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POLICY ISSUE

(Information)

April 25, 2024

SECY-24-0035

FOR: The Commissioners

FROM: Raymond V. Furstenau
Acting Executive Director for Operations

SUBJECT: ADVANCING THE USE OF ARTIFICIAL INTELLIGENCE AT THE
U.S. NUCLEAR REGULATORY COMMISSION

PURPOSE:

This paper responds to the Chair's tasking memorandum¹ directing the staff to identify how artificial intelligence² (AI) can be used to enhance the work of the U.S. Nuclear Regulatory Commission (NRC). This paper summarizes potential AI applications and the staff's overall approach to effectively leverage AI to drive value for the agency and enhance how it meets its mission. It offers a vision of how the NRC will continue to innovate and responsibly use the latest advances in AI technology to meet its safety and security mission. The paper reflects how the staff embraced the Chair's direction to advance the agency's knowledge and develop concepts for using AI to enhance our mission.

SUMMARY:

Recent advances in computer processing capabilities, machine learning³ (ML) algorithms, and greater access to large data sets have led to an exponential acceleration in AI development.

CONTACTS: Bob Randall, OCIO/SDOD
301-287-0828

Taylor Lamb, RES/DSA
301-415-7128

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¹ Memorandum from Christopher T. Hanson, Chair, to Daniel H. Dorman, Executive Director for Operations, "Advancing Use of Artificial Intelligence at the U.S. Nuclear Regulatory Commission," October 30, 2023, Agencywide Documents Access and Management System (ADAMS) Accession No. ML23303A143.

² This paper broadly uses the term "artificial intelligence" to mean computing systems that "learn" how to improve performance to automate workflows and help the NRC staff complete tasks or aid in their decisions.

³ "Machine learning" means an application of AI that is characterized by providing systems with the ability to automatically learn and improve on the basis of data or experience, without being explicitly programmed.

As a result, private companies and Federal agencies are aggressively evaluating and implementing AI technology to improve organizational efficiency, provide better or expanded services, or increase profits. The staff used a structured approach to identify potential use cases⁴ and the necessary components to effectively implement AI. The staff has identified several potential use cases where AI can improve organizational efficiency and provide better experiences and services for agency stakeholders. Specifically, 23 offices developed 61 potential use cases. From these 61 potential use cases, the staff identified 36 use cases that align with the capabilities of current AI tools, while the remaining 25 could be addressed using non-AI solutions.

To effectively implement AI solutions, the NRC will need to develop a framework to deploy AI at the agency. This necessitates having several foundational components in place. The agency will need a sound data strategy and data management program, AI governance, an information technology (IT) infrastructure that supports AI development, and a skilled AI workforce. As part of this effort, the NRC will continue to strengthen its many partnerships to stay current with the evolving state of AI. To achieve the promise of AI, leadership engagement will be essential. The staff is highlighting two strategic next steps to best position the agency for sustainable success:

- (1) Develop an enterprisewide AI strategy to advance the use of AI within the agency.
 - Prepare AI governance to ensure responsible and trustworthy AI implementation.
 - Mature the agency Data Management Program.
 - Strengthen AI talent by strategically hiring and upskilling the existing workforce.
 - Allocate resources to support the integration of AI tools as part of the IT infrastructure.
- (2) Invest in foundational tools to advance the use of AI by (1) acquiring generative AI⁵ services that integrate with current applications, and (2) integrating the use of AI with the Agencywide Documents Access and Management System (ADAMS) cognitive search technology.

These steps will help maintain momentum toward improving the agency's AI maturity, prepare its workforce for the responsible use of AI, and meet future challenges by sustaining a culture of innovation.

BACKGROUND:

In October 2023, the Chair directed the NRC staff to review how AI could streamline operations, optimize processes, and make well-informed decisions. The Executive Director for Operations established a team (NRC AI Team) from the Office of the Chief Information Officer (OCIO) and the Office of Nuclear Regulatory Research (RES) to lead this review.⁶ This OCIO and RES partnership built the foundation for the NRC AI Team. The team included an executive from each office plus three subject matter experts (SMEs). The NRC staff developed a plan to

⁴ A use case is a specific situation in which a product, technology, or service could potentially be used.

