

# Digital Demonstration Facility



Southern Company's Plant Barry

# **Key Research Question**

The "digital transformation" of the power industry has been promoted as a significant opportunity to improve processes using digital tools and intelligence technologies. In the case of power generation, the practical value from adopting digital technologies has not been well defined.

Demonstrations of select technologies, both hardware and software, have been conducted at smaller scales to show potential and approaches to implementation. To realize value for power generation, a Digital Demonstration Facility (DDF) has been established to:

- Evaluate digital technology solutions across a plant and fleet
- Refine the infrastructure and resources needed to sustain connectivity and functionality of digital components
- Understand the practical value from implementing select technologies
- Discern good practices for evaluating and integrating new technologies into industrial power plant environments

The "digitization" of a plant can encompass many areas and the DDF will initially focus the following technologies:

- Monitoring and control hardware
- Computational algorithms to support process control, diagnostics and prognostics
- Utilization of data management and analytic platforms to support advanced analysis of large data sets
- Digitization of procedures, drawings, plant equipment and components
- Use of mobility and digital worker technologies

- Large scale plant demonstration to show value of low cost/high benefit technologies using dynamic plant conditions
- Practical application of digital technologies to support flexibility and improve asset management
- Collaborative platform to demonstrate usefulness of digital, analytics, and advanced control technologies
- Leverage EPRI's Data Analytics Platform

It is a challenge to justify most digital technology solutions for immediate investment and deployment because some level of adaptation, improvement and/or verification is needed to derive tangible and practical benefits for power generation. Scalable platforms and infrastructure may enable automated input and output so the end user can work effectively with the data and technology.

# Objective

EPRI along with others in the industry are developing detailed visions of tomorrow's power plant – a cyber-physical system – with seamless integration of data, autonomous communication of information, and corresponding response, action, or control. A cyber-physical system is a powerful approach to "dynamically optimize" a power plant. Real time operation and representation of the process control and operation of the plant may be integrated and modelled with the physical state and mechanical condition of equipment. The DDF intends to be first full-scale system to undertake this type integration through this collaborative effort.

The overarching objective of the DDF is to provide the digital and physical infrastructures for research activities and technology demonstrations. A full-scale plant operating in flexible mode with access to common plant equipment and resources may support a variety of R&D projects in plant digitization. The processes and procedures required to implement these technologies at full-scale are other key aspects to be studied.

# Approach

In the realm of digital transformation, there are numerous technologies and combinations of hardware and software

solutions being offered to the power industry. Using a fullscale generation plant as the backdrop for evaluating and selecting practical digital technology solutions, the collaborative membership will support the industry in developing value-based applications. EPRI worked in collaboration with participating members to develop evaluation and selection criteria for a given application in a generating plant.

### **Research Value**

The DDF creates a model of what future generation will look like by fully embracing technologies that are centered on the beneficial application of data analytics, monitoring and diagnostics, and digitalization of power producing assets. Taking a holistic approach to digitizing an entire plant allows the end user to understand how combined hardware, software, and algorithms can improve or optimize plant operation and reliability. Specific value areas may include:

- Determining value of workforce efficiency and effectiveness
- Improve capabilities in flexible plant operations via advanced process control
- Leverage collaboration on data analytic algorithms to support prognostics of equipment condition and other predictive capabilities around key indicators of reliably and performance
- Greater insight and options for system, plant, and fleet performance
- Practices for secure and connected data
- Field tested approaches to transition to a digital workforce

## Deliverables

Deliverables under this research project encompass technology evaluation and selection, technology demonstration projects, project assessment, and an overall project summary. A summary-level result of phase 1 activities will also be included. The non-proprietary results of this work will be incorporated into the applicable EPRI R&D Program(s), and made available to the public, for purchase or otherwise.

- Report on technology evaluation and selection process and criteria, including results
- Presentation materials
- Annual and final technical reports

While ongoing EPRI work demonstrates benefits to utilities and the public through increased reliability of power generation sources, the cumulative synergies of these technologies cannot be realized unless many of these technologies can be integrated and demonstrated at a single site. The full-scale demonstration of these technology areas builds on the maturity and efforts conducted by the I4Gen<sup>™</sup> projects.

#### **Price of Project**

Pricing for two tiers of non-nuclear generation capacity:

- \$25,000 per year with a three-year commitment for utilities with 7,500 MW or less
- \$50,000 per year with three-year commitment for utilities with greater than 7,500 MW

#### **Project Schedule**

The extension of this project is expected to start in the first quarter of 2023; and estimated duration of the project is 36 months.

## Who Should Join

Utilities who have or are planning to introduce digital tools into their facilities to facilitate plant improvement, effective operations, and workforce transition. Utilities interested in applied analytics, prognostics, advanced process control, and digital worker functions may also benefit from participation in this project.

## **Contact Information**

For more information, contact the EPRI Customer Assistance Center at 800.313.3774 (<u>askepri@epri.com</u>).

#### **Technical Contact**

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#### EPRI

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