

FOR: The Commissioners

FROM: Victor M. McCree
Executive Director for Operations

SUBJECT: PROPOSED RULE – CYBER SECURITY AT FUEL CYCLE
FACILITIES (RIN 3150-AJ64; NRC-2015-0179)

PURPOSE:

The purpose of this paper is to obtain Commission approval to publish for public comment a proposed rule to amend Title 10 of the *Code of Federal Regulations* (10 CFR) Part 73, “Physical Protection of Plants and Materials,” to establish cyber security requirements for certain nuclear fuel cycle facility (FCF) applicants and licensees.

SUMMARY:

In the March 24, 2015, staff requirements memorandum (SRM) for SECY-14-0147, “Cyber Security for Fuel Cycle Facilities” (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15083A175), the Commission directed the U.S. Nuclear Regulatory Commission (NRC) staff to proceed with a high-priority cyber security rulemaking for FCFs. In response to the Commission’s direction, the staff prepared the attached proposed rule that, if approved by the Commission, would amend the current regulations in 10 CFR Part 73, and make conforming changes to additional regulations in 10 CFR Parts 40 and 70, to establish cyber security requirements for certain FCF applicants and licensees. The proposed regulation, if approved, would require FCF applicants and licensees within the scope of the rule to establish, implement, and maintain a cyber security program designed to promote common defense and security and to provide reasonable assurance that the public health and safety remain adequately protected against the evolving risk of cyber attacks. The cyber security program would be required to detect, protect against, and respond to a cyber attack capable of causing one or more of the consequences of concern defined in the proposed rule.

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As discussed in greater detail below, the proposed requirements would apply to each applicant or licensee subject to the requirements of 10 CFR 70.60, “Applicability” and to each applicant or licensee subject to the requirements of 10 CFR Part 40, “Domestic Licensing of Source Material,” for the operation of a uranium hexafluoride conversion or deconversion facility (hereafter FCF licensees).

BACKGROUND:

In SRM-SECY-14-0147, the Commission directed the staff to initiate a high-priority cyber security rulemaking for FCFs and to complete and implement the final rule in an expeditious manner. The Commission also directed the staff to augment the work already performed to develop the technical basis for a proposed rulemaking and to interact with stakeholders in developing the proposed and final rule. Additionally, the Commission directed that in developing its technical basis, the staff should ensure an adequate, integrated look at cyber security as only one aspect of site security (for example, site access controls may provide an element of digital asset protection) and take the requisite care to avoid unintended adverse consequences to safety based on a stand-alone focus on cyber security. Furthermore, the Commission stated that the technical basis should address the need to integrate safety and security and also apply a disciplined, graded approach to the identification of digital assets and a graded, consequence-based approach to their protection. The staff was also directed to monitor licensee implementation of any voluntary cyber security measures undertaken at FCFs during the rulemaking process. Finally, the Commission stated that the staff should consider an 18-month implementation period for the final rule.

After the issuance of SRM-SECY-14-0147, the staff conducted extensive and substantive interactions with stakeholders throughout the development of the draft proposed rule, supporting analyses, and associated guidance document. The staff shared relevant documents for public review, conducted site visits, and held 11 public meetings with stakeholders during the period June 11, 2015, through March 29, 2017. During the first two public meetings (ADAMS Accession Nos. ML15174A130 and ML15208A450), the staff discussed the Commission direction in SRM-SECY-14-0147, the rulemaking timeline, the proposed technical approach for the rule, licensees’ voluntary cyber security efforts, the staff’s proposed site visits to observe cyber security programs at FCFs, and the status of the FCF cyber security rulemaking draft regulatory basis document.

On September 4, 2015, the staff announced the availability of the draft regulatory basis for public comment in the *Federal Register* (80 FR 53478, ADAMS Accession No. ML15198A024). On September 23, 2015, the staff held a third public meeting (ADAMS Accession No. ML15306A267) during the 30-day comment period to receive stakeholder feedback on the draft regulatory basis.

