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A Study for the Canadian Nuclear Safety Commission on Artificial Intelligence Applications and Implications for the Nuclear Industry

Artificial Intelligence (AI) is defined by its ability to perform human-like tasks consisting of reasoning and logic. Its adoption can accelerate technological development in the nuclear sector, as well as automate processes leading to reduced costs, better design, and increased safety. However, AI use can lead to safety and/or security risks, thus its readiness in the nuclear industry must be investigated. The nuclear industry has expressed interest in incorporating AI into their activities. For instance, Industry is now seeking to use AI to introduce predictive maintenance and only replacing parts when the AI, based on its programming, data and sensors "think" a component needs to be replaced. While this has the promise of very large savings for industry, it does pose a regulatory risk given the current level of regulatory knowledge of AI.

In its discussions with regulators, government departments, industry partners and academia, there was concern that industry interest in AI preceded the CNSC's ability to determine requirements for its use. As such, CNSC commissioned a research project to determine how AI can be used in the nuclear regulatory framework, and an approach to engage expertise to assess its use in nuclear safety.

The report was commissioned to determine challenges from AI adoption in the nuclear industry, and ways for its safe implementation in nuclear activities. To that end, the report analyzed international regulations of AI use in nuclear activities to provide recommendations on addressing its impact through a regulatory framework in Canada.

The report revealed three common themes around regulatory challenges of AI in nuclear activities: reliability, trustworthiness, and security. A regulatory framework for AI use in the nuclear industry that addresses these themes will allow Canada to safely adopt technologies that are rapidly becoming reliant on AI, such as small modular reactors (SMRs). Moreover, clarity around regulatory requirements for AI application will allow for its implementation in licensing and compliance, resulting in potential savings for regulated parties. To deliver these results to federal regulators, CNSC developed workshops and outreach activities in coordination with the Community of Federal Regulators (CFR).