

# Low-Carbon Distributed Generation Demonstration



# **Background, Objectives and New Learnings**

Utilities and customers leverage thousands of diesel generators to provide standby backup power for emergency power, routine maintenance, remote power support, and other applications. Distributed and emergency power needs could derive from weather events, including storms, floods, and wildfires, with potentially unexpected locations for an uncertain duration of operation. To mitigate the impact of wildfires, utilities in California have also scheduled Public Safety Power Shutoffs, impacting customers during severe weather situations with limited power options. Diesel generators have also served routine maintenance power outages, such as those for substations, and remote power applications for essential loads. For each of the backup applications, the diesel generator, or even generator fleet, is expected to run until power is restored, serving longer term resilience needs. Due to air quality regulations, diesel generators are generally limited almost exclusively to emergency or remote applications and have not served other grid applications, including peak shaving or market applications.

Currently, diesel compression ignition engines are the most mature and reliable technology for backup applications. However, traditional diesel engines produce higher emissions of CO2, NOx, PM and other pollutants than alternative designs, and are inconsistent with the overall strategy to achieve cleaner air and carbon reduction targets.

### **Project Highlights**

- Validation of alternative and low-carbon backup generation technology performance
- Evaluate emissions over different operating conditions
- Improve understanding of operation considerations, including fuel logistics
- Direct engagement with the OEMs and technology providers
- Investigate carbon intensity of operating alternative backup technologies

Replacement and/or refurbishment of existing diesel generators with alternative, low-carbon technologies may help reduce carbon emissions. Despite recent technology developments, however, the operational reliability and performance characteristics for low-carbon generators is not well understood. The emissions aspects of the alternative backup generators require more research, as much of the data is limited. Logistics of procuring and storing alternative fuels, particularly for a distributed scale, should be examined. As well, the carbon intensity of different generator and fuel combinations of potential low-carbon technologies remains unclear and not defined in a standardized way. As the diesel generation fleet transitions to low-carbon generator options, there is a need to examine the performance of alternative technologies and their compatibility to replace or upgrade existing generators.

This project intends to evaluate modified compression ignition engines that run on alternative fuels (i.e., ethanol, linear generators, or other technologies), under basic duty cycle conditions, operating performance, fuel logistics, criteria pollutants, and carbon emissions.

#### **Benefits**

Expected project benefits include:

Detailed analysis of technology performance for replacement or retirement of traditional diesel backup generator fleet with possible low-carbon alternatives. Improved understanding of technical specification and performance of low-carbon generator alternatives, which may result in lower costs of operation for alternative generators, lower emission, while achieving similar or improved reliability.

# **Project Approach and Summary**

EPRI intends to test and examine the generator performance and emissions characteristics of potential reliable low-carbon replacement solutions that can meet, or exceed, the same operational requirements as traditional standby diesel generators. The project will be conducted through the following tasks:

Use Case and Test Plan Development: EPRI intends to evaluate existing generator use cases and define their applicability for testing alternative generator technology.

**Performance and Emissions Requirements:** Inform product performance and emissions requirements for stationary alternative generator technology, based on utility performance constraints and air quality regulations.

**Product Evaluation and Testing:** Conduct emissions compliance and system performance testing in accordance with EPA federal regulations and Standards of Performance for Stationary Compression Ignition Internal Combustion Engines (40 CFR Part 60 Subpart IIII).

**Fuel Feasibility:** Evaluate technical requirements related to the production, sourcing, quality, use, and storage of alternative fuel. Conduct carbon consideration study.

There are two levels of participation. Collaborators will participate on the project advisory team and Host participants will contribute experience and data from their field deployment. Both will receive deliverables as defined.

# Deliverables

#### Collaborators

- Quarterly webcasts
- Summary report of non-proprietary findings from Host demonstration projects, in addition to leading practices, use cases and performance/emissions requirements

# Hosts

- All deliverables provided to Collaborators
- Use Cases, Emissions and Performance Test Plans
- Product Performance and Emissions Requirements Specification & Site-specific Testing Report
- Fuel Feasibility Study and Final Report

The non-proprietary results of this work will be incorporated into EPRI's R&D programs and made available to the public, for purchase, or otherwise.

# **Price of Project**

Collaborator: \$60,000

Host: Contact EPRI for custom scope and pricing

This project qualifies for use of Tailored Collaboration (TC) or Self-Directed Funds (SDF) and can be spread over three years.

# **Project Status and Schedule**

This project is expected to commence in first half of 2022, or upon participation of two site hosts and one collaborator, and to continue for 30 months.

# Who Should Join

All utilities that expect a significant number of diesel generators in their territories, as well as those interested in understanding alternative low carbon distributed generation technologies collaborative environment.

# **Contact Information**

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

# **Member Support Contacts**

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