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MEMORANDUM TO: Jennie K. Rankin, Chief
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                      Office of Nuclear Regulatory Research

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SUBJECT: SUMMARY OF THE SEPTEMBER 17, 2024, PUBLIC
                      WORKSHOP ON ARTIFICIAL INTELLIGENCE REGULATORY
                      FRAMEWORK APPLICABILITY CONSIDERATIONS

On September 17, 2024, the NRC staff hosted a public workshop on artificial intelligence (AI) regulatory framework applicability considerations at the U.S. Nuclear Regulatory Commission (NRC)'s headquarters in Rockville, Maryland with the option for virtual participation. The meeting was a continuation of the NRC staff's Data Science and AI Regulatory Applications Public Workshop series. The purposes of these workshops are to prepare for safety reviews of future AI applications and to support the AI Project Plan, Revision 1 (NRC Agencywide Documents Access and Management Systems Accession No. ML24194A116), which describes how the agency will execute the five strategic goals from NURG-2261, "Artificial Intelligence Strategic Plan: Fiscal Years 2023-2027," issued May 2023 (AI Strategic Plan) (ML23132A305).

This meeting gave the NRC staff the opportunity to meet directly with stakeholders to discuss regulatory and technical issues in the areas of data science and AI. Specifically, the workshop provided an opportunity to (1) discuss the outcomes from the regulatory framework applicability assessment of AI in nuclear applications, (2) present AI use cases being developed for nuclear applications, and (3) provide feedback on regulatory and technical issues surrounding AI use in nuclear applications. The workshop was the largest to date, with around 430 participants from 12 countries, including representatives from academia, industry, government, and international organizations.

The NRC's Chief Data Officer led with the first presentation. She outlined current initiatives for integrating AI at the agency. The presentation included schedule milestones in the AI Strategic Plan and as outlined by the NRC's AI Governance Board. The NRC aims to create a robust AI strategy, improve infrastructure, and manage risks in areas such as procurement and safety with oversight from the NRC's Chief AI Officer. Near-term activities focus on refining governance, assessing AI maturity, and implementing AI tools.

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Next, a fireside chat was held among Federal agency leaders. The participants underscored the importance of AI governance, interagency collaboration, and transparency to build public trust. The conversation acknowledged the need to balance innovation with safeguards and focus on responsible AI practices to improve operations and public services. Workforce challenges were highlighted, and one participant emphasized the importance of test, evaluation, verification, and validation. The discussion highlighted an overarching theme of adopting AI responsibly and collaboratively to harness its full potential while maintaining robust oversight and security.

The first panel session focused on advancements in applying AI in nuclear regulatory research. The NRC staff presented a research project with Purdue University on using AI and machine learning for nuclear cybersecurity to classify system states and identify potential threats. Under a separate research project, the NRC staff is developing the Boiling Water Reactor Autonomous Learning Tasks Optimizer (BALTO) autonomous software tool to optimize core designs to meet safety and efficiency goals. An NRC regional representative discussed a proposed use case to enhance inspection oversight through use of AI and mobile technology. These projects highlight how the NRC staff is leveraging AI for operational efficiency, regulatory improvements, and enhanced safety.

The NRC staff then presented on the findings from its AI regulatory gap analysis (ML24290A059). The gap analysis is part of the NRC's AI Project Plan. The analysis identified potential gaps in existing regulatory guides for AI applications, which fall into eight categories: (1) implied manual actions, (2) special computations, (3) preoperational and initial testing programs, (4) habitability under autonomous operations, (5) periodic testing, surveillance, and reporting, (6) updates to software guides for AI-specific risks, (7) radiation safety support, and (8) miscellaneous topics. Recommendations include developing cross-cutting guides on data quality, systematic testing, and fail-safe designs. Future efforts may draw insights from the Food and Drug Administration or the Federal Aviation Administration, while a pilot program may aid in evaluation of AI-enabled computation in licensed activities.

The second panel session focused on AI application in the nuclear industry. X-energy presented its AI-driven predictive maintenance for nuclear plant operations using machine learning models to forecast equipment health and enhance data management for long-term reliability. Blue Wave AI Labs showcased various tools to optimize reactor core management and improve documentation accuracy. The Pressurized Water Reactor Owners Group discussed AI applications for reactor safety, such as accident mitigation, equipment monitoring, and operator training, with a focus on performance and predictive maintenance. NEI emphasized a balanced approach to AI adoption, advocating for a flexible regulatory framework to encourage innovation while ensuring safety and transparency.

The final panel session focused on AI innovations for nuclear materials, radioactive waste, and permitting. Microsoft highlighted its generative AI solution aimed at expediting the small modular reactor licensing process by generating application documents and integrating project-specific data for regulatory compliance. Florida International University presented its advancements in nuclear waste management, which feature AI-driven computer vision for waste identification and robotics for segregation, along with a knowledge management tool to support decommissioning efforts. Pacific Northwest National Laboratory introduced PolicyAI, which is an initiative to improve environmental permitting through AI tools like SearchNEPA, which enhances document searchability, public comment processing, and analysis. Commonwealth Fusion Systems (CFS) discussed AI applications in fusion energy, particularly for enhancing plasma control and data standardization.

The workshop closed with an interactive discussion among the audience, panelists, and NRC staff. Industry stakeholders asked the NRC staff to consider developing AI regulatory sandboxes to allow industry and the NRC to collaboratively address the challenges and benefits of AI in safety-related applications. Also, data availability and confidence will be key to successful AI implementation externally and internally to the NRC. Additionally, ensuring the quick retrieval of public data in ADAMS will provide confidence and in generative AI products.

SUBJECT: SUMMARY OF THE SEPTEMBER 17, 2024, PUBLIC WORKSHOP ON
ARTIFICIAL INTELLIGENCE REGULATORY FRAMEWORK APPLICABILITY
CONSIDERATIONS DATED: NOVEMBER 18, 2024

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