During the period August 25 through October 8, 2015, the NRC staff conducted a number of cyber security site visits at FCF licensees, including: Honeywell International, Inc. (Metropolis, IL); Westinghouse Electric Company (Columbia, SC); Global Nuclear Fuels – Americas (Wilmington, NC); and BWXT Nuclear Operations Group, Inc. (Lynchburg, VA). The objective of these site visits was to inform the proposed rulemaking by monitoring licensee implementation of voluntary cyber security measures undertaken at FCFs, as directed by the Commission in SRM-SECY-14-0147. The NRC summarized the site visits in the final regulatory basis document (ADAMS Accession No. ML15355A466).

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After performing the site visits and considering the public comments on the draft regulatory basis, the staff began development of the final regulatory basis for the FCF cyber security rulemaking. The staff held additional public meetings on October 22, 2015; December 10, 2015; February 18, 2016; and March 17, 2016 (ADAMS Accession Nos. ML15288A514, ML15356A357, ML16054A160, and ML16092A124). The staff used these meetings to obtain additional input from stakeholders on technical issues relating to the development of the final regulatory basis. During these meetings, discussion topics included: the NRC's proposed consequences of concern related to safety, security, and safeguards functions; the NRC's proposed methodology for screening digital assets; cyber security control sets; support systems within the scope of the rule; methods for identifying digital assets; a proposed timeline for conducting periodic reviews of cyber security implementation; lessons learned from the power reactor cyber security rulemaking; and the resolution of public comments on the draft regulatory basis. The staff completed the final regulatory basis on March 24, 2016. On April 12, 2016, the staff announced the availability of the final regulatory basis in the *Federal Register* (81 FR 21449).

After completion of the final regulatory basis, the staff began development of the proposed rule. On May 19, 2016, the staff held its eighth public meeting (ADAMS Accession No. ML16155A442). This meeting provided stakeholders an opportunity to review and comment on preliminary draft proposed rule language. On August 25, 2016, the staff held its ninth public meeting (ADAMS Accession No. ML16271A019). This meeting provided stakeholders an opportunity to discuss the revised preliminary draft proposed rule language along with the associated preliminary draft guidance document. On October 12, 2016, the staff held its tenth public meeting (ADAMS Accession No. ML16306A050). This meeting provided stakeholders an opportunity to discuss projected costs associated with the implementation of the proposed rule. On March 29, 2017, the staff held its eleventh public meeting (ADAMS Accession No. ML17100A111). This meeting provided stakeholders an opportunity to discuss how their concerns and comments have been addressed in the draft proposed rule, draft guidance, and associated documents.

Consistent with the direction in SRM-SECY-14-0147, the staff has engaged in extensive interactions with stakeholders. As a result of these interactions, the staff gained valuable insight into the development of the regulatory basis, the proposed rule, and the associated draft regulatory guide.

DISCUSSION:

The staff has developed a proposed rule that would, if adopted, require FCF applicants or licensees subject to 10 CFR 70.60 or subject to 10 CFR Part 40 for operation of a uranium hexafluoride conversion or deconversion facility to establish, implement, and maintain a cyber security program. Accordingly, the proposed requirements would apply to each applicant or licensee that is or plans to be authorized to: (1) possess greater than a critical mass of special nuclear material (SNM) and engage in enriched uranium processing, fabrication of uranium fuel or fuel assemblies, uranium enrichment, enriched uranium hexafluoride conversion, plutonium processing, fabrication of mixed-oxide fuel or fuel assemblies, scrap recovery of SNM, or any other FCF activity that the Commission determines could significantly affect public health and safety; or (2) engage in uranium hexafluoride conversion or uranium hexafluoride deconversion.

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The proposed rule would apply a graded, consequence-based approach to the protection of digital assets that takes into account hazards specific to the different types of FCF licensees: (1) 10 CFR Part 70 licensees authorized to possess or use a formula quantity of strategic special nuclear material (SSNM) as defined in 10 CFR 73.2 (Category I FCF licensees); (2) 10 CFR Part 70 licensees authorized to possess or use SNM of moderate strategic significance as defined in 10 CFR 73.2 (Category II FCF licensees); (3) 10 CFR Part 70 licensees authorized to possess or use SNM of low strategic significance as defined in 10 CFR 73.2 (Category III FCF licensees); and (4) 10 CFR Part 40 licensees authorized to perform uranium hexafluoride conversion or deconversion (conversion or deconversion facilities). Under this graded approach, FCF licensees would only have to protect against the defined consequences of concerns applicable to their specific type of facility (Category I, II, III FCFs and uranium conversion or deconversion facilities).

