Supplemental Project Notice

Enhanced Gas Turbine SCR Process Control

For More Representative and Faster Time Response Measurements

UV-DOAS NOx & NH_3 Measurements Between the Ammonia Injectin Grid (AIG) and SCR Catalyst

PROJECT HIGHLIGHTS

- Demonstrate SCR process control measurements between the ammonia injection grid (AIG) and SCR catalyst
- Assess SCR process control response time and emission tracking improvements relative to current single point extractive measurements
- Evaluate operational improvements associated with reduced O&M costs, including SCR reagent consumption

Background, Objectives, and New Learnings

Simple- and combined-cycle gas generation units equipped with selective catalytic reduction (SCR) systems for NOx control are operating more flexibly in response to increased development of renewable energy resources. Current gas turbine SCR process control systems typically employ single-point extractive sampling at the SCR inlet and stack. Delays in responding to changes in actual flue gas NOx concentrations can be associated with this process control approach.

Recent in-situ optical monitor technology demonstrations on gas turbine combined cycle (GTCC) units (3002022785 and 3002028401) have proven the viability of in-situ optical monitors to measure NOx, NH_3, CO, O_2, CO_2, and H_2O under typical stack flue gas conditions. In-situ optical measurements have been obtained under both cross-stack (6-meter measurement path length) and long-path (25-meter measurement path length) optical configurations. Ultraviolet differential optical absorption spectroscopy (UV-DOAS) monitors on gas turbine stacks have shown these measurement systems to provide accurate, continuous, and reliable in-situ measurements of both NOx and NH_3 simultaneously.

By applying an in-situ, long-path UV-DOAS for both NOx and NH_3 flue gas measurements between the ammonia injection grid (AIG) and SCR catalyst, a direct, representative, and near instantaneous measurement of the SCR inlet NH_3/NOx ratio can be obtained for enhanced SCR process control. The current project focuses on (1) demonstrating the optimum optical configuration required to obtain these measurements at typical SCR inlet NOx and NH_3 concentrations, (2) assessing improvements to current SCR process control measurement representativeness and response time, and (3) evaluating operational improvements associated with reduced O&M costs and SCR reagent consumption.

Benefits

This project is intended to provide the information necessary to assess improved SCR process control accuracy and response time. This information could provide potential public benefits through more efficient gas turbine SCR system operation, as well as reduced reagent requirements and pollutant emissions.

Data obtained through this project will enable project participants to better understand enhanced SCR process control design and installation requirements, as well as potential benefits relative to existing, single-point extractive SCR process control approaches.

Improvements in measurement accuracy and SCR process control time response have the potential to lessen the environmental impacts of power generation, while improving electricity affordability and pollution control system performance.

Project Approach and Summary

Project research will focus on working with a host site to determine the best locations for installing ports for the SCR inlet measurement path. The project will provide measurement port design drawings and materials, with the host site being responsible for installing the measurement ports at prescribed locations on the flue gas duct between the AIG and SCR inlet. These measurement ports will be used to mount the UV-DOAS monitor and detector.

Project data will be collected in parallel with existing SCR process control measurements to assess any differences in absolute measured SCR inlet NOx and NH_3 concentrations and overall SCR process control response time, relative to changes in gas turbine operation.

A host site is sought that would enable this assessment to be conducted over a range of gas turbine SCR operating conditions due to changes in load demand. The following represents a summary of the project approach and scope:

- Site visit to identify measurement locations for UV-DOAS monitor installation, and measurement port requirements.
- Design of UV-DOAS measurement ports, procurement of materials, and shipment of materials to host site for installation by host site during an outage.
- Installation of UV-DOAS monitor and collection of continuous NOx and NH_3 data in parallel with an existing SCR process control monitor over a nominal one-month period.
- Document data obtained from the host site field project and associated data analysis in a report.

Deliverables

All project funders will be invited to participate in periodic project webcasts to review the in-situ optical monitoring system design and installation approach, along with test results obtained.

Price of Project

The project costs $50,000 to join, with a minimum of three project participants required to initiate the demonstration on a GTCC. The project qualifies for self-directed funding (SDF) and tailored collaboration.

Project Status and Schedule

Initiation of the project is subject to attainment of sufficient participants by July 31, 2025, with the anticipated initial project scope scheduled to be completed by June 30, 2026.

Who Should Join

Energy companies with gas turbine combined-cycle SCR systems that are experiencing significant load variations, or would like to assess the potential to reduce SCR reagent and/or process control monitor O&M costs, could benefit from participation in this project.

Contact Information

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

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