

# A Lot Has Been Added to the “Original” Look of the BCHP Screening Tool

BCHP Screening Tool powered by DoeRayMe - [BCHP Screening Tool - untitled.drm]

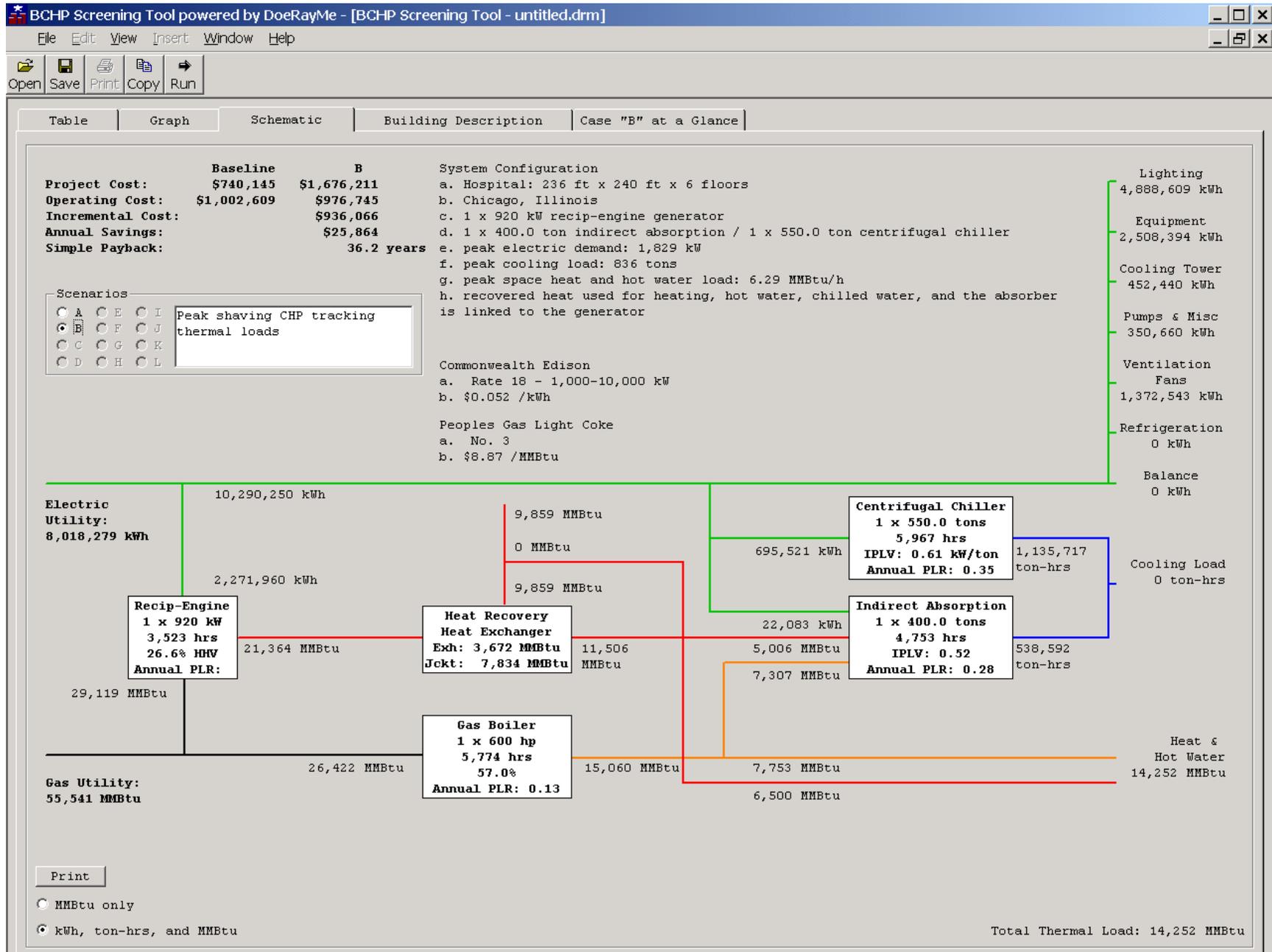
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Table Graph Schematic Building Description Case "B" at a Glance

