

Appalachian Energy Summit Poster Contest

Abstract Submission

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**Combined Heat and Power Project for  
Western Carolina University**

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Western Carolina University

## **Introduction**

Western Carolina University is a public four year university located in Cullowhee, North Carolina which is located on the western border of the state. Western Carolina University's student population is growing every year, and with increased student population comes the increased use of utilities. The primary utility being used is steam, which is used for supplying heat and hot water to the entire campus. Western Carolina University's steam is provided by a steam plant that contains four boilers, which are all over forty years old. The steam plant is prone to mechanical failures during the winter months, with increased campus demand. Western Carolina University's Facilities Management approached the Kimmel School to create a Capstone project regarding the development of a CHP plant on campus; CHP stands for combined heat and power generation. This CHP plant would replace the current outdated steam plant on campus.

## **Approach**

The Capstone team determined that Western Carolina University's demand for steam is approximately 10,000 lbs/hr during the non-winter months, and is around 20,000 lbs/hr during the winter months. A thorough analysis of the Solar Saturn 20 gas turbine and Solar Centaur 40 was conducted and based on the analysis performed, it was determined that the Solar Saturn 20 gas turbine would be Western Carolina University's best option for a CHP system. With information provided from Solar turbines, the Saturn 20 gas turbine package produces up to 39,000 lbs/hr and produces 1.1 megawatts of electricity. Analyses were conducted determined Western Carolina University's energy usage is averaging 3500 Kilowatt hours. Analysis formulas and tables were also used to determine unknown data such as MMBtu usage and projected savings.

## **Preliminary Results/Evaluation**

It was determined, based on the examination of data from the past 5 years that the savings from the Saturn 20 gas turbine package would average around \$536,000 annually. Additionally, the Saturn 20 gas turbine package is much more efficient than Western Carolina University's current boilers, and if Western Carolina University this package, the payoff period is projected to be 13 years. The savings estimate was determined based on sensitivity analysis, and showed that the CHP system in summer months produced the greatest savings with increased MMBtu cost, and in winter months produced the greatest savings with decreased MMBtu cost.

## **Conclusion/Future Work**

Western Carolina University is located in the perfect location for a CHP facility, which makes the Saturn 20 gas turbine package a realistic and highly desirable project. Our research determined that the best option to save money with a CHP system for Western Carolina University is to produce less steam; decreased steam demand equals increased savings.

Outside source

*Solar Turbines Representative*

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