



Cogeneration

> Combined heat and power solutions



Our energy working for you.™



**Power
Generation**

We understand the challenges faced today by your business and facilities.

Companies today face global competition, environmental concerns and regulatory issues—all while dealing with the ever-increasing need to control costs. Energy is a major contributor to total costs, so many manufacturers, institutions and facilities are looking for energy management solutions.

The goal of energy management is to reduce both the amount and cost of energy a building consumes. This is the goal of cogeneration—an on-site power generation approach that uses fuel to produce multiple types of energy. Cogeneration, also known as combined heat and power (CHP), can significantly reduce your energy consumption and costs, increase power reliability, expand your facility's capacity and minimize your greenhouse gas footprint.

Front cover photo, De Breuck tomato greenhouse, Belgium

Cogeneration minimizes environmental impact

Cogeneration offers energy efficiency and the ability to reduce carbon dioxide emissions. These benefits help users comply with global pacts and government initiatives. The Kyoto Protocol—now adopted by over 100 nations—established binding emissions reduction targets for the participating industrialized countries.

Taking emissions reduction a step further, the European Union developed the European Emissions Trading Scheme (EU ETS), which has initiated “commodity” trading of carbon dioxide; the EU ETS provides installations with incentives to both reduce emissions and bring excess reductions to market.

In the United States, the increasingly popular LEED Green Building Rating System recognizes the energy efficiency contribution of CHP systems toward earning Energy and Atmosphere credits.

All of these initiatives have created goals that can be met with energy-efficient, low-emissions CHP systems.

Cogeneration—maximizing energy output, minimizing energy costs



Cogeneration is an energy management solution for today.

The principles of cogeneration have long been known and put to use in a wide variety of applications—from Thomas Edison’s first electric generating plant in 1891, to modern processing facilities and municipal utilities supplying power and district heating. In the past, economies of scale favored large, complex projects or special situations.

Today, advances in diesel and lean-burn gas reciprocating engine technology, heat exchangers and systems controls make cogeneration both a practical and economical energy management solution for applications as small as 30 kW.

Determining whether cogeneration is right for your facility begins by learning how your building uses energy. Cummins Power Generation Inc. can help you evaluate every area of your building’s energy usage so you can decide whether cogeneration should be a part of your energy management program.

Cogeneration applications

- > Hospitals
- > Nursing homes
- > Colleges and universities
- > Commercial facilities
- > Hotels
- > Greenhouses
- > Industrial/chemical plants
- > Manufacturing
- > Government facilities
- > Food processing
- > Health clubs
- > Swimming pools
- > District heating
- > Coal mining and oil fields
- > Landfills and sewage treatment plants



Cogeneration — for energy efficiency

A cogeneration system normally consists of a prime mover turning an alternator to produce electricity, and a waste heat recovery system to capture heat from the exhaust and cooling water jacket. The prime mover can be a diesel engine, a lean-burn gas reciprocating engine or a gas turbine. Over 90 percent of the energy in the original fuel is put to productive use. Total energy savings can amount to 35% or more.

> Electricity, space heating and cooling

Fonda-Fultonville School District New York, USA

Facing rapidly rising electric costs, the K-12 Fonda-Fultonville Central School District in Fonda, New York, installed a 1336 kW combined heat and power system from Cummins Power Generation to power the school campus. The project was the first grid-independent cogeneration project in New York state and today provides all the electricity, space heating and cooling needed for the 300,000-square foot facility.

The power system consists of four 334 kW prime-rated lean-burn natural gas engine generator sets, each with hot water recovery equipment that collects waste heat from the engine exhaust. In the winter, the generators provide electricity and the exhaust heat provides space heating for the campus. In warmer months, the system provides electricity and powers a 200-ton electric chiller and 200-ton absorption chiller for air conditioning. The system saves the school an estimated \$100,000 annually on its energy costs.



Cogeneration provides heating, cooling and cost savings.



> Electricity for grid export, heat, CO₂ for plants

Hazlewood VHB Hernhill Nursery Kent, United Kingdom

The Hazlewood VHB Hernhill Nursery supplies tomatoes to supermarket chains across the UK, and the greenhouse needs a constant source of heat to maintain ideal growing temperatures. The turnkey solution from Cummins Power Generation generates 12 MW of recovered heat energy for use in the nursery and 9 MW of electricity for export. The system also incorporates exhaust gas purifiers that remove impurities from the carbon dioxide exhaust; the gas is then used to feed plants, eliminating the need to purchase liquid CO₂ plant food.