Key Features of the Proposed Rule

The proposed regulation, if approved, would require FCF licensees within the scope of the rule to establish, implement, and maintain a cyber security program to detect, protect against, and respond to a cyber attack capable of causing one or more defined consequences of concern.¹ To meet these cyber security program performance objectives, these FCF licensees would be required to: (1) establish and maintain a cyber security team that is structured, staffed, trained, qualified, and equipped to implement the cyber security program; (2) develop a site-specific cyber security plan that the licensee must submit to the NRC for review and approval; (3) identify digital assets associated with a consequence of concern; (4) determine which of those assets are vital digital assets (VDAs) that require protection;² (5) identify and apply cyber security controls for VDAs; (6) provide temporary compensatory measures to meet the cyber security program performance objectives when the cyber security controls are degraded; (7) establish a configuration management program to ensure that changes to the facility are evaluated prior to implementation; (8) periodically review the cyber security program; and (9) report and track certain cyber security events. The enclosed *Federal Register* notice (Enclosure 1) discusses each of these actions in greater detail.

FCF licensees have digital assets integrated into various safety, security, and safeguards programs. They rely upon these assets for the performance of important safety, security, and safeguards functions. There is currently no regulatory requirement for FCF licensees to perform an analysis to determine if a cyber attack is capable of causing a consequence of concern by compromising these functions. In the proposed rule, the staff identified the three specific types of functions (safety, security, and safeguards) performed by digital assets that would require protection from cyber attacks capable of causing a defined consequence of concern. These functions correlate to the types of consequences of concern that the proposed rule would

¹ The consequences of concern defined in the proposed rule include the compromise of a digital asset needed to prevent: theft and diversion of SNM, radiological sabotage, loss of material control and accounting, loss or unauthorized disclosure of classified information or matter, or certain radiological or chemical exposures.

² VDAs are those digital assets associated with a consequence of concern for which no alternate means of preventing the consequence of concern exists. An alternate means could be another digital asset already protected from a cyber attack, or an existing feature (e.g., guard force, physical barrier) that provides an equivalent substitute capable of performing the needed safety, security, or safeguards function in the event of a cyber attack.

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require FCF licensees to protect against through their cyber security programs. The proposed thresholds for the consequences of concern were informed by existing regulatory requirements in 10 CFR Part 70 for safety; Parts 73 and 95 for security; and Part 74 for safeguards. The focus on consequences of concern corresponding to existing safety, security, and safeguards analyses would limit the scope of digital assets covered by the proposed rule and therefore reduce the burden of the rule on FCF licensees. The various consequences of concern defined in the proposed rule are identified and discussed in Section IV of the enclosed *Federal Register* notice.

In accordance with the requirements in 10 CFR 70.76, “Backfitting,” the enclosed draft backfit analysis, “Draft Backfit Analysis and Documented Evaluation for Proposed Rule: Cyber Security at Fuel Cycle Facilities (10 CFR 73.53)” (Enclosure 2), presents the staff’s evaluation of the proposed cyber security rule. The Draft Backfit Analysis examines the impacts of the proposed rule relative to the current regulatory framework, including existing regulations and orders. Based on this analysis, the staff has determined that the proposed rule would constitute a backfit. This backfit is justified, in part, based on the adequate protection exception to the backfit analysis requirement, and in part based on a cost-justified substantial increase in overall protection of public health and safety. The adequate protection exception applies to those parts of the proposed rule associated with: (1) protecting against the design basis threat (DBT); or (2) the loss or unauthorized disclosure of classified information or matter (10 CFR Part 95). These parts of the proposed rule correspond to the security and safeguards consequences of concern. The cost-justified portion of the proposed rule applies to the safety consequences of concern, as discussed in Section V of the enclosed draft backfit analysis.

