

Supplemental Project Notice

# SF6-FREE BREAKER PILOTS



EPRI's 138kV Research substation will host the  $SF_6$ -free breaker pilots and allow utilities to reduce the risk in adoption of these new technologies.

## **PROJECT HIGHLIGHTS**

- The project aims to reduce the risk for the specification and application of new SF<sub>6</sub>-free circuit breaker technologies.
- The EPRI research substation allows for rapid learning in a safe but realistic environment.
- SF<sub>6</sub>-Free circuit breaker technologies will be subject to a wide range of accelerated-aging factors over a 12-month period.
- The participating members will be able to gain early and valuable insights into the adoption of these new technologies.

# Background, Objectives, and New Learnings

Utilities are faced with an increasing array of new  $SF_6$ -free circuit breaker options. There is an industry need to de-risk the widespread adoption through effective accelerated aging testing in a realistic research substation. The intention of this collaborative research project is to perform these research tests against a welldeveloped test protocol – allowing rapid and valuable insights into specification and application of new  $SF_6$ -free circuit breaker options.

Sulfur hexafluoride (SF<sub>6</sub>) has been used for decades in utility applications due to its excellent insulating and arc quenching capabilities. A drawback for SF<sub>6</sub> is that it has an extremely high global warming potential (GWP) and there is growing pressure to phase it out. This has led to the emergence of a range of new SF<sub>6</sub>free circuit breaker technologies that use either a Fluoronitrile gas mixture or vacuum and clean air as the interruption and dielectric medium. These new technologies are seeing early adoption in the field but there is a parallel and important need to collaboratively learn in a research setting - since it provides the ability to control many variables that would not be possible to vary once the circuit breaker is installed in a customer-serving substation.

#### Objective

The research objective is to rapidly de-risk the application of new  $SF_6$ -free technologies. This is an important and timely objective due to the ever-increasing pressure to reduce emissions of  $SF_6$ . These pressures come from various directions including regulatory pressures and pressures from internal utility goals to reduce net  $CO_2$  emissions to zero.

Applications of new SF<sub>6</sub>-Free circuit breaker technologies provide an opportunity to respond to these pressures – and this project provides the opportunity to rapidly and effectively learn about the technologies and associated gas handling in a safe yet realistic research substation environment.

## Approach

- Deploy a range of SF<sub>6</sub>-free circuit-breaker technologies in the EPRI research substation.
  - Technologies plan to include (but may not be limited to) Fluoronitrile-based solutions and solutions that use vacuum and clean-air.
- EPRI plans to develop and execute test protocols tailored to each technology that accelerate the aging of the circuit breakers.
- The test protocols will be designed to maximize the learning on commissioning, operation, gas handling, off-line testing, maintenance and end-of-life assessment and disposal.
- The approach will be hands-on in the EPRI research substation in Lenox, MA. Participating utilities will be encouraged to send staff to the substation to learn about the new technologies directly.

#### **Benefits**

- Reduced utility risk in adopting new SF<sub>6</sub>-free circuitbreaker technologies.
- Rapid hands-on learning on a range of SF<sub>6</sub>-free technologies including vacuum/clean-air and Fluoronitrile-mixture technologies.
- Full-scale deployment of new circuit breaker technologies in the EPRI research substation
- Insights on circuit breaker performance in response to multiple stressors including:
  - Wide weather extremes from hot humid summers and cold snowy winters.
  - Rain spray for 5min every hour to replicate extremely wet environments.
  - AC and lightning impulse voltage extremes.
  - The full lifetime of circuit breaker mechanical operations performed within a 12-month period.
  - Introduction of intentional gas leaks to understand detection and performance.
  - Regular batteries of off-line testing to monitor degradation.

### Deliverables

The project deliverables will be as follows:

- Monthly insights on laboratory findings
- Monthly webcast slides
- Final published report
- Hands-on utility visits to the research substation

#### **Project Status and Schedule**

The cost is \$462k per participant and is contingent on a minimum of 5 funders. The project schedule is estimated at 24 months.

#### Who Should Join

Owners and operators of equipment using  $SF_6$  gas today and are considering transition to alternative technologies.

## **Contact Information**

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

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