Parameter	Units	A	B
<b>INPUT</b>			
<b>1. Scenario Description</b>			
a. descriptive summary		Baseline hospital with utility power	Peak shaving CHP tracking the
<b>2. Building Description</b>			
a. Building Type		Hospital	Hospital
b. Location		Illinois Chicago 41.98 87.9	Illinois Chicago 41.98 87.9
c. Length of Building	feet	236	236
d. Width of Building	feet	240	240
e. Number of Floors		6	6
f. Basement Present		No	No
g. Story Height	feet	12	12
h. Building Rotation	degrees	0	0
i. Peak Date Shown		Annual Peak Cooling Day	Annual Peak Cooling Day
<b>3. Utility Selection</b>			
a. Electric Utility		IL-Elec-CommonwealthEdison	IL-Elec-CommonwealthEdison
<b>RESULT</b>			
<b>1. Major Plant Equipment Sizes</b>			
a. Boiler	MMBtuh	18.413	20.087
b. Lead Elec Chiller	MMBtuh	4.800	
c. Lag Elec Chiller	MMBtuh	6.600	6.600
d. Lead Steam Absorber	MMBtuh		4.800
e. Lag Steam Absorber	MMBtuh		
f. Gas Absorber	MMBtuh		
g. Engine-Driven Chiller	MMBtuh		
h. Cooling Tower	MMBtuh	6.682	10.141
i. Generator	MMBtuh		3.140
j. Boiler	hp	549.9866	599.988
k. Lead Elec Chiller	tons	400	0
l. Lag Elec Chiller	ton	550	550
<b>HELP</b>			

# Energy Flows & System Summary on Schematic Diagram



# Symbols on Schematic Link to Equipment Selection Screens

**BCHP Screening Tool powered by DoeRayMe - [BC**

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Table Graph Schematic

	Baseline	B
Project Cost:	\$740,145	\$1,676,213
Operating Cost:	\$1,002,609	\$976,740
Incremental Cost:		\$936,060
Annual Savings:		\$25,860
Simple Payback:		36.0

Scenarios

A  E  I Peak shaving CHP tracking thermal loads

B  F  J

C  G  K

D  H  L

---

**Electric Utility:**

8,018,279 kWh

10,290,250 kWh

2,271,960 kWh

21,364 MMBtu

29,119 MMBtu

26,422 M

**Gas Utility:**

55,541 MMBtu

37.0%

Annual PLR: 0.13

6,500 MMBtu

14,252 MMBtu

Print

MMBtu only

kWh, ton-hrs, and MMBtu

Total Thermal Load: 14,252 MMBtu

**Generator Data**

Help About...

Number of Generators:

Type of Generator: Recip-Engine

Selection: 800 kW Generic Onsite (Current)

\* user defined generators

1. Monday - Friday

a. Mid-Day Operation

(1) operating hours: Summer (8 am - 10 pm), Winter (8 am - 10 pm)

(2) tracking: Thermal Demand

b. Non-Mid Day Tracking: Don't Run

2. Weekend Operation: Off Saturday and Sunday

3. Applications of Recovered Heat (chilled water for lead absorption chiller, other uses optional)

Heating  Service Hot Water  Link Absorption Chiller To Recovered Heat

4. Scaling Capacity:  Automatic  Manual

a. fixed generator capacity: 920 kW

Generic Engine Generator Model No. Onsite (Current)

1. Rated Performance

a. electrical capacity.....800 kW

b. fuel rate.....9.29 MMBtu/h (HHV)

c. heat recovery.....3.67 MMBtu/h

d. efficiency

(1) electrical.....29.40%

(2) thermal.....39.54%

(3) overall.....68.94%

2. Generator Costs

a. equipment

(1) generator (equipment only)....\$355/kW.....\$284,000

(2) installation.....\$500/kW.....\$400,000

(3) total.....\$855/kW.....\$684,000

b. operating and maintenance.....\$0.0110/kWh

3. Service Life.....25 years

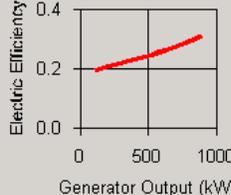
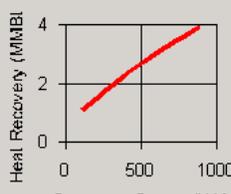
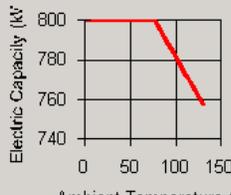
4. Emission Rates

a. CO2.....110 lb/MMBtu

b. CO.....0.560 lb/MMBtu

c. NOx.....4.08 lb/MMBtu

d. SOx.....0.000588 lb/MMBtu

# “Help About...” Links to Display of Database Thermal & Electrical Capacities

**BCHP Screening Tool powered by DoeRayMe - [BC]**

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Table Graph Schem

**Project Cost:** Baseline \$740,145  
**Operating Cost:** \$1,002,609  
**Incremental Cost:**  
**Annual Savings:**  
**Simple Payback:**

