant at the U.S. Department of Energy’s (“DOE”) Savannah River Site.<sup>2</sup> We address, in this final portion of this proceeding, three contentions filed by Nuclear Watch South, Blue Ridge Environmental Defense League, and Nuclear Information and Resource Service (“Intervenors”) challenging Applicant’s material control and accounting (“MC&A”) system, which is required by 10 C.F.R. Part 74.<sup>3</sup>

DOE intends the MOX Facility to further U.S.-Russian efforts to reduce each country’s nuclear weapon stockpiles.<sup>4</sup> Mixed oxide (“MOX”) fuel, which can be used in nuclear power reactors, is manufactured out of the SSNM obtained from those weapons.<sup>5</sup> Plutonium is to be first extracted from the weapons, then converted to plutonium oxide, mixed with uranium oxide, and formed into MOX fuel.<sup>6</sup> NRC’s MC&A regulations require the tracking of SSNM items during storage and processing in order to safeguard these materials from diversion.<sup>7</sup>

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<sup>1</sup> 10 C.F.R. § 74.4 (defining SSNM to mean “uranium-235 (contained in uranium enriched to 20 percent or more in the U235 isotope), uranium-233, or plutonium”).

<sup>2</sup> See Duke Cogema Stone & Webster (Savannah River Mixed Oxide Fuel Fabrication Facility), LBP-01-35, 54 NRC 403, 410 (2001); LBP-11-9, 73 NRC 391, 394 (2011).

<sup>3</sup> Petitioner’s Motion for Admission of Contentions 9, 10, and 11 Regarding Shaw AREVA MOX Services’ Revised Fundamental Nuclear Control Plan (July 26, 2010) [hereinafter Petition] (challenging Applicant’s compliance with 10 C.F.R. §§ 74.55(b)(1), 74.57(b), and 74.57(e)).

<sup>4</sup> See Record of Decision for the Surplus Plutonium Disposition Final Environmental Impact Statement 65 Fed. Reg. 1,608, 1,609 (Jan. 11, 2000).

<sup>5</sup> Id.

<sup>6</sup> 66 Fed. Reg. 13,794, 13,795 (Mar. 7, 2001).

<sup>7</sup> 52 Fed. Reg. 10,033, 10,036 (Mar. 30, 1987) (to be codified at 10 C.F.R. pts. 70 and 74).

The MOX facility proposal has been challenged from the initial filing of its application by groups asserting that Applicant has taken an inadequate approach to MC&A in concept, design and execution. At the Construction Authorization Request (“CAR”) stage, the board handling that adjudication dismissed an MC&A contention as moot, pending submittal of Applicant’s Fundamental Nuclear Material Control Plan (“FNMCP”) that would require inclusion of a detailed MC&A program.<sup>8</sup>

The pending MC&A challenge arose in 2010, when Applicant filed its amended FNMCP.<sup>9</sup> Both NRC Staff and Applicant opposed Intervenor’s challenge to the amended FNMCP on timeliness grounds, but neither claimed failure to raise an issue cognizable under the agency’s contention admissibility rules.<sup>10</sup> The Board subsequently admitted Contentions 9, 10, and 11.<sup>11</sup>

Against that background, we conducted two evidentiary hearings, both under “Subpart L” of the agency’s procedural regulations.<sup>12</sup> The issues addressed in this portion of the proceeding revolve around use of a fully computerized and automated MC&A system to satisfy regulations which establish requirements for performance but neither prescribe nor proscribe any particular method for achieving those requirements.<sup>13</sup> Intervenor’s assert that back-up systems beyond

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<sup>8</sup> See Duke Cogema Stone & Webster (Savannah River Mixed Oxide Fuel Fabrication Facility), LBP-04-9, 59 NRC 286, 293-95 (2004); LBP-11-9, 73 NRC at 396.

<sup>9</sup> LBP-11-9, 73 NRC at 394.

<sup>10</sup> Id. at 395.

<sup>11</sup> See id. at 414.

<sup>12</sup> The Board originally consisted of Judges Farrar, Trikourous, and McDade, but Judge Abramson was appointed to replace Judge McDade prior to the second evidentiary hearing. Notice of Atomic Safety and Licensing Board Reconstitution 77 Fed. Reg. 70,193 (Nov. 16, 2012). Throughout this decision, unless otherwise indicated, we refer to the board as “the Board” regardless of its membership.

<sup>13</sup> See Tr. at 1242-43 (Pham).

what Applicant has included in its FNMCP, including direct physical involvement, are necessary to comply with the regulations.<sup>14</sup>

After the initial hearing, the Board found the record inadequately developed regarding certain aspects of contentions 9 and 11. The parties were given the opportunity to provide additional information on these two contentions,<sup>15</sup> which was considered at a supplemental evidentiary hearing.

Before the second hearing, Applicant presented additional approaches and analysis to show that its automated MC&A systems were in full compliance with agency regulations.<sup>16</sup> In its filing, the Staff substantially agreed with Applicant's position.<sup>17</sup> Intervenors did not submit additional witness testimony to address that testimony of Applicant and the NRC Staff.

We now find that the challenged aspects of Applicant's MC&A program components (including those related to item monitoring, alarm resolution, and alleged theft assessment) fulfill the requirements of NRC's regulations. First, we conclude that, contrary to the allegation in Contention 9, Applicant has demonstrated that its program of automated equipment, computer systems (and their verification), and the use of secured and tamper-safed item storage area boundaries, satisfactorily demonstrates the ability to verify "the presence and integrity" of all

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<sup>14</sup> See Intervenors' Initial Statement of Position on Contentions 9, 10, and 11 (Oct. 19, 2011) at 4-6 [hereinafter Intervenor Initial Statement of Position].

<sup>15</sup> See Licensing Board Memorandum and Order (Requesting Further Information from the Applicant) (June 29, 2012) (unpublished) [hereinafter Order Requesting Further Information].

<sup>16</sup> See Shaw AREVA MOX Services, LLC Supplemental Statement of Position on Contentions 9 and 11 and Response to Surreply (Oct. 15, 2012) [hereinafter Applicant Supplemental Statement of Position]; Shaw AREVA MOX Services, LLC Clarification of Supplemental Statement of Position on Contentions 9 and 11 and Response to Surreply (Dec. 5, 2012) [hereinafter Applicant Clarification of Supplemental Statement of Position]. Applicant simultaneously argued that no additional information was required and that the Board had no authority to call for it. Id.

<sup>17</sup> See NRC Staff's Response to Applicant's Supplemental Statement of Position on Contentions 9 and 11 and Response to Surreply (Jan. 16, 2013) [hereinafter Staff Supplemental Statement of Position].

SSNM items in storage as specified by 10 C.F.R. § 74.55(b)(1). Second, we conclude that, contrary to the allegation in Contention 10, Applicant's preliminary program satisfactorily demonstrates the ability to "resolve the nature and cause of any MC&A alarm within approved time periods" in each of the four storage areas at issue as required by 10 C.F.R. § 74.57(b). Finally, we conclude that, contrary to the allegation in Contention 11, Applicant's preliminary program satisfactorily demonstrates the ability "to rapidly assess the validity of alleged thefts" as required by 10 C.F.R. § 74.57(e). The details of our decision regarding each of these three contentions are provided in Section V of this decision.

We note that significant portions of the assurances respecting integrity and presence, as well as the detection of losses of SSNM, rely upon physical security and cyber-security systems whose adequacy is not currently before us. We rely upon the Commission, NRC Staff, and DOE, under whose auspices this facility is being constructed and will be operated, to effectively assure the adequacy of these security systems.

This decision first summarizes the procedural background of this proceeding in Section II. Section III discusses the applicable legal standards. Section IV identifies the parties' witnesses and their qualification. Section V sets forth the parties' positions and the Board's determinations on Contentions 9, 10, and 11. Section VI summarizes the Board's conclusions and Section VII contains our Order finding in favor of Applicant. A list of the many technical terms and acronyms used in this decision is provided in Appendix A.

## **II. Procedural Background**

Applicant pursued licensing of the MOX Facility in two steps. First, the CAR was submitted on February 28, 2001,<sup>18</sup> resulting in issuance of Construction Authorization on March 30, 2005.<sup>19</sup> On September 27, 2006, Applicant initiated the second stage of the process by

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<sup>18</sup> See 66 Fed. Reg. 19,994 (Apr. 18, 2001).

<sup>19</sup> Mixed Oxide Fuel Fabrication Facility Construction Authorization (Mar. 30, 2005), available at ADAMS Accession No. ML 050660392.

filing its License Application for possession and use of SSNM, byproduct, and source material at the MOX Facility,<sup>20</sup> along with its initial FNMCP, Physical Protection Plan (“PPP”), and other supporting documents required by NRC regulations.<sup>21</sup> The availability of the License Application and supporting documents was publicly noticed on March 15, 2007.<sup>22</sup> Intervenors filed a petition to intervene and request for hearing on May 14, 2007,<sup>23</sup> which the Board granted.<sup>24</sup>

On June 27, 2008, the Board admitted Intervenors’ Contention 4, dealing with Applicant’s management of radioactive waste produced at the MOX facility.<sup>25</sup> On December 17, 2009, Applicant filed an exemption request regarding certain aspects of its FNMCP.<sup>26</sup> On

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<sup>20</sup> See Mixed Oxide Fuel Fabrication Facility License Application (Sept. 27, 2008) available at ADAMS Accession No. ML 062750195. Applicant submitted a revised license application with MC&A and PPP information on November 17, 2006. See Shaw AREVA MOX Services Mixed Oxide Fuel Fabrication Facility License Application at 13-1 (Nov. 17, 2006), available at ADAMS Accession No. ML 070160311.

<sup>21</sup> Letter from David Stinson, President and COO of Duke Cogema Stone & Webster, to NRC, Submittal of License Application (Sept. 27, 2006), available at ADAMS Accession No. ML 062750194. Relevant portions of the original FNMCP and PPP were provided as exhibits. See MOX Fuel Fabrication Facility MC&A FNMCP, Chapter 2 and Annex D § D.G.3.4.11 (Apr. 2010) (Exh. APP000019) [hereinafter FNMCP Chapter 2]; MOX Fuel Fabrication Facility MC&A FNMCP, Chapter 3 (Apr. 2010) (Exh. APP000020) [hereinafter FNMCP Chapter 3]; MOX Fuel Fabrication Facility MC&A FNMCP, Chapter 4.1 (Apr. 2010) (Exh. APP000032); MOX Fuel Fabrication Facility MC&A FNMCP, Chapter G.3.4.12 (Apr. 2010) (Exh. APP000034) [hereinafter FNMCP Chapter G.3.4.12]; MOX Services MOX Facility, Physical Protection Plan (May 2011) (Exh. APP000022).

<sup>22</sup> See Notice of License Application for Possession and Use of Byproduct, Source, and Special Nuclear Materials for the Mixed Oxide Fuel Fabrication Facility, Aiken, SC, and Opportunity To Request a Hearing, 72 Fed. Reg. 12,204 (Mar. 15, 2007).

<sup>23</sup> See Petition for Intervention and Request for Hearing (May 14, 2007), available at ADAMS Accession No. ML 071410426.

<sup>24</sup> LBP-07-14, 66 NRC 169, 175 (2007).

<sup>25</sup> See LBP-08-11, 67 NRC 460, 464, 468 (2008).

<sup>26</sup> See Letter from David Stinson, President and COO of Shaw Areva MOX Services, to NRC, Request for Exemption from Aspects of Process and Item Monitoring (Dec. 17, 2009), available at ADAMS Accession No. ML 093561015.

March 22, 2010, intervenors submitted Contention 8, challenging Applicant's exemption request.<sup>27</sup> Applicant withdrew the exemption request on May 11, 2010, and provided the NRC Staff with a revised FNMCP.<sup>28</sup> On May 17, 2010, Applicant provided intervenors with notice and copies of that withdrawal and the revised FNMCP.<sup>29</sup> On May 24, 2010, intervenors withdrew Contention 8 as moot.<sup>30</sup> On July 26, 2010, intervenors filed a motion to admit Contentions 9, 10, and 11 based on the revised FNMCP,<sup>31</sup> which the Board granted on April 1, 2011.<sup>32</sup> On February 9, 2012, the Board dismissed Contention 4,<sup>33</sup> following intervenors' decision not to submit supporting evidence.<sup>34</sup> This left Contentions 9, 10, and 11 pending before the Board.

The Board held a site visit at the MOX Facility on February 22, 2012, which all parties attended.<sup>35</sup> Several weeks later, the Board conducted its evidentiary hearing on Contentions 9, 10, and 11 in the Hearing Room at the agency's headquarters in Rockville, Maryland.<sup>36</sup>

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<sup>27</sup> See Petitioners' Motion for Admission of Contention 8 Regarding Shaw MOX AREVA Services' Request for Exemption from Material Control and Accounting Requirements (Mar. 22, 2010) at 2.

<sup>28</sup> Letter from David Stinson, President and COO of Shaw Areva MOX Services, to NRC, Withdrawal of the Request for Exemption from Aspects of Process and Item Monitoring (May 11, 2010), available at ADAMS Accession No. ML 101340402.

<sup>29</sup> Certificate of Service Transmitting Withdrawal of the Request for Exemption from Aspects of Process and Monitoring (May 17, 2010).

<sup>30</sup> See Intervenors' Response to Shaw AREVA MOX Services' Withdrawal of Exemption Application and Withdrawal of Contention 8 (May 24, 2010), available at ADAMS Accession No. ML 101540423.

<sup>31</sup> Petition at 1.

<sup>32</sup> See LBP-11-9, 73 NRC at 395.

<sup>33</sup> See LBP-12-2, 75 NRC 159, 161 (2012).

<sup>34</sup> Intervenor Initial Statement of Position at 2 n.1.

<sup>35</sup> See Licensing Board Order (Establishing Dates for Site Visit and Evidentiary Hearing) (Dec. 21, 2011) at 2 (unpublished).

<sup>36</sup> See id.

Because of the potential involvement of security-related information, the Board chose not to open the hearing to the public.<sup>37</sup> None of the parties requested an opportunity to conduct cross-examination.<sup>38</sup>

The Parties submitted proposed corrections to the hearing transcript on March 29 and 30, 2012.<sup>39</sup> On May 3, 2012, the Board issued an Order tentatively accepting the parties' proposed corrections, but reserved the right to reject some or all of the corrections at a later date, if necessary.<sup>40</sup>

On June 29, 2012, the Board issued an Order requesting that Applicant provide additional information on Contentions 9 and 11 relating to system data verification and reliability.<sup>41</sup> On October 15, 2012, Applicant responded to the Board's request for additional information, supported by written testimony and additional exhibits.<sup>42</sup>

On November 16, 2012 the Board was reconstituted to its present membership, substituting Judge Abramson for Judge McDade.<sup>43</sup>

On December 5, 2012, Applicant submitted a Clarification of Supplemental Statement of Position on Contentions 9 and 11 and Response to Surreply, along with Additional Direct

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<sup>37</sup> See id. at 2 n.6.

<sup>38</sup> Tr. at 1568-69 (Curran, Klukan, Jones).

<sup>39</sup> See Intervenors' Proposed Corrections to Hearing Transcript (Mar. 29, 2012); Shaw AREVA MOX Services, LLC's Proposed Corrections to the Hearing Transcript (Mar. 30, 2012); NRC Staff's Proposed Transcript Corrections (Mar. 30, 2012).

<sup>40</sup> See Licensing Board Order (Regarding Transcript Corrections) (May 3, 2012) at 2 (unpublished).

<sup>41</sup> See Order Requesting Further Information at 10, 14.

<sup>42</sup> See Applicant Supplemental Statement of Position; MOX Fuel Fabrication Facility MC&A FNMCP, Revisions to Chapter 2 (Oct. 15, 2012) (Exh. APP000039) [hereinafter FNMCP Revised 2]; MOX Fuel Fabrication Facility MC&A FNMCP, Revisions to Chapter 3.3 (Oct. 15, 2012) (Exh. APP000040) [hereinafter FNMCP Revised 3.3].

<sup>43</sup> 77 Fed. Reg. at 70,193.

Testimony Related to an NRC Staff Request for Additional Information, and other supporting exhibits,<sup>44</sup> reflecting their responses to the NRC Staff Requests for Additional Information (“RAIs”) on the FNMCP revisions. On January 16, 2013, Staff filed its responsive statement of position, witness testimony, and exhibits, supporting Applicant’s position.<sup>45</sup>

On April 19, 2013, Intervenors submitted their response.<sup>46</sup> On May 3, 2013, Applicant submitted its reply to Intervenors’ filing.<sup>47</sup>

On May 21, 2013, the Board conducted a supplemental hearing, also closed to the public, in the Hearing Room in Rockville, Maryland.<sup>48</sup>

As discussed below, the contentions at issue in this proceeding challenge the sufficiency of Applicant’s newly proposed automated MC&A system, and allege that Applicant has not

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<sup>44</sup> See Applicant Clarification of Supplemental Statement of Position; Shaw AREVA MOX Services, LLC’s Revised Pre-Filed Direct Testimony in Response to Board’s June 29, 2012 Memorandum and Order (Dec. 5, 2012) (Exh. APPR10037) [hereinafter Applicant Supplemental Direct Testimony]; Shaw AREVA MOX Services, LLC’s Additional Direct Testimony Related to NRC Staff Requests for Additional Information (Dec. 5, 2012) (Exh. APP000041) [hereinafter Applicant Additional Supplemental Direct Testimony]; SSNM Item Identity and Location Data Verification Procedure (Dec. 5, 2012) (Exh. APPR10038) [hereinafter SSNM Procedure]; Revisions to Shaw AREVA MOX Services, LLC’s Pre-Filed Direct Testimony in Response to Board’s June 29, 2012 Memorandum and Order (Dec. 5, 2012) (Exh. APP000042); Responses to NRC Requests for Additional Information and Revised Fundamental Nuclear Material Control Plan Pages (Dec. 5, 2012) (Exh. APP000043).

<sup>45</sup> See Staff Supplemental Statement of Position; NRC Staff’s Prefiled Supplemental Testimony of Tom Pham Concerning Contentions 9 and 11 (Jan. 16, 2013) (Exh. NRC000012) [hereinafter Staff Supplemental Testimony]; NRC Staff Requests for Additional Information on the MOX Services’ Fundamental Nuclear Material Control Plan revisions dated October 15, 2012 (Jan. 16, 2012) (Exh. NRC000013); Supplemental to Final Safety Evaluation Report for the License Application to Possess and Use Radioactive Material at the Mixed Oxide Fuel Fabrication Facility in Aiken, SC (Jan. 16, 2012) (Exh. NRC000014) [hereinafter FSER Supplement].

<sup>46</sup> See Intervenors’ Response to Shaw AREVA MOX Services’ Clarified Supplemental Statement of Position on Contentions 9 and 11, Reply to NRC Staff’s Response to MOX Services, and Reply to MOX Services’ Response to Surreply Regarding Contentions 10 and 11 (Apr. 19, 2013) [hereinafter Intervenor Consolidated Response].

<sup>47</sup> See Shaw AREVA MOX Services, LLC’s Reply to Intervenors’ April 19, 2013 Response to MOX Services and NRC Staff Submittals (May 3, 2013) [hereinafter Applicant Supplemental Reply Statement of Position].

<sup>48</sup> Tr. at 1648-49 (Farrar).

provided the assurances necessary to show the MOX facility can achieve the performance objectives established by the regulations. Contention 9 challenges Applicant's compliance with 10 C.F.R. § 74.55(b)(1),<sup>49</sup> which states that "[t]he licensee shall verify on a statistical sampling basis, the presence and integrity of SSNM items" with "at least 99 percent power of detecting item losses that total five formula kilograms or more, plant-wide." Contention 10 challenges Applicant's compliance with 10 C.F.R. § 74.57(b),<sup>50</sup> which states that "[l]icensees shall resolve the nature and cause of any MC&A alarm within approved time periods." Contention 11 challenges Applicant's compliance with 10 C.F.R. § 74.57(e),<sup>51</sup> which states that "[t]he licensee shall provide an ability to rapidly assess the validity of alleged thefts."

### **III. Legal Standards**

#### **A. Regulatory Requirements**

The NRC may issue a license to possess and use five or more formula kilograms<sup>52</sup> of SSNM only if an applicant can "establish, implement, and maintain a Commission-approved material control and accounting (MC&A) system that will achieve [general performance objectives]."<sup>53</sup> To achieve these SSNM loss-related performance objectives, "the MC&A system must provide the capabilities described in §§ [74.55 and 74.57]," among other sections.<sup>54</sup>

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<sup>49</sup> See Licensing Board Order (Appendix – New Contentions 9, 10, and 11) (Apr. 1, 2011) at 1 (unpublished) [hereinafter Contention Text Order].

<sup>50</sup> See id.

<sup>51</sup> See id.

<sup>52</sup> 10 C.F.R. § 74.4 (defining formula kilogram to mean "SSNM in any combination in a quantity of 1000 grams computed by the formula, grams=(grams contained U-235) + 2.5(grams U-233 + grams plutonium).")

<sup>53</sup> 10 C.F.R. § 74.51(a).

<sup>54</sup> 10 C.F.R. § 74.51(b).

NRC's MC&A regulations are intended to "provide flexibility for licensees to select the most cost-effective ways of achieving performance objectives."<sup>55</sup> This flexible approach requires an applicant's proposed controls to be "adequate" to show compliance with the regulations.<sup>56</sup> An adequacy finding requires the Board to make a case-by-case determination, guided by the Atomic Energy Act's mandate that no license to possess special nuclear material may be issued if issuance "would be inimical to the common defense and security or would constitute an unreasonable risk to the health and safety of the public."<sup>57</sup> Here, the Board adopts the reasonable assurance standard to determine the adequacy of Applicant's MC&A system, finding the guidance contained in NUREG-1718 to be consistent with our statutory mandate.<sup>58</sup>

The reasonable assurance standard is used in other license application contexts, though NRC regulations do not specify objective criteria needed to satisfy the requirement. The Commission has stated, in the context of a license renewal application, that "[r]easonable assurance' is . . . based on sound technical judgment of the particulars of a case and on

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<sup>55</sup> 52 Fed. Reg. at 10,034.

<sup>56</sup> 10 C.F.R. § 70.23(a)(6); see also 10 C.F.R. § 70.22(b) (stating that "applicant's program for control and accounting of such special nuclear material [must] show how compliance with the requirements of § . . . 74.51 . . . will be accomplished").

<sup>57</sup> 42 U.S.C. § 2077(c)(2); cf. Union of Concerned Scientists v. NRC, 880 F.2d 552, 558 (D.C. Cir. 1989) (stating that "[t]he determination of what constitutes 'adequate protection' under the [AEA], absent specific guidance from Congress, is just such a situation where the Commission should be permitted to have discretion to make case-by-case judgments").

<sup>58</sup> See Division of Fuel Cycle Safety and Safeguards, Office of Nuclear Material Safety and Safeguards, Standard Review Plan for the Review of an Application for a Mixed Oxide (MOX) Fuel Fabrication Facility, NUREG-1718, at xxi-xxii (Aug. 2000) (Exh. APP000029) [hereinafter NUREG-1718] (stating that "[t]he staff's responsibility in the review of a new license application . . . for a MOX fuel fabrication facility is to determine that there is reasonable assurance that . . . the facility can be operated in a manner that will not be inimical to the common defense and security and will provide reasonable protection of the health and safety of workers, the public, and the environment including that the facility was constructed consistent with the application").

compliance with our regulations.”<sup>59</sup> To meet this reasonable assurance standard, an applicant “must make a showing that meets the ‘preponderance of the evidence’ threshold of compliance with the applicable regulations.”<sup>60</sup> Therefore, to determine whether Applicant has complied with the regulations at issue, the Board will look to whether Applicant has provided reasonable assurance that the use of its automated MC&A system satisfies the relevant regulatory requirements.

