



Houweling's Tomatoes

13-MW CHP System



Owner- Casey Houweling



4.3 MW GE Jenbacher JMS 624 Engine

Quick Facts

LOCATION: Camarillo, CA
MARKET SECTOR: Agriculture
FACILITY SIZE: 128 acres
FACILITY PEAK LOAD: 12.5 MW
EQUIPMENT: 13 MW (three 4.3 MW GE Jenbacher engines), three 1 Million-gallon hot water storage tanks
FUEL: Natural gas
USE OF THERMAL ENERGY: Greenhouse heating
CHP TOTAL EFFICIENCY: 88%
ENVIRONMENTAL BENEFITS: Carbon Footprint is half of utility grid (220 kg/MWh net CO₂ vs. 430 kg/MWh)
TOTAL PROJECT COST: \$18.5 million
REBATES: \$880,000 (from California's SGIP Program)
ANNUAL ENERGY SAVINGS: \$4.3 million
PAYBACK: 4 years
CHP IN OPERATION SINCE: 2012

Site Description

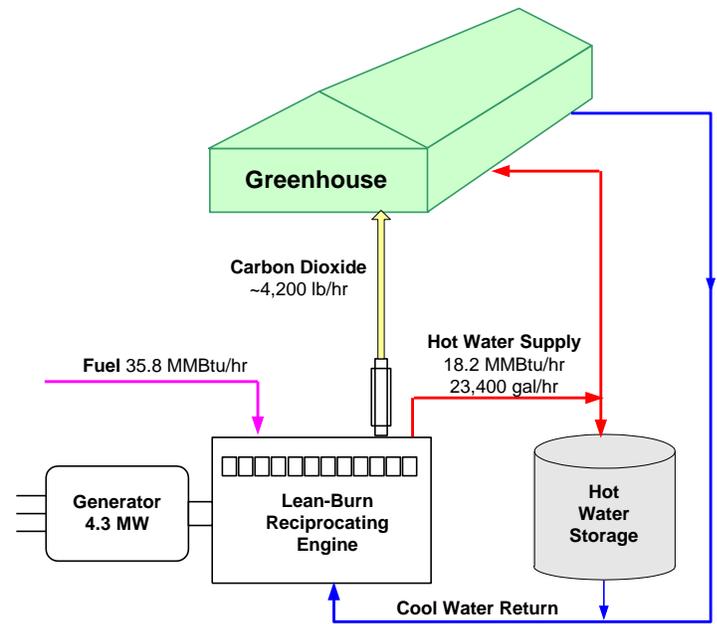
Houweling's Tomatoes is a family owned, world-renowned greenhouse tomato grower with facilities in Camarillo, CA; Mona, UT; and Delta, BC. Houweling's state-of-the-art greenhouse complex in Camarillo consists of six greenhouses covering 128 acres that operate year round and is located close to consumer markets for increased shelf life. California's coastal climate provides ideal growing conditions for fresh vegetables such as tomatoes, lettuce, bell peppers and cucumbers. Houweling's primary crop is tomatoes with cucumbers secondary. The first greenhouse phase was commissioned in 1996 with full build-out completed in 2008. At the Camarillo site, crops are grown hydroponically through drip irrigation to deliver the right amount of water and nutrients to the plants at the right time, reducing water usage by 85% and increasing acreage production twenty-five fold over open land farming.

Reasons for CHP

Modern greenhouses, because of their need for temperature control and enriched carbon dioxide (CO₂) levels represent a good application for combined heat and power. However, the demand for CO₂ is generally not coincident with the need for heat; the demand for electricity during daylight hours is small (1.5 MW) relative to the need for heat and CO₂; and at night, grow lights increase demand by 11 MW. So a correctly sized CHP system needs an outlet for excess electricity during the day. CPUC established the CHP feed-in-tariff (FIT), which made CHP in greenhouses economically viable in California. For more information on feed-in-tariff visit: <http://www.cpuc.ca.gov/PUC/energy/Renewables/hot/feedintariffs.htm> In addition to the economic benefits, CHP completed the sustainability matrix for Houweling's Tomatoes that included a myriad of energy efficiency, renewable energy, and water conservation measures.

CHP Equipment & Operation

Houweling's was the first entity to apply for the CHP FIT. The first two CHP units were commissioned in 2011 but encountered significant delays obtaining the Grid Interconnection Agreement and the Power Purchase Agreement (PPA). For the first couple years, these two units were only able to operate at night, serving the electric demand for the grow lights. In the fall of 2013, the third CHP unit was commissioned and the Agreements for Interconnection and Power Purchase were signed with the local utility. The thermal output from each CHP unit is coupled to a one million gallon hot water storage tank and serves two of the six greenhouses. Likewise, exhaust CO₂ from each unit is directed to the two connected greenhouses. During daylight hours, all generated electricity is exported to the grid. At night, CHP generated electricity is used to power the grow lights when they are on and excess power is exported to the grid.



The CHP system is designed to maximize heat recovery and utilization. On each engine, heat is captured from both turbocharger intercoolers, the lube oil cooler, engine jacket and the exhaust (high temperature and condensing). As there is no mechanism to dump heat if the hot water storage tank is full and there is no demand for heat in the greenhouse, the engine shuts down. The overall Combined Heat & Power system efficiency is 88%.

Lessons To Share

Several issues mired the CHP project development at Houweling's Tomatoes:

- The process of obtaining a grid interconnection agreement and power purchase agreement were overly complex and caused delays, taking three years to complete. This resulted in unexpected costs and caused the commissioned CHP system to be economically underutilized for two years.
- Sites expecting to export significant amounts of power to the grid may need to consider additional costs for distribution system changes and early engagement with the utility is recommended to fully understand all the interconnection issues and costs.

"The economic and environmental benefits of installing the CHP system outweighed the pioneering hurdles we faced exporting power under the new feed-in tariff."

- Casey Houweling, President & CEO

For More Information

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More CHP Project Profiles:

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