



**Combined Heat and Power - Stage 1 Economic Analysis (Power and Cooling Generation)**  
**June 2013**

Current Facility Information	
<b>Total Power Demand</b>	<b>5,700 kW</b>
Annual Usage	49,932,000 kWh/yr
Power Percentage for Cooling	38%
Estimated Cooling Demand	2,166 Rt
Cooling Demand	2,166 Rt
HVAC EER	12 Btu/kWh
Cost of Electricity	\$0.150 /kWh

CHP Assumptions	
Current Power Demand	5,700 kW
Current Cooling Demand	2,166 Rt
Power Taken by Cooling	2,166 kW
Base Power Load	3,534 kW
Cooling from Power Generation	47%
Power Demand for Cooling	1,026 kW
<b>Total CHP Generation</b>	<b>4,560 kW</b>
Cooling Capacity	0.25 Rt/kW
Cooling Capacity	1,140 Rt
Cooling Requirement	1,140 Rt
Natural Gas Usage	35.7 mmBtu/hr
<b>Overall Efficiency</b>	<b>82%</b>

Carbon Dioxide Emissions		
	Utility (Coal)	CHP
Power Generation (kW)	5,700	4,560
Power Used (MWh/yr)	49,932	39,946
Heat Rate (Btu/kWh)	7,828	7,828
Natural Gas Usage (scfh)	44,619	35,696
CO2 Emission Factor (lb/mmscf)	120,000	120,000
CO2 Emissions (TPY)	23,452	18,762
Energy From Cooling (MWh <sub>c</sub> /yr)	0	35,112
<b>CO2-Energy Ratio (lb/MWh<sub>e</sub>)*</b>	<b>1,879</b>	<b>500</b>

\* Based on coal-fired facility emitting twice as much CO<sub>2</sub> as natural-gas-fired facility

Power Source / System Cost Information		
Engine Chosen for Analysis**	Recip Engine	
Efficiency	43.6%	
Power Supply Heat Rate	7,828	Btu/kWh
Natural Gas Cost	\$6.00	/mmBtu
<b>Natural Gas Cost</b>	<b>\$0.0470</b>	<b>/kWh</b>
<b>Operation and Maintenance Costs</b>	<b>\$0.0270</b>	<b>/kWh</b>
<b>Extended Service Agreement Cost</b>	<b>\$0.0080</b>	<b>/kWh</b>
<b>Lease Cost</b>	<b>\$0.0216</b>	<b>/kWh</b>
Annual Lease Payment	\$862,825	

Projected Savings	
<b>Grid Costs</b>	
Electricity Cost	\$7,489,800 /yr
<b>Total Annual Cost</b>	<b>\$7,489,800 /yr</b>
<b>CHP Costs</b>	
Natural Gas Cost	\$1,876,161 /yr
Operation and Maintenance Costs	\$1,078,531 /yr
Extended Service Agreement Cost	\$319,565 /yr
Lease Cost*	\$862,825 /yr
<b>Total Annual Cost</b>	<b>\$4,137,082 /yr</b>
<b>Annual Savings vs. Grid</b>	<b>\$3,352,718 /yr</b>
<b>Savings Percentage vs. Grid</b>	<b>45%</b>

\* Savings estimates do not account for tax incentives or grants

\*\* A similar analysis can be performed with a natural gas turbine