



ORNL CHP Capacity Optimizer Determines Optimum Size of Distributed Energy Components

Spreadsheet Tool Finds the “Right Size” to Maximize Economic Benefit

Background

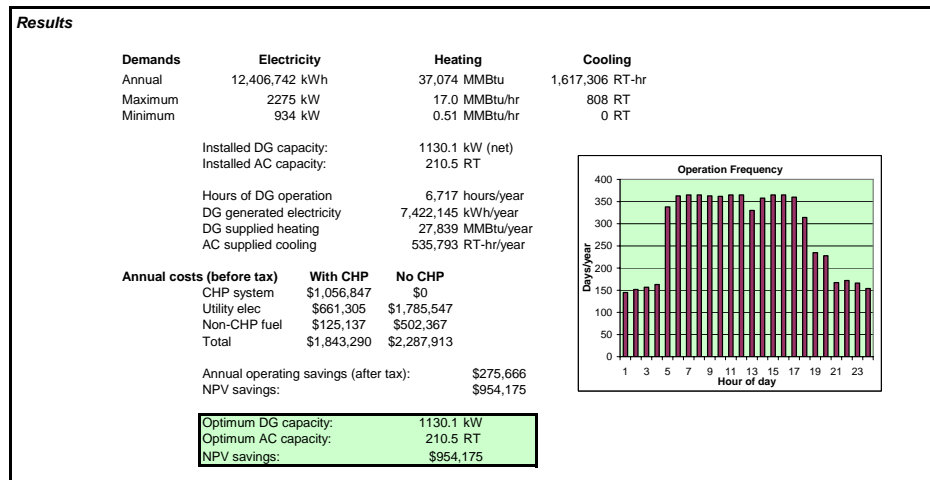
Distributed energy/cooling heating and power (CHP) applications have the potential to save both money and natural resources. A critical element in achieving savings is selecting the proper installed capacities for the distributed generator (i.e., prime mover) and absorption chiller. Electric and thermal demands vary by application type (i.e., end use), building size, location, and time. Further, electrical, heating, and cooling demands are not coincident in time. Determining the correct capacities for a CHP system requires striking a balance between the energy provided by the CHP system and the energy provided by the conventional electricity grid and on-site boiler.

Technology

In order to accurately capture the demand behavior at a given building or facility, electric and thermal energy demand and supply must be modeled on an hourly basis. Using hourly load data generated by building simulation programs such as BCHP Screening Tool¹ or Building Energy Analyzer² as input, the CHP Capacity Optimizer simulates the operation of a distributed energy system as a classic make-or-buy decision. For given prime mover and absorption chiller capacities, the operation simulation determines the life-cycle net present value savings of the CHP system, relative to the conventional grid and on-site boiler arrangement. By coupling the operation simulation to an effective nonlinear optimization algorithm, equipment capacities that maximize life-cycle CHP system savings are determined. The capacity optimization and operation simulation are contained in a single Microsoft Excel™ spreadsheet file, which employs intuitive user controls for providing input, performing optimization, and assessing the results.



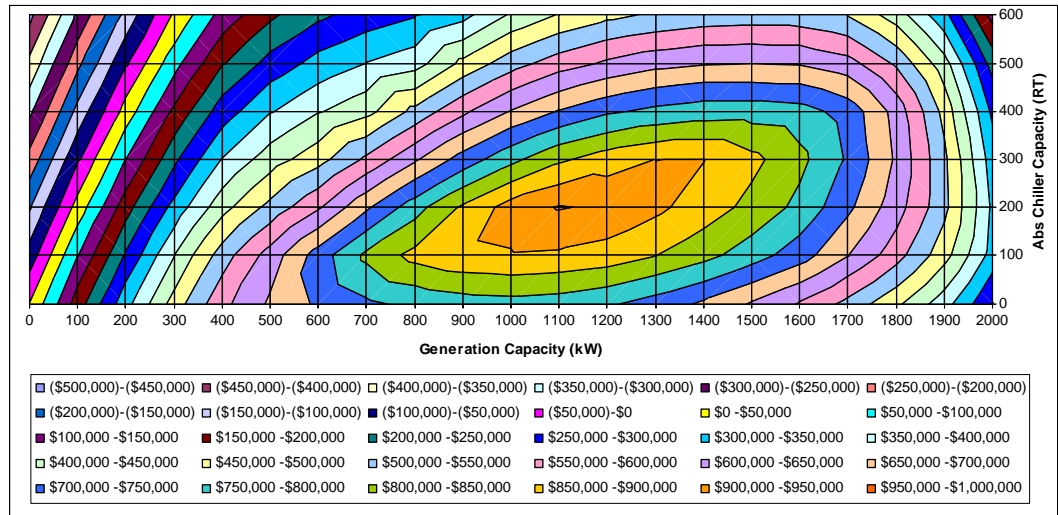
CHP system at telecom center



Example summary output from CHP Capacity Optimizer

¹ Available from ORNL (fischersk@ornl.gov)

² Available from InterEnergy Software, www.interenergysoftware.com



Contour plot of total solution space from CHP Capacity Optimizer

Benefits

- The CHP Capacity Optimizer provides an efficient, easy to use tool to allow end-users and system designers to determine the most economic installed capacities for CHP equipment.
- Installing the optimum size of equipment will maximize project economic benefits.
- Contour plot guidance and quick manual entry capabilities allow users to explore the economic impact of alternative equipment sizes.

Future Work

Future activities in this area include continued distribution of the CHP Capacity Optimizer to the Regional Applications Centers and others, as well as updates for improvements to the tool.

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