⁵ Generative AI refers to models that can create new data (e.g., text, images, and videos) by learning patterns from existing data.

⁶ OEDO Tasking in Response to Chair's Tasking Memorandum, "Advancing the Use of Artificial Intelligence at the U.S. Nuclear Regulatory Commission," December 11, 2023, (ML23321A030).

engage the agency in developing AI use cases as a first step in the widespread adoption of AI at the NRC. The NRC AI Team challenged the agency to think creatively and suggest use cases that would use AI to approach the agency's processes and procedures in new ways. Each office identified a Point of Contact (POC) to work with the team to develop office-specific use cases. These POCs provided support in submitting the use cases for their offices via the IdeaScale platform. The NRC AI Team then partnered with the agency's data scientists and AI SMEs to complete an in-depth review of all the use cases to determine their viability. The active engagement by NRC staff to develop use cases demonstrates the agency's enthusiasm for using AI to improve our work.

Current State of AI at the NRC

Although AI has been around since the 1950s, advances in computer processing capabilities and ML algorithms, along with greater access to large data sets, have led to an exponential acceleration in AI development, which is rapidly disrupting how the world works. The nuclear industry is already using AI to change its approach to some nonregulated activities and has expressed interest in using AI for NRC-regulated activities. As a forward-looking organization, the NRC must keep pace with technological innovations and be ready to assess the potential applications of AI to NRC-regulated activities. Anticipating this advancement, the agency published the NRC's AI Strategic Plan in May 2023 to ensure the NRC is ready for the industry's use of AI in an NRC-regulated activity.⁷ In addition, the NRC is investing in AI research through the Future Focused Research program to identify areas where AI could be used to meet the agency's mission while building foundational knowledge across the NRC.⁸ Further, this broad approach to AI research at the NRC is preparing the agency to use AI to increase staff knowledge and experience for future regulatory reviews and oversight.

Over recent years, the NRC has been actively preparing the agency to support AI technology and implementing it to enhance specific IT tools. This work includes the development of the NRC IT/IM Strategic Plan, IT Roadmap, and Data Strategy. One of the initial steps was digitizing agency records, converting over 1.3 million records (equivalent to 43 million images) from 1979–1999 into digital format using AI-based computer vision. These records are now accessible via ADAMS, opening new possibilities for leveraging historical data alongside recent information for training AI models. Next, the agency developed its data strategy, which lays out a set of agencywide goals and supporting strategies to enhance the management of the agency's data. Effective data management is essential for effective AI implementation. More recently, the NRC used AI-powered cognitive search technology to create an enhanced ADAMS search engine, significantly streamlining search processes for the staff. This project offered valuable insights into practical uses of available AI tools. Lastly, the staff has worked to improve the technical skills of the workforce. The agency added data science and AI expertise in the last 5 years and upskilled (i.e., provided specialized training) several staff members with various IT backgrounds. The NRC is currently pursuing a Presidential Innovation Fellow⁹ for AI in collaboration with the General Services Administration.

As the NRC navigates the Federal AI environment, the staff benefits from the work of other Federal agencies by participating in the Chief Artificial Intelligence Officers (CAIO) and Responsible Artificial Intelligence Officers Councils, as well as collaborating with individual

⁷ NUREG-2261, "Artificial Intelligence Strategic Plan: Fiscal Years 2023–2027," May 2023 (ML23132A305).

⁸ "NRC's Future-Focused Research Program," November 2021 (ML21326A184).

⁹ The Presidential Innovation Fellows program aims to bring external innovation and technology industry best practices into Federal agencies to enhance government operations and services.

agencies. For example, the NRC has a memorandum of understanding with the Department of Energy on operating experience and data analytics and has participated in the National Institute of Standards and Technology AI Risk Management Framework. These partnerships are essential to the agency's response to the rapidly changing AI landscape.

