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# PUBLIC SUBMISSION

**Docket:** NRC-2021-0048

Role of Artificial Intelligence Tools in Nuclear Plant Operations

**Comment On:** NRC-2021-0048-0001

Role of Artificial Intelligence Tools in U.S. Commercial Nuclear Power Operations

**Document:** NRC-2021-0048-DRAFT-0004

Comment on FR Doc # 2021-08177

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## General Comment

Attached are comments from Northern States Power Company, a Minnesota corporation (NSPM), d/b/a Xcel Energy, operator of the Monticello and Prairie Island Nuclear Generating Plants.

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## Attachments

Xcel Energy Comments on Role of AI Tools in US Commercial Nuclear Power Ops

**Xcel Energy Comments on Role of Artificial Intelligence Tools in U.S. Commercial Nuclear Power Operations Docket ID NRC-2021-0048**

**IV. Requested Information and Comments**

AI and ML are emerging, analytical tools, which, if used properly, show promise in their ability to improve reactor safety, yet offer economic savings. The NRC requests comments on issues listed below in this solicitation to enhance the NRC's understanding of the short- and long-term applications of AI and ML in nuclear power industry operations and management, as well as potential pitfalls and challenges associated with their application.

**1. What is status of the commercial nuclear power industry development or use of AI/ML tools to improve aspects of nuclear plant design, operations or maintenance or decommissioning?**

**• What tools are being used or developed?**

- Xcel Energy is beginning to leverage cloud-based technology to create applications that utilize machine learning and artificial intelligence. These tools will allow streamlined data visualization, as well as streamlining the manual effort required to implement required processes.
- The first application currently in development is the CAP (Corrective Action Program) Intelligent Advisor, which provides an enhanced user environment while improving the organization's agility in implementation of the CAP.
- Xcel Energy anticipates applications to continue to be developed as the business identifies critical areas where efficiency could be gained by reducing manual touchpoints.

**• When are the tools currently under development expected to be put into use?**

- Xcel Energy is anticipating the first deployment in late 2021, which will be utilized to support the Corrective Action Program.

**2. What areas of commercial nuclear reactor operation and management will benefit the most, and the least, from the implementation of AI/ML? Possible examples include, but are not limited to, inspection support, incident response, power generation, cybersecurity, predictive maintenance, safety/risk assessment, system and component performance monitoring, operational/maintenance efficiency and shutdown management.**

- Focus areas for future implementation of AI / ML will be those that require significant repetitive manual input. Automation will ensure the current process has a repeatable, consistent outcome that can be reviewed by humans, as needed.
- One example is enhanced identification and communication of equipment conditions. Based on comparison of current to expected performance, algorithms can alert personnel to early deviations, prompt a review by knowledgeable individuals to maintain equipment. As technology advances, other processes that require repetitive support will be considered, such as enhancement to data reviews for trending, supply chain efficiencies, maintenance processes and back-office automation.

**3. What are the potential benefits to commercial nuclear power operations of incorporating AI/ML in terms of (a) design or operational automation, (b) preventive maintenance trending, and (c) improved reactor operations staff productivity?**

- Incorporating AI / ML will support the organization's safety focus by efficiently identifying and addressing the most important issues. Automated data collection from

equipment with computer supported trending will permit real-time equipment assessment and support optimized equipment performance. This also supports efficient use of available resources through enhanced predictability and planning.

- Use of AI / ML will provide the ability to gain greater insights and understanding from the nuclear data and information produced.

**4. What AI/ML methods are either currently being used or will be in the near future in commercial nuclear plant management and operations? Example of possible AI/ML methods include, but are not limited to, artificial neural networks, decision trees, random forests, support vector machines, clustering algorithms, dimensionality reduction algorithms, data mining and content analytics tools, gaussian processes, Bayesian methods, natural language processing, and image digitization.**

- All items listed above are currently being considered and Xcel Energy is open to utilizing emerging technology.

**5. What are the advantages or disadvantages of a high-level, top-down strategic goal for developing and implementing AI/ML across a wide spectrum of general applications versus an ad-hoc, case-by-case targeted approach?**

- Currently, Xcel Energy is evaluating value provided through AI / ML on a case-by-case basis. Each application is reviewed broadly for use across the enterprise. This approach provides agility to review current, critical needs while evaluating the benefits in small, measured improvements.
- In the future, Xcel Energy would be open to considering use of a common standard, where applicable. It is envisioned this could create open, efficient lines of communication, both within Xcel Energy, but also potentially with external stakeholders, to streamline alignment within the regulatory and oversight process.
- In all applications, the vision is to create efficiency to meet current nuclear regulatory requirements through technology.

**6. With respect to AI/ML, what phase of technology adoption is the commercial nuclear power industry currently experiencing and why? The current technology adoption model characterizes phases into categories such as: the innovator phase, the early adopter phase, the early majority phase, the late majority phase, and the laggard phase.**

- Xcel Energy is an early adopter of technology and digitalization efforts.

**7. What challenges are involved in balancing the costs associated with the development and application of AI/ML, against plant operational and engineering benefits when integrating AI/ML applications into operational decision-making and workflow management?**

- For each possible use, a business case is created to determine potential future value. This process allows items with significant repetitive manual processes to benefit when replicating the current business practices into an automated format.
- The integration of AI and ML methods / algorithms into nuclear processes are very early in development. The current challenge surrounds data quality and availability for those processes that will employ AI / ML tools.

**8. What is the general level of AI/ML expertise in the commercial nuclear power industry (e.g. expert, well-versed/skilled, or beginner)?**

- Xcel Energy is currently utilizing external support, through vendors, national labs and universities, to identify and guide applications for both proven and emerging technology.

- Internal talent is being hired and developed using a measured approach and is benefiting from the partnerships with external support.
- 9. How will AI/ML effect the commercial nuclear power industry in terms of efficiency, costs, and competitive positioning in comparison to other power generation sources?**
- Current methods to ensure compliance are heavily reliant on manual processes and repetitive steps. Xcel Energy believes that reduction of compliance cost through automation, including data visualization / AI / ML, will allow Xcel Energy to gain cost efficiencies and improved performance around nuclear processes and regulations. This will also allow nuclear to remain competitive within the Xcel Energy generation portfolio, even compared to electric sources that may not have similar regulatory requirements.
- 10. Does AI/ML have the potential to improve the efficiency and/or effectiveness of nuclear regulatory oversight or otherwise affect regulatory costs associated with safety oversight? If so, in what ways?**
- Xcel Energy believes AI / ML / automation will provide the ability to assess compliance on a continual basis. This will provide efficiency for both the licensee, as well as external stakeholders and enhance open communication paths.
- 11. AI/ML typically necessitates the creation, transfer and evaluation of very large amounts of data. What concerns, if any, exist regarding data security in relation to proprietary nuclear plant operating experience and design information that may be stored in remote, offsite networks?**
- Xcel Energy is following both company and nuclear requirements pertaining to data security regulations in our first use of offsite networks.
  - Overall security around data and information continues to strengthen as new tools and capabilities become available (i.e. encryption of data at rest and transient).