U.S. DEPARTMENT OF ENERGY | Office of NUCLEAR ENERGY

Overview of DOE Nuclear Cyber Security R&D Program

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Rebecca Onuschak
Office of Nuclear Energy
US Department of Energy

About the DOE Office of Nuclear Energy

NE's mission is to advance nuclear energy science and technology to meet U.S. energy, environmental, and economic needs. NE has identified the following goals to address challenges in the nuclear energy sector, to help realize the potential of advanced technology, and to leverage the unique role of the Government in spurring innovation:

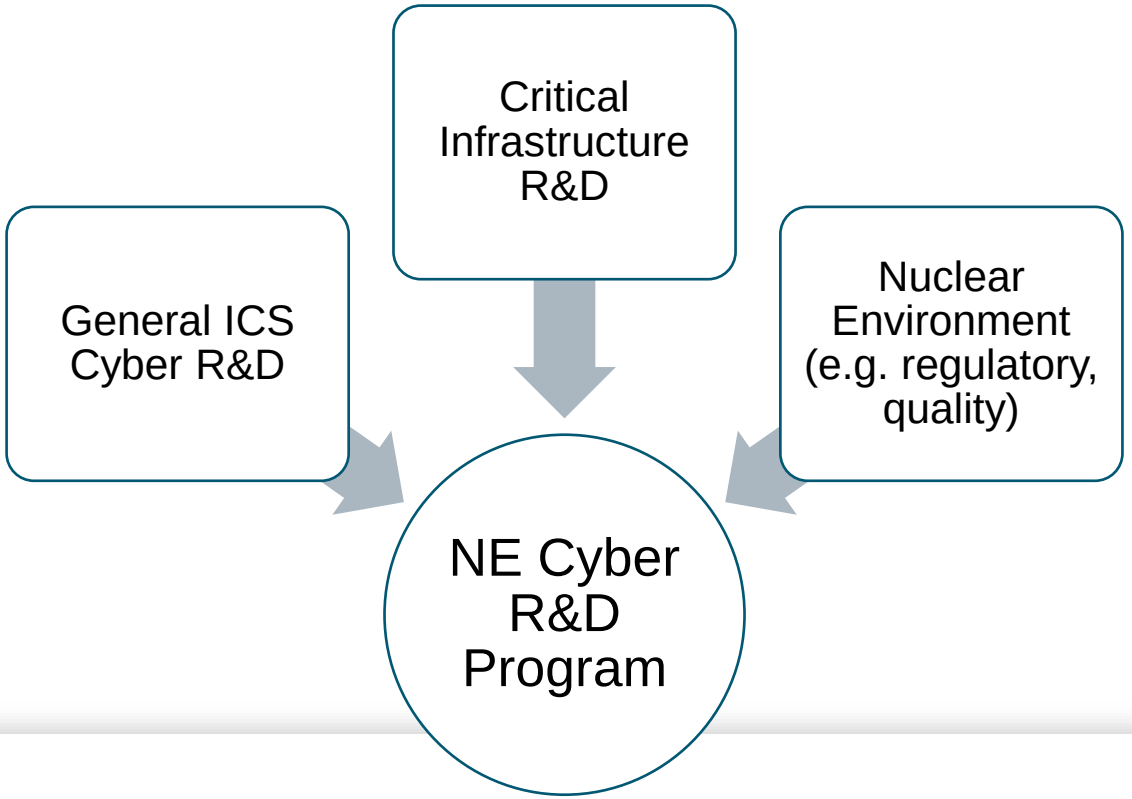
1. **Enable continued operation of existing U.S. nuclear reactors.**
2. **Enable deployment of advanced nuclear reactors.**
3. **Develop advanced nuclear fuel cycles and spent nuclear fuel management options.**

Nuclear Cyber Security R&D Program

Mission

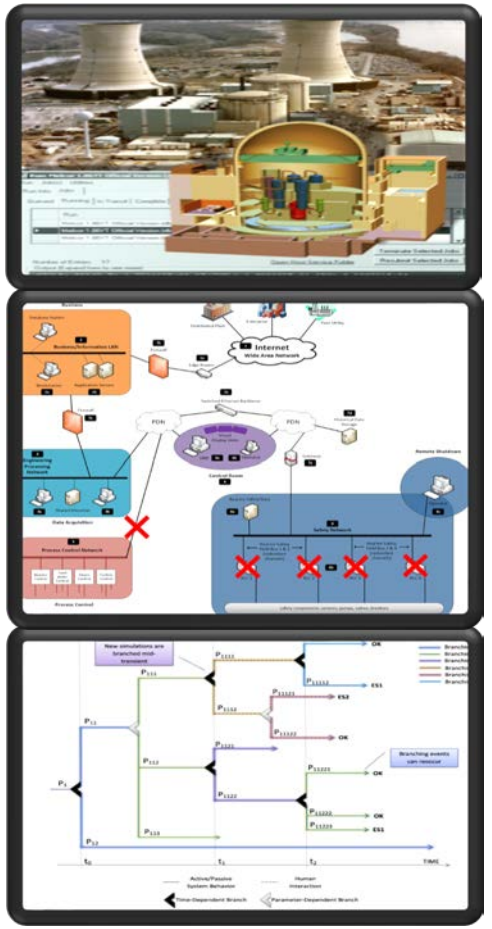
Enable science-based methods and technologies for cost-effective, cyber-secure digital instrumentation, control and communication for current and future nuclear power plants.

Small program does not duplicate other work. Narrow focus on nuclear power plant control systems applications.



Historical Major Program R&D Areas

- **Cyber Risk Management**: Research into threat informed, science-based and experimentally validated risk methodologies
- **Secure Architecture**: Establish a science-based foundation to inform the fundamental architectural features, requirements, and standards for nuclear facility digital systems
- **Supply Chain**: Deliver science-based tools, methodologies, and guidelines for cyber-resistant supply chains
- **Modeling and Simulation**: Develop at-scale emulation systems for experimentation, demonstration, and risk-consequence assessments



Elements of Risk Methods adapting traditional risk analysis to cyber security

Roadmap for Secure Digital Innovation

DOE-NE Future Fleet R&D

Advanced Reactor Programs (non-LWRs)

Small Modular Reactors

Micro Reactors

- **Enable future innovations, such as:**
  - Remote and/or autonomous systems
  - Continued expansion of use of wireless in SMRs
  - Other novel digital architectures?
- **Understand functional needs early, to better design architectures with cybersecurity from the beginning.**
- **Potentially produce or apply novel secure communication technology**
- **Leverage toolsets from other industries and programs**
- **Improve economics of implementing, licensing and operating advanced digital technologies**

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