Intervenors consistently have asserted that the regulations at issue in these three contentions must be interpreted to require a certain specific method (involving physical action as opposed to automation only) to achieve the performance requirements of those regulations. Staff has repeatedly referred to these regulations as “performance-based.” But “performance-based” regulation is a term of art in the NRC regulatory system, being fully explained in NUREG BR-0303, which was released in 2002 and defines a methodology for the development of regulations for risk-informed regulation.<sup>61</sup> Not only was NUREG BR-0303 released well after release of the present versions of the regulations at issue here, but the regulations at issue here do not involve any risk-informed related matters -- the defined term of art is inapplicable here. Nonetheless, 10 C.F.R. § 74.55(b) and (e) indeed establish requirements for the performance of Applicant’s system and neither prescribe nor proscribe any methodology for achievement of those performance requirements. In that sense, Staff’s assertions are, if taken in their common-sense meaning, correct. As to choice of methodology, these regulations are technology-neutral. This is the most effective way to draft regulations for application to a science and technology based area such as nuclear power and its related disciplines where one can reasonably expect

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<sup>59</sup> Amergen Energy Co., LLC (Oyster Creek Nuclear Generating Station), CLI-09-7, 69 NRC 235, 263 (2009).

<sup>60</sup> Id.

<sup>61</sup> See N.P. Kadambi, Office of Nuclear Regulatory Research, Guidance for Performance-Based Regulation, NUREG BR-0303 (Dec. 2010).

continuing advances in both science and technology after implementation of the regulations. By so doing, these regulations remain applicable as technology in the arena develops. They are not intended to be, and are not, under our common law system, interpreted to require, as intervenors would have it, any particular methodology to achieve the performance requirements they establish.

**B. Burden of Proof**

As suggested above, Applicant bears the ultimate burden of proof in this proceeding.<sup>62</sup> With respect to each contention, however, intervenors have the initial “burden of going forward” and must provide sufficient evidence to support the claims made.<sup>63</sup> If intervenors make that showing, Applicant has the burden of demonstrating by a preponderance of the evidence that it has met the relevant NRC regulations and that the Board should therefore reject each contention on the merits.<sup>64</sup>

**C. Guidance Documents**

Although compliance with NRC regulations is legally mandated, NRC guidance documents, such as the Standard Review Plan in NUREG-1718, are intended merely to “assist the staff (and applicant[s]) in understanding the underlying objective of the regulatory requirements.”<sup>65</sup> Guidance documents describe particular means of satisfying regulatory

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<sup>62</sup> See 10 C.F.R. § 2.325; see also Duke Power Co. (Catawba Nuclear Station, Units 1 & 2), CLI-83-19, 17 NRC 1041, 1048 (1983) (stating that “[i]t is well established that the Applicant carries the burden of proof on safety issues”) (citing Consumers Power Co. (Midland Plant, Units 1 & 2), ALAB-283, 2 NRC 11, 17 (1975)).

<sup>63</sup> See Consumers Power Company (Midland Plant, Units 1 & 2), ALAB-123, 6 AEC 331, 345 (1973).

<sup>64</sup> See Midland, ALAB-123, 6 AEC at 345.

<sup>65</sup> NUREG-1718, at xxii; see also Division of Fuel Cycle Safety and Safeguards, Office of Nuclear Material Safety and Safeguards, Standard Format and Content Acceptance Criteria for the Material Control and Accounting (MC&A) Reform Amendment, NUREG-1280, at 1 (Rev. 1 Apr. 1995) [hereinafter NUREG-1280] (stating that NUREG-1280 “describes the standard format and content suggested by the NRC for use in preparing [FNMCPs]”).

requirements in ways acceptable to the NRC Staff, but they do not bind applicants who remain free to choose different means.<sup>66</sup> Guidance documents also do not bind the Board, so applicant compliance with guidance does not ensure the grant of a license.<sup>67</sup> As such, if the Board concludes that the guidance documents are fully consistent with establishing the requisite “reasonable assurance” of compliance with applicable regulatory requirements, the Board may consider compliance with such guidance as support for a conclusion that Applicant satisfies the applicable regulatory requirements.

#### **IV. The Parties’ Witnesses**

##### **A. Applicant’s Witnesses**

Applicant presented four witnesses on Contentions 9, 10, and 11: Ms. Sue King, Mr. Gary Bell, Mr. Gary Clark, and Ms. Martha Williams.<sup>68</sup> All four witnesses provided written and oral testimony at both evidentiary hearings.<sup>69</sup>

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<sup>66</sup> See Int’l Uranium (USA) Corp., CLI-00-1, 51 NRC 9, 19 (2000); see, e.g., NUREG-1280, at 1 (noting that “conformance with the standard process is not required by the NRC”).

<sup>67</sup> See Int’l Uranium (USA) Corp., 51 NRC at 19 (stating that “NRC NUREGs[,] Regulatory Guides, [and] NRC Guidance documents are routine agency policy pronouncements that do not carry the binding effect of regulations”).

<sup>68</sup> See Shaw AREVA MOX Services, LLC’s Initial Statement of Position on Contentions 4, 9, 10 and 11 (Sept. 29, 2011) at 20-21 [hereinafter Applicant Initial Statement of Position]; Curriculum Vitae of Sue M. King (Sept. 29, 2011) (Exh. APP000015); Curriculum Vitae of Gary A. Bell (Sept. 29, 2011) (Exh. APP000016); Curriculum Vitae of Gary Clark (Sept. 29, 2011) (Exh. APP000017); Curriculum Vitae of Martha C. Williams (Sept. 29, 2011) (Exh. APP000018).

<sup>69</sup> See Shaw AREVA MOX Services, LLC’s Revised Prefiled Direct Testimony on Contentions 9-11 (Mar. 1, 2012) (Exh. APPR00014) [hereinafter Applicant Direct Testimony]; Shaw AREVA MOX Services, LLC’S Prefiled Reply Testimony on Contentions 9-11 (Jan. 24, 2012) (Exh. APP000031) [hereinafter Applicant Reply Testimony]; Applicant Supplemental Direct Testimony; Applicant Additional Supplemental Direct Testimony; Shaw AREVA MOX Services, LLC’S Pre-Filed Reply Testimony in Response to Board’s June 29, 2012 Memorandum and Order (May 3, 2013) (Exh. APP000044) [hereinafter Applicant Supplemental Reply Testimony]; Tr. 1080-81 (King, Clark, Bell, Williams, Farrar), 1650 (King, Clark, Bell, Williams, Farrar).

**B. NRC Staff's Witnesses**

At the first hearing, Staff presented one witness, Mr. Tom Pham, on Contentions 9, 10, and 11.<sup>70</sup> At the supplemental hearing, Staff again presented Mr. Pham, along with Mr. Thomas Grice and Mr. David Tiktinsky,<sup>71</sup> who appeared at the suggestion of the Board.<sup>72</sup> Mr. Pham provided written and oral testimony at both evidentiary hearings.<sup>73</sup> Mr. Grice and Mr. Tiktinsky did not provide written testimony but were questioned by the Board at the supplemental hearing.<sup>74</sup>

**C. Intervenors' Witness**

Intervenors presented one witness, Dr. Edwin Lyman, on Contentions 9, 10, and 11.<sup>75</sup> Dr. Lyman provided written and oral testimony at the initial hearing.<sup>76</sup> Dr. Lyman did not provide written testimony for the supplemental hearing, but did respond to oral questioning.<sup>77</sup>

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<sup>70</sup> See NRC Staff's Initial Statement of Position on Contentions 4, 9, 10, and 11 (Oct. 19, 2011) at 10, 13, 15 [hereinafter Staff Initial Statement of Position]; Curriculum Vitae of Thomas N. Pham (Oct. 19, 2011) (Exh. NRC000007).

<sup>71</sup> Curriculum Vitae of Thomas A. Grice (May 15, 2013) (Exh. NRC000015); Curriculum Vitae of David H. Tiktinsky (May 15, 2013) (Exh. NRC000016).

<sup>72</sup> Tr. at 1621-22 (Farrar) (suggesting that Staff make additional witnesses available "to make sure that [Staff has] a witness who can explain effectively to [the Board] the reasoning behind staff decisions and if they comply with regulations, why they do and what the thought process was . . . that went into it").

<sup>73</sup> See NRC Staff's Prefiled Direct Testimony of Tom Pham Concerning Contentions 9-11 (Oct. 19, 2011) (Exh. NRC000006) [hereinafter Staff Direct Testimony]; NRC Staff's Prefiled Response Testimony of Tom Pham Concerning Contentions 9, 10, and 11 (Dec. 20, 2011) (Exh. NRC000008) [hereinafter Staff Reply Testimony]; Staff Supplemental Testimony; Tr. at 1081 (Pham, Farrar), 1651 (Pham).

<sup>74</sup> See Tr. at 1651-62 (Farrar).

<sup>75</sup> See Intervenor Initial Statement of Position at 2; Curriculum Vitae of Edwin S Lyman (Oct. 20, 2011) (Exh. INT000002).

<sup>76</sup> See Direct Testimony of Dr. Edwin S. Lyman in Support of Intervenors' Contentions 9, 10, and 11 (Oct. 19, 2011) (Exh. INT000001) [hereinafter Intervenor Direct Testimony]; Tr. at 1081 (Farrar).

**D. Witness Qualifications**

No party challenged the qualifications of any witness or their ability to testify as to the issues before the Board.<sup>78</sup> The Board has considered each witness' testimony to the extent appropriate.

**V. Contentions**

**A. Contention 9**

**1. Text of Contention 9**

As admitted by the Board, Contention 9 asserts:

[Applicant's] Revised FNMCP does not satisfy the MC&A requirements in 10 C.F.R. § 74.55(b)(1) because it does not demonstrate that [Applicant's] item monitoring program has the capability to verify, on a statistical sampling basis, the presence and integrity of SSNM items. In particular, [Applicant] fails to show that it is capable of detecting item losses that total 5 formula kilograms of plutonium or more plant-wide within the time frames specified by the regulation 30 calendar days for Category 1[A] items and 60 days for Category 1B items contained in a vault or in a permanently control access area isolated from the rest of the material access area (MAA).<sup>79</sup>

**2. The Relevant Regulation**

The regulation at issue in Contention 9 is 10 C.F.R. § 74.55(b)(1), which states:

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 losses that total five formula kilograms or more, plant-wide, within:

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

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<sup>77</sup> Intervenor's counsel stated that "in our view, the Applicant has not given us anything new that would show that it satisfies the regulations. We do not need to submit evidence." Tr. at 1671 (Curran).

<sup>78</sup> See Tr. at 1650-52, 1080-81 (Farrar).

<sup>79</sup> Contention Text Order at 1.

The regulation applies only to those licensees that are authorized to possess five or more formula kilograms of SSNM.<sup>80</sup> Licensees must satisfy § 74.55(b)'s detection requirements for tamper-safed<sup>81</sup> or sealed<sup>82</sup> SSNM items<sup>83</sup> in order to achieve the performance objectives set out in § 74.51(a).<sup>84</sup> The regulation calls for the use of statistical sampling to achieve verification of item presence and integrity but does not prescribe a particular method of sampling, stating only that statistical sampling must result in "at least 99 percent power of detecting losses that total five formula kilograms or more."<sup>85</sup> An applicant may satisfy the regulation if it can provide reasonable assurance

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<sup>80</sup> See 10 C.F.R. §§ 74.51(a) and 74.55(a). The regulation defines Category IA material to mean "SSNM directly usable in the manufacture of a nuclear explosive device;" and Category IB material to mean "all SSNM material other than Category IA." 10 C.F.R. § 74.4. This proceeding concerns, among other things, Category IB items that are "contained in a vault or permanently controlled access area isolated from the rest of the [MAA]." Contention Text Order at 1. The regulation defines "vault" to mean "a windowless enclosure . . . designed and constructed to delay penetration from forced entry," and "controlled access area" to include a "permanently established area which is clearly demarcated, access to which is controlled, and which affords isolation of the material or persons within it." 10 C.F.R. § 74.4.

<sup>81</sup> 10 C.F.R. § 74.4 (defining "tamper-safing" to mean "the use of devices on containers or vaults in a manner and at a time that ensures a clear indication of any violation of the integrity of previously made measurements of special nuclear material within the container or vault").

<sup>82</sup> Id. (defining "sealed source" to mean "any special nuclear material that is physically encased in a capsule, rod, element, etc. that prevents the leakage or escape of the special nuclear material and that prevents removal of the special nuclear material without penetrations of the casing").

<sup>83</sup> Id. (defining "item" to mean "any discrete quantity or container of special nuclear material or source material, not undergoing processing, having a unique identity and also having an assigned element and isotope quantity").

<sup>84</sup> The capability to verify presence is most clearly aimed at "[o]ngoing confirmation of the presence of SSNM in assigned locations," while the capability to verify integrity is most clearly aimed at the "prompt investigation of anomalies potentially indicative of SSNM losses." 10 C.F.R. § 74.51(a)(1), (4).

<sup>85</sup> 10 C.F.R. § 74.4 (defining "power of detection" to mean "the probability that the critical value of a statistical test will be exceeded when there is an actual loss of a specific SSNM quantity"). In other words, the 99% power of detection requirement means that there must be a 99% probability that a missing item will be included within the sample chosen for inspection and would thus be detected.

that the methods described in its FNMCP will meet this 99% power of detection within the stated time periods.

The regulation does not specify the method or approach that has to be taken to provide the required presence and integrity verifications; it only specifies the goal to be achieved.

Where a regulation neither prescribes nor proscribes any particular methodology to achieve the required performance, it will not be interpreted to require or prohibit any such method.

### **3. Issues Raised by Contention 9**

Applicant proposes to verify the presence of all SSNM items every day by comparing the data contained in the “Perpetual Inventory Report” generated by the Manufacturing and Management Information System (“MMIS”) with item locations and identities determined by the data stored in remote computer equipment -- Programmable Logic Controller (“PLC”) Mapping.<sup>86</sup> Movement of SSNM items is automated through the Process and Utility Control System (“PUCS”). The MMIS part of the PUCS monitors and supervises the automated production activities and records the information. A series of PLCs control the movement and placement of SSNM items and record or map this information. A daily comparison of the information stored in each of these computer systems forms the basis for item presence verification.

With regard to item integrity verification, Applicant proposes to seal and design SSNM item storage locations to be tamper-safed or equivalent to tamper-safing such that confirmation that the physical boundary of these locations has not been breached ensures the “integrity” of these items in accordance with 10 C.F.R. § 74.55.<sup>87</sup>

Intervenors contend that NRC regulations require that presence and integrity must both involve a physical element and that the methodology of Applicant, which relies entirely upon

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<sup>86</sup> See Applicant Direct Testimony at 35-42.

<sup>87</sup> Id. at 52-53.

automated systems and controlled security boundaries, fails to satisfy those regulatory requirements.<sup>88</sup> Thus, the issue raised by Intervenors in Contention 9 is whether Applicant's proposed use of the data in the MMIS and PLCs, in conjunction with the storage location controlled security boundaries, meets the requirements of 10 C.F.R. § 74.55(b)(1). Intervenors are saying that Applicant "needs to show that it has some system for verifying that the computer program is correct."<sup>89</sup> They are questioning whether, as claimed by Applicant, "there is absolute equivalence between the PLC data and the actual physical presence and integrity of SSNM items."<sup>90</sup> In this regard, they are asserting that the accuracy of the data in the computer systems has to be verified, but they are "not insisting on any particular kind of verification."<sup>91</sup>

Intervenors' witness asserts that the requirement of 10 C.F.R. § 74.55(b)(1) for material presence to be demonstrated by statistical sampling that meets a 99 percent power of detection must be read to include some quantitative requirement for accuracy.<sup>92</sup> Implicit in this assertion is the argument that accuracy is an integral part of the power of detection requirement.

Intervenors also point out that a procedure for data verification was scheduled to be developed "some time in the future."<sup>93</sup> They argue that in this particular application, delayed

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<sup>88</sup> See generally Intervenor Initial Statement of Position at 5 (arguing that Applicant's "proposed alternative measures are completely inadequate . . . to demonstrate that it complies with NRC's MC&A requirements"). See also infra Parts V.A.4 and V.A.5.

<sup>89</sup> Tr. at 1106 (Curran).

<sup>90</sup> Id.

<sup>91</sup> Tr. at 1104 (Curran).

<sup>92</sup> Intervenor Direct Testimony at A.5(1) (reading § 74.55's requirements to be "fundamentally quantitative in nature, in that they require licensees to develop a sampling plan to that is capable of detecting the loss of items totaling or exceeding a specified quantity (5 formula kilograms of SSNM), with a specified statistical power of detection (99 percent), within a certain quantified time period").

<sup>93</sup> Tr. at 1107 (Curran).

development of this procedure should not be permitted but should be developed prior to the issuance of the license.<sup>94</sup>

In this respect, the Board is mindful of the fact that all systems for presence and for integrity “verification” have imbedded in them an element of accuracy. For example, when human direct measurement (a “physical” element) is used, there is an obvious potential for inaccuracies to be introduced through human error, such as inaccurate recording (by hand-written record) of item identifiers and inaccurate observation of seal condition. These human-error based inaccuracies are intended to be reduced by NRC regulatory guidance suggesting the use, for example, of “tamper-safe” seals, and implementation of machine-readable identifiers such as bar codes<sup>95</sup> And, although human error in verification of presence and integrity is expected to be reduced through the use of automation, the automation itself has its own characteristics which could introduce inaccuracies. These characteristics were examined by the Board and are discussed below.

With regard to the statistical sampling requirement in the regulation, Intervenors take the position that “when you do statistical sampling for item monitoring purposes that you actually locate, that you take a random sample of items, and you actually physically inspect them for identity and integrity purposes”<sup>96</sup> and that the use of the MMIS/PLC computer systems does not meet this requirement.

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<sup>94</sup> Tr. at 1107-09 (Curran).

<sup>95</sup> See Division of Fuel Cycle Safety and Safeguards, Office of Nuclear Material Safety and Safeguards, Standard Format and Content Acceptance Criteria for the Material Control and Accounting (MC&A) Reform Amendment, NUREG-1280, at 95 (Rev. 1 Apr. 1995) (Exh. APP000033) [hereinafter NUREG-1280 Chapter 4.9] (recommending that “MC&A data [be] 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”).

<sup>96</sup> Tr. at 1231 (Lyman).

In this portion of the proceeding, Intervenors have raised a generalized contention (Applicant's plan does not comply with the regulation) by making three more specific, but still generalized, contentions and raising a large number of specific challenges in their initial pleadings and testimony. Permeating most of these specific challenges is the fundamental argument challenging Applicant's use of automated methods to achieve its compliance with MC&A requirements of our regulations. In raising these challenges, the matters which Intervenors challenge do not relate to physics, nor do they relate to nuclear engineering or science. Instead, they relate principally to interpretation of our regulations. As we make clear, the particular regulations at issue do not specify the methodology for achieving the required performance specified by the regulations, and Intervenors' principal complaint is that they believe the "old" system for tracking and verifying location and identity of SSNM in a facility -- by direct human observation and measurement (or by physical action not controlled by or implemented solely through automation) -- is required and some element of that process must be included. To succeed in this challenge, Intervenors face the task of making a case for an interpretation of the regulations which requires analysis of the law.

That said, there are basic principles which fully enabled the Board to decide that there is no support for the assertion that any particular methodology is prescribed or prohibited. The portion of the hearing and this Order devoted to this particular aspect is lengthy -- largely because we have attempted to address each of the myriad more specific challenges which we see as falling under the umbrella of this particular assertion.

In addition to this broad category of assertions, Intervenors asserted from the beginning that Applicant's automated methodologies are fatally flawed because (1) there was no verification procedure submitted with the application, and (2) computer systems are susceptible to error and security breaches. And, although continuing to assert a preference for direct and indirect physical action such as human measurement and detection, they indeed raised a crucial point. The Board recognized that no system of accumulation of data and checking for presence

and integrity of the SSNM at issue could meet the regulation if the data were not accurate enough to meet the specific quantitative criteria for performance set out in the regulation. And, when the Board requested, in response to Intervenor's complaint that the accuracy determinations of the plan should not be an "action item" for future resolution, more information on how Applicant would address the issue, Applicant submitted a modification to its plan setting out the details. Intervenor had offered no information whatsoever regarding what sort of errors might be inherent in the human-touch type of system they advocate, nor did they comment on the aspects of NRC regulatory guidance which suggests that automation is preferable because it reduces human error, but the issue of accuracy became a material portion of this part of the hearing. At bottom, Applicant's additional procedures were not challenged by Dr. Lyman (Intervenor's sole witness), and as we explored the matter Applicant and Staff assisted us in development of a standard by which these new procedures could be measured to determine if there was compliance with our regulations' specific performance requirements, even though there was no element of the regulations which addressed accuracy. The resultant approach, which we believe is applicable to any methodology, automated or not, is that in the end the data must be sufficiently accurate to enable the Board to find compliance with the overarching requirements of the Atomic Energy Act that there be reasonable assurances of compliance with the regulation. Substantial discussion is devoted to this in our Order, and in the end we find that the preponderance of the evidence plainly supports the conclusion that such reasonable assurances are present.

The regulation at issue has two fundamental precepts: first it requires "sampling;" and second, it requires that the sampling produce a specific statistical result. As to the requirement for sampling, our regulations neither prescribe nor proscribe the use of any particular methodology -- and therefore the automated systems proposed by Applicant are not proscribed; as a result, if Applicant's methods can provide the required statistical information and meet the required statistical measure, the regulations' requirements will be satisfied.

The challenge to the regulation requires us to consider whether Applicant’s method may rely entirely upon automated systems or must contain a direct or indirect human element or some “physical” action which is not fully automated.<sup>97</sup> This, in turn, requires consideration of the requirements of the regulation and whether, where the regulation is silent as to methodology, it should be interpreted to prescribe or proscribe any particular methodology. It also involves analysis of whether the regulation at issue here and the overarching requirements of our enabling legislation impose accuracy requirements upon the data underlying the presence and integrity determinations, and, if so, what those requirements are.

**4. Verification of Presence of SSNM Items**

**a. Parties’ Positions on Verification of Presence**

**i. Intervenors’ Position on Verification of Presence**

Intervenors challenge Applicant’s proposal to verify the presence of all SSNM items every day by comparing the data contained in the Perpetual inventory Report generated by the MMIS with item locations and identities determined by the data stored in remote equipment (PLC mapping). Intervenors would reject the claim by Applicant and NRC Staff that this meets the verification of item presence requirements of 10 C.F.R. § 74.55(b)(1).<sup>98</sup>

Moreover, Dr. Lyman’s opinion is that the “conventional understanding of item ‘sampling,’ . . . would normally involve the random selection, location, removal and physical inspection of an item’s identification and integrity.”<sup>99</sup> Intervenors assert that the context in which the term “verify” is used in 10 C.F.R. § 74.55(b) demonstrates that the verification requirement is essentially itself quantitative because it requires the licensee to “verify on a statistical sampling

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<sup>97</sup> Compare Applicant Direct Testimony at 47-48 (describing Applicant’s proposal to meet the requirements of § 74.55(b)(1) with an automated, computerized system), with Intervenor Direct Testimony at A.5(5) (asserting that the regulations require either sampling through physical interaction or validation of computer data through the use of a physical inventory).

<sup>98</sup> Intervenor Direct Testimony at A.5(8-10).

