

SHOWCASE PROJECT: LOCKHEED MARTIN: SIKORSKY COGENERATION SYSTEM AND CENTRAL UTILITY PLANT OPTIMIZATION

SOLUTION OVERVIEW



2021 BETTER PROJECT WINNER

The Lockheed Martin (LM) Sikorsky Stratford facility is a two million square foot plant located in Stratford, Connecticut. Sikorsky is a military and rotary-wing aircraft producer and was acquired by Lockheed Martin in 2015. As a business unit of Lockheed Martin, the Sikorsky portfolio hosted Tiger Team events not long after their integration into the company. Tiger Team events are led by the corporate environmental, safety, and health “Go Green” team and site facilities members to identify efficiency projects at LM facilities. (“Go Green” is the name for LM’s environmentally conscious approach to business operations). A Tiger Team evaluation of the Stratford plant revealed opportunities to improve the Combined Heat and Power (CHP) system and the central utility plant (CUP). Subsequently, the team implemented a solution that is projected to save 10.3 million kWh in energy consumption and \$3.3 million in purchased electricity.

A CHP system is a system that uses a heat engine or power station to generate electricity and useful heat simultaneously. Historically, the CHP system at the Stratford site has produced approximately 75 percent of the plant’s electricity. The system’s high-pressure steam output of 50,000 lbs. at full capacity is used for building heat loads and, when needed, is supplemented by a duct burner to produce an additional 30,000 lbs. per hour of steam. Additionally, the system provides low-pressure steam to an absorption chiller to satisfy plant cooling demand.

When the Tiger Team evaluated the plant, they identified two issues that could be improved. Issue number one with the system was that during the summer months, steam output from the system frequently exceeded site demand, leading to unnecessary energy and financial waste. The other issue was that due to prior energy efficiency projects and other variables, demand on the CHP system was declining. Because the system must operate at a minimum output level of 5 MW, the plant had difficulty maintaining the proper load needed by the CHP system to operate reliably. To address these issues, the team outlined a multi-year central utility plant optimization project plan.

SECTOR TYPE

Industrial

LOCATION

Stratford, Connecticut

PROJECT SIZE

2 million square feet

FINANCIAL OVERVIEW

\$3,321,000

SOLUTIONS

The Tiger Team's onsite pre-planning and data collection began in November 2016 and the Tiger Team event took place in April 2017, with assistance from an outside engineering service. The event led to a Go Green capital funding request for the purchase of three pieces of equipment: a 550 kW generator, 800 CFM air compressor, and 400-ton absorption chiller. The request was approved for funding in January of 2018 and two months later an engineering contractor was selected to deliver equipment specifications, engineering drawings, and bid support for the equipment. By August, a completed bid package and final design drawings were completed, and construction began shortly thereafter as the project was awarded to an installation contractor.

The equipment was delivered in November 2018 and by May 2019 the installation of equipment, controls, and piping was completed. The steam generator and air compressor both utilize high-pressure steam to produce medium pressure steam that is used to heat the plant. The equipment also provides steam for process loads and the absorption chillers to produce chilled water. When in operation, the generator will produce up to 550 kW of electricity at a very low cost.

Following the installation of the equipment, the team began planning for phase 2 of the project. To address the previously mentioned issue of system load, LM devised a plan that would export excess power to the grid. LM conducted feasibility and impact studies to evaluate phase 2. The site followed up by installing electrical infrastructure that allows the site to export electricity back to the grid. To make this possible, the site received and signed a revised interconnection agreement, which allows for stable operation of the CHP system at all times, regardless of total plant load. A full program budget is outlined in the table below.

Budget	Phase 1	Phase 2
550 kW turbine	\$1,026,000	-
Compressor	\$869,000	-
Chiller	\$769,000	-
Export	-	\$664,000
Phase Total	\$2,657,000	\$664,000
Project Total	\$3,321,000	

Based on the projected annual run time of the new generator, LM forecasts an annual savings of approximately 1.8 million kWh per year in imported electricity. LM anticipates that the compressor will eliminate the need to run an existing 200 HP electric compressor, which will result in annual

savings of 732,000 kWh. Additionally, the company expects the new absorption chiller to save approximately 635,000 kWh annually and the new interconnection agreement is projected to save 7,100,000 kWh annually.

The total project resulted in annual avoidance of 2,458 metric tons of CO₂, 10.3M kWh, and \$3.3M in energy costs annually. The project has a 2.3-year payback.

OTHER BENEFITS

In addition to the direct savings of the project, the new equipment has multiple indirect benefits. One positive development of the project is that staff at the Stratford plant are now free from the burden of balancing plant load during low-use times. The project has allowed the site to maximize the amount of value from the natural gas used to generate energy, while also ensuring that the CHP system operates at a stable load even during low site demand timeframes. Because the CHP system operates at or above its safe minimum output of 5 MW, the project both saved energy and improved the reliability of the site's main source of power.

Another benefit is that staff gained a better understanding of generator turbine safety and foreign object debris (FOD) removal procedures. This is because, during equipment installation, a large quantity of carbon steel piping was installed which introduced FOD from welding slag. Such debris can be detrimental to the life of the generator turbine; therefore, a steam blow was performed. The process involved arranging temporary piping to the exterior of the building and venting high-pressure steam generated by the cogeneration system and boilers to clean the inside of the piping. Brass targets were inserted downstream of the new piping and were observed hourly. Once the targets no longer contained imperfections from high-velocity FOD strikes, the cleaning was considered completed.

As a result of the success of the Stratford plant, LM is reviewing similar projects at other sites that use CHP systems. The corporate environmental, safety and health Go Green team is also using the highly integrated Tiger Team approach to improve the efficiency of central plants at several LM sites including Marietta, Palmdale, and Waterton.

Annual Energy Use

Energy Savings

10.3 million kWh

Annual Energy Cost

Cost Savings

\$3.3 million