

**RIC 2024 Hybrid**

U.S. Nuclear Regulatory Commission  
36th Annual Regulatory Information Conference

**MARCH 12-14, 2024**

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# THE FUTURE OF NUCLEAR: ADAPTING TO AI-ENABLED AUTONOMY

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ADAPTING TO A  
**CHANGING LANDSCAPE**

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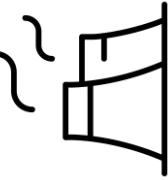
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# Artificial Intelligence (AI) Landscape and the NRC

## NUCLEAR INDUSTRY (EXTERNAL)



Industry  
wants to use  
AI

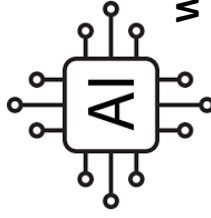


AI Strategic Plan  
to prepare staff  
to review AI

## OTHER CONSIDERATIONS AND OPPORTUNITIES (INTERNAL)



Federal actions for  
advancing the use of AI in  
government operations<sup>1</sup>



## ACTIVITIES

Wide range of AI meetings,  
conferences, and activities

## INTERNAL TO THE NRC



NRC Evidence Building  
Plan Priority Questions

Chair's Memorandum  
on Advancing the Use  
of AI at the U.S. NRC<sup>2</sup>



Internal interest in researching  
AI-based tools, ranging from AI  
embedded in commercial  
applications to custom  
programming



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<sup>1</sup> <https://ai.gov/actions/> <sup>2</sup> <https://www.nrc.gov/docs/ML2330/ML23303A143.pdf>

## Clarifying Automation, Autonomy, and AI

- AI technologies can enable autonomous systems
  - Not all uses of AI are fully autonomous—they may augment human decision-making rather than replace it.
  - Higher autonomy levels indicate less reliance on human intervention or oversight and, therefore, may require greater regulatory scrutiny of the AI system.
- Multiple definitions exist; however, it is important to have a clear understanding of the differences between automation and autonomy
  - Automation—considered to be a system that automatically acts on a specific task according to *predefined, prescriptive rules*. For example, reactor protection systems are automatically actuated when process parameters exceed certain defined limits.
  - Autonomy—a set of intelligence-based capabilities that *allows the system to respond to situations that were not preprogrammed or anticipated* (i.e., decision-based responses) before system deployment. Autonomous systems have a degree of self-governance and self-directed behavior, resulting in the ability to compensate for system failures without external intervention.

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## Notional AI and Autonomy Levels in Commercial Nuclear Activities

Level	Notional AI and Autonomy Levels	Potential Uses of AI and Autonomy in Commercial Nuclear Activities
Level 0	<b>AI Not Used</b>	No AI or autonomy integration in systems or processes
Level 1	<b>Insight</b> Human decision-making assisted by a machine	AI integration in systems is used for optimization, operational guidance, or business process automation that would not affect plant safety/security and control
Level 2	<b>Collaboration</b> Human decision-making augmented by a machine	AI integration in systems where algorithms make recommendations that could affect plant safety/security and control and that are vetted and carried out by a human decision-maker
Level 3	<b>Operation</b> Machine decision-making supervised by a human	AI and autonomy integration in systems where algorithms make decisions and conduct operations, with human oversight, that could affect plant safety/security and control
Level 4	<b>Fully Autonomous</b> Machine decision-making with no human intervention	Fully autonomous AI in systems where the algorithm is responsible for operation, control, and intelligent adaptation, without reliance on human intervention or oversight, that could affect plant safety/security and control

Human Involvement



Machine Independence



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Common Understanding of the Level Key for  
Regulatory Readiness