Federal Law and Executive Actions

Responsible use of AI is a national priority. Federal laws, Executive Orders, and guidance provide direction to Federal agencies on the responsible uses of AI.¹⁰ The Office of Management and Budget (OMB) recently issued guidance to strengthen and advance the use of AI within the Federal Government.¹¹ The guidance requires agencies to take steps to advance AI governance and innovation while managing risks from the use of AI. Examples include:

- Designate a CAIO to coordinate the agency's use of AI.
- Establish an AI Governance Board to govern the agency's use of AI.
- Develop an enterprisewide AI strategy to advance the responsible use of AI and achieve improvements in AI maturity, including strategies related to IT infrastructure, data, cybersecurity, and workforce.
- Implement minimum practices when using AI that could affect the public's safety or rights (e.g., assessing, testing, and monitoring the impacts of the AI technology).

To assist with hiring AI talent, the Office of Personnel Management (OPM) recently approved Federal agencies' use of Governmentwide hiring authorities¹² and workplace flexibilities¹³ to build AI capacity. One example is the empowerment of agencies to use pay flexibilities and incentive programs without needing approval from OPM, including recruitment and retention incentives, student loan repayment programs, and various pay-setting authorities, to attract and retain AI and related technical staff. The NRC will need to leverage these flexibilities to remain competitive in attracting and retaining AI talent.

DISCUSSION:

Internal Outreach and Education

In December 2023, the NRC AI Team hosted a meeting with a vendor and NRC senior leadership in Rosslyn, Virginia, to begin discussions of AI adoption at the agency. The NRC AI Team then facilitated a similar virtual meeting the following week to allow all interested NRC

¹⁰ See, for example, "Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence" (88 FR 75191; October 30, 2023), and Pub. L. No. 117-263, div. G, title LXXII, subtitle B, §§ 7224(a), 7224(d)(1)(B), and 7225 (codified at 40 U.S.C. 11301 note), <https://www.congress.gov/117/plaws/publ263/PLAW-117publ263.pdf>.

¹¹ See OMB Memorandum M-24-10, "Advancing Governance, Innovation, and Risk Management for Agency Use of Artificial Intelligence," (March 28, 2024). OMB Memorandum M-24-10 outlines three major requirements for Federal agencies to (1) strengthen AI governance, (2) remove barriers to responsible AI use and develop agency AI strategies for achieving enterprisewide advances in AI maturity, and (3) adopt minimum risk management practices for AI applications affecting rights and safety.

¹² OPM memorandums to Heads of Departments and Agencies ([September 29, 2023](#), and [December 29, 2023](#)).

¹³ CPM 2024-06 (February 7, 2024).

staff to participate and gain insight into the vendor’s current AI tools. These meetings provided an initial forum for the NRC to understand the vendor’s AI environment and helped a shift in mindset regarding the use of AI in the agency’s work.

After these meetings, the NRC AI Team set up shared communication platforms in SharePoint and a Microsoft Teams channel, giving one-stop access to key resources. To encourage agencywide participation in collecting use cases, the NRC AI Team engaged all 23 NRC offices and regions in one-on-one meetings. These meetings gave the offices an opportunity to ask questions, share initial thoughts on the use case requirements, and explore partnerships with other offices. For example, because of this outreach, the regions collaborated on many of their use cases related to the NRC oversight process. Enclosure 1 summarizes the outreach and education efforts.

Use Case Development and Evaluation

Following the meetings with the offices, the NRC AI Team supported the offices and regions as they worked with their POCs to prepare use case ideas. The NRC AI Team used the IdeaScale platform to gather the proposals. Once the cases were submitted, the NRC AI Team reviewed the content of the use cases for completion and moved them to the next review stage in the IdeaScale platform, which allowed the entire agency to review the use cases, providing transparency to the process.

Figure 1 summarizes the NRC AI Team’s outreach and education activities. Through this collaborative approach, the 23 offices developed 61 potential use cases. The staff’s successful engagement provided an initial collection of ideas that begins to explore what might be possible using AI. Enclosure 2 (nonpublic) provides information from an internal dashboard of all the recommended use cases. As the agency begins implementing the use cases, the NRC will, consistent with Federal law,¹⁴ prepare and share an inventory of AI use cases with other Government agencies and the public.