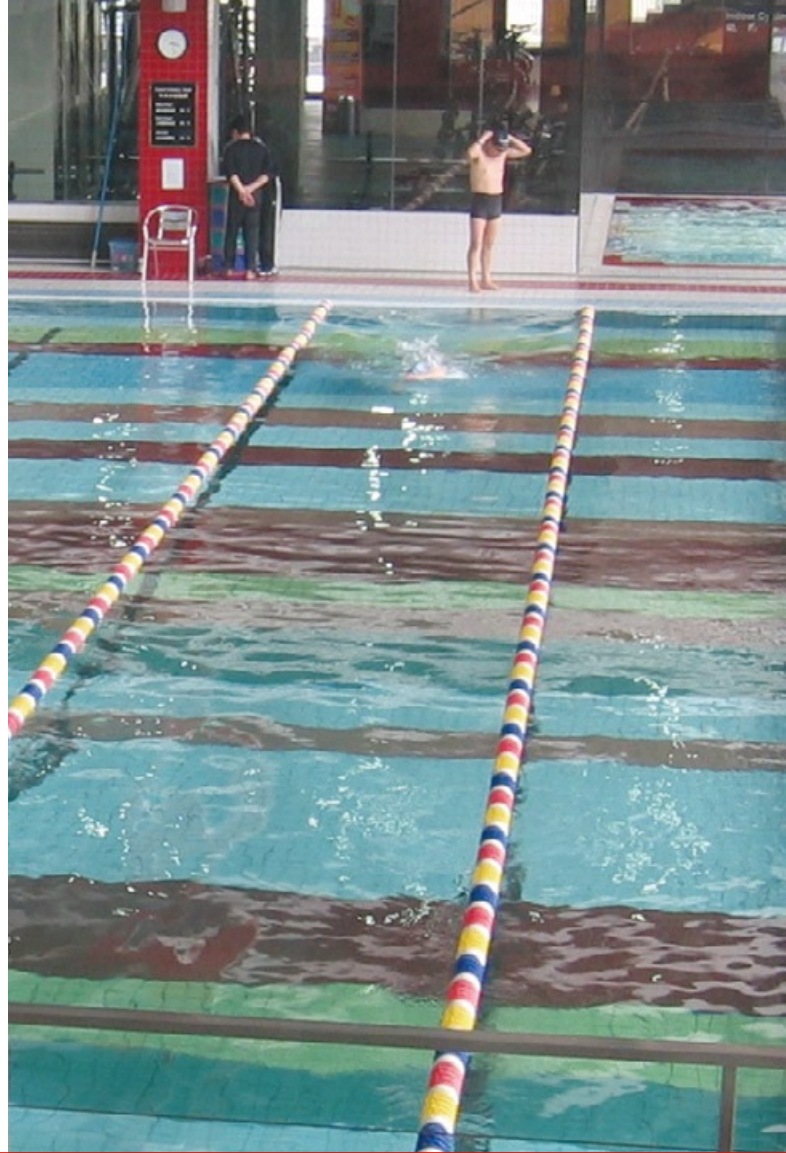
> Electricity, hot water

Jinqiao Sports Center Shanghai, China

Visitors to the 120,000-square foot Jinqiao Sports Center located in Shanghai's Pudong Development Zone can exercise in comfort, thanks to a new CHP system from Cummins Power Generation. The system uses natural gas to power an on-site electric generator that supplies electricity to the facility, while the waste heat from the engine is used to heat the water system, swimming pool and building.

The CHP system is so efficient that the center's energy cost savings will pay for the system in less than three years. By having an on-site generator running in parallel with normal utility power, the sports center also benefits from higher power reliability than if the facility used utility power alone.

Services from Cummins Power Generation included engineering design, procurement advice and making the formal application for paralleling approval from the power grid.



> Electricity, water heating, chilled water cooling

ExCel Exhibition Centre London, United Kingdom

London's ExCel Exhibition Center, a state-of-the-art venue for conferences, exhibitions and special events, is the single largest roofed structure in the UK. The facility's location alongside the Royal Victoria Dock posed a serious power problem due to a limited electricity grid supply. A 7 MW grid supply system from Cummins Power Generation operates in parallel continuously with the electricity grid supply to ensure baseload power, while a 1350 kW CHP generator (plus boilers and chillers) uses the engine exhaust heat for space heating and air conditioning.

> Electricity, steam, hot water

Western Milling animal feed facility California, USA

Western Milling produces animal feed products ranging from organic feeds to food by-products. It uses large amounts of electricity to run conveyors, mixers, grinders, blenders and pellet mills. In addition, it uses steam and hot water for processing.

To combat soaring rates for electricity and natural gas, Western Milling installed a CHP system from Cummins Power Generation. The generator produces 1250 kW of electricity, and the heat recovered from the engine exhaust produces up to 2,200 pounds of steam at 115 psi and 30 gallons per minute of hot water at 190° F. To meet California's strict air-quality standard that limits nitrogen oxide emissions to 9 ppm, Cummins Cal Pacific installed a selective catalytic reduction (SCR) system to reduce the nitrogen oxide in the engine's exhaust.

By helping Western Milling reduce overall energy costs and increase system reliability—while meeting strict air quality standards—the Cummins Power Generation CHP system is proving that energy management solutions, economic success and environmental responsibility can go hand in hand.



“Every hour the CHP system runs, we save money.”