The proposed rule adopts a graded, consequence-based approach to the protection of digital assets. Consistent with this approach, the scope of the cyber security controls applicable to a specific digital asset is dependent upon the potential consequence that could result from the compromise of that asset. For example, the consequence of concern involving theft or diversion of formula quantities of strategic SSNM (applicable to Category I FCF licensees) would require more protection, and therefore a more comprehensive set of controls, than the consequence of concern involving unauthorized removal of SNM of moderate strategic significance (applicable to Category II FCF licensees).

The proposed rule’s graded, consequence-based approach to the protection of digital assets limits the burden on FCF licensees by allowing them to focus their cyber security efforts on protecting against only those cyber threats that could compromise VDAs and result in a defined consequence of concern. This approach reduces the number of digital assets at FCFs that licensees are required to protect. The proposed rule also avoids a stand-alone focus on cyber security by allowing licensees to take credit for an alternate means of preventing a consequence of concern through the integration of cyber security requirements with the physical security measures currently employed at FCFs.

The proposed rule would also require FCF licensees within the scope of the rule to provide a cyber security plan that accounts for site-specific conditions and describes how the licensee will meet the program performance objectives of the rule. The cyber security plan would be submitted to the NRC for review and approval. The staff has also developed draft regulatory guide (DG-5062), “Cyber Security Programs for Nuclear Fuel Cycle Facilities,” (ADAMS Accession No. ML16319A320) that provides an acceptable method for establishing, implementing, and maintaining a cyber security program at FCFs subject to the proposed rule.

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Also provided in DG-5062 are: (1) a template for developing a cyber security plan; (2) an example of the implementation process for the proposed rule; and (3) cyber security controls that a licensee may choose to adopt. The draft regulatory guide and proposed rule will be available for public comment at the same time.

Implementation of the Proposed Rule

As directed by the Commission in SRM-SECY-14-0147, the staff is considering an 18-month (540-day) implementation period once the rule becomes effective. Within 180 days of publication of the final rule, each FCF licensee would be required to submit, through an application for amendment of its license, a cyber security plan that satisfies the requirements of the new 10 CFR 73.53. In addition, each FCF applicant who has submitted an application for a license to the Commission prior to the effective date of the final rule would be required to amend its application to include a cyber security plan that satisfies the requirements of the proposed rule. The NRC would review the license amendment request and the associated cyber security plan. If the requirements are met, the license amendment would be granted with specific implementation dates for the cyber security plan specified in the NRC's written approval. As discussed in the enclosed *Federal Register* notice, the staff is considering the following phased implementation schedule: (1) within 180 days of NRC approval of the cyber security plan, each FCF licensee would identify and document VDAs; and (2) within 540 days of NRC approval of the cyber security plan, each FCF licensee would fully implement the approved cyber security plan.

Coordination with the Advisory Committee on Reactor Safeguards (ACRS)

The ACRS reviews NRC regulatory matters in order to advise the Commission on production and utilization facilities and the adequacy of proposed safety standards. On November 2, 2016, the staff briefed the ACRS, Digital Instrumentation and Control subcommittee (DI&C SC) (ADAMS Accession No. ML16326A417). The staff held a second briefing of the ACRS, DI&C SC on February 23, 2017 (ADAMS Accession No. ML17107A332). Based on these briefings, the staff incorporated feedback from the subcommittee into the rulemaking documents. The staff plans to brief the full ACRS on June 8, 2017. The transcripts of these meetings will be posted on the ACRS Web site once they become available. The staff anticipates that the ACRS will send a letter to the Commission with recommendations on both the proposed rule and associated draft regulatory guide.