Figure 1: Summary of outreach and educational activities for NRC staff.

¹⁴ Under the Advancing American AI Act, Federal agencies are required to inventory their AI use cases and share their inventories with other Government agencies and the public on the agency’s public website. The inventory will include nonclassified and nonsensitive AI use cases, including current and planned uses, but exclude those related to research and development.

Finally, the NRC AI Team collaborated closely with the agency's data scientists and AI SMEs to analyze potential use cases, yielding significant additional insights into their feasibility. The data scientists' and AI SMEs' expertise in applying data science principles offered valuable structure to categorizing and validating the use cases. Among the 61 use cases reviewed, the team identified 36 cases that align with the abilities of today's AI tools. The team concluded that the 25 remaining use cases could be addressed with non-AI solutions.

Results and Common Themes

After reviewing the potential 61 use cases and consulting with the data scientists and AI SMEs, the NRC AI Team identified several common themes. Among the 36 recommended AI use cases, 16 had an overarching theme of leveraging generative AI, including commercially available productivity tool assistants. These 16 use cases would apply AI to automate routine tasks and implement workflow and process improvements, making many of the staff's daily tasks more efficient. Examples of these use cases include using generative AI to summarize meeting transcripts, documents, and web pages. The overarching theme of the remaining 20 recommended AI use cases was using other types of AI (e.g., ML and natural language processing¹⁵) for predictive analytics, semantic analysis, and comment analysis. Examples of these use cases include using other types of AI to perform predictive analytics, automating the review of public comments on proposed regulations, and aiding inspectors in scheduling and planning their availability across the regions. These use cases are expected to enhance staff productivity and support the workforce by automating routine processes and improving data analysis efficiency to facilitate data-driven decision-making.¹⁶ The NRC will use the newly implemented AI governance board and the IT roadmap Development, Modernization, Enhancement (DME) processes to evaluate the value proposition of these potential applications and prioritize implementation.

The other 25 use cases focus on aspects of data analytics or process automation that could be achieved without the use of AI. These use cases will be referred back to the respective offices and regions to determine whether to submit them through the existing IT DME intake process.¹⁷ Several of them could be implemented by enhancing agencywide data governance practices to aid in the enhancement of the Federal Data Strategy.¹⁸ Figure 2 illustrates the categories of use cases recommended by NRC staff.

¹⁵ Natural language processing is the use of algorithms to determine properties of natural human language so that computers can understand what humans have written or said. It includes teaching computer systems how to extract data from bodies of written text, translate from one language to another, and recognize printed or handwritten words.

¹⁶ Enclosure 2 presents the potential benefits and drawbacks, as well as the projected costs and savings, for each recommended use case.

¹⁷ The DME intake process is used to review request for new IT assets or system(s), or changes and modifications to an existing IT asset(s) that require review by the Digital Service Center (DSC). The DSC assess the request against a set of criteria including alignment with the agency IT roadmap, agency impact, efficiency and effectiveness, technical and cost feasibility, and risk.

¹⁸ OMB, "Federal Data Strategy," <https://strategy.data.gov/>, accessed on April 2, 2024.

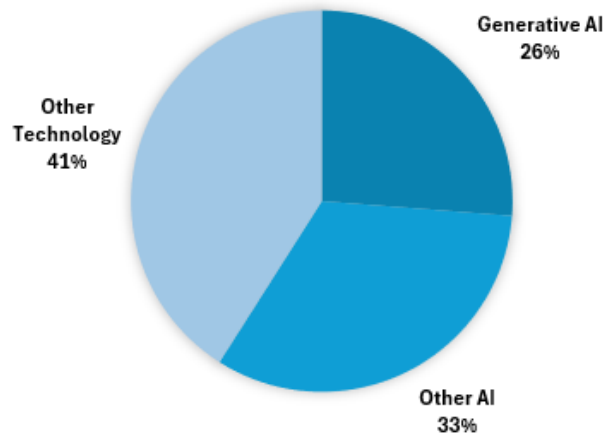


Figure 2: Categories of Recommended Use Cases

Next Steps:

As the NRC considers how to effectively use AI technology to improve the agency’s processes and procedures, the NRC AI Team has identified several next steps that will provide a solid foundation for the NRC’s adoption of AI across the agency. Figure 3 illustrates the proposed foundational blocks of the NRC enterprisewide AI strategy.

