By mounting the system on the roof near the main air handing unit, the system was successfully integrated into the store design in a cost effective manner. The microturbine was added in the store’s main distribution panel without need for additional transformers or other electrical interconnection hardware. A system as described here could easily and cost-effectively be integrated into a standard store design. This system has broad applicability to supermarkets across the country. Based on this configuration, energy modeling was performed to learn how well the system would run in other regions. In Consolidated Edison territory, the system yields almost $19,000 a year in savings with similar results found in Southern California.
Energy Overview
This Waldbaum’s store is located on Long Island, which has some of the highest electricity rates in the country. An attractive feature of this site is the ability to use the rejected thermal energy from the generator on a year-round basis. In the summer, dehumidification of the incoming air significantly reduces the energy consumption of the electric air conditioning system. In the winter there is a significant space heating load. This system was extensively monitored for a period of 18 months. Net CHP system efficiency ranged from more than 60% based on higher heating value (HHV) on cold winter days to over 50% HHV on humid summer days. Displaced gas use due to heat recovery, after system modifications, is greater than 24,000 therms per year. Extensive environmental testing showed that the microturbine exceeded its emissions specifications. The NOx emissions from the microturbine were 3 to 5 ppmv (@ 15% O2) at full load.

Benefits
- Reduction in annual energy costs
- Improvement in store’s power factor
- Free heating and air conditioning
- Partial hedge against energy cost increases
- Significant opportunity for technology transfer to other sites with similar equipment.
- >300,000 lbs. CO₂ reduced annually
- 1,300 lb reduction in NOx emissions (11%)

Lessons Learned
Early problems with system efficiency were fixed in part with a replacement turbine engine. Space heating heat recovery was less than expected due to the small differential between the gas furnace and heat recovery coil set points. More ideal heat recovery control settings could have resulted in daily CHP efficiencies over 70%. Local utility rates are an important criteria. If the system were installed in Con Edison service territory, the annual net savings would increase by 355%. Results are similar in Southern California. Decreasing gas commodity costs by 10¢ per therm increases annual savings by $4,500 (85%).

For Further Information
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“Recovered heat was successfully used to meet summertime dehumidification loads. Lower humidity levels allow improved customer comfort as well as more efficient display case operation.”

Hugh Henderson
CDH Energy Corp.
Project Developer