<sup>99</sup> Id. at A.5(5) (emphasis added).

basis, the presence and integrity of SSNM items.”<sup>100</sup> Intervenor contends that because the regulation also requires that the statistical sampling plan must have at least 99% power of detecting losses that total five formula kilograms or more, the concept of verification as used in § 74.55(b) includes two additional requirements: (1) the direct physical intervention to make a quantitative statistical measure (i.e., the random selection, location, removal, and the physical inspection of an item’s identification and integrity),<sup>101</sup> and (2) a sample size determined by quantitative analysis.<sup>102</sup> Explaining further, Intervenor’s witness asserts that verification must (1) have some unspecified “independent” component,<sup>103</sup> and (2) include some assurance regarding the licensee’s records.<sup>104</sup> Intervenor further asserts that computer systems may contain inaccuracies and that those systems are vulnerable to manipulation by adversaries. As a result, Intervenor asserts that reliance on the data in the MMIS and PLCs cannot provide a level of verification equivalent to that obtained by physically retrieving and inspecting actual items.<sup>105</sup>

Intervenor’s witness, Dr. Lyman, asserts that the interrogation of the remote PLC mapping data and the reliance on physical protection measures do not constitute item

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<sup>100</sup> 10 C.F.R. § 74.55(b).

<sup>101</sup> See Intervenor Direct Testimony at A.5(5). Intervenor also provided evidence that members of Applicant’s own staff believed that to provide the required assurance that the MMIS and PLC data represent “an accurate reflection of the location of the items,” it would be necessary to periodically physically validate the data provided by the system. This would entail comparing the data with the actual presence and integrity of items in the storage areas at the plant as verified through direct inspection. Id. at A.5(11-13).

<sup>102</sup> Id. at A.5(5-6).

<sup>103</sup> Id. at A.5(20).

<sup>104</sup> Id.

<sup>105</sup> See id. at A.5(6). We note, however, that Intervenor offers no discussion whatsoever of the human errors which can be expected in such physical retrieval and inspection, nor do they offer any data or other information which might enable this Board or the other Parties to compare the reliability or accuracy of the two methodologies.

“sampling” in the quantitative manner required by 10 C.F.R. § 74.55(b)(1).<sup>106</sup> He further explained his belief that:

[i]n order to provide the required assurance that the PLC mapping system is accurate to desired quantitative standard, it would be necessary to periodically physically validate the data provided by the system. This would entail comparing the data with the actual physical inventories of the storage areas at the plant. There is no indication in the testimony of MOX Services that it intends to do such validation.<sup>107</sup>

Dr. Lyman further asserts that Applicant’s “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.”<sup>108</sup>

As to evidence, Intervenors provided exhibits indicating that the NRC Staff was in communication with Applicant regarding the use of the MMIS and that, assert Intervenors, Applicant was well aware of the need for specific verification of the MMIS reliability, functionality, and security if it were to be used for MC&A purposes.<sup>109</sup> Intervenors also provided another exhibit discussing Applicant’s internal evaluation of the revised approach using the “rationale of inaccessibility, automation, and Perpetual Inventory Report.”<sup>110</sup> This exhibit discussed the importance of MMIS data verification and provided methods that would be used to establish the functionality of the MMIS Perpetual Inventory Report. It also indicated that the “functionality of the perpetual inventory report is critical to the daily operation of the plant so that all stakeholders are assured that if the MMIS does not function properly in this regard, then operations will-must-

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<sup>106</sup> See id. at A.5(5).

<sup>107</sup> Id. at A.5(6).

<sup>108</sup> Id. at A.5(10).

<sup>109</sup> See e-mail from Mark Whittingham, MC&A Safeguards Specialist, Shaw AREVA MOX Services, to Robert Harivel, Plant Information Systems Analyst, Shaw AREVA MOX Services (Apr. 29, 2010) (Exh. INT000005); e-mail from Adam Redwine, MC&A Security Specialist, Shaw AREVA MOX Services, to Dave Kehoe and Dealis Gwyn (Nov. 18, 2010) (Exh. INT000006).

<sup>110</sup> Internal Memorandum, Food for Thought Regarding Item Monitoring Rationale, at 1 (Exh. INT000007) [hereinafter Food for Thought].

cease.”<sup>111</sup> Dr. Lyman’s direct testimony regarding these exhibits indicates his view that Applicant “fully understood that its proposal to take full credit for MMIS for satisfying the item monitoring regulations was technically uncertain and at a minimum would require periodic physical verification of MMIS data.”<sup>112</sup>

Dr. Lyman asserts that Applicant “equates the data in the PLCs with the exact configuration of all SSNM in the plant at any time.”<sup>113</sup> He asserts that to be able to make this statement, Applicant “takes credit for ‘robust physical protection features’ to support its assertion that the PLCs ‘know’ where all SSNM items are at any given time. Thus the accuracy of the PLCs is also directly tied to the functionality of the physical protection system, which must also operate perfectly.”<sup>114</sup>

In addition, Dr. Lyman asserts that Applicant is “taking the position that their other automation and physical protection features, which as we said in our testimony are qualitative, are compensatory measures that allow them to essentially get what we think is an exemption from the letter of the regulations.”<sup>115</sup> Dr. Lyman also asserted at the hearing that Applicant’s item monitoring approach for item presence is a “substitute” or “alternative” for compliance with 10 C.F.R. § 74.55(b)(1).<sup>116</sup>

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<sup>111</sup> Food for Thought at 5.

<sup>112</sup> Intervenor Direct Testimony at A.5(11).

<sup>113</sup> Id. at A.5(14).

<sup>114</sup> Id.

<sup>115</sup> Tr. at 1232 (Lyman).

<sup>116</sup> Intervenor Direct Testimony at A.4 (portraying Applicant’s program as “proposing novel, poorly documented, untested and vague alternative approaches to compliance”).

Indeed, at the Supplemental Hearing, Intervenors made clear that, on this point, it is their view there must be physical detection of each item via some human action, not by automation or computer. This assertion does not challenge whether or not the statistical test can be met via sampling the number or percentage of items to be sampled in Applicants’ FNMCP; rather it

Intervenors further assert that the regulations were developed without contemplation of automated systems<sup>117</sup> and that, despite the fact that the requirements neither prescribe nor proscribe any particular method for compliance, we must read into those regulations a requirement for physical verification. In addition, Intervenors assert that, because the entire process is automated and computer not only control the movement of materials but also record their movement, the requirement for demonstrating satisfaction of the 99% power of detection must include a determination regarding the accuracy of the computer-recorded data.<sup>118</sup>

Intervenors assert that “physical verification of the actual presence and integrity of containers . . . is plainly contemplated by § 74.55(b)[(1)].”<sup>119</sup> Dr. Lyman expressed his view that it is necessary (at least) that Applicant uses its automated systems to physically remove and verify the presence of individual items in order to meet the regulatory requirements.<sup>120</sup> Dr.

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challenges the method of identifying each sampled item as insufficient to satisfy the regulatory requirement because it involves only automated systems.

<sup>117</sup> We discuss issues revolving around the intent of the original draftspersons regarding methodology infra note 225.

<sup>118</sup> Intervenors contend that Applicant’s approach is based on the implicit assumption that the PLC mapping data “knows” where all items are at all times, and any attempt to manipulate the data would be promptly detected. Intervenor Direct Testimony at A.5(14). Put another way, Intervenors state that it is implied by Applicant’s position that the PLC mapping data is 100 percent accurate as defined by Applicant in its reply testimony -- “the PLC memory is an accurate reflection of the location of the items.” Applicant Reply Testimony at 15; Tr. at 1230-31 (Lyman).

<sup>119</sup> Intervenor Consolidated Response at 6. See also id. at 3, 8, 10 (repeatedly asserting that Applicant’s approach is a “substitute” (and presumably an inferior one) for “physical” item monitoring).

<sup>120</sup> See Intervenor Direct Testimony at A.5(6) (stating that “[i]n order to provide the required assurance that the PLC mapping system is accurate to desired [sic] quantitative standard, it would be necessary to periodically physically validate the data provided by the system. This would entail comparing the data with the actual physical inventories of the storage areas of the plant.”).

Lyman stated that “[t]here is no indication in the testimony of [Applicant] that it intends to do such validation.”<sup>121</sup>

**ii. Applicant’s Position on Verification of Presence**

Applicant’s witnesses dispute Intervenors’ argument, which is fundamentally that physical involvement in the sampling is required,<sup>122</sup> asserting that the interrogation of the remote PLC mapping data constitutes item “sampling” and that its “robust physical protection features” ensure the integrity of the data generated by the remote equipment.<sup>123</sup> They contend that the use of data from computer systems that were originally designed to keep track of the facility’s inventory for management purposes can be relied on for verification of the presence and integrity of SSNM items as mandated by NRC’s MC&A requirements.<sup>124</sup> By relying on the data in the MMIS and the PLCs, rather than conducting actual physical retrieval and inspection of items to achieve the required statistical sampling, Applicant will satisfy the NRC’s requirements for item monitoring.<sup>125</sup>

Applicant’s witnesses explained how Applicant uses separate computers that control item movements locally (PLCs) and that maintain the book inventory of the MOX Facility (MMIS) to verify the presence -- that is, the identity and location -- of items, as required by 10 C.F.R. § 74.55(b)(1).<sup>126</sup> The witnesses explained that movement of SSNM through the MOX facility is

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<sup>121</sup> Id.

<sup>122</sup> Tr. at 1231-32 (Lyman).

<sup>123</sup> Applicant Direct Testimony at 50.

<sup>124</sup> Id. at 56-57.

<sup>125</sup> Id.

<sup>126</sup> See id. at 47-49.

performed entirely through use of an automated system that is remotely directed, controlled, and monitored by the MMIS and PLCs.<sup>127</sup>

Applicant's witnesses explained the PLCs control and execute local item movements, track the actual geographical location of items, and record their current location in computer memory.<sup>128</sup> Those actual item locations are stored in the PLCs' memory and displayed in real time to operators on control-room computer screens (referred to as "graphic user interfaces" or "GUIs").<sup>129</sup> The MMIS, on the other hand, controls the overall movement of material through the MOX Facility, and therefore indicates the expected locations of items based on the MOX Facility production process. Applicant's witnesses describe the MMIS records as representing the "book" inventory.<sup>130</sup> To perform timely item presence verification using these highly automated systems, Applicant proposes to compare a "Perpetual Inventory Report" generated by the MMIS with the "map" of actual item locations and identities maintained by the PLCs, thus taking advantage of the fact that the PLCs and the MMIS computer systems are separate and independent from each other.<sup>131</sup>

With reference to the 30- and 60-day item monitoring periods and the 99 percent power of detecting 5 formula kilogram losses referred to in 10 C.F.R. § 74.55(b)(1), Applicant's witnesses point out that Applicant will run this MMIS/PLC mapping comparison "every night" (i.e., daily) for all SSNM items in all SSNM item storage areas, rather than for a subset of

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<sup>127</sup> See id. at 35-36.

<sup>128</sup> See id. at 37, 48.

<sup>129</sup> Id. at 48.

<sup>130</sup> See id. at 48-49. We note also that the purpose or function of the MMIS at the MOX Facility has not changed. See Tr. at 1733-36 (King, Bell). Accordingly, Mr. Pham's review of the MMIS at the reference facility is relevant to an understanding of the NRC Staff's consideration of Applicant's item monitoring approach. See Tr. at 1832 (Pham).

<sup>131</sup> See Applicant Direct Testimony at 49.

items.<sup>132</sup> It can also run the comparison on demand at any time.<sup>133</sup> Moreover, during facility processing, each time the PLCs retrieve a specific item from a precise location and confirm that item's identity using its unique identifier, the PLCs are not only confirming the presence of that item, but also the accuracy of the PLCs' records.<sup>134</sup> Applicant's witnesses assert that these daily, on demand, and continuous mapping functions provide the timely (indeed daily) verification of the presence of all SSNM items (rather than a subset of items) "well within the 30 and 60 day time limitations" set forth in the rule.<sup>135</sup>

Applicant's witnesses do not claim that Applicant is excused from compliance, rather their position is that its daily, on demand, and continuous mapping functions performed by the PLC and MMIS systems provide the timely verification of presence of SSNM items required by the rule.<sup>136</sup> At the initial hearing, Applicant's counsel, Mr. Silverman, stated: "[o]ur position is very clear. We're not suggesting that we're doing anything that's equivalent to the regulation, or a substitute for the regulation. We absolutely firmly believe we meet the regulation."<sup>137</sup>

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<sup>132</sup> Id.

<sup>133</sup> Id.

<sup>134</sup> See id. at 37.

<sup>135</sup> Id. at 51.

<sup>136</sup> See id. at 50 (stating that "the daily and on demand mapping comparisons, in conjunction with the robust physical protection features, provide a sample size that contains 100% of SSNM items in storage locations, thus providing at least 99% power of detection of item losses of at least 5 formula kilograms"); id. at 51 (stating that Applicant "meets the 30 and 60 day regulatory requirements"); id. at 51-52 (stating that "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"); Tr. at 1265 (Clark) (stating that "[w]e don't believe that we have to do the verifications in the way that Dr. Lyman has outlined them. . . . I have a pretty long career of doing this sort of thing, and you don't have to do that this way. . . . [Y]ou can verify the presence and integrity, which is what the regulation requires, by doing exactly what we're doing. We have protected the inventory physically from any kind of thing that might impinge on it and cause items to be misplaced or stolen, and we have designed a way to verify the integrity of that inventory as well. So we meet the letter of the regulation by the method that we use.").

<sup>137</sup> Tr. at 1244 (Silverman).

Applicant's witness, Mr. Clark, echoed Mr. Silverman, saying "[o]ur position is that we actually meet the letter of the regulation, not the spirit. We believe that we are doing 100 percent verification of the presence and integrity of items in storage."<sup>138</sup>

Applicant's witness, Ms. Williams, addressing the use of automation, noted that when the regulations were implemented, the common practice was for human access to material, with people going in and out of vaults and keeping paper records of material and when they used it. She then explained that "this is an entirely different situation because everything is automated, and there's no human access."<sup>139</sup> Mr. Pham of the NRC Staff testified that he is in agreement with Ms. Williams regarding this view.<sup>140</sup>

**iii. NRC Staff's Position on Verification of Presence**

Mr. Pham, the NRC's lead MC&A reviewer, testified that Applicant's "FNMCP provides a fully-implemented item monitoring program."<sup>141</sup> He summarized Staff's position to be that "the practices in the . . . FNMCP for item monitoring for Category IA and IB items in specific storage areas are adequate and acceptable for ensuring the protection of [SSNM] at the MOX Facility" using the MMIS and PLC mapping reconciliation and certain physical protection features.<sup>142</sup> He continued that, "[t]he verification of the presence of all items on a daily basis, as proposed by MOX Services, exceeds the regulatory requirement in 10 C.F.R. § 74.55(b)(1) to verify items every 30 or 60 days, as required for Category IA and IB items, respectively, using a statistical sampling method."<sup>143</sup> In Section 13.2.3.2 of the SER, Staff determined that "the FNMCP

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<sup>138</sup> Tr. at 1249-50 (Clark).

<sup>139</sup> Tr. at 1242 (Williams).

<sup>140</sup> Tr. at 1242 (Pham).

<sup>141</sup> Staff Direct Testimony at 4.

<sup>142</sup> Id.

<sup>143</sup> Id.

identifies and describes an item monitoring program that establishes the capability to provide timely plant wide detection of the loss of items that total two kilograms of plutonium, with 99-percent power of detection.”<sup>144</sup> Similarly, in his direct testimony, Staff’s witness, Mr. Pham, stated that the FNMCP “provides a fully-implemented item monitoring program, including item loss detection, item identification, item categorization, tamper-safing, accessibility, accounting and control procedures, item measurements, item verification, and monitoring of samples.”<sup>145</sup>

Mr. Pham also concurs with Applicant’s assertion that the interrogation of the remote PLC mapping data is a “100 percent verification” approach (rather than random sampling) which meets the regulation’s statistical sampling requirement.<sup>146</sup> Mr. Pham indicated in pre-filed direct testimony that §§ 2.8.3.1 and 2.8.3.2 of Applicant’s FNMCP describe how Applicant meets the requirements for item monitoring for Category IA and 1B materials.<sup>147</sup> Mr. Pham testified that:

[Applicant] uses the MMIS to generate a Perpetual Inventory Report for all items in these areas. The MMIS provides records on where items should be located and the PLCs provide the actual current location of each item. The Perpetual Inventory Report is generated on a daily basis and . . . compared with operating location[s] recorded by the PLCs.<sup>148</sup>

According to Mr. Pham, “any discrepancies between where an item should be and where it is physically located [according to the PLCs] will be promptly investigated and resolved in

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<sup>144</sup> Final Safety Evaluation Report for the License Application to Possess and Use Radioactive Material at the Mixed Oxide fuel Fabrication Facility in Aiken, SC (Dec. 2010) at 13-5 (Exh. APP000021) [hereinafter FSER]. In Staff’s Reply Testimony, Mr. Pham clarified that the term, “power of detection,” is an expression that “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.” Staff Reply Testimony at 1.

<sup>145</sup> Staff Direct Testimony at 4.

<sup>146</sup> See Tr. at 1276 (Pham).

<sup>147</sup> Staff Direct Testimony at 10-11 (stating that the comparison of MMIS and PLC records “would meet the requirement to verify the presence of Category 1A . . . and 1B items”). See also FNMCP Chapter 2 at 138-139.

<sup>148</sup> Staff Directory Testimony at 10-11.

accordance with the alarm resolution program described in Section 3.0 of the . . . FNMCP.”<sup>149</sup>

Mr. Pham concluded that this would meet the requirement to verify the presence of Category IA and 1B items.<sup>150</sup> Also with respect to verification of item presence, Mr. Pham testified regarding Applicant’s comparison of where items should be (the MMIS’s Perpetual Inventory Report) and where they actually are (the PLC map), and concluded that these daily mapping comparisons meet the requirements of the rule.<sup>151</sup>

Mr. Pham summarized Staff’s overall position regarding Contention 9 by indicating “that the approach described by [Applicant] in its testimony would provide an adequate item monitoring program that would meet the requirement of 10 C.F.R. § 74.55(b)(1).”<sup>152</sup> This position was affirmed by Staff Counsel during the initial hearing on March 7, 2012.<sup>153</sup>

**b. Board Determinations on Verification of Presence**

We find no support for Intervenors’ proposition that the plain language of the regulation, which does not speak to the method used for verifying presence or integrity, plainly contemplates physical verification. Moreover, neither the regulation itself nor its regulatory history sets out any explicit requirement that the verification process must satisfy any of the elements Intervenors propose.<sup>154</sup>

More fundamentally to Intervenors’ basic claim, there is no requirement in NRC regulations that there be any “physical” verification of item presence. And the silence of a regulation as to a particular compliance technique does not indicate the prohibition of that

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<sup>149</sup> Id.

<sup>150</sup> See id.

<sup>151</sup> Id.

<sup>152</sup> Id. at 13.

<sup>153</sup> Tr. at 1094-95 (Klukan).

<sup>154</sup> See supra Part V.A.4.a.i; see also 52 Fed. Reg. at 10,033; 49 Fed. Reg. 4,091 (Feb. 2, 1984).

technique. Here, the silence of NRC regulations as to whether automated methodologies may be used to meet the regulatory performance requirements cannot be read to impose some other methodology. The regulation does not explicitly prohibit the use of new technologies or methodologies, nor does it require licensees to use any particular method of item monitoring.

As to the argument that this requirement was established before automated systems were available to make the required measurements and, therefore, that it did not contemplate the use of automation, we find, as Applicant and Staff witnesses testified,<sup>155</sup> the regulation is technology-neutral, establishing only performance requirements, and thus it can be reasonably applied to embrace technologies developed after its implementation.<sup>156</sup> In this regard, we find

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<sup>155</sup> See Tr. at 1811 (Pham) (stating that “this is a performance-based regulation. So we are receptive for the Applicant to come up with a method. And any method they can propose to us, we evaluate it, we review it, and we determine it is adequate or not adequate.”); Tr. at 1738-39 (Bell) (characterizing the requirements at issue as “performance requirements”); see also Tr. at 1748-49 (Klukan) (stating that “[10 C.F.R. §] 74.55 is a performance-based regulation. They have to meet a certain task. . . . Now how they go about doing that is up to the Applicant and the staff applies its best technical expertise to determine whether there’s reasonable assurance that the plan specified by the Applicant or proposed by the Applicant will meet that standard”); Tr. at 1945 (Jones) (stating that “[§] 74.55(b)(1) is a performance-based rule that requires a licensee to verify presence and integrity on a certain regular basis but does not prescribe the method for achieving compliance. Whatever method the licensee chooses, the NRC staff must determine whether there is reasonable assurance that the method is effective.”); Tr. at 1829 (Grice) (stating that “the NRC has always tried to make its best effort to keep regulations technology-neutral, so that we are performance-based. And so the requirement is that you do the verification. The method of performing that verification is up to the licensee. It’s up to Staff to determine whether their preferred method of verification is acceptable.”). Moreover, Applicant’s reliance on computerized systems for item monitoring is, in fact, not entirely new. As Applicant’s witnesses testified at the supplemental hearing, using a computerized system to keep the book inventory is common practice for facilities regulated under Part 70. Tr. at 1793 (Bell) (stating that “ultimately the book value is a computer, as it is with any other facility under this regulation.”); Tr. at 1889 (King) (stating that “the book inventory of most systems is maintained on a computer. That’s not novel about our facility.”).

<sup>156</sup> As we noted above, this approach to regulation in a technologically evolving area is eminently sensible -- it provides regulations which have a long useful life, needing modification only when the performance requirements change. Our view is not inconsistent with the Proposed Rule wherein the Commission, discussing the state of the art for material control at the time portions of these regulations were written and noting that at that time “most facilities did not have, as part of their MC&A programs, automated tracking systems and computer-based accounting systems to help track SNM items,” observed that “[t]oday, licensees have the ability to track items immediately upon creation instead of waiting for hand-written ledgers to be



sampling method. We find that Applicant's sampling method, which examines data representative of the entire set of SSNM items, and not a limited subset, samples 100 percent of SSNM items and thus we conclude it complies with the requirement to sample a sufficient number of items to result in at least 99 percent power of detecting the specified losses. Nonetheless, the ability of Applicant's method to satisfy the regulatory power of detecting requirement hinges upon the accuracy of the data providing the 100 percent sample size. We discuss below, in subsection 6, evidence submitted respecting Intervenors' assertion that the accuracy of data used on, and generated by, these automated systems is material to a determination of compliance, and our conclusion that there are reasonable assurances of compliance in that regard.

#### **5. Verification of Integrity of SSNM Items**

The second issue raised by Contention 9 is whether Applicant satisfies the requirement to verify, on a statistical sampling basis, the "integrity" of SSNM items, again with at least a 99 percent power of detecting losses totaling five formula kilograms or more, within 30 days for Category IA and 60 days for Category IB items.<sup>160</sup> A determination regarding item integrity refers to the ability to determine that a container holding SSNM items has not been breached and that the amount of SSNM within has not been altered.

To satisfy the item integrity requirements of § 74.55(b)(1), Applicant proposes to use each of the MOX facility's SSNM item storage areas as containment boundaries. Applicant will use tamper-indicating devices ("TIDs"), or protection equivalent to tamper-safing at each containment boundary.<sup>161</sup> For each item storage area containment boundary except one -- the Assembly Storage Area ("TAS") -- the integrity and the unique identifier of the TIDs will be

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<sup>160</sup> See 10 C.F.R. § 74.55(b)(1).