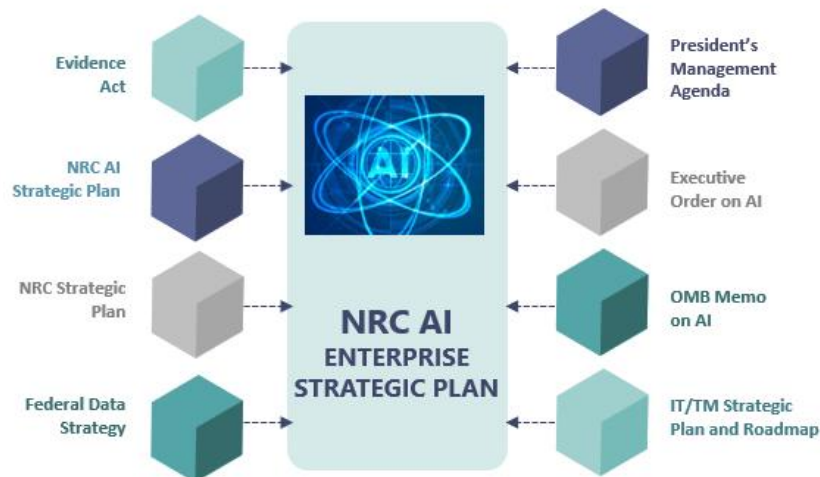


Figure 33: NRC AI Enterprisewide Strategic Plan

Develop an enterprisewide AI strategy to advance the use of AI within the agency. This strategy will build on the AI objective and goals included in the IT roadmap and will complement the current AI Strategic Plan by emphasizing an internal focus that prioritizes agency readiness to implement AI, including the requirements outlined in the OMB guidance. An enterprisewide AI strategy will ensure that the NRC is aligned with the Federal policy that Federal agencies use AI in a safe and responsible manner. This would complement NRC’s current practice for choosing new technologies (i.e., DME processes). Key components of an enterprise-wide strategy include:

- **Prepare AI governance to ensure responsible and trustworthy AI implementation.** AI governance provides for the ethical, safe, and equitable development and use of AI technologies and addresses potential risks and impacts. Establishing strong AI governance and clear guidelines is crucial and must precede the full deployment of AI.
- **Mature the Agency Data Management Program.** This portion of the strategy would lay the groundwork for successful agencywide AI implementation. To successfully adopt AI, the NRC needs to continue implementing the goals and supporting strategies in the Federal Data Strategy, particularly its data architecture and data stewardship. Additionally, the entire NRC workforce will need to acquire basic data literacy skills, to ensure a collective understanding of how data underpin and enhance the agency's operations. The Chief Data Officer and the Chief Learning Officer would deliver targeted training to the NRC staff to ensure agencywide understanding of these key issues.
- **Strengthen AI talent by strategically hiring and upskilling the existing workforce.** This part of the strategy would optimize current recruitment methodologies and advocate for workplace adaptability, which would ensure the smooth incorporation of AI into the agency's daily workflows. Given the competitive nature of current hiring, where numerous organizations are vying for the same talent pool, it is critical for the NRC to attract the necessary talent. The strategic acquisition of talent is necessary to support the NRC's AI enterprisewide strategy and the AI strategic plan. Lastly, the NRC will upskill the talent of our existing highly skilled workforce by investing in comprehensive training to enhance AI literacy and encourage and educate on the responsible use of AI.
- **Allocate resources to support the integration of AI tools as part of the IT infrastructure.** This portion of the strategy would prioritize strategic investment in essential resources across the agency to facilitate the widespread adoption of AI and focus on strengthening IT infrastructure. This strategy encompasses the deployment of an advanced generative AI tool designed to boost productivity. In addition, the NRC will empower early adopters within the agency to understand challenges and develop effective strategies. Lastly, the NRC will need to establish a method to monitor progress in adopting AI to support the agency's work.