— Ejnar Knudsen, executive vice president, Western Milling



> Electricity, heat for pasta drying

Pastas Doria Mosquera, Colombia

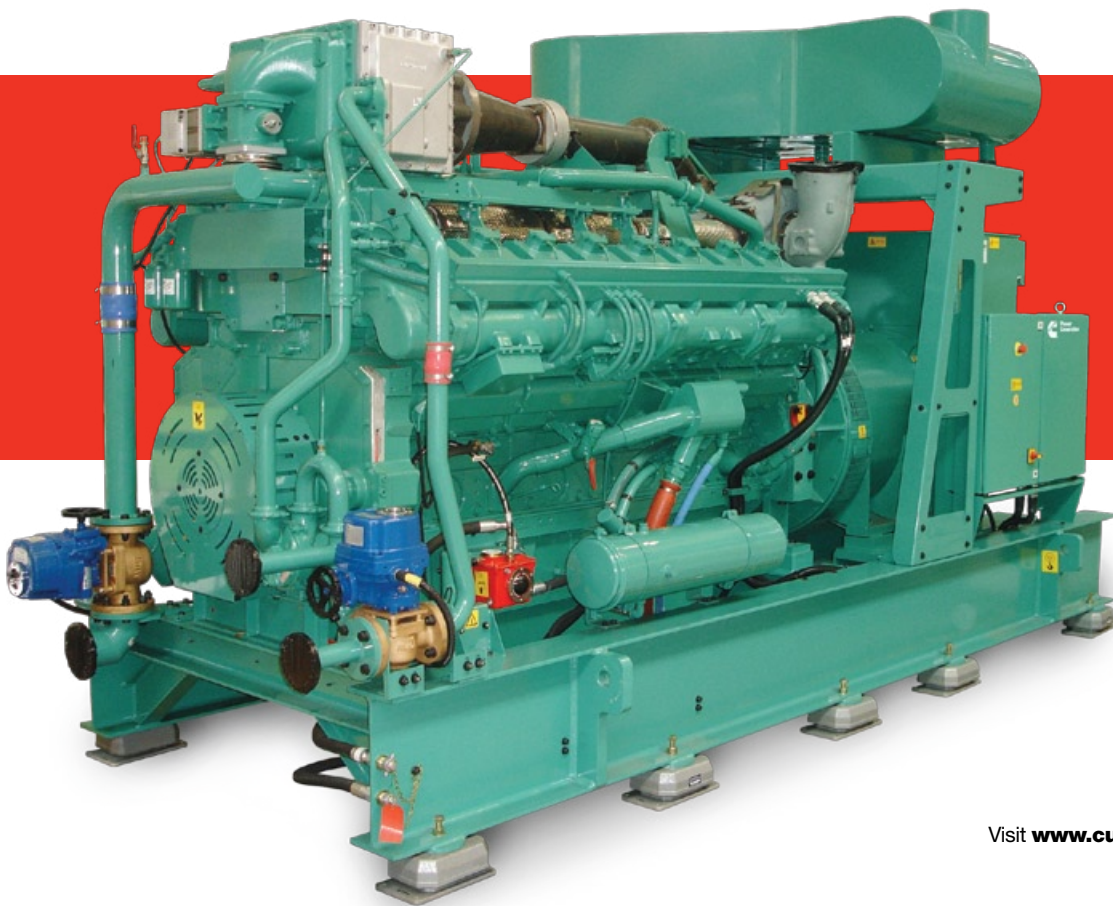
Pastas Doria, manufacturer of about 40 percent of all the pasta products consumed in Colombia, was losing production time due to unreliable utility power. That's why Pastas Doria installed a CHP system from Cummins Power Generation to generate electricity plus heat for food processing. A 1750 kW lean-burn natural gas generator set operates 24 hours a day — in parallel with the local utility — in order to stabilize the utility power coming into the facility and to replace a portion of the power the company purchases. Waste heat from the engine's exhaust also provides 3.4 million Btu/hr of heat energy to the plant's boilers and pasta-drying operations.

Complete cogeneration solutions from Cummins Power Generation

Whether your facility is commercial, industrial, institutional or government, Cummins Power Generation can provide a comprehensive cogeneration solution that fits your energy management needs. We have the knowledge, experience and relationships necessary to successfully implement cogeneration systems of all sizes, anywhere in the world. We can partner with our distributors and developers to deliver a turnkey power plant, and even provide project financing and power availability guarantees.

Once your cogeneration system is installed, we can also provide operations and maintenance. We will do whatever it takes to help you save money on energy for years to come.

Cummins Power Generation makes more of the core cogeneration systems equipment than all other providers that promise complete solutions. We manufacture the entire power generation system—reliable, pre-integrated PowerCommand® diesel engine generator sets, lean-burn gas engine generator sets, digital master controls, paralleling switchgear, transfer switches and more. That means you can count on PowerCommand performance and reliability when Cummins Power Generation designs and builds your cogeneration system.



One source for expertise and service

Talk to the one company that can provide **comprehensive, cost-effective solutions** from local distributors in 130 countries and over 4,000 service centers worldwide.

Visit www.cumminspower.com/cogeneration



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