<sup>161</sup> See Applicant Direct Testimony at 53-55; see also Tr. at 1698-99 (Clark).

visually inspected every day by Operations personnel.<sup>162</sup>

In the TAS, Applicant proposes to ensure the integrity of the SSNM fuel assemblies by controlling access to the TAS crane.<sup>163</sup> Applicant's witnesses testified that, "[s]ince the assemblies are large heavy components, controlling access to the crane ensures that no one can breach the integrity of the stored assemblies and provides protection equivalent to tamper-safing. Crane access logs will be reviewed daily for unauthorized use to confirm" integrity.<sup>164</sup>

**a. Parties' Positions on Verification of Integrity**

**i. Intervenors' Position on Verification of Integrity**

Intervenors argue that Applicant's proposed approach fails to satisfy the "quantitative" requirements of § 74.55(b)(1), and instead relies on a containment boundary approach to verification of item integrity that is essentially "qualitative" in nature as it relies solely on physical protection features.<sup>165</sup> Intervenors also contend that Applicant does not satisfy the regulation because its approach does not involve direct access to items to verify the presence and integrity of cans, reading bar codes and inspecting seals, but instead relies solely on the data within the MMIS and PLCs and the presence of physical protection features.<sup>166</sup> Intervenors' witness, Dr. Lyman, testified at the initial hearing that Applicant's "concept of a containment integrity boundary is something that does not appear in the regulations or the guidance. . . . it is a novel

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<sup>162</sup> See Applicant Direct Testimony at 53-55; see also Tr. at 1865 (Clark). In the supplemental hearing, Mr. Clark made clear that all of the TIDs used for item integrity containment boundaries are "uniquely identified," tracked and accounted for from receipt to disposal, and may be accessed by only a small number of persons. It bears note that this activity involves direct human action -- the particular method which Intervenors have asserted is absent and must be used more broadly.

<sup>163</sup> Applicant Direct Testimony at 55.

<sup>164</sup> Id. "Fuel assemblies weigh around 1500 lbs and are about 13 feet in length." Id. at 33.

<sup>165</sup> Intervenor Direct Testimony at A.5(5); Tr. at 1244 (Lyman). We note, however that the assertion that there is a quantitative aspect to the determination of boundary integrity was not accompanied by any evidence respecting what that quantitative requirement is or should be.

<sup>166</sup> See Intervenor Direct Testimony at A.5(5).

concept.”<sup>167</sup> According to Dr. Lyman “the [NRC] regulations . . . already assume that you have items that are tamper safed or placed in a vault or a controlled access area that provides protection at least equivalent to tamper safing. That is the prerequisite for the item monitoring program.”<sup>168</sup> Dr. Lyman asserts that the tamper-safing of items cannot be used by Applicant to “verify on a statistical sampling basis the . . . integrity of SSNM items.”<sup>169</sup>

Intervenors fault Applicant’s integrity verification approach for failing to involve statistical sampling of the items within the containment boundaries to meet the 99% power of detection and assert, as they did respecting item presence, that § 74.55(b)(1) requires physical verification of item presence and integrity and that Applicant’s approach does not physically verify item integrity.<sup>170</sup> As Dr. Lyman indicated at the initial hearing, he “believe[s] that the regulations mean when you do statistical sampling for item monitoring purposes that you actually locate, that you take a random sample of items, and you actually physically inspect them for identity and integrity purposes.”<sup>171</sup> According to Intervenors, if it were acceptable to verify item integrity by verifying the integrity of storage area boundaries, then it should be possible to verify presence the same way.<sup>172</sup> Intervenors conclude that, “[a]s a result of this

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<sup>167</sup> Tr. at 1389 (Lyman).

<sup>168</sup> Tr. at 1403-04 (Lyman).

<sup>169</sup> Tr. at 1404 (Lyman).

<sup>170</sup> See Intervenor Consolidated Response at 8 (stating that “[a]n applicant must demonstrate the same capability to statistically sample and physically inspect items to verify their integrity as it does to verify their presence”).

<sup>171</sup> Tr. at 1231 (Lyman) (emphasis added).

<sup>172</sup> See Intervenors’ Statement of Position in Rebuttal to NRC Staff’s Statement of Position on Contentions 9, 10, and 11 at 5 (Dec. 19, 2011) [hereinafter Intervenor Reply Statement of Position] (stating that “[a]fter all, if the system is sensitive enough to detect removal of the partial contents of a container it should also be sensitive enough to detect the removal of the entire container”). In so doing, Intervenors asserted that “[i]f one knows the identity of all items within the containment boundary at any time, and it is assumed that the area has not been entered as long as the boundary remains intact, then there would never be a need to re-verify the identity of the items within the boundary.” Intervenors’ Proposed Cumulative Findings of Fact and





daily basis, the integrity of the boundaries, the TIDs, and the unique identifier on the TIDs).<sup>183</sup> Applicant's witnesses conclude that "these detection methods . . . would be effective in detecting the loss of integrity of an SSNM item well within the 30 and 60 day requirements."<sup>184</sup>

In response to Intervenor's argument that Applicant's approach makes § 74.55(b)(1)'s item presence requirements superfluous, Applicant's witnesses testified that due to automated movement of SSNM items throughout the MOX Facility, "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)."<sup>185</sup> As a result, they argue, verifying item integrity through examination of storage area boundaries could not be used to replace the necessary item presence verification component of § 74.55.<sup>186</sup>

**iii. NRC Staff's Position on Verification of Integrity**

Staff's witness, Mr. Pham, stated that the MOX Facility SSNM storage areas meet the acceptance criteria in NUREG-1280 for providing protection equivalent to tamper-safing.<sup>187</sup> As such, Staff found that Applicant can verify the integrity of SSNM items inside the storage areas at the MOX Facility through verifying the integrity of the storage area containment boundaries.

In the Final Safety Evaluation Report, Staff concluded that Applicant's "tamper-safing procedures are acceptable to ensure the continuing validity of previously measured and attested to nuclear material values assigned to unique items, and the personnel access controls,

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<sup>183</sup> Tr. at 1351 (Clark).

<sup>184</sup> Applicant Direct Testimony at 56.

<sup>185</sup> Applicant Reply Testimony at 26.

<sup>186</sup> See id.

<sup>187</sup> See Staff Direct Testimony at 11-13. Mr. Pham asserted that Applicant's "verification of the integrity of the vault boundaries on a daily basis . . . also exceeds the regulatory requirement to verify the integrity of the items every 30 or 60 days, as required by 10 C.F.R. § 74.55(b)(1)." Id. at 4.

surveillance and records procedures for entrance and exit of personnel to and from control access areas.”<sup>188</sup>

Staff’s witness, therefore, agreed with Applicant that confirmation that the containment boundary has not been breached ensures the integrity of all of the items contained therein.<sup>189</sup> Additionally, Mr. Pham agreed that Applicant’s approach was not novel and is currently employed at other facilities.<sup>190</sup>

**b. Board Determinations on Verification of Integrity**

Intervenors’ claim that Applicant’s approach “do[es] not involve . . . sampling”<sup>191</sup> rests upon the faulty premise that sampling requires physical action (and that the interrogation of data stored in computer records is not considered statistical sampling). Intervenors also err in asserting that Applicant’s examination of computer data representing 100 percent of the items in any storage area cannot satisfy the requirement to take a sufficiently sized sample to achieve the 99 percent power of detection goal of statistical sampling. Moreover, Intervenors err in asserting that “[a]n applicant must demonstrate the same capability to . . . physically inspect items to verify their integrity as it does to verify their presence.”<sup>192</sup> Neither the plain language of § 74.55(b)(1) nor its regulatory history suggests that verifications of item integrity must be in any way “physical.”<sup>193</sup> Intervenors offer no support for the proposition that there is some

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<sup>188</sup> FSER at 13–6.

<sup>189</sup> See Staff Direct Testimony at 4. The NRC Staff position on item integrity verification was also summarized at the initial hearing by Mr. Klukan by referring to direct testimony that “if a storage area provides protection equivalent to tamper safing it is generally acceptable for an applicant to verify the integrity of the storage area including the boundaries thereof and any tamper safing devices on access points as opposed to the integrity of each item contained in that storage area.” Tr. at 1096 (Klukan).

<sup>190</sup> Tr. at 1403 (Pham).

<sup>191</sup> Intervenor Consolidated Response at 8.

<sup>192</sup> Id.

<sup>193</sup> See 10 C.F.R. § 74.55(b)(1); 52 Fed. Reg. at 10,033-43; 49 Fed. Reg. at 4,091-97.

requirement imbedded within 10 C.F.R. § 74.55(b)(1) for physical action in integrity (or presence) verification. In contrast, Applicant provided substantial testimony, which is supported by Staff's witnesses, regarding their approach to verifying the integrity of 100 percent of items, and we find that their approach satisfies the statistical sampling requirement and achieves the 99 percent power of detection required by 10 C.F.R. § 74.55(b). Additionally, Applicant's integrity verification approach does involve daily, physical, human confirmation that the containment boundaries around SSNM items have not been breached. Although the rule does not require any physical aspect to item integrity verification, Applicant's approach involves daily, physical confirmation of the integrity of SSNM item containment boundaries.

As to the argument that a containment boundary integrity approach would make part of our regulations irrelevant, a containment boundary that has not been breached will nonetheless have items moving in and out as the facility operates. Thus, item presence is not assured by confirming boundary integrity, and § 74.55 is not, as Intervenor's claim, 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.<sup>194</sup> We therefore find that Applicant could not use its integrity verification approach for presence verification as well. And, the boundary integrity concept is inapplicable to certain other facilities to which these regulations apply. As Applicant's witnesses explained, those other facilities have item storage areas that are regularly accessed by humans and thus, the storage area boundary of those facilities cannot be used to verify integrity.<sup>195</sup>

To be clear, we also find that verifying the integrity of SSNM item storage area containment boundaries enclosing the particular, uniquely identified SSNM items ensures that those SSNM items retain their integrity. If the boundaries have not been breached, the discrete,

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<sup>194</sup> See Intervenor Reply Statement of Position at 5.

<sup>195</sup> Applicant Reply Testimony at 24.

identified, and previously measured SSNM contained within those items could not have been changed from the previously measured value.

We view the physical protection features, which prevent intruder access, as providing assurance that the data as originally generated in the PLCs represents an unchanged condition of storage of the items so tracked and recorded.

Finally, Intervenor asserts that if we accept the concept of the use of boundary integrity to determine integrity, “all SSNM items within a single ‘containment boundary’ would effectively become a single ‘item’ for the purposes of item monitoring.”<sup>196</sup> We find this argument to be more reasonably directed to the subject matter of Contention 10, which regards the alarm conditions that would occur once a storage area boundary is found to have been breached. Because we separately address Applicant’s compliance with that particular regulatory requirement in Contention 10,<sup>197</sup> we do not address this assertion here.

Based upon the foregoing, and the other evidence before us, we find that Applicant’s program, which requires checking, on a daily basis, the integrity of the boundaries, the TIDs, and the unique identifier on the TIDs satisfies the quantitative requirements of the rule and is sufficient to provide the integrity verification required within the 30- and 60-day timeframes.

That said, however, we distinguish the matter of “integrity” of the SSNM from the accuracy of the data in the computer systems; a matter we discuss in depth below.

## **6. Power of Detection and Accuracy**

The third issue raised by Contention 9 involves two sub-issues: (1) whether § 74.55(b) includes a requirement regarding the accuracy of the data in the computer systems that are

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<sup>196</sup> Intervenor asserts that if the containment boundary were breached, “it would be necessary to inventory the entire vault in order to resolve an alarm.” Intervenor Reply Statement of Position at 6.

<sup>197</sup> See supra Part V.B.

being used to satisfy the required 99% power of detection;<sup>198</sup> and (2), if the regulation does include an accuracy requirement for these computer and automated systems, what standard is to be used to measure whether Applicant has satisfied the requirement and whether that standard has been met.<sup>199</sup>

**a. Quantitative Requirement for Accuracy**

**i. Parties' Positions on Quantitative Requirement for Accuracy**

**(1) Intervenors' Position on Quantitative Requirement for Accuracy**

Intervenors assert that § 74.55(b)(1)'s requirement for statistical sampling with a 99 percent power of detection includes, directly or indirectly, some accuracy requirement to ensure that "the PLC memory is an accurate reflection of the location of the items."<sup>200</sup> Dr. Lyman agreed with the distinction between "power of detection" and "accuracy," testifying that he "mean[s] accuracy the same way the Applicant means it."<sup>201</sup> However, he faults Applicant for "assum[ing] that the PLC mapping data is at least 99 percent accurate" without providing "quantitative evidence supporting this claim" and relying solely on "qualitative reassurance that physical protection measures will ensure accuracy of the PLC mapping data."<sup>202</sup> Thus, Dr.

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<sup>198</sup> The regulation's definition of "power of detection" does not explicitly require a demonstration of data accuracy. See 10 C.F.R. § 74.4.

<sup>199</sup> In considering the accuracy of Applicant's approach, we remain cognizant that the alternative approach suggested by Intervenors would itself be susceptible to inaccuracies, such as human error, which NRC regulatory guidance documents attempt to reduce through the use of automated systems. That is to say, the accuracy question cannot be considered in a vacuum. Rather, it must be judged in terms of whether or not Applicant's approach provides the required reasonable assurances that it will have the ability to fulfill the regulatory performance requirements.

<sup>200</sup> Tr. at 1230 (Lyman) (quoting Applicant's Reply Testimony); see also Intervenor Direct Testimony at A.5(5-6).

<sup>201</sup> Tr. at 1230-31 (Lyman) (stating that "[a]ccuracy means the representation of the actual items by . . . the information in the PLCs. . . . It has nothing to do with the power of detection or anything.").

<sup>202</sup> Intervenor Direct Testimony at A.5(5).

Lyman asserts, Applicant fails to meet the requirements and the intent of the regulation.<sup>203</sup> Dr.

Lyman further asserts that

[i]n order to provide the required assurance that the PLC mapping system is accurate to desired quantitative standard, it would be necessary to periodically physically validate the data provided by the system. This would entail comparing the data with the actual physical inventories of the storage areas at the plant. There is no indication in the testimony of [Applicant] that it intends to do such validation.<sup>204</sup>

Moreover, as we noted earlier, Dr. Lyman asserts that Applicant's interrogation of the remote PLC mapping data does not constitute item "sampling," which he suggests would normally involve the random selection, location, removal and physical inspection of an item's identification and integrity.<sup>205</sup> Underlying this argument is Intervenor's assertion that Applicant assumes that the "PLC mapping data is at least 99 percent accurate."<sup>206</sup>

**(2) Applicant's Position on Quantitative Requirement for Accuracy**

Applicant asserts that no accuracy concept is imbedded in the regulation because the power of detection of the statistical sampling plan is not affected by the accuracy of the method employed to confirm item presence.<sup>207</sup> Moreover, Applicant's witnesses assert that the power of detection and the accuracy of underlying data are two distinct concepts and § 74.55(b)(1) contains no explicit quantitative accuracy requirement.<sup>208</sup> Rather, Applicant's witnesses testified

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<sup>203</sup> Id.

<sup>204</sup> Id. at A.5(6).

<sup>205</sup> Id. at A.5(5).

<sup>206</sup> Id.

<sup>207</sup> See Applicant Reply Testimony at 7-8, 11.

<sup>208</sup> See id. at 11. At the hearing, however, Dr. Lyman expressed his view that Applicant actually samples "not 100 percent of items but zero percent." Tr. at 1231 (Lyman) (emphasis added). His perspective is that Applicant's automated mapping function fails to satisfy the regulation because an actual physical removal of items from storage locations is required to meet the regulation. Tr. at 1231-32 (Lyman). This rests upon his view that there is an underlying assumption by MOX that the information in the PLCs is exactly equivalent to the state of all the items in the plant at all times, and that, to him, this means they have assumed that the

that the regulation has two explicit quantitative aspects: (1) the required 99% power of detection for the licensee's statistical sampling plan; and (2) the time within which such losses must be detected (i.e. 30 or 60 calendar days).<sup>209</sup>

Applicant's witnesses asserted that, "[a]s 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."<sup>210</sup>

Using the calculation provided in NUREG-1280 for illustration, Applicant's witnesses further stated:

The only variables that affect power of detection are the minimum number of items to divert 2000 g Pu [5 formula Kg] (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.<sup>211</sup>

When a power of detection of 99 percent is achieved, "there is a 99 percent chance that a missing item (or collection of items) totaling 5 formula kilogram [of SSNM] will be selected to be included in the subset of items to be verified during the item monitoring checks."<sup>212</sup> The only variable that will affect power of detection for a given population is the number of items in the

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information is 100% accurate. Applicant's witnesses argue that Dr. Lyman's view conflates "power of detection" with "accuracy."

<sup>209</sup> Applicant Reply Testimony at 5.

<sup>210</sup> Id. at 6.

<sup>211</sup> Id. at 7. In addition, Applicant's witness, Ms. Williams, testified that the formula identified by the NRC Staff in its NUREG-1280 guidance for determining power of detection "does not take into consideration accuracy." Tr. at 1214 (Williams). As an aside, Intervenor's witness suggested at the hearing that Applicant's approach of using computer data to monitor the location of 100% of items fails to satisfy the requirement for at least a 99% power of detection. See Tr. at 1231 (Lyman) (claiming Applicant actually samples "not 100 percent of items but zero percent").

<sup>212</sup> Applicant Reply Testimony at 5.

sample.<sup>213</sup> By sampling a greater portion of the population, one increases the power of detection.

Applicant's witnesses testified that mapping of 100 percent of the items in storage via the MMIS and PLCs constitutes a statistical sample that involves a sample size of 100 percent of the item population.<sup>214</sup> Applicant's witness, Mr. Clark, explained that sampling 100 percent of the population satisfies the power of detection requirement because the only factor that can affect the power of detection is the sample size.<sup>215</sup>

Mr. Clark testified that "[a]ccuracy . . . goes to how confident you are that if you select the defective item for the item monitoring test, [you will] be able to detect that it is, in fact, defective. . . . The regulations don't actually have any . . . quantitative measure" to determine the accuracy of this detection.<sup>216</sup>

Nonetheless, Applicant agrees that there is an accuracy requirement. Regarding the question of whether the Staff would allow an Applicant to use inaccurate data, Applicant's witnesses testified that "whatever methods the licensee chooses, those methods must be able to provide reasonable assurance that item losses . . . will be detected."<sup>217</sup> In response to a follow-up question regarding whether an inspection method that had only 50% accuracy would be acceptable, Mr. Clark indicated "that the regulator at that point would not allow that verification process. If there was that kind of effectiveness, that would not be ruled a sufficient

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<sup>213</sup> See id. at 5-8; Tr. at 1211-13 (Clark) (stating that the 99 percent power of detection requirement "refers, ultimately, to the size of the population that will be subjected to the item test").

<sup>214</sup> See Applicant Reply Testimony at 9.

<sup>215</sup> Tr. at 1249 (Clark).

<sup>216</sup> Tr. at 1211-12 (Clark).

<sup>217</sup> Applicant Reply Testimony at 11.

check of the integrity or the presence of those items.”<sup>218</sup> Applicant’s witnesses stated that “there is no requirement [in § 74.55(b)(1)] that the licensee demonstrate the accuracy of its method on a quantitative basis, and [§] 74.55(b)(1) does not even speak to method accuracy.”<sup>219</sup>

Nonetheless, Applicant noted that whatever methodology is used must satisfy the overarching requirements of NRC regulations and the Atomic Energy Act by providing reasonable assurance of public health and safety and environmental protection<sup>220</sup> -- in this instance, that the data can be used to demonstrate that item losses totaling five formula kgs will be detected.<sup>221</sup>

Applicant’s witness, Mr. Clark, described the relationship between power of detection and accuracy by explaining that:

the 99 percent power of detection that means you have a 99 percent probability that that particular item in question will be selected to be verified.

Accuracy is -- actually goes to how confident you are that if you select the defective item for the item monitoring test, [you will] be able to detect that it is, in fact, defective. It goes to how effective is your -- or how effective is your test itself.<sup>222</sup>

### **(3) NRC Staff’s Position on Quantitative Requirement for Accuracy**

NRC Staff’s witness, Mr. Pham, agreed with Applicant’s position that “accuracy” and “power of detection” are distinct concepts and that there is no explicit quantitative accuracy requirement in the power of detection requirement. Mr. Pham also provided testimony regarding his view on the scope and limits of the quantitative requirements of § 74.55(b)(1):

[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

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<sup>218</sup> Tr. at 1213 (Clark).

<sup>219</sup> Applicant Reply Testimony at 11.

<sup>220</sup> See supra Part III.A.

<sup>221</sup> See Applicant Reply Testimony at 11.

<sup>222</sup> Tr. at 1211 (Clark).

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.<sup>223</sup>

**ii. Board Determination on Quantitative Requirement for Accuracy**

All parties agree that the regulation's power of detection requirement is a concept distinct from the accuracy of the method used to determine item presence and integrity. There is also testimony that, for an automated, computer-based methodology, the accuracy of the method used to establish the presence and integrity required by the regulation must logically include a consideration of accuracy.<sup>224</sup> Based on the foregoing, and the other evidence before us, we conclude that accuracy of the methodology is an integral component of the requirement to provide reasonable assurance of item presence and integrity with a 99% power of detection, especially when item sampling is entirely computer-based.

As a result, the Board finds that consideration of the quantitative accuracy of the MMIS/PLC computer system data must be considered in determining whether or not requirements of 10 C.F.R. § 74.55(b)(1) are satisfied by Applicant's plans.

**b. The Standard for Quantitative Accuracy of Applicant's Data**

Having found that quantitative accuracy must be considered, we consider next the standard against which the accuracy of Applicant's item monitoring method must be judged ("reasonable assurances" of meeting the regulatory requirement) and then evaluate whether a preponderance of the evidence in the record supports a finding that Applicant's item monitoring method meets that standard.

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<sup>223</sup> Staff Reply Testimony at 1.

<sup>224</sup> In response to questions regarding whether the regulations were developed assuming human involvement in the inspection process and that being the reason why accuracy is not included, Mr. Clark, responded that "I suppose that could be possible, yes. The regs, though, do specify that you are to verify presence and integrity, so they expect that you will do that with a very high confidence." Tr. at 1212 (Clark). Moreover, Mr. Pham testified that Applicant's move toward computerization implies the "need to go back and revise" the regulation to include the consideration of computer control and automation. Tr. at 1243 (Pham). Presumably this would include explicit consideration of the accuracy of the data in the computer systems.

i. **Parties' Positions on Quantitative Accuracy of Applicant's Data**

(1) **Intervenors' Position on Quantitative Accuracy of Applicant's Data**

Dr. Lyman asserts that Applicant must establish specific quantitative accuracy requirements for the data in the MMIS/PLCs in addition to the qualitative measures that are described in the FNMCP.<sup>225</sup> This rests upon Intervenors' view that Applicant relies upon an assumption that the information in the PLCs is 100% accurate and exactly equivalent to the state of all the items in the plant at all times.<sup>226</sup> Intervenors assert that the regulation's accuracy requirements require an additional verification of the MMIS/PLC data.<sup>227</sup>

Intervenors' position, re-stated by Dr. Lyman at the supplemental hearing, is that in order to establish adequate accuracy for the MMIS/PLC data, there has to be sufficient verification of the data. In this regard, Intervenors noted that a procedure for data verification was scheduled to be developed "some time in the future" and argued that that procedure should be developed prior to issuance of the license.<sup>228</sup>

Dr. Lyman claims that unless there is independent and periodic verification of the data used for MMIS and PLC mapping, Applicant's approach to item presence only shows that the MMIS and PLCs are consistent and does not provide assurance that a diverted item will be detected in a timely manner.<sup>229</sup> He argued that "[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."<sup>230</sup> At the supplemental

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<sup>225</sup> Intervenor Direct Testimony at A.5(5).

<sup>226</sup> See Intervenor Consolidated Response at 6; Intervenor Direct Testimony at A.5(14).

<sup>227</sup> Intervenor Direct Testimony at A.5(6).

<sup>228</sup> Tr. at 1108 (Curran).

<sup>229</sup> Intervenor Direct Testimony at A.5(20).