Invest in foundational tools to advance the use of AI. In fiscal year (FY) 2025, the staff plans to invest in two foundational AI tools that will address several AI use cases and facilitate staff learning and understanding of various AI tools needed to develop other AI use cases. Acquiring generative AI services that integrate with current applications and integrating AI with the ADAMS cognitive search technology would provide the building blocks for approximately a third of the staff's initial proposed use cases. These tools will allow the staff to gain experience and knowledge using generative AI and evolving AI tools. It should be noted that governance, data readiness, and training will be required before implementing these foundational AI tools. These first steps will offer some immediate productivity improvements. After implementing these initial steps, the NRC will use the newly implemented AI Governance Board and NRC's IT roadmap DME processes to determine if and when to implement the other use cases.

Leadership engagement will be essential to achieve the promise of AI. The NRC can build off the success from the past six months, which saw staff from all NRC offices and regions increase AI awareness and bring innovative ideas forward. Continuing to engage staff and maintain a high level of enthusiasm will keep NRC staff motivated about the opportunities that AI has to offer.

CONCLUSION:

AI presents an opportunity for the NRC to improve operations and support for its mission. Successful internal adoption of AI will expand the staff's understanding of the technology and thereby strengthen the agency's ability to regulate the use of AI in NRC-regulated activities. The tasking memorandum has catalyzed the staff in developing AI use cases that showcase their engagement and creativity. Looking ahead, the NRC should strike a balanced pace that does not race ahead or lag behind Federal partners and industry. The next steps will include developing an enterprisewide strategy and investing in foundational tools to support the implementation of several use cases identified by the staff. By employing a balanced approach, the NRC can embrace a responsible AI strategy that promotes learning and makes the best use of all the agency's people, processes, and technologies. The NRC is undertaking the journey ahead as a collaborative and forward-looking agency where AI-driven innovation supports the NRC's core mission to enable the safe and secure use of nuclear energy.

RESOURCES:

Enclosure 3 (non-public) provides the resources to advance the use of AI within the agency. The NRC's FY 2025 budget requests funding for AI guidance implementation. For resources in FY 2026 and beyond, the planning, budgeting, and performance management process will address these needs.

COORDINATION:

The Office of the General Counsel (OGC) conducted a legal sufficiency review of the use cases and found no significant legal concerns. However, implementation of some use cases will need to be delayed until after the development of the NRC's enterprisewide AI strategy, including AI governance documents. These use cases may implicate the rights and privileges of internal parties (e.g., civil rights and human capital) and external parties (e.g., allegations, investigations, and enforcement proceedings), emergency and incident response communications with the public (e.g., emergency response and external risk communication), and the use of data from external copyright-protected sources. The AI governance documents will include provisions to manage the legal risk to the agency that these use cases may pose if incorrect or misleading data are considered in the staff's decisions. Existing policies and procedures already cover other use cases related to the use and generation of purely internal data and documents (such as chat bots, internal research systems, improved ADAMS search, and internal workflows). OGC has reviewed this paper and has no legal objection.

The Office of the Chief Financial Officer (OCFO) reviewed this package and determined that it has no financial impact at this time. However, implementing some use cases may have a financial impact, which will be addressed through the planning, budgeting, and performance management process.

Raymond V. Furstenau
Acting Executive Director for Operations

Enclosures:

1. Summary of Outreach Activities
And Education
2. List of Recommended
Use Cases (non-public)
3. Resources for Advancing the
Use of AI (non-public)

SUBJECT: ADVANCING THE USE OF ARTIFICIAL INTELLIGENCE AT U.S. NUCLEAR REGULATORY COMMISSION DATED: APRIL 25, 2024

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