



“The operation of the cogeneration system, real-time energy monitoring, data for energy savings, and reduction of emissions will be a learning tool for students and a valuable educational experience.”

- Siraj Khan, Director of Engineering for Facilities Management, Oakland University

The Opportunity

OpTerra Energy Services has been a long-term partner with Oakland University for nearly 20 years, implementing energy efficiency measures that save the University money and improve the performance and reliability of its facilities that serve 19,355 students.

Starting in 2013, the University pursued the installation of a new cogeneration system – where a natural gas turbine generates electricity and useful heat at the same time. This technology attracted University stakeholders for its ability to grant greater flexibility and independence from the utility, all while delivering millions of dollars in annual energy cost savings. The Year 1 guarantee is \$1,243,050 and the actual savings have exceeded predictions by over \$200,000:

Cogeneration savings for Year 1:	Electrical	Natural Gas	Total
	\$2,520,739	(\$1,044,528)	\$1,476,211

The Partnership

Oakland University and OpTerra teamed up to implement a cogeneration system at the University’s Central Heating Plant. OpTerra installed a five-megawatt cogeneration natural gas-driven turbine and a waste heat recovery boiler, which captures and utilizes turbine exhaust waste heat in order to heat the University’s high temperature hot water system, serving heating and cooling needs on campus. This new system provides flexibility and gives the University capability to produce its own electrical power for the entire campus, impacting 50 buildings.

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Program Highlights

- **5 MW** cogeneration system is expected to produce approximately 62% of the electricity consumed by the University
- Cogeneration infrastructure improvements are expected to offset annual CO₂ emissions by **4,045,797 gallons of consumed gasoline** per year – the equivalent of removing **7,500 cars** from the road
- Central Heating Plant modernizations are expected to generate/maintain **263 jobs** over the project lifetime

The Technical Scope

Cogeneration Modernizations (operating as of 2016)

- New 5 MW cogen plant consisting of a Solar Centaur 50 gas turbine package with an E-Tech 60 MMBTUH Waste Heat Recovery Unit with a Duct Burner

Installation Project Cost

\$12.7MM over a 15-year contract term

Program Timeline

- **11/2013 - 4/2014**
Program Development
- **12/2014**
Implementation Contract Signed
- **1/2015**
Construction Started
- **6/2016**
Substantial Program Completion



During the course of program installation, OpTerra worked closely with the University to overcome obstacles that arose. At program start, the University encountered a challenge stemming from the new turbine's gas pressure requirements. The gas compression station that would have been needed to meet the turbine's pressure requirements would detract from the overall reliability of the new system. Fortunately, OpTerra and the University were able to negotiate with the local gas supplier to install a dedicated high pressure line for the project. Over time, the supplier will refund approximately 95 percent of the cost based on projected future gas consumption. In the end, the need for gas compression was eliminated and the University was equipped with a more reliable system.

OpTerra worked with University staff on financing options and guaranteed savings, helping to make the program possible. The generated savings and the natural gas pipeline rebate from a local energy provider created funding to pay for debt service and an annual comprehensive maintenance program for the turbine. As a result of this additional partnership, the project was completely funded by positive cash flow from the energy savings.

Real World Learning for Students

In addition to reducing utility costs, the University was excited to work with OpTerra to incorporate educational opportunities into the program implementation. Working in partnership with administration, faculty, staff, and students, OpTerra delivered educational enhancements enabling students to obtain field experience in science, technology, engineering, and math (STEM). OpTerra supported energy internships and job-shadowing programs during the construction process, in collaboration with Oakland University's Clean Energy Research Center. Additionally, a live dashboard with data from the cogeneration system is available to students and professors for academic use.

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The Impact

As a result of the long-term partnership with OpTerra, the University is no longer dependent on the electric utility as its primary source of power. Now the University is equipped with a more reliable source which will help to eliminate power outages. The more efficient production of electricity and heat at its Central Heating Plant means that Oakland University will offset annual carbon emissions, while providing economic and safety benefits to the community at large.

The University now has greater power reliability with backup capability. The modernizations at the Central Heating Plant have put the University in a position to provide a safe haven for the surrounding community in the event of a major outage at the utility. Additionally, the modernizations at the Central Heating Plant bolster the local economy through a combination of job creation and increased local spending.