Outcome of this Proposed Rule: Advancing the NRC's Strategic Goals and Objectives

The staff recommends Commission approval to publish this proposed rule for public comment. The proposed rule is consistent with the agency's goals of ensuring adequate protection of public health and safety, and promoting the common defense and security. The proposed rule would promote common defense and security and provide reasonable assurance that the public health and safety remain adequately protected as the risk and complexity of cyber attacks continues to grow. Furthermore, the proposed rule would also promote clarity, effectiveness, and openness in the regulatory process by providing an open and transparent regulatory framework that FCF licensees can consistently implement. The provisions of the proposed rule were carefully considered by the staff to help ensure that the cyber security requirements would not obstruct a licensee's ability to meet other regulatory requirements. In the area of organizational excellence, the proposed rule would support the openness objective. The

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rulemaking has been and continues to be conducted in an open and collaborative process. The staff conducted 11 public meetings to better inform this proposed rule. Also, the proposed rule and associated draft regulatory guide would be available for public comment for 90 days.

Stakeholder Interactions

As discussed in the background section of this document, the staff conducted extensive and substantive interactions with stakeholders throughout the development of the draft regulatory basis, final regulatory basis, draft proposed rule, and draft regulatory guide. The staff shared documents for public review, conducted site visits, and held 11 public meetings between June 11, 2015, and March 29, 2017. The staff used these interactions to discuss the topics set forth in the background section above as well as the preliminary proposed rule language, the associated draft regulatory guide, and the projected costs associated with the implementation of the proposed rule. During the 11 public meetings, the staff received limited feedback from non-industry stakeholders, primarily two non-governmental organizations (NGOs). NGO feedback focused on technical clarifications regarding the draft regulatory basis and the proposed rule language. The NGOs generally supported the NRC's initiation of a rulemaking to develop cyber security requirements for FCFs. All of the noted interactions with various stakeholders assisted the staff in developing the technical and cost basis for the proposed rule. Should the Commission approve publication of the proposed rule, the staff would expect additional and perhaps extensive comments from stakeholders during the public comment period.

The staff also received feedback from industry stakeholders. One significant issue raised by industry stakeholders was the applicability of the rule to computer networks accredited by other Federal agencies. The proposed rule does not apply to classified computer systems at FCFs accredited by other Federal agencies. The staff has determined that those existing accreditation processes adequately address cyber threats to classified systems at FCFs. Stakeholders commented that unclassified computer systems at FCFs accredited by other Federal agencies should also be outside the scope of the proposed rule. Based on these comments, the staff initiated dialogue with the three Federal entities (National Nuclear Security Administration (NNSA) Headquarters, NNSA Naval Reactors, and the U.S. Department of Energy's Oak Ridge Office) involved with the accreditation of unclassified systems at FCFs. The staff will assess the protection provided to digital assets residing on these unclassified systems after the respective Federal entities finalize revisions to their requirements for accreditation. A final decision on this issue will not be made until this assessment is completed.

Following the public meeting on October 12, 2016, the Nuclear Energy Institute (NEI) submitted a letter to the staff dated October 19, 2016 (ADAMS Accession No. ML16315A290), expressing concerns about the proposed rule. NEI's first concern was that the rule would impose cyber security requirements on FCF licensees that are not currently subject to the DBT. NEI is correct that the proposed rule would affect FCF licensees not subject to the DBT, as currently only Category I FCF licensees are subject to the DBT. However, the Interim Compensatory Measure Orders issued between 2002 and 2003 require FCF licensees, including those not subject to the DBT (i.e., Category III FCF licensees), to protect against cyber threats. Since then, the cyber threat has continued to evolve and FCF licensees have become more dependent on digital technology to implement safety, security, and safeguards functions. As discussed above and in the enclosed draft regulatory analysis, "Draft Regulatory Analysis for Proposed Rule: Cyber Security at Fuel Cycle Facilities (10 CFR Part 73)" (Enclosure 3), the proposed rule would apply

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a graded, consequence-based approach to protecting digital assets that, if compromised, could result in one or more consequences of concern at those FCFs within the scope of the proposed rule, including Category I and III FCF licensees.