<sup>230</sup> See id.

hearing, Intervenor's witness, Dr. Lyman, repeated Intervenor's position that in order for Applicant to establish adequate accuracy of the MMIS/PLC data, there has to be sufficient verification of the data but confirmed that, in his view, process movements could be used to provide this verification.<sup>231</sup> Regarding the number of such process movements that would be necessary, Dr. Lyman stated his opinion that:

In our view of reading those requirements, we -- it's not clear how many actual item process moves would be necessary to comply with the regulations. But we aren't clear -- the regulations are clear. You want to know, you want to be able to verify the presence and integrity of a certain quantity of plutonium to a certain standard within a certain period of time. And we would need to see further demonstration of how a particular verification plan would actually comply with the regulations.<sup>232</sup>

Other than acknowledging the acceptability of process movements for establishing data accuracy, Intervenor's did not provide any pre-filed direct testimony regarding inadequacies of the quantitative standard chosen by Applicant in response to the Board's June 29, 2012 Order nor did they identify any other quantitative standard that they would find acceptable.

## **(2) Applicant's Position on Quantitative Accuracy of Its Data**

Applicant's witnesses maintain that Applicant "has not asserted that its PLC mapping data is '100 percent accurate' . . . Rather, [its] item monitoring program relies on multiple, redundant methods to provide reasonable assurance of the accuracy and integrity of the MMIS and PLCs."<sup>233</sup>

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<sup>231</sup> See Tr. at 1756 (Lyman) (stating "[s]o I do think that if you are conducting a verification of the accuracy of the MMIS and PLC data, that the data that you acquire through certain process operations and movements on a case-by-case basis could be used to verify the data in the computer."); see also Tr. at 1790 (Lyman) (stating that "I think what I said was that on a case-by-case basis, that doing the kind of verification of data that's been described could be accomplished through process movements. At least, a process movement could provide verification that the data in the PLCs is correct for that particular item. But, again, on a case-by-case basis, depending on what you're actually doing. But, you know, in principle it's not a bad approach.").

<sup>232</sup> Tr. at 1757 (Lyman).

<sup>233</sup> Applicant Direct Testimony at 36.

Applicant's witnesses testified that there is neither a quantitative accuracy requirement in 10 C.F.R. § 74.55(b)(1) nor any such expectation in the applicable Staff guidance document, NUREG-1280.<sup>234</sup> However, Applicant expressed its view, which we believe consistent with the general dictates of the Atomic Energy Act, that the NRC does not intend to allow licensees to use "inaccurate" item monitoring methods and thus, as Applicant's witnesses stated, "[w]hatever methods the licensee chooses . . . must be able to provide reasonable assurance that item losses totaling five formula kilograms will be detected."<sup>235</sup>

Applicant provided documentary evidence, as well as prefiled and live testimony, to describe its programs for assuring the accuracy of its item monitoring method. Applicant asserts that these programs will include multiple features that both prevent errors and detect errors in the MMIS and PLC data.

#### **Features that Prevent Errors**

Applicant's witnesses presented largely uncontroverted testimony discussing at least six program features that prevent errors in MMIS and PLC data: (1) the software is derived from the operating reference facility;<sup>236</sup> (2) control of the development and life cycle of the software used in MMIS and PLC data systems is in accordance with applicable NRC and industry-accepted ASME NQA-1 Quality Assurance (QA) standards<sup>237</sup> and use of a specific software life cycle

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<sup>234</sup> Id. at 11.

<sup>235</sup> Id.

<sup>236</sup> See id. at 20-22 (responding to Dr. Lyman's assertion that the MOX facility's software was developed by foreign nationals and therefore could include malicious code, Applicant's witness, Mr. Bell, noted that the software "has been used successfully for 15 years" and was developed prior to the institution of efforts to build the MOX facility, so intentional corruption respecting this facility was not credible.)

<sup>237</sup> See id. at 20-22; Tr. at 1180, 1189-91 (Bell). Intervenors challenged Applicant's use of NQA-1. See Intervenor Consolidated Response at 13-14. Why Intervenors believe that use of NQA-1 is inadequate or inappropriate is not at all clear. It appears they believe this is the case because they state that "[Applicant] has testified that the PLC and MMIS were not developed for safety, security or MC&A purposes" but instead for "managing the MOX Facility inventory." Id. But Applicant's witnesses testified that the MMIS was developed for multiple purposes, including

process that provides a defined and structured approach to software development and testing and originates from Industry Standard IEEE 1012-1998, IEEE Standard for Systems and Software Verification and Validation; (3) extensive pre-operational, in-plant testing of MMIS and PLC software and operating procedures;<sup>238</sup> (4) rugged and resilient design of MMIS and PLC hardware;<sup>239</sup> (5) MOX Facility elements and procedures that provide physical protection of MMIS and PLC software and hardware;<sup>240</sup> and (6) the use of automation in the MOX Facility.

Applicant's witnesses testified that "[b]y using automated systems, [Applicant] is able to significantly reduce the potential for human errors that could adversely affect the accuracy of

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material balance, MC&A, and non-IROFS, defense-in-depth criticality prevention. See Tr. at 1202-03 (Bell) (providing testimony on the multiple purposes of the MMIS). Even if Intervenors' claim were true, that does not support a challenge to the adequacy of the use of NQA-1.

<sup>238</sup> Applicant Supplemental Direct Testimony at 10 (stating that "[t]he goal of the in-plant testing is to demonstrate that the MOX Facility components, process units, and systems meet their functional requirements, and that the Facility is ready to accept radioactive material").

<sup>239</sup> Tr. at 1155 (Bell) (explaining the reliability of the hardware of the computer systems used for item monitoring. He explained that the PLCs, which control the MOX process at a local level, are digital computers that have been used in industry since the late 1960s. The PLCs are ruggedly designed to operate in a wide range of environments, including extended temperature ranges, dusty, vibrating and noisy environments, and have no moving parts, such as disk drives or fans. Moreover, the PLCs execute pre-programmed instructions on movement of items and retain item movements in memory; thus information recorded in PLC memory can then be called upon to identify the location of items in storage. And, PLC memory is non-volatile, solid state with battery back-up, "[s]o, even if [the MOX Facility] lost total power, with the battery, [PLCs] will retain memory for six months."). As to the MMIS, Mr. Bell testified that it is "comprised of two redundant servers, each with its own disk array, which are mirrored, which means they are kept identical at all times." Tr. at 1149 (Bell). And the servers are in separate locations, each has an uninterruptable power supply, and each can perform all of the MMIS functions "alone indefinitely." See Applicant Direct Testimony at 39.

<sup>240</sup> See Applicant Direct Testimony at 10-18, 53-55 (describing MOX facility features that, in addition to external barriers, provide physical protection, including: the "two-person rule," which prohibits any single individual from having access to SSNM; "separation of duties," which prohibits any person from having access to both MC&A records and SSNM; "compartmentalization," which limits the SSNM to which individuals have access; and protection of individual SSNM items via individual tamper-safing, encapsulation, placement in a vault or PCAA that provides protection at least equivalent to tamper-safing, containment boundaries or some combination of the above).





integrity, periodic review, auditability, and traceability.<sup>250</sup> Mr. Pham also testified that Section 4.9 of Applicant's 2010 FNMCP discusses measures proposed by Applicant to prevent human error and reduce the likelihood of data falsification.<sup>251</sup> Staff witness, Mr. Grice, concluded that Applicant's approach not only meets the requirements of the rule, but is an improvement on more conventional means of item monitoring.<sup>252</sup>

Mr. Pham further testified that "[t]here 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)."<sup>253</sup>

**ii. Board Determination on Quantitative Accuracy of Applicant's Data**

**(1) Board Finding Regarding the Standard for Determination of Accuracy**

For the reasons set out previously we find that there is a general overarching requirement that Applicant's item monitoring method be sufficiently accurate to provide reasonable assurance that the specific regulatory requirement of 10 C.F.R. § 74.55(b)(1) is satisfied.<sup>254</sup> Thus, because there is no applicable explicit standard of accuracy set out in our regulations, the standard by which the determination as to whether Applicant's methodology is satisfactorily accurate is whether or not that methodology provides reasonable assurance that the explicit requirements of that regulation are met.

For the reasons that follow, we find that a preponderance of evidence in the record demonstrates that Applicant's item monitoring approach, when taken together with the supporting programs and the MMIS Verification Procedure, satisfies the "reasonable assurance" standard.

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<sup>250</sup> See MOX Fuel Fabrication Facility MC&A FNMCP, Chapter 4.6 (Apr. 2010) (Exh. NRC000010).

<sup>251</sup> See Staff Reply Testimony at 2; see also MOX Fuel Fabrication Facility MC&A FNMCP, Chapter 4.9 (Apr. 2010) (Exh. NRC000011).

<sup>252</sup> See Tr. at 1829 (Grice) (stating that "I do personally, professionally believe it is better").

<sup>253</sup> Staff Reply Testimony at 3.

<sup>254</sup> See supra at Part III.A.



Applicant intends to use to verify the accuracy of the MMIS and PLC data” was not evident.<sup>256</sup>

The Board noted that Applicant’s FNMCP called for the future development of an “MMIS Item Verification Procedure” to “verify the reliability of the MMIS to conduct . . . item monitoring tests,” and that Applicant had not “set forth and memorialize[d] a plan to verify the accuracy of the data generated by the PLCs and MMIS.”<sup>257</sup> Therefore, the Board asked Applicant to provide:

a document, accompanied by supporting testimony and evidence, setting forth the approach to and criteria underlying its planned process for verifying the accuracy of the data generated by the PLCs and MMIS throughout the life of the MOX Facility. The Applicant may provide an amendment to the 2010 FNMCP, or a similarly consequential document of its choosing [that is] easily identifiable and enforceable . . . .<sup>258</sup>

While Applicant and Staff take the position that there is no such requirement,<sup>259</sup>

Applicant nonetheless provided a response to the question by accelerating and completing development of the “MMIS Item Verification Procedure,” which it had committed to provide in FNMCP Section 2, to proceduralize Applicant’s approach for verifying the accuracy of its MMIS and PLC data used for item monitoring.<sup>260</sup> Applicant satisfied this compliance item by providing this newly developed procedure.<sup>261</sup> Applicant also provided a page change revision to the

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<sup>256</sup> Order Requesting Further Information at 10.

<sup>257</sup> Id. at 11.

<sup>258</sup> Id. at 12.

<sup>259</sup> Applicant Supplemental Statement of Position at 10-11; NRC Staff’s Response at 4. See Tr. at 1662 (Klukan) (stating that “[b]oth the MOX Services and the staff are of the position that the additional information requested by the Board is not required by the regulations”); Tr. at 1667-68 (“Q (Abramson): Just let me make sure I understand the staff’s position. I think it’s pretty clear, that there’s two issues here. The fundamental legal question is what’s required here. And that, in my mind, overrides everything. Then there are technical questions about what was submitted which the members of the Board want to address. But that’s a second issue and there’s still the primary issue of the legal requirement for this information. Is that right? A (Klukan): That is correct, Your Honor. I think that’s the staff’s position. Q (Abramson): And do I read the Applicant’s pleadings to essentially say the same? A (Jones): That’s correct, Your Honor.”).

<sup>260</sup> See FNMCP Chapter 2 at 127.

<sup>261</sup> See SSNM Procedure; see also FSER Supplement at 4.

FNMCP that, among other things, explains this verification approach and removes the associated compliance item.<sup>262</sup>

The revised FNMCP also specifically commits Applicant to take actions to ensure the accuracy of item identity and location data provided by the MMIS and PLCs. This includes commitments to various preoperational development and testing activities, as well as routine verifications of the accuracy of the data during operations.

These routine operational verifications, states Applicant, will involve physically retrieving items, reading unique item identifiers, and comparing that information to the data retained by the PLCs. Additionally, the information stored in the PLCs will be compared against the information in the MMIS during the nightly mapping reconciliation. The number of item verifications conducted will be comparable to that required to detect a 3% data defect rate at a 99% confidence level (a conservative industry standard discussed below). Applicant will verify enough items to meet that target quantity every thirty days. Applicant's accompanying testimony and new procedure provided details about this verification process.<sup>263</sup>

The Staff's guidance recognizes that process operations are a valid mechanism for verifying the presence of an item. Specifically, NUREG-1280, Section 2.1.7 states that "[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."<sup>264</sup>

Intervenors do not challenge this proposition. As indicated earlier, at the first evidentiary hearing, Intervenors' witness, Dr. Lyman, addressed process operations as a means to verify

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<sup>262</sup> FNMCP Revised 2 at 127.

<sup>263</sup> See Applicant Supplemental Direct Testimony at 13-17; SSNM Procedure.

<sup>264</sup> Division of Fuel Cycle Safety and Safeguards, Office of Nuclear Material Safety and Safeguards, Standard Format and Content Acceptance Criteria for the Material Control and Accounting (MC&A) Reform Amendment, NUREG-1280, at 29 (Rev. 1 Apr. 1995) (Exh. APP000030) [hereinafter NUREG-1280 Chapters 2-3].

the accuracy of PLC data. Dr. Lyman took issue with this approach only to the extent that, based on the information available to him at that time, he believed that the number of items moving through processing would be insufficient to verify the data systems:

we don't believe that simple normal operations gives you the necessary throughput of items that would naturally lead to an accurate verification of the PLC information.<sup>265</sup>

Applicant addressed Dr. Lyman's concern regarding the number of verifications by requiring in its new procedure that MC&A personnel must determine the number of items that must be verified in a 30-day period to equate to a number that, for a statistical sampling test, would detect a 3% data defect rate with a 99% confidence level.<sup>266</sup> The procedure then provides that MC&A personnel will determine the number of items that are physically accessed in each storage location, identified, and compared to PLC records during process operations. Applicant stated in its procedure that it will physically access and confirm the presence of an additional number of items if doing so is necessary to satisfy its statistical test.<sup>267</sup>

Applicant explained that its "test parameters in no way indicate that an error rate of 3% is acceptable . . . [t]hey simply are test parameters utilized as tools to quantify the data accuracy confidence."<sup>268</sup> And, in setting values for the test parameters, Applicant stated that it (1) looked to accepted and available industry standards for similar types of activities, and (2) applied the

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<sup>265</sup> Tr. at 1237 (Lyman). Similarly, at the supplemental hearing, Dr. Lyman testified: "I do think that if you are conducting a verification of the accuracy of the MMIS and PLC data, that the data that you acquire through certain process operations and movements on a case-by-case basis could be used to verify the data in the computer." Tr. at 1756 (Lyman).

<sup>266</sup> See generally Applicant Supplemental Direct Testimony at 16-17; SSNM Procedure; see also Tr. at 1914 (King).

<sup>267</sup> SSNM Procedure at 8.

<sup>268</sup> Applicant Supplemental Direct Testimony at 16.

most stringent sampling parameters used in connection with Physical Inventories of Category I SSNM or for verification of material quantities.<sup>269</sup>

No written testimony or evidence was presented by Intervenors on this topic.

We explored Applicant's choice of a 3% data defect rate at the supplemental hearing. Applicant's witness, Mr. Clark, testified that "three percent represents the detection target,"<sup>270</sup> and that

the detection target of three percent of the data is similar to the 5kg target [from 10 C.F.R. § 74.55(b)(1)], a number that you used in the other formula that's in [NUREG-1280]. Those are parallel terms. Just like it doesn't mean that it's okay to lose 5kgs of SNM material because we have 5 kgs as the detection target there. Similarly, the three percent doesn't mean it's okay to have three percent defect. In fact, when you calculate your sample size, the first defect you have you fail the test.<sup>271</sup>

Applicant's witness agreed with Judge Trikouros' inquiry into whether the relevance of the defect rate could be stated as follows:

[The 3% data defect rate is] used to calculate the number of item movements required. That's to me the key. They will use that number to come up with the number of process moves that they need to do. . . . The defect rate appears to be one number that goes into the equation. And I've seen these equations. . . . So that's it. If you can't come up with a physical reason for it, it doesn't matter, because it's the outcome that I think is important. . . . And in that equation you would have to say how many failures you would accept and the answer's going to be no, zero failures.<sup>272</sup>

### **(3) Board Finding on Applicant's Proposed Accuracy Standard**

While Intervenors questioned the use of existing DOE criteria for selecting the 3% data defect rate and 99% confidence level parameters,<sup>273</sup> Intervenors cite no alternative standard and provide no testimony or evidence challenging the technical validity of Applicant's use of this

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<sup>269</sup> See *id.* at 14-15.

<sup>270</sup> Tr. at 1913 (Clark).

<sup>271</sup> Tr. at 1913-14 (King).

<sup>272</sup> Tr. at 1921-22 (Trikouros).

<sup>273</sup> Intervenor Consolidated Response at 12 n.3.

DOE criteria. This use, according to Applicant, is appropriate as there is no NRC standard for evaluating item monitoring data accuracy. Applicant's witnesses testified that they had researched, but found no precedent for, a requirement for an item monitoring data verification process, and it therefore used "industry standard practices for activities such as item monitoring, verification or confirmation measurements, and physical inventories."<sup>274</sup> Intervenors provided no evidence challenging the adequacy of Applicant's procedure.<sup>275</sup> Staff provided evidence supporting Applicant's position, and concluded that the procedure provided "sets out a robust process for both verifying the accuracy of SSNM item identity and location data provided by the MMIS and PLCs, and confirming the accuracy of the item monitoring tests."<sup>276</sup>

NRC regulations do not set forth any quantitative standard to measure the acceptability of this methodology; therefore the applicable standard is whether it provides reasonable assurances for the accuracy of the data. We find that, in creating a statistical test for a process for which no standard exists in NRC regulations, Applicant has appropriately looked to similar industry tests and conservatively applied the most stringent parameters of those tests. We therefore conclude that there is reasonable assurance that Applicant's use of the DOE procedure is sufficient to support the accuracy of the data from which reasonable assurances of satisfaction of the regulatory criteria are to be measured.

By describing its approach and criteria for its verification process in testimony and a revision to the FNMCP, and by providing the applicable procedure, Applicant has satisfied the Board's request and addressed its concerns. Because they have done so, and thereby strengthened their application, we need not address their assertion that they should not have been required to supply the additional information.

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<sup>274</sup> Applicant Supplemental Direct Testimony at 14.

<sup>275</sup> See Tr. at 1671 (Curran) (stating that "in our view, the Applicant has not given us anything new that would show that it satisfies the regulations. We do not need to submit evidence.").

<sup>276</sup> Staff Supplemental Testimony at 7; see generally id. at 6-8.

Intervenors provide nothing that would contradict Applicant and NRC Staff testimony or challenge a conclusion that the preponderance of evidence in the record demonstrates that the reasonable assurance test is met. This evidence includes information about the design of the MMIS and PLCs, the physical protection features that preserve the integrity of the MMIS and PLCs, and the ways through which Applicant can prevent and detect errors in MMIS and PLC data, including the new verification procedure.

For the foregoing reasons, we agree with Applicant and the Staff, and conclude that Applicant's item monitoring approach, as enhanced by the newly provided (in response to our June 29, 2012 Order) item verification procedure, provides reasonable assurance that the quantitative accuracy of the MMIS/PLC data is sufficient to enable the procedures employing that data to meet the requirements in § 74.55(b)(1).

**7. Additional Matters**

**a. Proposal for Further Assurance of Item Monitoring Accuracy**

During the May 21, 2013 supplemental hearing, Applicant provided testimony and discussion that suggested the possibility of Applicant committing to some further form of MMIS and PLC data accuracy verification that would involve greater "physical" involvement.<sup>277</sup>

Following the hearing, Applicant responded to the Board's follow-up request about that possibility. In a letter dated June 12, 2013, Applicant offered to establish an additional data accuracy verification process involving Operations personnel visually verifying unique identifiers from a sample of items for the period during which bi-monthly Physical Inventories are required by 10 C.F.R. § 74.51(d).<sup>278</sup>

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<sup>277</sup> See Tr. at 1942-44 (King, Farrar, Silverman, Abramson, Jones).

<sup>278</sup> Letter from Kelly Trice, President and COO of Shaw AREVA MOX Services, LLC, to the Atomic Safety Licensing Board, Regarding MOX Services' Commitment in Connection with Contention 9 (June 12, 2013).

We appreciate Applicant's consideration of our request and proposed commitment. However, we have determined that such a commitment would not add appreciably to what it is already doing during the period of bi-monthly physical inventories, which meets the applicable requirements without the suggested additional operator verification.<sup>279</sup>

**b. Additional Intervenor Challenges and Concerns**

Throughout this proceeding, Intervenors have raised additional concerns regarding Applicant's proposed approach for verifying item presence that are beyond the scope of this proceeding.<sup>280</sup> The Board addressed and resolved many of those concerns as Intervenors raised them.

**i. Threats from Adversaries**

Intervenors would have us find that there is a need to "quantify the potential for an adversary to take measures to conceal any abnormalities [in MMIS and PLC mapping]."<sup>281</sup> No such requirement can reasonably be found in (or implied by) the language of § 74.55(b)(1). Nowhere does the rule require or even suggest such quantification is necessary.<sup>282</sup> Intervenors have provided no evidence in support for their position. We conclude that there is no such requirement in our regulations.

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<sup>279</sup> We note that the Commission recently announced it is planning to conduct a future rulemaking involving consideration of a two-person rule to verify the accuracy of MC&A information within a fuel cycle facility. 78 Fed. Reg. at 67,226.

<sup>280</sup> See e.g., Shaw AREVA MOX Services, LLC's Proposed Findings of Fact and Conclusions of Law for Contentions 9, 10, and 11 (Apr. 13, 2012), at 43-45 (discussing Intervenors' Euratom reference, the Board's conclusion that Euratom requirements are not binding on Applicant, and also Applicant's testimony that Euratom requirements are not relevant to the item monitoring requirements at issue in the admitted contentions); id. at 34-35 (evaluating an Intervenor exhibit, presented at the initial hearing, and concluding that it is not relevant because it pertains to Applicant's business software and that the vulnerabilities of that software do not exist for MMIS or PLC software).

<sup>281</sup> Intervenor Proposed Cumulative Findings at ¶ 4.36.

<sup>282</sup> See 10 C.F.R. § 74.55(b)(1).

**ii. Impact of the Withdrawn Exemption Request**

Intervenors asserted, based upon information contained in superseded versions of the FNMCP and the withdrawn Exemption Request, that Applicant cannot meet the item monitoring requirements of 10 C.F.R. § 74.55(b)(1).<sup>283</sup> Those documents predate and are not at issue in Contentions 9, 10, and 11 and are not part of Applicant's pending license application.<sup>284</sup> We find no merit in Intervenors' concerns respecting these prior documents.

**iii. Cyber Security Concerns**

Intervenors also expressed concern respecting the absence of NRC requirements for cyber security for fuel cycle facilities. Applicant's witnesses testified that Applicant specifically committed in the FNMCP that the MOX Facility Software Security will meet DOE's National Nuclear Security Administration ("NNSA") cyber security standards.<sup>285</sup> The software is under development on a computer network that is also certified and accredited to those standards.<sup>286</sup>

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<sup>283</sup> See Intervenor Direct Testimony at A.6(1, 4), A.7(3) (citing the timing commitments and other features in prior iterations of the FNMCP and Exemption Request).

<sup>284</sup> Tr. at 1881 (Abramson) (stating that "[t]he FNMCP that's presently before the Board [is] what we should be considering").

<sup>285</sup> Applicant Reply Testimony at 20-21; Applicant Supplemental Direct Testimony at 11-12 (discussing that the cyber security policy to which Applicant has committed -- NNSA NAP 14.2C -- requires that Applicant document the information system baseline and inventory the system's constituent components. Applicant states that it will routinely confirm that the software that manages MMIS and PLC data is the current approved software and that the software has not been changed in an unauthorized fashion.). The configuration management software is subject to the same protections for MOX Facility software that Applicant's witnesses described. See Applicant Supplemental Reply Testimony at 3 (explaining that protections for MOX Facility software apply to the configuration management software as well), including: (1) life cycle controls and testing in accordance with NQA-1, Applicant Supplemental Direct Testimony at 5-10 (discussing controls on software development); (2) access that is limited by separation of duties, *id.* at 50 (explaining that, because of Applicant's use of separation of duties and the two-person rule, corruption of item monitoring data would require a team of at least eight individuals); and (3) application of DOE's cyber security policy, *id.* at 37-40 (describing the electronic and cyber security measures at the MOX Facility).

