

New Technology Provides Cost-Effective Emissions Control Solution for CHP Applications

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Fact Sheet

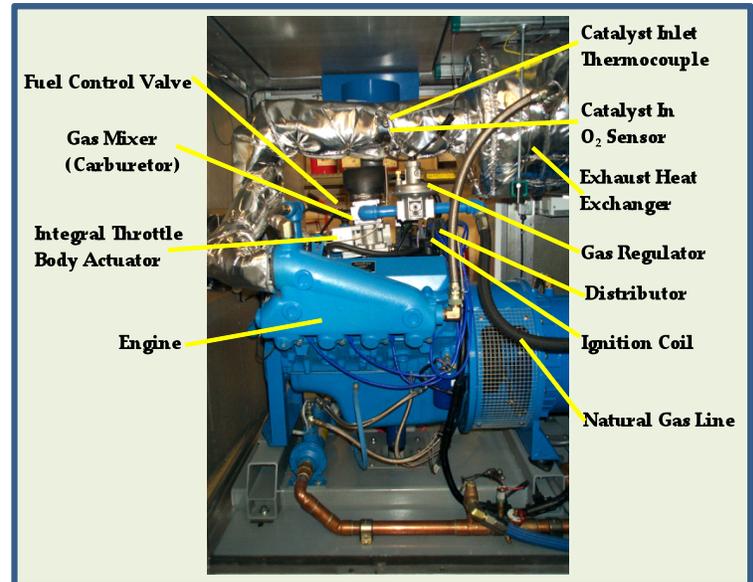
The Issue

Reciprocating engines have been the preferred prime mover for combined heat and power (CHP) applications less than three megawatts (MW). Because they are relatively low cost and have high efficiency, reciprocating engines are projected to be the preferred choice for a large majority of CHP applications through 2020. The inconsistent ability of engine emission control technology to comply with tightening emission requirements, however, impedes the adoption of CHP in the state. Indeed, a major deterrent for new CHP implementation in California is the failure to achieve and sustain compliance with stringent air regulations and guidelines such as:

- California Air Resources Board (CARB) guidelines to the local air districts requiring new distributed generation (DG) to achieve standards equal to the best available control performance from central station power plants.
- South Coast Air Quality Management District (SCAQMD) rule requiring new DG engines to meet the CARB guidelines for oxides of nitrogen (NO_x) while appreciably lowering carbon monoxide (CO) and volatile organic carbon (VOC) limits from previous levels.

Project Description

The goal of this project was to develop and test ultra-clean emission technology for small to medium (60 – 1,000 kilowatt (kW)) engine CHP systems that:



Emission controls installed in a 100 kW CHP unit
Image credit: DE Solutions, Inc.

- Emit well below CARB 2007 emission guidelines.
- Provide control techniques for robust CARB 2007 emission compliance on a sustainable basis without the need for frequent emission tests.
- Have a cost premium less than 10 percent of existing CHP systems.

The project successfully developed, designed and tested an ultra-low emission control system for rich burn engines for CHP applications. The key innovation is a two-stage exhaust after-treatment catalyst that proved to provide an elegant, yet robust solution, to achieving CARB 2007 emission

levels, based on laboratory tests and field data. The current cost estimate for this emission control system is for a cost premium of around 3 percent or less over the baseline product, which met the project's economic target of 10 percent or less cost premium. Tecogen, Inc., a key subcontractor on the project and an established manufacturer of engine driven CHP and chiller products, is incorporating this advanced emission system across its product line and have plans to make the technology available to non-Tecogen engine products.

Anticipated Benefits for California

Engines are the most cost-effective CHP technology less than three MW in size. With a cost effective emission control solution for engines and proactive state policies toward CHP, engines are expected to account for approximately 1,500 MW of new CHP in California over the next twenty years. This equates to avoided carbon dioxide emissions of about 1.6 million metric tons (MMT) and natural gas consumption of 23 trillion BTU in 2029.

The California Energy Commission-sponsored 2009 CHP Assessment projected that engine-based CHP will provide the large majority of known CHP benefits. The study projected that societal benefits of new CHP through 2020 could range from \$200 million to \$7 billion depending on the policy scenario. These benefits could be achieved if engines are supported by adequate emission control technologies, such as the technology developed through this project. CHP technology also benefits California ratepayers and businesses by:

- Providing ultra-high natural gas use efficiencies, conserving natural gas resources, and enhancing utilization of California gas distribution system.
- Achieving combined electric and thermal efficiencies of 80 percent or more.

- Eliminating transmission and distribution losses and reduces or eliminates grid congestion.
- Providing commercial, institutional, industrial and multi-family residential energy users with an option to curb energy costs.
- Boosting power reliability for business adopters.

Project Specifics

Grant Agreement Number: PNG-06-002

Contractor: DE Solutions, Inc.

City/County: Encinitas

Application: Statewide, Nationwide

Amount: \$749,013

Co-funding: \$37,888 from DE Solutions (in-kind)

\$148,456 from Tecogen (in-kind)

\$187,437 from Southern California Gas Company (cash and in-kind)

Term: April 2007 to June 2011

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