In their letter, NEI also expressed a concern that the proposed rule should reflect the outcome of their previously submitted petition for rulemaking (PRM)-73-18, “Protection of Digital Computer and Communication Systems and Networks.” In their PRM, NEI requested that the NRC revise its power reactor cyber security regulations by narrowing the scope of 10 CFR 73.54 to the protection of those structures, systems, or components that are either necessary to prevent core damage and spent fuel sabotage, or whose failure would cause a reactor scram. The staff is currently evaluating the PRM. In SECY-14-0147, not publicly available because it contains security-related information, the staff committed to considering the resolution of the PRM in this rulemaking to the extent relevant to FCF licensees. The staff recognizes that, depending on the outcome of the PRM process, PRM-73-18 may have the potential to impact the scope of this rulemaking. If the NRC accepts the PRM and narrows the scope of the safety and security functions protected by the provisions of 10 CFR 73.54, the NRC staff would have to determine if this change in the power reactor rule would impact the scope of safety and security functions considered in the proposed FCF cyber security rule. Once the decision on PRM-73-18 is issued, the staff will determine if any corresponding changes are necessary during the rulemaking process.

Finally, NEI’s letter provided other concerns related to: industry cost estimates for implementation of the proposed rule, development of the cyber security plan, and staffing a cyber security team; the burden of screening digital assets and documenting VDAs; and the aforementioned possible exclusion of digital assets that are part of an unclassified system accredited by another Federal agency. As a result of NEI’s feedback, the staff revised the cost estimates upward and incorporated the insight gained from the discussions with NEI into the enclosed draft regulatory analysis. Based on comments received from stakeholders, the staff modified the draft regulatory guide to include an acceptable method for screening digital assets and documenting VDAs that minimizes burden on licensees.

Implementing Guidance

The staff has developed DG-5062 to assist licensees in the implementation of the proposed rule (ADAMS Accession No. ML16319A320). The draft regulatory guide describes a proposed method that the staff considers acceptable for use in complying with the cyber security requirements in the proposed rule. Because the enclosed draft regulatory analysis provides sufficient discussion of both the proposed rule and DG-5062, a separate regulatory analysis was not prepared for the draft regulatory guide. The draft regulatory guide and the proposed rule will be available for public comment at the same time.

COMMITMENT:

The staff plans to conduct an additional public meeting to facilitate stakeholder comments during the public comment period for the proposed rule and draft regulatory guide.

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RESOURCES:

The resources associated with this rulemaking are addressed in Enclosure 5, which is non-public.

RECOMMENDATIONS:

That the Commission:

1. Approve for publication, in the *Federal Register*, the proposed rule (Enclosure 1) amending 10 CFR Parts 40, 70, and 73.
2. Note:
 - a. That the proposed amendments will be published in the *Federal Register*, allowing 90 days for public comment;
 - b. The Chief Counsel for Advocacy of the Small Business Administration will be informed of the certification that the rule will not have a significant economic impact on a substantial number of small entities, and the reasons for the certification, as required by the Regulatory Flexibility Act, 5 U.S.C. 605(b);
 - c. That a draft backfit analysis has been prepared for the proposed rule (Enclosure 2);
 - d. That a draft regulatory analysis has been prepared for the proposed rule (Enclosure 3);
 - e. That a draft environmental assessment, “Draft Environmental Assessment and Finding of No Significant Impact for the Proposed Rule Cyber Security at Fuel Cycle Facilities,” has been prepared for the proposed rule (Enclosure 4);
 - f. The appropriate Congressional committees will be informed of this action;
 - g. That a press release will be issued by the Office of Public Affairs when the proposed rule is filed with the Office of the Federal Register; and
 - h. An Office of Management and Budget (OMB) review is required and a clearance package will be forwarded to OMB no later than the date the proposed rule is submitted to the Office of the Federal Register for publication.

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COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objection. The Office of the Chief Financial Officer has reviewed this paper for resource implications and has no objections.

Victor M. McCree
Executive Director
for Operations

Enclosures:

1. *Federal Register* Notice
2. Draft Backfit Analysis
3. Draft Regulatory Analysis
4. Draft Environmental Assessment
5. ~~Resources~~ (*Removed from ACRS package*)

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SUBJECT: PROPOSED RULE – CYBER SECURITY AT FUEL CYCLE FACILITIES (RIN
3150-AJ64; NRC-2015-0179), DATED: _____

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