<sup>286</sup> Applicant Reply Testimony at 22.

At the supplemental hearing, Intervenors raised a concern that the NRC has not yet adopted any cyber security requirements for fuel cycle facilities licensed under 10 C.F.R. Part 70. Intervenors claim “cybersecurity is fundamental to the Board’s licensing determination.”<sup>287</sup> However, Intervenors provided no evidence on the matter and did not raise this concern before the supplemental hearing.

Applicant and Staff agreed that the NRC has no cyber security requirements for fuel cycle facilities, but explained that the MOX Facility is contractually obligated to adhere to DOE’s cyber security standards.<sup>288</sup> Applicant provided extensive testimony about its cyber security provisions in the context of Contention 11.<sup>289</sup> Applicant committed in NRC licensing documents to adhere to the full suite of DOE cyber security standards,<sup>290</sup> and the NRC can inspect against

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<sup>287</sup> Tr. at 1857 (Curran).

<sup>288</sup> See Tr. at 1750 (Klukan) (stating that “the Applicant is required by DOE regulations to conform to the DOE Manual regarding cybersecurity which is very stringent.”).

<sup>289</sup> See, e.g., Applicant Supplemental Direct Testimony at 37-40. Mr. Bell testified:

in the FNMCP plan, we’ve made very specific references that I’ve also repeated in our written testimony submitted for this hearing on the cybersecurity rules we’re meeting which the Department of Energy’s, the two different NAPS, one for cyber systems and accreditation systems and for classified systems. In no uncertain terms, these are very strong cybersecurity requirements that we’re meeting and we did not decide to do those because we’re using this computer system for MC&A. We use that because this is a plutonium facility that we have to meet -- we have the Government’s plutonium, so we have to meet a very high level of cybersecurity. I held this back earlier because you were asking the question about Part 73 guidance for cybersecurity which is true. But the DOE standards which are also in line with the national standards NIST 800.53. We have a high level of cybersecurity built from the beginning into our system.

Tr. at 1742-43 (Bell).

<sup>290</sup> See FNMCP Chapter G.3.4.12 at 15; see also Applicant Reply Testimony at 20-21; Tr. at 1849 (Clark) (stating that “it is a commitment and it’s an enforceable commitment . . . in an NRC licensing document”); Tr. at 1759 (“Q (Trikouros): Are you picking and choosing or are you really meeting a full DOE standard for a computer system? A (Bell): We’re meeting the full standard. DOE requirements apply to the entire information system.”).

and enforce Applicant's commitment.<sup>291</sup> Although the NRC does not currently have cyber security requirements in place for fuel cycle facilities, the NRC is in the process of initiating a rulemaking on this very matter.<sup>292</sup> But the fact that the NRC lacks its own cyber security requirements for fuel cycle facilities is beyond the scope of Contentions 9, 10, and 11. Furthermore, it is well established that licensing proceedings are not the appropriate venue for generic issues, especially those that are about to become the subject of a rulemaking.<sup>293</sup> Thus, we conclude that the question of whether or not the NRC may license the MOX Facility without NRC cyber security regulations in effect is beyond the scope of this proceeding and not relevant to our determination on the contentions before us.

## 8. Conclusion

We find that Applicant's proposed item monitoring system, including the data recorded by the computer systems, satisfies the requirements of the relevant regulations. Accordingly, we hold that Contention 9 is resolved in Applicant's favor.

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<sup>291</sup> See Tr. at 1844 (Tiktinsky).

<sup>292</sup> See SECY-12-0088, The Nuclear Regulatory Commission Cyber Security Roadmap at 4-5 (June 25, 2012) (discussing the NRC's approach for a rulemaking on cyber security requirements for fuel cycle facilities); see also Cyber Security Initiative for Fuel Cycle Facilities (available at <http://www.nrc.gov/security/domestic/phys-protect/reg-initiatives/fuel-cycle-cyber-security.html>) (Mar. 28, 2013).

<sup>293</sup> Southern Nuclear Operating Co. (Vogtle Electric Generating Plant, Units 3 and 4), CLI-11-8, 7 N.R.C. 214, 228-29 (2011) (reaffirming that "a contention that . . . seeks to litigate a matter that is, or clearly is about to become, the subject of a rulemaking, is inadmissible") (citation omitted). See Sacramento Mun. Util. Dist. (Rancho Seco Nuclear Generating Station), ALAB-655, 14 NRC 799, 816 (1981) (instructing that matters that are or are about to become the subject of a general rulemaking are not appropriate subjects for contentions before individual licensing boards); Potomac Elec. Power Co. (Douglas Point Nuclear Generating Station, Units 1 and 2), ALAB-218, 8 AEC 79, 85 (1974) ("[C]onsideration in adjudicatory proceedings of issues presently to be taken up by the Commission in rulemaking would be, to say the least, a wasteful duplication of effort" (emphasis added)).

**B. Contention 10**

**1. Text of Contention 10**

As admitted by the Board, Contention 10 asserts:

The Revised FNMCP is inadequate to satisfy the alarm resolution requirements in 10 C.F.R. § 74.57(b), which requires that licensees “shall resolve the nature and cause of any MC&A alarm within approved time periods.” In the event that alarm resolution requires an inventory of one of the four item storage areas identified in [Applicant’s] December 17, 2009 Exemption Request, [Applicant] has not demonstrated that it can meet its commitment to normally resolve the alarm within three days.<sup>294</sup>

**2. The Relevant Regulation**

Contention 10 challenges Applicant’s compliance with 10 C.F.R. § 74.57(b), which requires applicants to “resolve the nature and cause of any MC&A alarm within approved time periods.” The regulation requires applicants applying to possess five or more formula kilograms of SSNM to maintain alarm resolution capabilities designed to achieve the performance objectives of § 74.51(a).<sup>295</sup> An MC&A alarm exists when there is:

(1) an out-of-location item or an item whose integrity has been violated, (2) an indication of a flow of SSNM where there should be none, or (3) a difference between a measured or observed amount or property of material and its corresponding predicted or property value that exceeds a[n established] threshold . . . .<sup>296</sup>

The regulation provides no guidance as to what constitutes an appropriate time period for alarm resolution. Thus, in its FNMCP, an applicant may propose a time period for alarm resolution, which must be approved by the NRC Staff. The fact that a time period has been approved by the NRC Staff does not, however, ensure that an applicant’s commitment satisfies the

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<sup>294</sup> Contention Text Order at 1.

<sup>295</sup> See 10 C.F.R. § 74.51(a) and § 74.57(a). The capability to resolve alarms within approved time periods is most clearly aimed at the “[p]rompt investigation of anomalies potentially indicative of SSNM losses.” 10 C.F.R. § 74.51(a)(1).

<sup>296</sup> 10 C.F.R. § 74.4.

regulation. Ultimately, the time period approved by the NRC Staff must be adequate to provide reasonable assurance that Applicant will achieve the performance objectives.

**3. Issues Raised by Contention 10**

**a. Acceptability of Applicant's Alarm Resolution Commitment**

The first issue raised by Contention 10 is whether Applicant's alarm resolution commitment, which has been approved by the NRC Staff, satisfies the regulatory requirement of § 74.57(b).

**b. Applicant's Ability to Conduct an Inventory for Alarm Resolution**

The second issue raised by Contention 10 is whether, in the event that an inventory is necessary for alarm resolution, Applicant would be able to conduct a complete inventory within the approved time period.

**c. Normal Conditions Subject to the Approved Time Period**

The final issue raised by Contention 10 is whether the inclusion of the term "normal" within Applicant's approved time period for alarm resolution creates a potential opt-out from regulatory compliance during any condition that is considered abnormal.

**4. Acceptability of Applicant's Alarm Resolution Commitment**

Section 3.1.3 of Applicant's FNMCP commits that "[t]he alarm resolution procedures of Sections 3.1.1.4 and 3.1.4.1 of [the FNMCP] will normally be completed within three calendar days after an item is declared missing."<sup>297</sup> Applicant identified twelve procedures or methods it intends to use, alone or in combination, to resolve an alarm within three days.<sup>298</sup> In Section

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<sup>297</sup> FNMCP Chapter 3 at 152.

<sup>298</sup> See id. at 147. In his direct testimony, Dr. Lyman suggested that Applicant's approach to alarm resolution should also include a review of the computer code for MMIS. See Intervenor Direct Testimony at A.6(5). Mr. Pham stated that Staff did not require Applicant to adopt code review as an alarm resolution method. See Staff Reply Testimony at 8. Applicant's and Staff's witnesses claim that review of the MMIS computer code would neither facilitate alarm resolution nor provide any further insight beyond that which would be provided by a record review. See Applicant Reply Testimony at 35 (Mr. Bell testified that "[a] software error would be revealed by corrupted or errant data identified during the records review without a review of the code. A



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.’”<sup>303</sup>

**iii. NRC Staff’s Position**

NRC Staff’s witness, Mr. Pham, testified that Applicant’s proposed alarm resolution procedures are consistent with the guidance set out in Chapter 3 of NUREG-1280 regarding alarm resolution time commitments.<sup>304</sup> Mr. Pham offered support for Applicant’s position by testifying that “MOX Services can use any method, or multiple methods, to resolve any alarm within [the] approved time period. A physical inventory of a storage vault is not the sole method for resolving an item alarm.”<sup>305</sup> Rather, according to Mr. Pham, Applicant may “use any number of alarm resolution methods so long as the applicant provides reasonable assurance that an available alarm resolution method or a combination of methods can meet the timing commitments.”<sup>306</sup>

**b. Board Determinations**

Section 74.57(b) contains no regulatory requirement that MC&A alarms be resolved within any particular timeframe, and requires only that a time period be approved by NRC Staff.<sup>307</sup> Here, Applicant proposed a plan to resolve alarms “normally . . . within three calendar days after an item is declared missing,”<sup>308</sup> which the NRC Staff approved. Applicant proposes a suite of procedures which can be performed individually or in combination to resolve alarms,<sup>309</sup>

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<sup>303</sup> Applicant Direct Testimony at 59.

<sup>304</sup> Staff Direct Testimony at 14-16; Tr. at 1455-56 (Pham).

<sup>305</sup> Staff Reply Testimony at 8; see also Staff Direct Testimony at 16.

<sup>306</sup> Staff Direct Testimony at 16.

<sup>307</sup> 10 C.F.R. § 74.57(b).

<sup>308</sup> FNMCP Chapter 3 at 152; see also FSER at 13–7.

<sup>309</sup> See Applicant Direct Testimony at 63-66.

but Contention 10 alleges only that Applicant cannot meet the approved time period by one of its proposed methods -- an inventory. Our reading of the regulations reveals no regulatory requirement that Applicant must resolve an MC&A alarm by means of an inventory.<sup>310</sup> As we noted several times above, when a performance-oriented regulation fails to specify a particular method for compliance, an applicant may choose any method that provides reasonable assurance that compliance will be achieved. We see no support for the proposition that Applicant must demonstrate that each individual resolution method can be completed, by itself, within the approved time period.<sup>311</sup>

The Board finds that Applicant has provided reasonable assurance that its proposed alarm resolution procedures, as a group, can resolve MC&A alarms within the three day period to which Applicant has committed.

**5. Applicant's Ability to Conduct an Inventory Within Approved Time Period**

Notwithstanding the foregoing finding, we also consider whether Applicant has provided reasonable assurance that it can resolve an alarm within three days if resolution requires an inventory.

**a. Parties' Positions**

**i. Intervenors' Position**

Intervenors assert that Applicant must demonstrate the ability to complete an inventory within three days. In support of this claim, Intervenors point to Mr. Pham's acknowledgment that "an inventory may be necessary 'in unusual circumstances.'"<sup>312</sup> Dr. Lyman posited, though the

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<sup>310</sup> This is indeed the approach that Staff took in its review. See, e.g., Staff Direct Testimony at 16; Tr. at 1446 (Pham).

<sup>311</sup> See 10 C.F.R. § 74.57(b); 52 Fed. Reg. at 10,033.

<sup>312</sup> See Intervenor Reply Statement of Position at 8.

need for an inventory may be rare, when necessary, Applicant could not resolve an alarm within three days and, therefore, cannot satisfy its approved timeframe commitment.<sup>313</sup>

**ii. Applicant's Position**

Applicant's witnesses assert that storage vault inventories for alarm resolution would be rare, occurring only "where a discrepancy may involve a relatively large storage location or population of items and where the integrity of the inventory perimeter protection is in question."<sup>314</sup> Ms. King testified that more typically alarms are caused when items are moved manually without corresponding updates to the MMIS records.<sup>315</sup> Applicant's witnesses described how Applicant will focus alarm resolution efforts on the storage areas or boundaries in question, or on movements conducted since completion of the last mapping reconciliation.<sup>316</sup> For example, because Applicant would divide the inventory of nuclear material into discrete populations whose boundaries are monitored for material movement, alarm resolution can be focused narrowly on the specific population in question.<sup>317</sup> Applicant's witnesses also described specific combinations of methods -- such as access control checks, exit monitor checks, and physical inventories -- that could resolve an alarm triggered by the breach of a storage area integrity boundary.<sup>318</sup>

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<sup>313</sup> See Intervenor Direct Testimony at A.6(3).

<sup>314</sup> Applicant Direct Testimony at 66.

<sup>315</sup> See Tr. at 1443 (King).

<sup>316</sup> See Applicant Direct Testimony at 63 (noting that "the performance of the daily MMIS and PLC item mapping comparison and the daily integrity checks focus alarm resolution efforts by permitting the investigation to focus on the activities of the previous (at most) 24 hours").

<sup>317</sup> See id.

<sup>318</sup> See Applicant Reply Testimony at 35-36.



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(4) XXX<sup>329</sup> XXXXXXXXXXXXXXXXXXXXXXX

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XX<sup>332</sup> XXXXXXXXXXXXXXX, Applicant's witnesses suggested the following three reasons why their capabilities satisfy the alarm resolution commitment.

First, the witnesses claimed that maximum capacity XXXXXXXXXXXXX is not an expected condition. They testified that the "number of items normally in storage is taken from an engineering calculation used for sizing of the vaults. The 'normal' capacity is based on assumed lag between upstream and downstream processes from the storage area. XXXXXX, the planned [PuO2 container] receipt schedule from NNSA was used."<sup>333</sup>

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<sup>327</sup> See Applicant Direct Testimony at 67, Table 2; XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  
XX.

<sup>328</sup> See Applicant Direct Testimony at 26 (XX  
XXX).

<sup>329</sup> See id. at 67, Table 2; MOX Capacity at 9; MOX Capacity Update at 3.

<sup>330</sup> See Applicant Direct Testimony at 67, Table 2; XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  
XX.

<sup>331</sup> See Applicant Direct Testimony at 23 (XX  
XXXXXXXXXXXXXXXXXXXX).

<sup>332</sup> Id. at 67, Table 2.

<sup>333</sup> Id. at 67.



XXXXXXXXXXXXXXXXXXXX<sup>340</sup> According to Applicant’s witnesses, in this situation, Applicant could reasonably complete an inventory of such a subsection within three days.<sup>341</sup>

**iii. NRC Staff’s Position**

NRC Staff’s witness, Mr. Pham, agreed that the need for an inventory for alarm resolution would be rare.<sup>342</sup> He further agreed that “[o]ne of the most common causes of MC&A alarms is human error in recordkeeping.”<sup>343</sup> Mr. Pham supported Applicant’s proposition that a combination of alarm resolution procedures can typically resolve alarms caused by recordkeeping in only a few minutes or a few hours.<sup>344</sup> Finally, Mr. Pham agreed that, if necessary, Applicant could normally complete an inventory XXXXXXXXXXXXXXXXXXXXXXXX within three days, based on the expected quantity of items in each storage area.<sup>345</sup>

**b. Board Determinations**

As discussed above, § 74.57(b) does not require an applicant to show that an alarm can be resolved within three days by the use of any particular resolution method separately. Even if an inventory were necessary, which we consider unlikely, we find that Applicant has demonstrated that it can conduct an inventory XXXXXXXXXXXXXXXXXXXXXXXX XXXXX within three days, even at full capacity. Additionally, we find that Applicant has

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<sup>340</sup> See Tr. at 1438-40 (King).

<sup>341</sup> See Applicant Direct Testimony at 67.

<sup>342</sup> See Staff Reply Testimony at 8; Tr. at 1467-68 (Pham) (claiming that an inventory is the last option to resolve an alarm). Mr. Pham went on to testify that, since an inventory was included on the approved list of alarm resolution methods, it becomes binding on Applicant to consider its use for potential alarm resolution as a part of the license. See Tr. at 1462-64 (Pham). If Applicant later decides to remove that method from the list, it would have to follow the change process prescribed by 10 C.F.R. § 70.32(c) or the license amendment process prescribed by 10 C.F.R. § 70.34. See Tr. at 1448-49 (Pham), 1464 (Silverman).

<sup>343</sup> Staff Direct Testimony at 15.

<sup>344</sup> Id.

<sup>345</sup> Id. at 17.

demonstrated its ability to conduct an inventory of the other two storage areas -- DCM and DCE -- within three days with the normal or expected number of items in these areas. Indeed, Applicant's normal capacity time estimates XXXXXXXXXXXXXXXXXXXXXXXXXXXX indicate the possibility that it could complete an inventory within three days for those two locations even if they were to contain more items than 'normally' expected. Accordingly, we conclude that Applicant has provided reasonable assurance of its ability to use an inventory to normally resolve alarms in each of the four storage areas within the three days committed to in its FNMCP.

**6. Normal Conditions Subject to the Approved Time Period**

Finally, we consider whether Applicant can satisfy its alarm resolution commitment if it takes longer than three days to complete an inventory XXXXXXXXXXXX when the storage areas are at maximum capacity. To assess that situation, we must consider whether the circumstances under which the need would arise would be "normal."

**a. Parties' Positions**

**i. Intervenors' Position**

Intervenors' witness, Dr. Lyman, alleges that Applicant's use of the term "normally" in its alarm resolution timing commitment creates an "opt-out" from regulatory compliance "should an alarm arise whenever the plant is operating under conditions that MOX Services contends are abnormal or atypical."<sup>346</sup> The basis of this view is his perception that "most alarms would actually arise under circumstances that could be considered abnormal," and his belief that "abnormal" conditions "should be confined to extreme events such as major natural disasters."<sup>347</sup>

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<sup>346</sup> Intervenor Direct Testimony at A.6(2, 6, 7). The Board pursued the meaning of the word 'normally' at some length. Due to the circumstances of this case and the manner in which the issue came before us, we need not resolve all questions raised.

<sup>347</sup> Id. at A.6(7).

Intervenors claim that a very narrow construction of what is ‘normal,’ could lead to Applicant claiming abnormal conditions exist in nearly every situation in which they are unable to meet the approved time period for alarm resolution.

**ii. Applicant’s Position**

Applicant’s witness, Mr. Clark, disputed Intervenors’ characterization of the term “normally” as an opt-out, stating his opinion that NRC Staff would require an explanation for any failure to resolve an alarm within three days:

It would be my expectation that -- and my experience bears this out, that we could normally, typically resolve an MC&A alarm in those three days. If we were unable to do that for some reason, then additional actions would result. For instance, the regulator -- I would expect that the regulator would begin to help us after that many days, and we would have a number of more questions to answer. But, typically, we can resolve those alarms in three days.<sup>348</sup>

Applicant’s witnesses interpreted the term ‘normally’ “to indicate a condition or state that is expected to be typical while the facility is in operation.”<sup>349</sup> They asserted that, “‘normal’ values and conditions can be contrasted with design parameters, maximum/minimum capacities, worst-case analyses, etc., which bound the ‘normal’ values, but are generally more extreme than the ‘normal’ values expected during facility operation.”<sup>350</sup>

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<sup>348</sup> Tr. at 1435 (Clark). 10 C.F.R. § 74.57(c) requires notification of the NRC within 24 hours of failure to resolve an alarm within the approved time period. Mr. Pham asserted that the NRC would then determine what response actions were necessary to resolve the event. See Tr. at 1459-60 (Pham). Mr. Grice also noted that “if you don’t have that resolved in three days you start to question, do you have a bigger issue that requires a more thorough, larger, greater scale of investigation into what’s happening” Tr. at 1930 (Grice).

<sup>349</sup> Applicant Direct Testimony at 61-62 (stating that Applicant will be able to resolve an alarm within three days in “most cases,” and that “[t]ime frames in excess of three calendar days would be considered unusual”).

<sup>350</sup> Id. at 62. Additionally, Ms. Williams testified that from a practical standpoint “[l]icensees cannot commit to always resolve alarms within a certain time frame” and that use of the term “normally” is entirely appropriate in light of NRC guidance. Applicant Reply Testimony at 32.

**iii. NRC Staff's Position**

Mr. Pham agrees with Applicant's use and interpretation of the term 'normally.'<sup>351</sup> At the supplemental hearing, Mr. Grice also put "normally in three days" in context by testifying that "[w]hen you have an item that is missing and it's been tamper-safed or is encapsulated, or it's been in a physical protection form such as a vault, you would expect that if that shows up as missing there will be sufficient evidence to resolve that within three days."<sup>352</sup> Thus, he states, "[i]t would be unusual that a facility would not be able to resolve that issue within three days and find out what happened."<sup>353</sup> Mr. Pham also asserted that NRC MC&A inspectors would review Applicant's alarm response and determine whether it met the requirements of 10 C.F.R. Part 74 and the commitments in Applicant's FNMCP.

As to the very serious event types described by Dr. Lyman as the type he would consider "abnormal," Mr. Pham asserted that "[a]bnormal 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."<sup>354</sup> Although NRC MC&A inspectors would take such events into account when investigating an applicant's failure to resolve an alarm within three days, Mr. Pham testified that such events are not part of this aspect of the licensing review.<sup>355</sup>

**b. Board Determinations**

Applicant's timing commitment -- including the term 'normally' -- derives from NUREG-1280, which states 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

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<sup>351</sup> See Staff Reply Testimony at 8.

<sup>352</sup> Tr. at 1929 (Grice).

<sup>353</sup> Tr. at 1929-30 (Grice).

<sup>354</sup> Staff Reply Testimony at 9.

<sup>355</sup> See id.

retained in a vault that provided protection equivalent to tamper-safing should normally not exceed 3 calendar days.<sup>356</sup> The guidance does not explain how licensees should use the term ‘normally.’ After review, we find that extreme events such as natural disasters are not the abnormal conditions anticipated by Applicant when it committed to resolve alarms normally within three days, nor by Staff when it approved that time period. Moreover, nothing before us convinces us that Applicant’s use of the term, and Staff’s interpretation of that use, is contradictory to a reasonable interpretation of the rule. We find that ‘normal’ conditions, during which Applicant has committed to resolve alarms within three days, are those which are reasonably to be expected for each of the storage areas.

We do not view as normal the conditions under which alarm resolution would be expected to take more than three days. We find, from the preponderance of the (indeed largely uncontroverted) evidence, that for such resolution to require more than three days and for an inventory to be necessary the following five conditions must occur simultaneously: (1) the alarm concerns material stored XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX in the MOX Facility; (2) the actual contents XXXXXXXXXXXX exceeds that which is anticipated; (3) multiple other alarm resolution methods fail to resolve the alarm; (4) an inventory of the stored items is deemed necessary to resolve the alarm; and (5) an inventory of a portion XXXXXXXXXXXX contents where the alarm would appear to be focused is inconclusive, such that the entire capacity XXXXXXXXXXXX must be inventoried. Each of these circumstances is itself an

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<sup>356</sup> NUREG-1280 Chapters 2-3, at 43-44 (emphasis added).

unexpected or unusual condition for the MOX Facility.<sup>357</sup> We find that the simultaneous occurrence of all five circumstances cannot be considered normal.<sup>358</sup>

## **7. Conclusion**

We therefore hold that Applicant has provided reasonable assurance of its ability to normally resolve alarms within its approved time period of three days, whether through a combination of alarm resolution methods or through the use of an inventory alone.

