# Improving Nuclear Power Plant Efficiency through Data Analytics

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**Program**: RC-5: Data Science and Big Data
Analytics to Improve Nuclear Power Plant
Efficiency

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**ABSTRACT:**

Nuclear power plants are undergoing competitive challenges from inexpensive natural gas, and subsidized renewables, thus threatening their continued operation. William Levis, President and Chief Operating Officer, PSEG Power, succinctly describes the current situation in the forward to NEI's Delivering the Nuclear Promise®: Advancing Safety, Reliability and Economic Performance:

*"Nuclear energy is carbon-free and large-scale, and our industry has delivered on its promise to generate energy safely and reliably. Yet nuclear energy still is not economically competitive in many electricity markets. That's our industry's most significant challenge and the one promise that we have yet to deliver."*

With 60% of generating costs coming from operations (the rest from fuel and capital), a major opportunity exists to improve the operational efficiency of nuclear power plants through the use of data analytics. Data Analytics is the science of examining data sets to gain information useful for making decisions. Business analytics technologies enable organizations to make more-informed business decisions to improve profitability and are expected to be the major driver for operational effectiveness through the next decade. This research proposal will develop and provide data analytics solutions to improve nuclear power plan economic efficiency. These solutions will utilize empirical models to integrate disparate data sources while providing uncertainty estimates to quantify risk and support decisions.

The proposed project will improve efficiencies throughout the organization through the following tasks:
- Identify and develop risk-based inferential sensor solutions to support uninterrupted operations during periods of sensor degradation.
- Integrate disparate data sources for component and process condition assessment to drive optimal maintenance and capital replacement decisions.
- Develop and drive the use of data analytics solutions through the business to improve organizational effectiveness of nuclear utilities.

The outcomes of this innovative research project aligns with the mission and vision of Advanced II&C Pathway's mission and vision, and will significantly benefit in enhancing the technical and economic competitiveness of the U.S. nuclear industry by enabling advanced monitoring of critical assets; improving the operating capability of the existing fleet by enabling predictive maintenance in lieu of labor intense and expensive periodic maintenance; and help achieve enhancements in organizational effectiveness. In addition the research will provide an agile and modular data analytic framework that would have high commercialization value and supports the industry wide drive towards digital innovation, in particular, digital monitoring.