



## Power Generation

# CHP SYSTEM IS A MODEL OF EFFICIENCY, DELIVERS SUBSTANTIAL COST SAVINGS

**Who** Rolls-Royce  
**What** MTU Natural Gas CHP system  
**Where** Novi, Michigan, USA

Rolls-Royce Power Systems' first U.S. installation of a combined heat and power (CHP) plant can be found at its North American corporate headquarters. Running at more than 90 percent efficiency, the unit has generated more than \$30,000 in heating and electrical cost savings in its first year of operation, while minimizing the building's carbon footprint.

In 2012, Rolls-Royce opened its North American headquarters for power systems in Novi, Michigan. The 73,000-square-foot commercial building is regional headquarters for MTU solutions, with over 250 sales, engineering and administrative professionals under its roof. Its CHP system exemplifies MTU's forward thinking philosophy and commitment to innovation.

“This is our flagship CHP installation in North America,” says Javier Gonzalez, sr. manager power gen sales. “It’s a showcase for distributors and their customers to come learn the benefits of CHP and see it in action. We wanted to instill confidence by showing that we not only stand by our products—we use our own products.”

Since 2012, nearly 50 companies have visited Novi to learn more. “The most common reaction is ‘wow.’ Many have never realized these units and the technology existed,” says J. George Polson, program manager. “They all find it interesting to see it in operation and to get a better feel and understand what it’s all about.”

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**J. George Polson**  
Program manager

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#### **Proven worldwide**

Similar MTU CHP systems have been successfully installed in Europe and Asia for more than 35 years, with the capability of running on natural gas, biogas, sewage gas or landfill gas. Utilizing over a century of engine expertise Rolls-Royce has developed and perfected MTU CHP technology in Germany. Since North American installations differ slightly from installations in Europe and Asia, several modifications

have been made to meet the needs of North America. The system in Novi offers a prime example to distributors and customers of an installation done right.

The building was designed with the CHP system in mind, with 20 heat exchangers installed throughout the facility. And since the heating system requires two 1,300 gallon water tanks (each weighing 10,000 lbs. when full), a special area was built to house the CHP unit and the tanks. According to Polson, “The project was completed in almost a year from concept to commissioning. A cross-functional team put this together, including Rolls-Royce power systems offices in Novi and Houston, and the MTU’s manufacturing facility in Augsburg, Germany. We also enlisted our landlord (Northern Equities Group), contractors, subcontractors and W.W.Williams, our local distributor, who sent a technician to Augsburg for training.”

#### **Combined heat and power**

The CHP process, also known as combined heat and power or cogeneration, is one way businesses and other large facilities can control costs for heating, electricity and cooling, because it extracts multiple forms of usable energy from a single fuel source. The unit produces electric power, which can be used to power some or all of the electricity needed by a facility while a heat exchanger is used to capture heat from the water jacket in the cooling system. Additional heat can be captured from the engine’s exhaust system. The CHP system can also be used for cooling.

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The MTU CHP system is incredibly efficient, economical and eco-friendly.





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Lobby of Rolls-Royce Power Systems, a 73,000-square-foot commercial building in Novi, Michigan.

The heat from the reciprocating CHP system is especially suited for powering an absorption chiller.

“We can also custom design to the building. Sometimes, the heat is a byproduct, other times the electricity is the byproduct. This impacts how the control system is set up,” says Polson. Since the Novi CHP unit’s main use is heating during the winter months, the unit is engineered for heating, with electricity as a byproduct.

#### **A lifetime of cost benefits**

Over the long term, a CHP unit can significantly reduce lifecycle costs, including expenditures for operation, installation and maintenance. For seven months out of the year, the system in Novi is in full operation, heating the building, while the electricity byproduct is used to offset some of the building’s grid electricity use. During the remaining five months of the year, the unit produces electricity only (no heat), at a lower cost than the utility.

“After three years of experience and optimization, we are saving \$30,000 per year on energy costs,” Polson says. “We see potential to increase that number even further by making some minor upgrades to the building’s HVAC system.”

MTU CHP systems are available in the United States, Canada and Mexico through a network of authorized MTU distributors. Rolls-Royce’s Novi office features a Series 400 GC128N6 CHP system, powered by natural gas. The compact Series 400 model can also be fueled by biogas, landfill gas or sewage gas, producing 128 to 358 kWe. Rolls-Royce also offers a larger MTU Series 4000 model fueled by natural gas, producing 763 to 2,135 kWe. Both models are in use worldwide at over 4,000 installations.

