## Natural Gas Driven Heat Pump

### Author

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### Description

Natural gas driven heat pumps burn natural gas to drive a refrigerant-absorbent heating and cooling cycle. These are currently available as large units that replace a boiler/chiller pair, providing hot and chilled water to a building. These heat pumps can reduce peak demand by shifting from electricity to natural gas. They may save heating energy since the heating COP of the heat pump is higher than direct combustion efficiency. However, cooling energy may increase since cooling efficiency is lower than standard vapor-compression chillers.

### Modeler Description

This measure identifies buildings with boiler/chiller pairs providing hot/chilled water to hydronic systems in the building. The boiler/chiller pair is replaced by a direct-fired absorption chiller heater. The condenser type is air cooled or water cooled depending on the configuration of the original chiller.

### Use Case Types

Retrofit, New Construction

### Arguments

“run\_measure” is a choice argument that determines whether or not the Measure is applied during a given run.

### Initial Condition Message

### Final Condition Message

### Not Applicable Messages

Not applicable if no chiller, no boiler, multiple chillers, or multiple boilers.

### Warning Messages

### Information Messages

The names of the chiller and boiler being replaced, the type of condenser being used, and the heating and cooling efficiencies.

### Error Messages

### Code Outline

* Find all Boiler:HotWater objects
  + NA unless there is only one boiler
  + Get the hot water inlet and outlet node names
* Find all Chiller:Electric:EIR objects
  + NA unless there is only one chiller
  + Get the chilled water inlet and outlet node names
  + Get the condenser water inlet and outlet node names
  + Determine if the chiller is water or air cooled based on the condenser nodes
* Create a ChillerHeater:Absorption:DirectFired
  + Hook it up to the chilled water, hot water, and condenser water nodes
  + Set the heating and cooling efficiencies
* Modify the Branch and PlantEquipmentList objects to reference the ChillerHeater:Absorption:DirectFired instead of the Boiler or Chiller.

### Tests

**This measure applies to:**

1. Primary School
2. Secondary School
3. Large Hotel
4. Hospital

Test results

### References

1. <http://energy.gov/sites/prod/files/2014/03/f12/Non-Vapor%20Compression%20HVAC%20Report.pdf>