

How to Flourish in the Age of Nuclear Renewal



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Nuclear power is more valuable today than it has ever been. While not a new notion among those who work in the domestic commercial nuclear power industry, the idea that nuclear power plants should and must continue safe, reliable, and economic operation has made significant inroads among policy-makers and experts nationwide. A brief look at the recent policy and regulatory events surrounding Diablo Canyon Nuclear Power Plant and the Inflation Reduction Act serve as an example of how far the nuclear industry has come in the eyes of governments and the public in the last two years.

With the future of nuclear power more secure now than it has been in decades, it is time to take a fresh look at business operating models in use in the United States (U.S.) commercial nuclear power industry. Over the last three years, Light Water Reactor Sustainability (LWRS) Program researchers at Idaho National Laboratory (INL) have been doing just that. Business models for the operation of North Sea offshore oil platforms served as inspiration for research combining the capabilities and advantages of state-of-the-art technology, data, and automation into new organizational approaches to business operations when implemented at nuclear power plants and fleets.

Through this research, we are suggesting a new business operating model for domestic nuclear power plants called Integrated Operations for Nuclear (ION). ION achieves lower operation and maintenance costs by deploying digital technology and business process innovations.

The ION model represents an integrated, multi-year digital and operational transformation strategy that connects technologies building on capabilities of previously completed projects. This long-term integrated strategy is made possible by the significant policy support mentioned above, but also by the trend of license extensions that allow plants to operate for as many as sixty years or more.

Digital infrastructure and the modernization of plant systems and processes are not the only advantages of ION. The building blocks of the ION model are what researchers are calling work reduction opportunities. Each work reduction opportunity represents a category of changes to processes and potentially plant equipment. Automated planning and scheduling or training modernization are examples of two work reduction opportunities that focus on automating and digitizing existing plant processes making them more efficient and effective with fewer person-hours required.

The suite of thirty-seven work reduction opportunities, which constitute projects included in the ION business model, is described in *Process for Significant Nuclear Work Function Innovation Based on Integrated Operations Concepts* (INL/EXT-21-64134). This report, developed by LWRS Program researchers and the nuclear business experts at ScottMadden Management Consultants provide estimates of potential cost and expected savings for each work reduction opportunity.

However, greater fidelity was needed for the cost and benefit estimates to assure the industry of sound analysis. Researchers verified initial costs and savings estimates with multiple utilities implementing these projects. Personnel were interviewed and project information was collected for efforts underway at Xcel Energy, Dominion Energy, Detroit Edison, Constellation, Duke Energy, Southern Company, Luminant, and NextEra Energy. LWRS Program researchers were also able to gather meaningful insights and data from industry sources such as the Nuclear Energy Institute, the Electric Power Research Institute, and Sandia National Laboratories.

Estimates and industry validation of these work reduction opportunities indicate significant operational and maintenance savings when implemented as a complete strategy. Figure 1 shows business cases and probabilities of

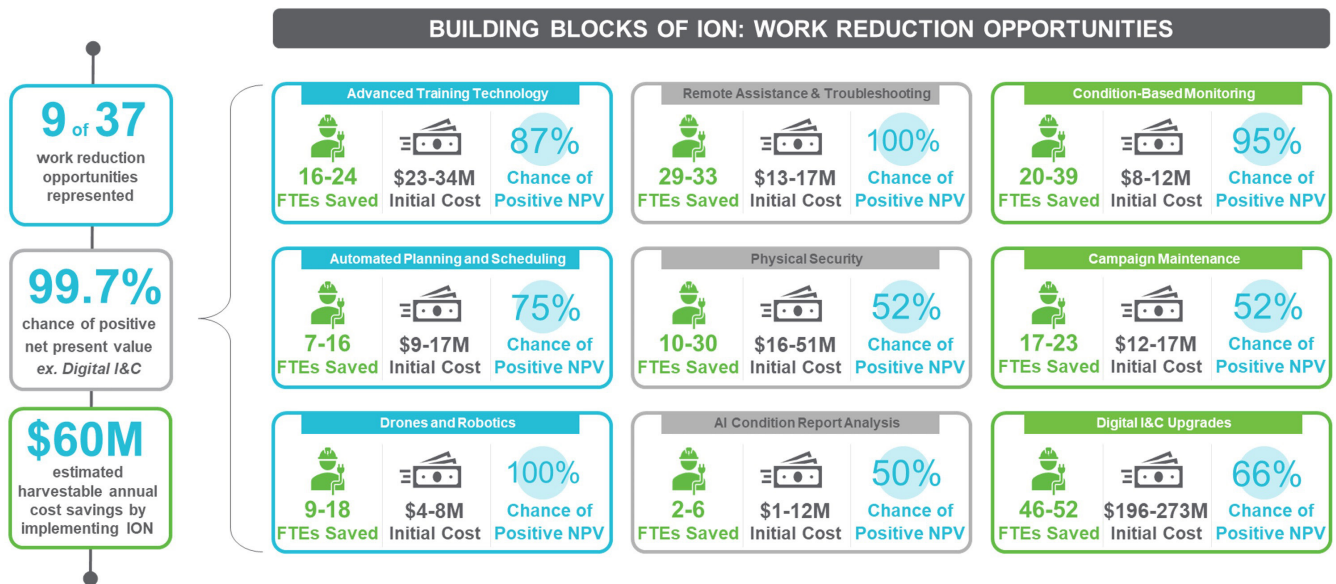


Figure 1. A sample of ION's work reduction opportunities and their benefits. The distribution of \$60M is spread across all 37 items. The 99.7% mentioned, excluding Digital I&C, refers to the 9 out of the 37 items that we validated.

a positive net present value for individual work reduction opportunities. It also shows the aggregate probability of achieving a positive net present value of the suite of projects. The full analysis and results of the research can be found in *Integrated Operations for Nuclear Business Operation Model Analysis and Industry Validation* (INL/RPT-22-68671).

As the domestic commercial nuclear power industry incorporates recent legislation into corporate strategies and business unit long-range plans, leaders will be thinking first and foremost of maintaining safe and reliable nuclear production for the decades to come. Thoughts of nuclear power plant cost-competitiveness, system obsolescence, and worker retention will dominate conversations and thoughts in the coming years as well.

The need for long-range planning will be even more important when considering a plant's approved or planned license extension to sixty and eighty years. The LWRS Program's ION business model can serve this

scenario as a well-researched and vetted starting point for nuclear operators.

Safe, reliable, and financially sound nuclear generation is more important than ever. The ION business model is designed to facilitate an industry poised to flourish in this age of nuclear renewal.

References:

1. Remer, S. J., 2022, *Integrated Operations for Nuclear Business Operation Model Analysis and Industry Validation*, INL/RPT-22-68671, August 2022, Idaho National Laboratory, Idaho Falls, ID, USA.
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