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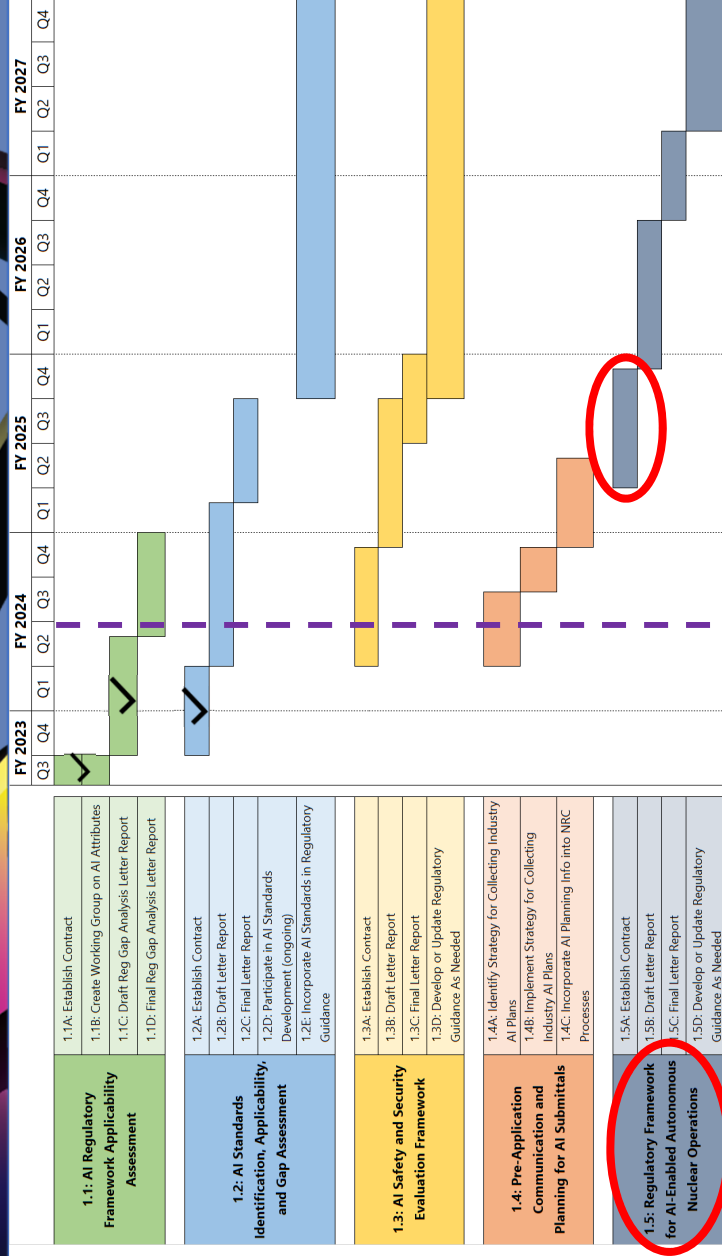
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## Goal #1: Ensure NRC Readiness for Regulatory Decision-Making

Project Plan for the U.S.  
Nuclear Regulatory  
Commission Artificial  
Intelligence Strategic Plan  
Fiscal Years 2023–2027,  
Revision 0

Available at [ML23236A279](https://www.nrc.gov/ml23236a279)



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## **Moving Forward: 2024 and Beyond**

- The NRC must remain vigilant—AI technologies are entering the nuclear domain in multiple venues
- The NRC has been proactively working to understand this evolving technology to identify technical and regulatory challenges and gaps, gather insights on potential use cases, and develop institutional knowledge
- We are working to ensure we have the staff with the knowledge, skills, and abilities to effectively regulate these new technologies
- We continue to encourage stakeholders to engage with the NRC early and often on plans and operating experience

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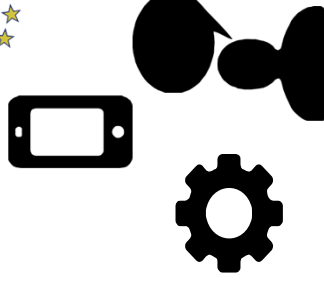
## Connect With us

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