For the foregoing reasons, we decide Contention 10 in favor of Applicant.

## **C. Contention 11**

### **1. Text of Contention 11**

As admitted by the Board, Contention 11 asserts:

[Applicant] claims that in the event of alleged theft of plutonium from the [MOX Facility], it is capable of confirming the presence of a specific individual plutonium item within eight hours and verifying the presence of all Pu in item form in vault storage within 72 hours. But [Applicant] does not support this assertion with any information that would show how such confirmation and verification will be carried out in the specified timelines. In addition, as discussed above in Contentions 9 and 10, other statements by [Applicant] in its exemption application and RAI responses strongly indicate that in fact, [Applicant] is not capable of meeting these timelines with respect to certain categories of plutonium in vault storage. Therefore [Applicant] has not demonstrated that it satisfies 10 C.F.R. § [74].57(e).<sup>359</sup>

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<sup>357</sup> Dr. Lyman asserts that “minor deviations from MOX Services’ assumptions of ‘normal’ conditions could easily lead to a situation where an inventory could exceed the three calendar day time period.” Intervenor Direct Testimony at A.6(8). But the deviations suggested by Intervenor would only reduce the probable occurrence of the already unlikely scenario described above. Such a confluence, therefore, would be even farther from ‘normal’ than the circumstances we consider outside the scope of Applicant’s commitment.

<sup>358</sup> Though some hypothetical scenario may exist in which Applicant is not able to resolve an alarm within three days, this does not call into question Applicant’s compliance with its commitment.

<sup>359</sup> Contention Text Order at 1. The text of the contention, as presented by Intervenor and admitted by the Board, incorrectly cites 10 C.F.R. § 75.57(e), which does not exist. The correct reference is to 10 C.F.R. § 74.57(e), which Intervenor correctly cite in presenting the basis for the Contention. Petition at 14.

## 2. The Relevant Regulation

Contention 11 challenges Applicant's compliance with 10 C.F.R. § 74.57(e), which requires applicants to "provide an ability to rapidly assess the validity of alleged thefts"<sup>360</sup> in order to achieve the performance objectives of § 74.51(a).<sup>361</sup> Part 74 does not define 'rapidly,' and prescribes no method for assessment of alleged thefts.<sup>362</sup> The regulation, therefore, provides an applicant with the flexibility to determine the most cost-effective means of meeting the requirement. Ultimately, an applicant's proposed approach to rapid theft assessment must provide reasonable assurance that it will achieve the performance objectives.

Section 3.3 of NUREG-1280, though non-binding, establishes timing guidelines for theft assessment and suggests that an applicant should be able "to locate on demand any specific tamper-safed or encapsulated item or an unencapsulated item stored in a vault equivalent to tamper-safing within 8 hours, and to verify the presence of all items in a vault within 72 hours."<sup>363</sup> The guidance document also identifies several response methods for rapid assessment of the validity of alleged thefts.<sup>364</sup> These described capabilities suggest that facilities operate with an item control system, inventory procedures, and time estimates for inventory performance and reconciliation.<sup>365</sup>

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<sup>360</sup> 10 C.F.R. § 74.57(e).

<sup>361</sup> The capability to rapidly assess the validity of alleged thefts is most clearly aimed at the "[r]apid determination of whether an actual loss of five or more formula kilograms occurred." 10 C.F.R. § 74.51(a)(3).

<sup>362</sup> Though not defined in the regulations, NUREG-1280 defines alleged thefts to mean "alarms that originate external to the MC&A system." NUREG-1280 Chapters 2-3, at 50.

<sup>363</sup> Id. at 49.

<sup>364</sup> Id. at 48-49.

<sup>365</sup> Id.

**3. Issues Raised by Contention 11**

**a. Acceptability of Applicant’s Theft Assessment Commitment**

The first issue raised by Contention 11 is whether Applicant’s theft assessment commitment satisfies the requirements of 10 C.F.R. § 74.57(e) even though it relies upon an underlying assumption of 100% accuracy of Applicant’s MMIS/PLC computer records system.

**b. Ability to Assess in the Event of a Compromised Computer System**

The second issue raised by Contention 11 is whether, in the event that the MMIS/PLC computer records system has been compromised, Applicant must still be prepared to assess the validity of an alleged threat within its committed timelines.

**4. Acceptability of Applicant’s Theft Assessment Commitments**

**a. Parties’ Positions**

**i. Intervenors’ Position**

Intervenors assert that Applicant made a commitment in its revised FNMCP and during the initial hearing to assess the validity of alleged thefts by maintaining the capability to locate on demand a specific item within eight hours and to verify the presence of all stored items within 72 hours, based on the NUREG-1280 timelines.<sup>366</sup> Intervenors claim that Applicant backed away from this commitment, with Applicant now arguing “that NUREG-1280’s quantitative guidelines for timely detection of alleged thefts apply only to updating records systems and not actual physical location of items.”<sup>367</sup> Thus, if a physical inventory -- or even a thorough check of the presence and identity of all items -- were needed, Intervenors claim an assessment would take Applicant far longer than its time commitments.<sup>368</sup>

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<sup>366</sup> Intervenor Consolidated Response at 3.

<sup>367</sup> Id. Intervenors further argue that “this legal argument is based on an illogical and incomplete reading of the guidance.” They claim that, in responding to the board’s questions, Applicant has weakened its MC&A program instead of providing new evidence of its strength. Id. at 3-4.

<sup>368</sup> Intervenor Direct Testimony at A.7(3).

The problem, according to Intervenor's witness, Dr. Lyman, arises out of Applicant's reliance on an assumption of 100% accuracy of its computer generated records without an independent verification of the validity of the information generated by Applicant's automated systems.<sup>369</sup> Dr. Lyman suggests that by assuming accuracy, through the equating of PLC mapping data with the actual physical state of all items, Applicant effectively takes the position that no physical inventory is ever necessary, even in the face of an alleged theft.<sup>370</sup>

Intervenor's fault Applicant for focusing on the acceptance criteria of NUREG-1280 § 3.3.1, which recommends "that the records of the identity and location of every item can be updated with sufficient speed to support" Applicant's eight and 72 hour commitment.<sup>371</sup> Intervenor's suggest that the importance of record maintenance can only be understood in the context of the affirmation portion of § 3.3.1, which states that "[a] contingency capability<sup>372</sup> is maintained to locate on demand any specific tamper-safed or encapsulated item or an unencapsulated item stored in a vault equivalent to tamper-safing within 8 hours, and to verify the presence of all items in a vault within 72 hours."<sup>373</sup> In other words, Intervenor's argue that Applicant's computer records may be used to support rapid theft assessment, but would be "of little use in assessing the validity of alleged thefts unless licensees are also able to confirm that they actually have [the stored items] they expect to have."<sup>374</sup>

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<sup>369</sup> Id. at A.5(6).

<sup>370</sup> Id. at A.5(3-4).

<sup>371</sup> NUREG-1280 Chapters 2-3, at 49.

<sup>372</sup> Both parties agreed that a NUREG-1280 contingency capability is equivalent to the primary capability in the face of an alleged theft. Tr. at 1902-03 (Trikouros, Pham, Curran, Lyman).

<sup>373</sup> NUREG-1280 Chapters 2-3, at 49.

<sup>374</sup> Intervenor Consolidated Response at 16.

ii. **Applicant's Position**

Applicant's witnesses assert that reliance on the MMIS/PLC system data to meet the eight and 72 hour theft assessment commitments is legally sufficient and will verify the identity and location of all items in any storage area, XXXXXXXXXXXXXXXXXXXX, "almost instantaneously."<sup>375</sup> Applicant maintains that NUREG-1280's acceptance criteria explicitly anticipate that applicants will rely on their records systems.<sup>376</sup> In the opinion of Applicant's witnesses, the purpose of this provision in the guidance is to encourage licensees to maintain current or near-current records that can be used in an emergency theft assessment.<sup>377</sup> Accurate and current records of the facility inventory are essential to the assessment of any alleged theft, so applicants are advised to maintain their records in a condition such that the records can be updated "with sufficient speed" to support a commitment to locate one item in eight hours or all items in 72 hours.<sup>378</sup>

Applicant's witnesses point out that the eight and 72 hour capabilities exist alongside NRC regulations and guidance that ensure the integrity, redundancy, and veracity of an applicant's records system.<sup>379</sup> Applicant asserts that its commitments in FNMCP Section 3.3.1.3 regarding the integrity of its records system, its commitments in FNMCP Section 3.3.1.6 to confirm the presence of one item in eight hours and all items in 72 hours, and all of its many

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<sup>375</sup> Applicant Direct Testimony at 72-73.

<sup>376</sup> See NUREG-1280 Chapters 2-3, at 49.

<sup>377</sup> Applicant Supplemental Direct Testimony at 30-32. Without up to date knowledge of what SSNM is expected to be present on site, it would be impossible to assess what SSNM might be missing in the face of an alleged theft.

<sup>378</sup> NUREG-1280 Chapters 2-3, at 49.

<sup>379</sup> Applicant Supplemental Direct Testimony at 29-30. For example, Applicant's FNMCP describes how the integrity of MC&A data is maintained. See FNMCP Chapter 3 at 152-53.

other commitments in FNMCP Section 3.3 collectively “establish[] the integrity of its records system” such that it may assume its accuracy for the purposes of theft assessment.<sup>380</sup>

Applicant’s witnesses testified that theft assessment does not end after the initial eight and 72 hour period during which the validity of an alleged theft is determined.<sup>381</sup> Rather:

[a]lthough MOX Services has committed to be able to locate one item in vault storage in 8 hours and all items in vault storage in 72 hours through the use of its MMIS and PLC records systems (in accordance with the specific acceptance criterion in NUREG-1280, Section 3.3.1), there is nothing in the regulation or guidance that requires MOX Services to complete all of the actions it would take to, more broadly, assess an alleged theft, in 8 or 72 hours. And there are, indeed, other actions MOX Services would take to assess an alleged theft. While the Staff guidance uses the ability of an applicant’s records system to identify one item and all items in vault storage in 8 hours and 72 hours respectively to gauge the applicant’s ability to rapidly assess an alleged theft, it does not require or anticipate that all other actions to be taken to assess an alleged theft must also be completed in those time frames.<sup>382</sup>

At the supplemental hearing, Ms. King testified that:

the guidance and the requirements aren’t set up to resolve [an alleged theft] using those techniques, they are to show you have the capability to do those things so that the NRC has confidence that you have the capability to rapidly assess an alarm that will encompass those tasks in part, but maybe a lot of other tasks in addition.<sup>383</sup>

Finally, Applicant’s counsel argued that “the way we demonstrate that we have those capabilities is through the record system, the computer system. But in the actual event of an . . . alleged theft there are any host of ways that we might verify or assess the validity of that theft, some using the computer system, some not.”<sup>384</sup>

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<sup>380</sup> Applicant Supplemental Direct Testimony at 29-30.

<sup>381</sup> See id. at 26-27.

<sup>382</sup> Id.

<sup>383</sup> Tr. at 1891-92 (King).

<sup>384</sup> Tr. at 1888 (Jones). Applicant’s Revised FNMCP describes the possible actions in response to a theft allegation as follows:

Actions taken to investigate an allegation or other indication of the diversion of SSNM from its authorized location will develop evidence that supports either a

iii. NRC Staff's Position

NRC Staff approved Applicant's proposed approach for assessing the validity of alleged thefts. Mr. Pham testified that Applicant's program provides an acceptable demonstration of the ability to rapidly assess the validity of alleged thefts.<sup>385</sup> He agreed that comparison of the data maintained by the MMIS and PLCs "would confirm both where the item should be located and the presence of the item at that location."<sup>386</sup> Mr. Pham concluded that, "[a]ny discrepancies would be identified in a very short time frame (e.g., a few minutes)."<sup>387</sup>

Mr. Pham further supported Applicant's position by testifying that

[i]t is correct that the regulation in 10 C.F.R. § 74.57(e) simply requires the licensee to provide the capability to rapidly assess the validity of alleged thefts. Because this is a performance-based rule, it does not either determine a timeframe for the completion of a theft assessment or stipulate a method to be taken to assess an alleged theft. However, the guidance NUREG-1280 recommends a number of discrete capabilities that a licensee may adopt in order to demonstrate its ability to comply with the regulatory requirement. Because MOX Services has committed to comply with the guidance in NUREG-1280 by updating item records in order to identify one item and all items in vault storage in 8 hours and 72 hours respectively, the staff finds that MOX Services is in

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confirmation or a denial of the allegation. The investigation activities conducted will depend on the fact-specific details of the allegation. A summary of typical steps to rapidly assess the validity of an alleged theft is listed:

- XXX
- XXX  
XXXX
- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
- XXX
- XXX
- XXX  
XXX

FNMCP Revised 3.3 at 162-63.

<sup>385</sup> Staff Direct Testimony at 20; see also Staff Reply Testimony at 10 (stating that "[t]he 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.").

<sup>386</sup> Staff Reply Testimony at 19.

<sup>387</sup> Id.

compliance with the regulatory requirement to provide the capability to rapidly assess the validity of alleged thefts.<sup>388</sup>

Mr. Pham added, “the rule and guidance do not require the licensee to complete all of the other actions to be taken to assess an alleged theft within those [8 and 72 hour] timeframes.”<sup>389</sup>

**b. Board Determinations**

To the extent that NRC Staff and its witness suggest that Applicant’s mere compliance with NUREG-1280 satisfies the regulatory requirements of § 74.57(e), they are mistaken. As noted earlier, guidance documents are not binding law and should not be treated as such by applicants, NRC Staff, or this Board. More fundamentally, though performance-oriented regulations provide applicants with flexibility to determine how best to achieve the stated performance objectives, the method chosen must still be found to demonstrate reasonable assurance that it complies with the underlying regulatory standard. Here, it was incumbent on NRC Staff to scrutinize Applicant’s chosen approach and determine whether or not it provides reasonable assurance that the alarm resolution capability required by § 74.57(e) will be met. Upon review, we hold that Applicant’s chosen approach does provide that reasonable assurance.

Applicant’s theft assessment commitments in Section 3.3 of its FNMCP follow NUREG-1280’s recommendations,<sup>390</sup> proposing to use the computer system to identify the location of items in the event of an alleged theft. While Applicant assumes the accuracy of its records systems, we find this acceptable because other NRC regulations and other elements of Applicant’s proposal provide reasonable assurance of the security and accuracy of its MC&A system. Additionally, and very importantly, the computer system is not the exclusive means by

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<sup>388</sup> Staff Supplemental Testimony at 13.

<sup>389</sup> Id.

<sup>390</sup> FNMCP Chapter 3 at 157-58.

which Applicant will assess an alleged theft.<sup>391</sup> We therefore hold that Applicant has provided reasonable assurance of its ability to rapidly assess the validity of alleged thefts within the 8 and 72 hour time frames.<sup>392</sup>

**5. Ability to Assess in the Event of a Compromised Computer System**

**a. Parties' Positions**

**i. Intervenors' Position**

Intervenors assert that if the MMIS and PLCs were maliciously manipulated, Applicant might be unable to meet its theft assessment timing commitments. For instance, if an individual alleged that he or she diverted a formula quantity of plutonium and infiltrated and corrupted the MMIS and PLC systems in order to conceal the alleged theft, then all data would be immediately rendered suspect.<sup>393</sup> In such a case, Dr. Lyman asserted, there would be no way to assess the validity of the threat without conducting a complete inventory of the facility, including an inventory XXXXXXXXXXXX.<sup>394</sup> Dr. Lyman observed during the initial hearing:

we haven't seen any details about the ability to actually rule out the possibility of compromise of the computer system within time lines. If, for instance, the applicant were able to show that they have two options, either they can show within eight hours to everyone's satisfaction that the computer system has not been compromised and therefore you can trust the data from the mapping and the data from the mapping checks out, then they've satisfied it.

If they can physically locate any randomly selected item within eight hours through retrieval of the item, then they meet it, but they don't meet these time lines if they don't have a demonstrated and credible way of resolving the issue of data tampering within eight hours.<sup>395</sup>

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<sup>391</sup> See Applicant Supplemental Direct Testimony at 36. See also Tr. at 1896-97 (Jones).

<sup>392</sup> While it is correct that the Affirmations section of NUREG-1280 section 3.3.1 does not address record-keeping, the NUREG does not exclude but clearly contemplates the use of facility records for MC&A purposes. See NUREG-1280 Chapter 2-3, at 48-50.

<sup>393</sup> Intervenor Direct Testimony at A.7(5).

<sup>394</sup> Id.

<sup>395</sup> Tr. at 1527 (Lyman).

According to Intervenor, Applicant's inability to either ensure the integrity of its computer system or physically locate items within eight hours prevents it from providing the rapid theft assessment capability required by § 74.57(e).<sup>396</sup>

**ii. Applicant's Position**

In response to the Board's June 29, 2012 request,<sup>397</sup> Applicant's witnesses asserted that it was not required and did not commit to updating its records system and meeting the 8 and 72 hour criteria "under every conceivable alarm or alleged theft scenario," such as following alleged corruption of the MMIS/PLC system.<sup>398</sup> Applicant's witnesses stressed that Applicant's commitment to maintain the eight and 72 hour capabilities assumed the use of its records system, and did not anticipate defending or verifying the integrity of its records system while also locating items within the time period.<sup>399</sup> Applicant maintains that the assumptions inherent in its commitment were appropriate because the relevant provisions of NUREG-1280 likewise assume that the licensee will rely on its records system.<sup>400</sup>

Notwithstanding that position, Applicant now represents that, when a theft allegation includes a claim that the MMIS or PLCs have been compromised, the following additional steps will be taken, as appropriate:

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<sup>396</sup> Intervenor Consolidated Response at 16-17.

<sup>397</sup> Prior to the supplemental hearing, the Board was concerned about Applicant's ability to assess an alarm within the timelines, and, in its June 29, 2012 M&O, asked Applicant to "provide us with its contingency plan, along with supporting testimony and evidence, for assessing, within the 8 and 72 hour timeframes . . . an external alarm that includes an assertion that an external entity compromised the MMIS and PLC systems remotely and maliciously changed their respective data. Again, this document may be an amendment to the 2010 FNMCP, or a similarly consequential document of Applicant's choosing. In any event, this document must also be easily identifiable and enforceable by future inspectors." Order Requesting Further Information at 15.

<sup>398</sup> Tr. at 1897 (Jones).

<sup>399</sup> See Applicant Supplemental Direct Testimony at 29-30.

<sup>400</sup> Shaw AREVA MOX Services, LLC Reply to Intervenors' April 19, 2013 Response to MOX Services and NRC Staff Submittals (May 3, 2013) at 22 n.94.

- XXX
- XXX  
XXXXXX
- XXX  
XXXX
- XXX<sup>401</sup>

Applicant does not claim to be able to complete these additional steps within the eight and 72 hour time period,<sup>402</sup> but argues that the regulation does not require it to do so.<sup>403</sup>

**iii. NRC Staff's Position**

NRC Staff supports Applicant's position. Mr. Pham concurred that the requirement "to assess theft allegations in 8 and 72 hours [is] not applicable to every conceivable theft scenario."<sup>404</sup> He further testified that:

[t]he staff agrees with MOX Services that the 8-hour and 72-hour capabilities recommended by NUREG-1280 assume the integrity of the supporting MMIS and PLC records system. MOX Services maintains separate protection measures to control the integrity of its records system through the FNMCP, the Physical Protection Plan, and cyber security program requirements; thus, MOX Services provides reasonable assurance that it will establish and maintain the integrity of its records system.

In addition, Section 3.3.1 of NUREG-1280 does not suggest that the 8-hour and 72-hour capabilities include reestablishment of the facility's records system. The NRC guidance simply recommends that the licensee should provide a performance capability to update the facility's records with sufficient speed and in order to locate selected items within specified time frames.<sup>405</sup>

**b. Board Determinations**

NRC regulations do not require an applicant to show the ability to rapidly assess the validity of alleged thefts in every conceivable theft scenario. Nor do our regulations

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<sup>401</sup> FNMCP Revised 3.3 at 163. LANMAS is the Local Area Network Material Accounting System, a separately maintained recording of MMIS data that is managed by DOE. Applicant Supplemental Direct Testimony at 46-49.

<sup>402</sup> See Applicant Supplemental Statement of Position at 25.

<sup>403</sup> Applicant Supplemental Direct Testimony at 29.

<sup>404</sup> Staff Supplemental Testimony at 14.

<sup>405</sup> Id. at 14-15.

require an applicant to rapidly assess without the use of its records system. In light of Applicant's commitment to take a specific set of additional steps in the event of an allegation of MMIS/PLC corruption, we find that Applicant has provided reasonable assurance of its ability to rapidly assess the validity of alleged thefts within the eight and 72 hour time frames. We are satisfied that Applicant will take "whatever actions are appropriate and necessary to evaluate the theft as it is alleged,"<sup>406</sup> including performance of a variety of steps that have been identified that are designed to respond to a claim that the records system has been compromised.<sup>407</sup>

## **6. Conclusion**

NRC regulations, including 10 C.F.R. § 74.57(e), do not require licensees to conduct assessments of alleged thefts without the use of their records systems, or by first verifying the integrity and accuracy of those records systems. All that is required under the regulation is a rapid assessment. The guidance in NUREG-1280 suggests that assessment should be completed within an eight or 72 hour time line, and we find that Applicant's compliance with this guidance provides reasonable assurance of its ability to make the "rapid determination of whether an actual loss"<sup>408</sup> has occurred as required by the performance objectives in § 74.51(a).

For the foregoing reasons, we resolve Contention 11 in favor of Applicant.

## **VI. Board Conclusions**

Having considered all of the material presented by the parties on Contentions 9, 10, and 11, and based upon our review of the evidentiary record relative to these contentions and the proposed findings of fact and conclusions of law submitted by the parties, and in accordance

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<sup>406</sup> Applicant Supplemental Direct Testimony at 27.

<sup>407</sup> For example, Applicant's witnesses testified that Applicant will be able to compare data stored in the LANMAS with MMIS records to check for discrepancies. Id. at 46-49.

<sup>408</sup> 10 C.F.R. § 74.51(a)(3).

with our views expressed in Sections 1-V above – which we find to be supported by a preponderance of the evidence -- we conclude as follows:

Applicant's daily reconciliation of the MMIS Perpetual Inventory Report and PLC mapping, as supported by its various accuracy-related programs and the MMIS verification procedure, provides reasonable assurance that it can verify the presence of all SSNM items in storage within the 30- and 60-day timeframes required by 10 C.F.R. § 74.55(b)(1).

By verifying the integrity of storage area boundaries, Applicant can verify the integrity of all SSNM items in storage within the 30- and 60-day timeframes required by 10 C.F.R. § 74.55(b)(1).

Applicant provides reasonable assurance that it can normally resolve an alarm within three days, fully satisfying the requirements of 10 C.F.R. § 74.57(b) and its commitments in the FNMCP, even if it must conduct an inventory XXXXXXXXXXXXXXXXXXXXXXXX.

Using its MMIS and PLC mapping, Applicant has the capability to locate one SSNM item in eight hours, and all SSNM items in vault storage in 72 hours. Therefore, Applicant provides reasonable assurance of its ability to rapidly assess the validity of an alleged theft, satisfying the requirements of 10 C.F.R. § 74.57(e) and Applicant's commitments in the FNMCP.

Applicant has met its burden of proof as to contentions 9, 10, and 11. Therefore, Contentions 9, 10, and 11 are resolved in favor of Applicant.<sup>409</sup>

**VII. Order**

WHEREFORE, IT IS ORDERED, in accordance with 10 C.F.R. § 2.1210, that Intervenor's Contentions 9, 10, and 11 are resolved on the merits in favor of Applicant.