#### **Using resources wisely**

CHP systems are highly efficient. Polson says, “Most modern engines and diesel generator sets are up to 43 percent efficient when solely producing electricity. There’s waste. Combined heat and power units have over 90 percent total efficiency. They use virtually all the energy present in the gas, turning it into heat and electricity. It’s much more of an efficient use of resources. Usually exhaust heat is waste energy, and doesn’t get used for anything. That’s not the case with our units.”

Compared to the use of separate heat and power systems, CHP is beneficial for the environment, thanks to its 90 percent efficiency, utilization of alternative fuels, low emissions and reduced overall fuel usage. Novi’s CHP system produces cleaner energy by using natural gas. By consuming less fuel, greenhouse gas emissions, such as carbon dioxide, as well as pollutants like nitrogen oxide are all significantly reduced. In comparison with conventional power generation, MTU CHP systems reduce carbon dioxide emissions up to 50 percent. “This system has the carbon dioxide equivalent of taking 27 cars off the street annually,” Polson says. “This Series 400 model is a relatively small unit. For our larger units, such as the Series 4000 that produces up to 2,135 kWe, the environmental benefits are even better.”

CHP systems come with many other advantages. Advanced control technology ensures a high availability rate, allowing for remote access and off-site monitoring through the Internet. This helps technicians identify faults early and save valuable service time. Temperature zones can be changed remotely. And for owners with multiple installations, programs are available that compare diagnostics from all units to optimize performance.

### Multi-purpose tool

Available as generator sets, power modules and containerized units, MTU CHP systems can fit just about any need. They can supply three different combinations of energy—power; and heat; and power, heat and cooling. The CHP system in Novi is fueled by natural gas. Other units can be fueled by specialty gasses produced from sewers or landfills, and biogas produced from dairy digesters as well as food waste and other biomass products. The wide range of usable fuels opens the way to a large number of applications, from farming operations to hospitals.

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The best applications for natural gas CHP units have a simultaneous need for electrical power and thermal power for more than 4,000 hours per year. Suitable sites include healthcare facilities, large corporate campuses, universities, farming operations and manufacturing facilities.

### A cleaner tomorrow

Javier Gonzalez says, “The role of CHP is well-suited for the future, because it has such a wide variety of applications. It can run from natural gas, which is abundant in the U.S. So as oil prices rise, we have our own reserve. It also can run from byproducts, so as people continue to recycle more, you can take these things and use the energy from recycled mass (biomass, or any material that degrades) to produce electricity and heat, and sometimes cooling. I see the market for this increasing significantly 20 years down the road. It’s an excellent complement to other green renewable and alternate energy technologies.”

There’s a huge opportunity for CHP power in North America, and it increases every day. “Due to the population and economic growth we will have a constantly rising demand for energy. This technology means that electricity and heat can be generated onsite where they are needed—reliably, extremely efficiently and in an environmentally friendly way,” said Gonzalez. “This is an important contribution for sustainable development.”

CHP systems have been proven in Europe and Asia for decades. Now that the first MTU CHP unit has been installed in North America, there’s great potential for growth. Gonzalez states, “The world continues to focus on reducing emissions, creating a greener planet and finding alternative energy solutions. This trend will continue to increase and influence business decisions across all industries. I think Rolls-Royce is well positioned to help businesses and customers by providing solutions that work towards that goal. The fantastic thing about these systems is their broad range of applications. I don’t see many reasons why these systems wouldn’t skyrocket in popularity, especially over the next decade or so.”

With the arrival of the first CHP system in North America, Rolls-Royce is ready for the years ahead. By demonstrating an efficient, environmentally friendly heat and power solution to its distributors and customers, the company is showing others how to capitalize on this great opportunity.

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Rolls-Royce provides world-class power solutions and complete lifecycle support under our product and solution brand MTU. Through digitalization and electrification, we strive to develop drive and power generation solutions that are even cleaner and smarter and thus provide answers to the challenges posed by the rapidly growing societal demands for energy and mobility. We deliver and service comprehensive, powerful and reliable systems, based on both gas and diesel engines, as well as electrified hybrid systems. These clean and technologically advanced solutions serve our customers in the marine and infrastructure sectors worldwide.

