

The Choice for Onsite Power

Energy Efficiency and Reliability: Vital to Our Economy

Ensuring an efficient and reliable supply of domestic energy is fundamental for economic growth and environmental protection. Further, restructuring in the energy marketplace presents new opportunities and challenges, requiring technologies to better integrate and optimize operations across the power grid, and to manage reliability and performance within an increasingly complex system. The mission of the Distributed Energy (DE) Program is to strengthen America's aging energy infrastructure and provide utilities and consumers with a greater array of energy efficient technology choices for the on-site generation of electricity and use of thermal energy.

An Innovative Portfolio

The DE Program conducts research, development, demonstration, and technology transfer activities in partnership with equipment manufacturers, electric and gas utilities, State agencies, universities, national laboratories, and energy consumers from industry, government, and the commercial sector. The Program's activities cover distributed generation technologies—using small devices that generate electricity and utilize thermal energy at the site where it is consumed—as well as an array of system integration technologies to create new energy systems for combined heat and power and other consumer applications.



Mercury 50 Industrial Gas Turbine

Specifically, the DE portfolio includes:

- **Distributed Energy Technologies.** Efforts focus on industrial gas turbines, microturbines, reciprocating engines, thermally activated technologies, and “technology base” areas such as advanced materials, sensors, and communications and control systems.
- **End-Use System Integration and Interface.** Efforts focus on the design and testing of innovative packaged combined cooling, heating, and power systems. Activities are aimed toward increasing acceptance of CHP in end-use sectors by demonstrating new systems; analyzing energy, economic, and environmental performance; and building public-private partnerships with industry consortia in the buildings, merchant stores, light industrial, supermarkets, restaurants, hospitality, healthcare and high-tech industries. Activities also address the regulatory and institutional barriers to distributed energy including air quality regulations, utility interconnection and rates, and environmental siting and permitting.

Nationwide Benefits

Distributed energy systems and applications will help strengthen America's electric power infrastructure by:

- Ensuring more reliable power delivery and power quality
- Relieving congestion on transmission and distribution systems
- Making the energy infrastructure less vulnerable to disruption
- Managing power consumption and loads
- Diversifying power supplies
- Reducing the need for new power plants to meet peak demand
- Improving the efficiency of power generation
- Reducing environmental emissions, including greenhouse gases



Meeting National Priorities

The Distributed Energy Program supports DOE's mission of advancing the economic and energy security of the United States. The program helps to protect America's economic and energy security by promoting energy supply diversity and delivery of clean, reliable, and affordable energy services to consumers, supporting the EERE vision. Distributed energy systems can be used to relieve stress on the Nation's aging electric power infrastructure, reduce peak electricity demands, reduce environmental emissions, including greenhouse gases, and provide consumers with a greater array of energy choices. By providing consumers with more energy choices, they can take steps to reduce their energy costs, improve energy efficiency, enhance their power quality or electric reliability, and improve their ability to continue operations when there are problems with the local grid. As a result, distributed energy devices can be used to sustain "mission-critical" operations when grid-connected power is not available or not sufficient. Electric utilities also look to distributed energy systems to improve the efficiency of power system operations by increasing utilization rates of distribution assets and reducing peak electricity demand.

Success Stories

Success stories illustrate the wide ranging benefits of DE systems. In December 2003, Solar Turbines, Incorporated, announced the commercialization of the Mercury 50 industrial gas turbine. The Mercury 50 was the result of a public-private partnership

with the U.S. Department of Energy through the Advanced Turbine Systems Program. The aim of this program was to produce new designs for a 21st century gas turbine, including systems that are more efficient, cleaner and economic to operate than today's turbines. The program's multi-faceted goals centered around a reduction of NO_x to a level of 9 ppm or less, improved energy efficiency and a reduction in the busbar cost of power, all while maintaining a high level of reliability, availability, maintainability, and durability. This commercially available advanced 4.8 MW unit represents a breakthrough in recuperated gas turbine technology. Over 40,000 hours of operating experience at field evaluation sites was conducted in the United States, France, and Australia. The unit has 38.5% electrical efficiency and an initial warranty level of 5 ppm NO_x and 10 ppm CO emissions.

Another success story showcases the value of distributed energy systems. When a storm interrupted grid power to the Hilton Garden Inn in Chesterton, Indiana, in June 2002, a distributed energy system kept the hotel in operation throughout the four-hour outage. Sponsored in part by the Department of Energy, the distributed energy system located in the hotel included an innovative design of three microturbines with advanced heat recovery, providing space heating, hot water heating, and swimming pool and spa heating as well as electricity. Protected electrical circuits included the hotel kitchen, freezers, coolers, part of the lobby, hot water heating, and hall lighting. Based on this demonstrated success, the hotel is considering distributed energy for other key areas of their hotel's operations.

CHP Regional Application Centers

The DE Program has assisted in the formation of six CHP regional application centers whose mission is to facilitate deployment of CHP technologies through:

- Educating regional players on benefits of CHP technologies, while reducing perceived risks;
- Providing project-specific support;
- Providing feedback to DOE and industry regarding future R&D program needs; and
- Interacting with states to provide the technical basis for developing favorable CHP policies.

A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

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