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<sup>409</sup> To the extent that any of Intervenor's arguments are not addressed herein, it is either because we have determined that a response is unnecessary to our decision or because, in rejecting them, we simply intend to rely upon the reasoning reflected in the post-hearing briefs of the Staff and/or Applicant regarding those arguments, finding those arguments to be persuasive and, to the extent necessary to resolve any such matters, those reasonings are hereby adopted.

IT IS FURTHER ORDERED that this Initial Decision will constitute a final decision of the Commission forty (40) days from the date of issuance (or the first agency business day following that date if it is a Saturday, Sunday, or federal holiday),<sup>410</sup> unless a petition for review is filed in accordance with 10 C.F.R. § 2.1212, or the Commission directs otherwise.

IT IS FURTHER ORDERED that any party wishing to file a petition for review on the grounds specified in 10 C.F.R. § 2.341(b)(4) must do so within twenty-five (25) days after service of this Initial Decision. The filing of a petition for review is mandatory for a party to have exhausted its administrative remedies before seeking judicial review. Within twenty-five (25) days after service of a petition for review, parties to the proceeding may file an answer supporting or opposing Commission review. Any petition for review and any answer shall conform to the requirements of 10 C.F.R. § 2.341(b)(2)–(3).

IT IS FURTHER ORDERED that the supplemental transcript corrections are accepted by the Board.<sup>411</sup>

IT IS FURTHER ORDERED that the Record in this proceeding is hereby closed.

THE ATOMIC SAFETY  
AND LICENSING BOARD\*  
*/RA/*

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Nicholas G. Trikouros  
ADMINISTRATIVE JUDGE  
*/RA/*

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Dr. Paul B. Abramson  
ADMINISTRATIVE JUDGE

Rockville, Maryland  
February 27, 2014

\*Judge Farrar is not subscribing to the above opinion. His separate statement is set forth on the following pages.

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<sup>410</sup> See 10 C.F.R. § 2.306(a).

<sup>411</sup> See Intervenors' Proposed Corrections to Hearing Transcript (July 1, 2013); Shaw AREVA MOX Services, LLC's Proposed Corrections to the Hearing Transcript (June 14, 2013); NRC Staff's Proposed Corrections in the Hearing Transcript (May 21, 2013).

**Separate Statement of Judge Michael C. Farrar**

Although my approach would have differed from theirs, I am in essential agreement with most of the substance of my colleagues' determinations, so far as they go, that lead them to resolve the merits of the three pending contentions against Intervenors. I write separately for three primary purposes:

- First, to be sure the matters before us are understood in their full context, which I present in Paragraph A, below.
- Second, to express in brief fashion my dissent from portions of the majority's rulings. Specifically, I take issue with their (1) declining to impose upon Applicant the additional steps it agreed to take to alleviate lingering concerns regarding Contention 9; and (2) approving Applicant's presentation regarding Contention 11 notwithstanding the present lack of a cyber-security plan, a plan which all parties agree must be developed for Applicant's proposals to succeed. Those matters, as well as some ancillary ones, are discussed in Paragraph B, below.
- Third, with respect to that cyber-security issue, to indicate why I believe, based on what came before us, that Applicant's long-ago promise to create a sound MC&A system will not -- indeed cannot -- be fulfilled until it puts forward, and this Agency reviews, the cyber-security measures that are the inherent underpinning, from both a regulatory and a practical standpoint, of a dependable MC&A system. But those matters -- having not yet been addressed either by Applicant or this Agency -- could not have been raised by the contentions filed at this stage of the proceeding, and are thus not before us for decision now. Accordingly, to urge that this critical issue eventually be thoroughly addressed, I present in Paragraph C, below, my thinking in that regard, focusing on what must be done later in this proceeding.

A. Contextual Background

Although the majority explains the purpose of this facility (Maj. Op. at 4), it assumes the reader will understand from that what the underlying dangers are. To review, the facility at issue before us -- being built at DOE's Savannah River Site -- has been envisioned as a place for the fabrication of MOX fuel for nuclear reactors. More specifically, in furtherance of a U.S. treaty with Russia intended to achieve mutual reduction in both countries' nuclear weapons, plutonium extracted from surplus nuclear weapons (at a co-located sister facility) would be converted to plutonium oxide, mixed with uranium oxide -- the typical ingredient of nuclear fuel -- and formed into MOX fuel.

One of the primary concerns about facilities that handle weapons-grade plutonium is that during its storage and processing that hazardous substance might be subject to diversion by terrorists or other determined adversaries with malicious motives. Such diversion could result in enormous, dreadful consequences, if those eventually obtaining access to the material had the resources and wherewithal to create devices that, if used for nefarious purposes, could have widespread devastating impact. As a result, the security risk here is critical and must be managed accordingly. For this reason, the Nuclear Regulatory Commission has enacted regulations establishing standards that such a facility's MC&A systems must meet in terms of tracking its inventory in storage and in process.

Those regulations were issued two decades ago and were drafted with then commonly employed, but now technologically superseded, manual tracking systems in mind. As the majority has discussed, a major issue before us involves determining what the standards embodied in that admittedly antiquated regulation mean in terms of modern, computerized systems, and how to apply those standard to Applicant's proposals.

Not only are the issues difficult, but there is no doubt about their significance and importance. The parties recognized this, for in a sharp departure from the norm in our proceedings, neither Staff nor Applicant opposed the admission of Intervenors' three

contentions into this proceeding on any ground other than their asserted untimeliness. And our former colleague Judge McDade, who believed the contentions were untimely, went so far as to suggest to the Commission that, were they indeed deemed untimely, approval should be given for the Board to consider them sua sponte -- a step not invoked in many years and a step the full Board endorsed -- given their fundamental importance. LBP-11-9, 73 NRC 391, 413-14, 417-18 (2011).

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It is in this context and against this background that I indicate where I disagree with the majority.

B. Dissenting Points

(1). *Imposition of Additional Measure (Contention 9).* The majority quite well describes the steps Applicant has taken to mesh its modern tracking system with an antiquated regulation. The ultimate problem Applicant faced was establishing that the comparison of computerized data in one system with similar data in another system is the equivalent of physically sampling the actual material (whether conducted by robotic or by human action). In that regard, the majority mentions certain measures Applicant will take to bolster its data-to-data comparison with physical checks.

These measures include checks that naturally occur during the processing of materials. For instance, every time the MMIS calls for retrieval of a specific item from a given location, a successful retrieval by a PLC confirms that the data was correct. Maj. Op. at 32. Applicant has also undertaken to add additional physical verification, if the process checks turn out to be too infrequent to meet the statistical sampling demands. Maj. Op. at 60-64. Additionally, daily physical inspection of containment boundaries will confirm the fact that the SSNM items contained within have not been tampered with. Maj. Op. at 38-39, 42-43. In part, these measures and others were created and adopted by Applicant in response to the original Board's calling, after the first hearing, for additional exposition on this point. Maj. Op. at 60-62 (citing

Licensing Board Memorandum and Order (Requesting Further Information from the Applicant) (June 29, 2012) at 10 (unpublished) [hereinafter Order Requesting Further Information]).

The majority quite rightly approves of those measures as bolstering Applicant's efforts to comply with the regulatory requirements. But the majority falls short, I believe, in not requiring Applicant to adopt an additional measure that it created in response to the Board's inquiry and suggestion at the second hearing. See Maj. Op. at 66-67.

I dissent from the majority's failure to impose that requirement. As should be clear from the majority's extensive discussion of Contention 9, the business of meshing Applicant's modern proposal with the demands of an antiquated regulation is not an easy one. To satisfy those demands, and at the majority's behest, Applicant was willing to adopt an additional check to physically validate its comprehensive data systems.

That step was, for me, sufficient to convert a close case into a compliant one. I would impose that step, as suggested by Applicant, and make it part of the licensing documents along with the other measures Applicant is pursuing (so that future inspectors and enforcers do not have to pore through numerous, lengthy Licensing Board decisions to determine the licensing basis and compliance status of the facility they are evaluating).

*(2) Absence of Cyber-Security Measures (Contention 11).* On its face, Contention 11 does not challenge Applicant's cyber-security plans or its failure to have a full-blown cyber-security system in place at this juncture. Strictly speaking, then, the matter could be viewed as not being before us and thus not within our jurisdiction to address.

But both the Applicant and the NRC Staff, in defending against the challenges that Intervenors did make to the MC&A system, relied upon the salutary impact that correlative physical security and cyber-security measures would have. Maj. Op. at 68-70, 95. By raising the cyber-security argument to defend against those challenges, Applicant can fairly be said to have brought that matter into play before us. And that provides me the latitude to point out that there are two things wrong with that argument.

The first is that Applicant is otherwise required to have a physical security system that meets other NRC regulations that are not before us here. Applicant cannot be given extra credit for doing what is already required.

The second is that Applicant does not have a cyber-security system in place (nor does the NRC have in place a regulation defining what is to be required in that regard, a point I will come back to). But Applicant defends against Contention 11 by arguing that its data systems are adequate for purposes of meeting the governing regulation, and that, albeit not now in place, cyber-security measures can eventually be counted on to assure the non-corruption of those data systems.

We don't know that. Perhaps there will come a time when it will be known. But strictly speaking, one could justifiably conclude that Applicant, in taking that position as part of its affirmative case, is entitled at this stage to, at most, a Scottish verdict of "not proven."

The Board already gave Applicant an opportunity to bolster the presentation it made at the first hearing with a supplemental showing during the second hearing phase. See Order Requesting Further Information. This being so, one would not normally be inclined to provide a third opportunity. With Applicant having the burden of proof, then, a "not proven" verdict would lead to the contention being upheld.

If we did that, however, Applicant could amend and re-submit its application once it had a cyber-security plan in place. (As will be seen, I reject the notion that something as fundamental and challenging as developing a cyber-security system adequate to foil increasingly capable and determined adversaries could be sloughed off to a mere "compliance item" to be handled after a license is issued.) To avoid such procedural inefficiencies, then, I would rule that the Applicant's presentation, so far as it goes, prevails against Contention 11, but would also rule that any reliance upon that ruling to obtain a license is subject to, and fully dependent upon, future actions and plans which, once put into place, will routinely trigger full-

blown NRC review before a license can be issued. If that approach is not to be implemented, then my dissenting vote is “not proven.”

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This leaves some ancillary, less significant matters to address. These relate to three points which, if I understand them correctly, raise the following concerns:

My first concern arose when, during the course of the proceeding, it was at least intimated that the cyber-security matter could be relegated to a post-licensing “compliance item.” See e.g., Tr. at 1851-58. If that were done, the license would issue first, leaving approval of the final version of the MC&A system, together with its eventual cyber-security provisions, to be resolved along with other routine “compliance items” by Staff in the ordinary course of its pre-operational review.

There is a major reason not to do this -- calling a matter a mere “compliance item” does not make it so, and thus cannot serve to take it out of the pre-licensing regulatory review bailiwick. As indicated earlier, by any measure and by all accounts the adequacy of the MC&A system is a paramount issue, it has been fairly raised in the adjudication, and because it is so fundamental to proper creation of the facility it deserves to be resolved -- along with its cyber-security underpinnings -- prior to the grant of a license.

If this were not self-evident, the recent decision of another Board points in that direction. In San Onofre, the Board was faced with a process that the NRC Staff had labeled as a “Confirmatory Action Letter” -- which is an enforcement process that does not allow for public intervention. See Southern California Edison Company (San Onofre Nuclear Generating Station, Units 2 and 3), LBP-13-7, 77 NRC 307, 316, 324-25 (vacated as moot, CLI-13-09, 78 NRC \_\_, \_\_ (slip op. at 1) (2013)). Despite the Staff labeling it in that fashion, the Board determined that it was indeed a de facto license amendment, which does indeed allow for public intervention. Id. at 344. In other words, the Board refused to let the matter turn on attempts by the Staff and Applicant to label a controversial matter in a way that would avoid adjudication. Id.

at 326. Instead, the Board examined in great detail the facts behind the situation, and concluded that the reality pointed toward the adjudicatory approach, not the administrative one. Id.

Here, the matter can be resolved without the need for the level of analysis that the San Onofre Board proffered. This important substantive matter quite justifiably came up during adjudication, and the attempt to remove it from the reach of that process and even from the pre-licensing regulatory process -- by placing upon it a label that would relegate it to the category of matters that involve merely administrative details -- must fail.

My second concern stems from the majority's apparent reliance upon Applicant's contractual commitment to adhere to the DOE developed and developing cyber-security standards. Maj. Op. at 68-70. This may be good as far as it goes, but it does not go far enough. Quite apart from the adjudication, it cannot be overlooked that DOE stands in the shoes of a mere Applicant here. Whatever regard might otherwise be owed to the extensiveness of DOE's capabilities and the quality of its analyses, its proposals regarding this application are subject, as in all other licensing proceedings, to the approval of the NRC.

Thus, absent a Commission-level Memorandum of Understanding or similar agreement with DOE expressing a willingness by this agency to accept DOE's work without review, DOE's application, and all aspects of it, remain subject to NRC scrutiny. That scrutiny will include (1) establishing a governing cyber-security standard (via rulemaking or otherwise), or in the alternative proceeding under some analogy to "best engineering judgment" that satisfies the demands of the Atomic Energy Act, and then (2) making a determination as to whether that standard or judgment has been met, i.e., evaluating that aspect of the application for compliance with the requisite norm.

Put another way, for all practical purposes, DOE is the real-party-in-interest Applicant here. Unless the NRC Commissioners formally adopt DOE's standards, or formally cede

jurisdiction to set a standard to DOE, the setting of the applicable standards, and the determination of whether those standards have been met, belong to the NRC, not DOE.

My *third* concern involves inherent limitations on the hoary doctrine the majority cites to the effect that matters that are, or are about to become, subjects of rulemaking are not suitable for adjudication. Maj. Op. at 70. That doctrine has its purposes -- to prevent the inefficiencies and duplication and waste that would be engendered by considering the same “generic” issue in several or a multiplicity of, say, nuclear reactor licensing proceedings.

But caution must be exercised in applying that long-standing principle to other situations. That principle plainly made eminent sense when there were large numbers of reactor permitting or licensing cases pending, or when consideration need be given to how existing licensees should proceed in the aftermath of an event like the Fukushima disaster. In both situations, there exists a real threat of duplication -- indeed multiplication -- in individual licensing proceedings.

Importantly, it bears mention that in neither situation was that principle intended to minimize the importance of the underlying matter to the various individual licensing proceedings. To the contrary, so-called “generic” issues were not less important to individual adjudications just because they affected more than one reactor; put another way, their generic character served to make them even more important to resolve.

And it was never doubted that deferring the underlying issue to a rulemaking proceeding was not viewed as the full response to that issue, and that there was a quid pro quo for taking that step. Specifically, it was the norm that at the conclusion of the rulemaking a way would have to be found to apply its result to the individual facility licensing proceeding in which the matter was sought to have been raised. In other words, when issues are handled in a generic rulemaking, it has always been the case that the outcome of that rulemaking has to be applied to the individual facilities that were spared the adjudication of that issue.

Moreover, the threat of duplication is not so apparent here. In this instance, we have before us a unique facility, which will likely have to be governed by unique standards. Similarly, from the beginning, licensing of the MOX facility has been governed by a two-part licensing process designed specifically for it. See Maj. Op. at 5-6; Duke Cogema Stone & Webster (Savannah River Oxide Fuel Fabrication Facility), LBP-01-35, 54 NRC 403, 411 (2001). It also presents unique dangers. And even after a cyber-security rulemaking, there will have to be a determination made that the facility complies with the rule -- and that is a fit subject about which there may need to be a later determination about an opportunity for adjudication.

C. Future Cyber-Security Considerations

Even if Applicant prevails on the contentions, as the majority holds, the cyber-security matter will demand far more future attention within the NRC than the Staff, Applicant, and majority seem to envision. In that regard, I have already mentioned the “compliance item,” DOE role, and generic rulemaking matters. But there are others as well.

Even if Applicant prevails herein upon appellate review, or if no such review is undertaken, I would go beyond what my colleagues say (Maj. Op. at 7, 68-70) and urge the Commission not to let this proceeding end as it began, with the NRC Staff planning to take a short cut to licensing (See LBP-08-11, 67 NRC 460, 498-500 (2008) (Farrar, J., concurring) (expressing concern over Staff’s earlier attempt to issue Applicant a possession and use license prior to completion of construction)). Just as the Staff eventually abandoned that opening approach, the Commission should insure that it does not contemplate such a closing step. To that purpose, I urge the Commission, as already indicated, to forbid the Staff from treating the creation of a cyber-security system as a mere “compliance item.”

On that score, there should be no need to write at length to establish the complexity of the cyber-security problem and the difficulty of protecting against cyber-breaches. Rather than listing the litany of recent and ongoing national and world-wide concerns about the cyber-

intrusion capability, motivation and dedication of adversarial governments and individuals, it is sufficient to put forward two brief quotations.

The first is a maxim announced by a federal court wrestling (in an entirely different context) with whether the record facts before it established the position being advocated. The court looked beyond the record by indicating that “what everybody knows, the court must know.” Meredith v. Fair, 305 F.2d 343, 344-45 (5th Cir. 1962) (quoting Jacobson v. Massachusetts, 197 U.S. 11, 30 (1905)). In a similar manner, the world, the Board and the Commission know of the enormity and pervasiveness of the cyber-security threat and what it could mean to the viability of Applicant’s required MC&A system.

And it is not a given that the response to that threat will be adequate -- as former NRC Chairman Dale Klein is said to have observed, in the context of the Fukushima disaster, the company involved “didn’t play enough of [the] what-if games . . . and didn’t have enough of that questioning attitude.” Chico Harlan, For Tepco and Japan’s Fukushima Daiichi Nuclear Plant, Toxic Water Stymies Cleanup, Wash. Post, Oct. 21, 2013, at A1. In that regard, Applicant’s witnesses here provided the Board with assurances that the cyber-security threat could be, and was being, dealt with. See e.g., Tr. at 1846-51. But in a perverse manner, their reassurances might have been more compelling had they contained more recognition of the difficulty of the task and the need to envision what future, highly skilled, capable and formidable adversaries might be plotting.

The upshot is simple. The Board has dealt with the contentions as presented, to the extent possible at this time. There is no reason to say that Applicant cannot eventually accomplish what it has been promising to do for over a decade. But the Board’s review of the contentions has pointed to problems that remain to be solved. Because Applicant’s papers do not yet provide the manner in which those problems will be addressed, I suggest that any contention filed on that topic at this juncture would have been subject to rejection as premature,

as we explained in some detail at an earlier stage. See LBP 08-11, 67 NRC at 503-05 (Farrar, J., concurring) (discussing issues related to the filing of timely contentions).

That being so, I urge that the Commission continue to make available the remedy we found appropriate earlier herein and thereby provide an opportunity for the filing -- free of any “good cause for lateness” strictures -- of further contentions when the long-promised system is eventually available for scrutiny. Specifically, early in this proceeding we set forth a rule for filing new contentions. See LBP-08-11, 67 NRC at 493-94. This rule established that the Board would consider new or amended contentions timely if filed within 60 days of any “triggering event.”

We took that action to provide a reasonable and practical time frame for Intervenors to research and analyze new developments in this unique and evolving proceeding. The Commission affirmed the Board’s rule that new contentions would be deemed timely if filed within 60 days after pertinent information first becomes available. CLI-09-2, 69 NRC 55, 58 (2009).

In the same vein, I respectfully propose that, subject to appropriate security constraints, the Commission specifically allow Intervenors -- whose dedicated, long-term participation and measured, thoughtful testimony herein advanced the inquiry into the matters raised by their contentions -- an opportunity to file a motion to admit one or more new contentions into this proceeding within 60 days of their notification of the availability of Applicant’s cyber-security plans and procedures. At that time, determinations can be made about the suitability, or not, of the matter for adjudication. And in any event, I urge the Commission to devote its personal, non-adjudicatory attention to reviewing Staff’s analysis of Applicant’s final cyber-security-included proposal, once completed, to be sure that the complex, significant problems threatening the safety of this unique facility, and until now guided by antiquated or empty regulations, are fully addressed. See also Maj. Op. at n.72 and accompanying text.

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In conclusion, I urge that the decision today in Applicant's favor be viewed as resolving no more than the very narrow set of issues before us now in a very narrow fashion. Whether and how all the facility's infrastructure and security will come together to guard its raw materials against diversion is to this day an open issue, and today's decision should not be taken as affording any assurances in that regard.

## Appendix A

### Definitions

- Alleged Thefts “alarms that originate external to the MC&A system.” NUREG-1280, at 50.
- Category 1A material “means SSNM directly useable in the manufacture of a nuclear explosive device, except if: (1) The dimensions are large enough (at least two meters in one dimension, greater than one meter in each of two dimensions, or greater than 25cm in each of three dimensions) to preclude hiding the item on an individual; (2) The total weight of an encapsulated item of SSNM is such that it cannot be carried inconspicuously by one person (i.e., at least 50 kilograms gross weight); or (3) The quantity of SSNM (less than 0.05 formula kilograms) in each container requires protracted diversions to accumulate five formula kilograms.” (10 C.F.R. § 74.4).
- Category 1B material “means all SSNM material other than Category IA.” (10 C.F.R. § 74.4).
- Controlled Access Area “means any temporarily or permanently established area which is clearly demarcated, access to which is controlled, and which affords isolation of the material or persons within it.” (10 C.F.R. § 74.4).
- Formula Kilogram “SSNM in any combination in a quantity of 1000 grams computed by the formula, grams=(grams contained U-235 + 2.5 (grams U-233 + grams plutonium).” (10 C.F.R. § 74.4).
- Item “means any discrete quantity or container of special nuclear material or source material, not undergoing processing, having an unique identity and also having an assigned element and isotope quantity.” (10 C.F.R. § 74.4).
- MAA (Material Access Area) “means any location which contains special nuclear material, within a vault or a building, the roof, walls, and floor of which constitutes a physical barrier.” (10 C.F.R. § 74.4).

- MC&A Alarm “means a situation in which there is: (1) an out-of-location item or an item whose integrity has been violated, (2) an indication of a flow of SSNM where there should be none, or (3) a difference between a measured or observed amount or property of material and its corresponding predicted or property value that exceeds a threshold established to provide the detection capability required by § 74.53.” (10 C.F.R. § 74.4).
- Power of Detection “means the probability that the critical value of a statistical test will be exceeded when there is an actual loss of a specific SSNM quantity.” (10 C.F.R. § 74.4).
- Sealed Source “means any special nuclear material that is physically encased in a capsule, rod, element, etc. that prevents the leakage or escape of the special nuclear material and that prevents removal of the special nuclear material without penetrations of the casing.” (10 C.F.R. § 74.4).
- SSNM (Strategic Special Nuclear Material) “means uranium-235 (contained in uranium enriched to 20 percent or more in the U235 isotope), uranium-233, or plutonium.” (10 C.F.R. § 74.4).
- Tamper-safing “means the use of devices on containers or vaults in a manner and at a time that ensures a clear indication of any violation of the integrity of previously made measurements of special nuclear material within the container or vault.” (10 C.F.R. § 74.4).
- Vault “a windowless enclosure with walls, floor, roof and door(s) designed and constructed to delay penetration from forced entry.” (10 C.F.R. § 74.4).

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

In the Matter of )  
 )  
Shaw AREVA MOX Services, LLC ) Docket No. 70-3098-MLA  
 )  
(Mixed Oxide Fuel Fabrication Facility )  
Possession and Use License) )

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing **ORDER (Public Release of Initial Decision)** have been served upon the following persons by U.S. mail, first class, or through NRC internal distribution.

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Docket No. 70-3098-MLA

**ORDER (Public Release of Initial Decision)**

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Dated at Rockville, Maryland,  
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