EPRI | ELECTRIC POWER RESEARCH INSTITUTE

Operational Flexibility Implementation: Case Studies

Fossil plants seeking to mitigate cycling impacts can benefit from case studies involving implementation of new operations.

- Field demonstrations of operational strategies to reduce impact of cycling on plant equipment
- Develop a fleet-wide approach to achieving improved operation of cycling assets
- Industry collaboration will enable access to field experience gained over a range of asset types
- One of several new EPRI projects focused on cycling challenges

Background, Objectives, and New Learnings

Reduced industrial demand and increased fuel price variability are forcing changes in fossil asset dispatching. In addition, increased deployment of renewable generation over the next decade will force coal and combined-cycle plants to provide system load-balancing services. Specific operational changes expected for coal and gas plants include two-shifting, high ramp rates, high unit turndown, and reserve shutdown. These operational changes accelerate damage mechanisms such as creep fatigue, thermal fatigue, and corrosion, increasing the rate of component life consumption. Performance of environmental control equipment also may be a limiting factor in operational flexibility. The need exists to demonstrate low-cost operational strategies that increase asset dispatch flexibility while minimizing the short- and long-term impact on costs and damage.

This project aims to demonstrate and document operational strategies for reducing the impact of two-shifting, ramping, and turndown on the operation on plant equipment. Multiple host units will allow case studies to be conducted across a range of generating asset types and systems. The primary research focus will be on reducing thermal transients experienced by components in the steam generating and turbine systems of both coal and combined-cycle plants. Other key focus areas will include managing impacts on environmental control equipment. Project objectives will be achieved by first applying cycle transient analyses to develop options, followed by operational trials to refine processes. This strategy has been successfully demonstrated by power producers outside the United States.

Benefits

A reliable supply of fossil-fueled electricity generation will remain strategically important in the worldwide generation mix. The transition to a lower-carbon asset mix will force existing conventional plants to adopt new operational practices. These new strategies will be essential to maintaining their reliability and economic viability.

Participants in this project will benefit from development of new operational strategies specific to their host plants. Sharing of this unit-specific information among peer participants can provide additional value through access to

results from a range of asset types. Participants can gain the experience necessary to apply the process and findings to improving flexible operations fleet-wide.

Project Approach and Summary

Each host participant will select a unit for the implementation of improved operational practices. EPRI will seek to assemble a diverse range of generating unit types and multiple project participants. The EPRI team will work closely with a team consisting of operations staff and system owners at each host site. The project steps for each host include:

- Identification of current or expected modes of flexible operation (two-shifting, ramping, etc.).
- Unit-specific investigation to identify all components at risk of experiencing damaging thermal transients, or operational limitations.
- Develop prioritized list of improved transient operational procedures, additional process sensor needs, and minor capital expenditures (drain modifications and valves).
- Conduct operational trials to optimize and demonstrate improved transient performance. Additional temporary instrumentation to monitor key components will be considered.
- Document process used and results obtained from each case study.

In addition, we are offing an opportunity for non-host participation where members can participate across all of the case studies. Non-host participants will receive the summary reports from each hosted case study and will be offered the opportunity to participate in all workshops and webcasts sponsored by this supplemental project.

Deliverables

EPRI will publish separate interim reports documenting the process used and results obtained from each case study. These reports will be available to all participants to support their fleet-wide initiatives to improve flexible operation. In addition to the published reports, EPRI will conduct a series of webcasts that report the status of each case study.

At the completion of all case study activities, a final industry report will be published. This report will define a generic process for identifying and resolving operational practices that reduce the rate of component life consumption or extend the range of unit flexible operation.

Price of Project

The price to participate as a host organization in this project depends on the specific scope of work conducted at each site, but is expected to be in the range of $150K to $350K.

The price for non-host project participation is $50K.

This project qualifies for TC and SDF funding.

Project Status and Schedule

Five case studies have been implemented since the launch of this project in 2011. These include a combined cycle with a vertical HRSG, a combined cycle with a horizontal HRSG, a drum-type coal-fired unit, a once-through supercritical unit, and a 2 on 1 combined cycle with HRSG's by two different OEMs.

The schedule of case study activities conducted at each host will be unit-specific, and is anticipated to require a period ranging from 9 to 18 months.

Who Should Join

This project is open to all EPRI member companies. Companies currently involved in their own projects to improve flexible operation could especially benefit from this collaborative project through access to results of other pilot implementation efforts.

Contact Information

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

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