Scenarios  
 A  E  I  
 B  F  J  
 C  G  K  
 D  H  L

Peak shaving Ch thermal loads

**Electric Utility:** 8,018,279 kWh

10,290,250

2,271,960 kWh

21,364 MMBtu

29,119 MMBtu

26,422 M

**Gas Utility:** 55,541 MMBtu

37.0%

**Annual PLR: 0.13**

6,500 MMBtu

14,252 MMBtu

**Recip-Engine**  
**1 x 920 kW**  
**3,523 hrs**  
**26.6% HHV**  
**Annual PLR:**

**2. Generator Costs**  
a. equipment  
(1) generator (equipment only).....\$355/kW.....\$284,000  
(2) installation.....\$500/kW.....\$400,000  
(3) total.....\$855/kW.....\$684,000  
b. operating and maintenance.....\$0.0110/kWh  
3. Service Life.....25 years  
4. Emission Rates  
a. CO<sub>2</sub>.....110 lb/MMBtu  
b. CO.....0.560 lb/MMBtu  
c. NO<sub>x</sub>.....4.08 lb/MMBtu  
d. SO<sub>x</sub>.....0.000588 lb/MMBtu

Print

MMBtu only  
 kWh, ton-hrs, and MMBtu

Total Thermal Load: 14,252 MMBtu

**Generator Data**  
Help About...  
Number of Generators: 1  
Type of Generator: Recip Engine

**Generator Database Information**  
Display Capacities:  
 0 to 250 kW  
 0 to 500 kW  
 0 to 900 kW  
 0 to 2,000 kW  
 0 to 3,000 kW  
 0 to 5,000 kW  
 all database entries

Point Parameters  
Recip Engine  
Mfr: Caterpillar  
Model No: G3406  
Capacity: 150 kW  
Recovered Heat: 0.81 MMBtu/h  
Fuel Rate: 1.68 MMBtu/h  
Non-fuel O&M: \$0.014/kWh

**Generator Database Electrical and Thermal Capacities**

Thermal Capacity (MMBtu/h)

Electrical Capacity (kW)

Recip Engine Microturbine  
Gas Turbine Fuel Cell

Electric Capac Ambient Temperature (F)

# Additional Links for Chiller & Boiler Selection

Space Cooling Equipment

### Lead Chiller Specification

- Type of Equipment:
- Type of Chiller:
- Model:
- Chiller Sizing:
  - Automatic  Manual
  - a. cooling plant oversizing:
  - b. lead chiller plant capacity:  tons
  - c. number of chillers:
- Chiller Staging:
 

	Summer		Winter	
	Start	Stop	Start	Stop
a. weekdays	<input type="text" value="8 am"/>	<input type="text" value="8 pm"/>	<input type="text" value="8 am"/>	<input type="text" value="8 pm"/>
b. Saturdays	<input type="text" value="8 am"/>	<input type="text" value="8 pm"/>	<input type="text" value="8 am"/>	<input type="text" value="8 pm"/>
c. Sundays and Holidays	<input type="text" value="8 am"/>	<input type="text" value="8 pm"/>	<input type="text" value="8 am"/>	<input type="text" value="8 pm"/>
- Lead Absorption Chiller Linked to Recovered Heat:  Yes  No
- IFSE Absorption Chiller:

Generic Generic Water Cooled Absorption Water Chiller

- Rated Performance:
  - a. nominal capacity: 500 tons
  - b. power consumption: 0.014 kW/ton
  - c. chiller cannot make ice
  - c. cooling COP: 0.63
- Operating Range: 0.1 to 1.15 times nominal
- Chiller Costs: capacity
  - a. equipment costs
    - (1) equipment only: \$500 / ton
    - (2) installation: \$90 / ton
    - (3) total installed cost: \$590 / ton
  - b. operating and maintenance costs
    - (1) repair costs: \$34.60 / ton per year
    - (2) maintenance costs: \$1.12 / ton per year
    - (3) total O&M costs: \$35.72 / ton per year
- Service Life: 20 years

Capacity (tons) vs Chilled Water Temperature

Chilled Water Temperature (F)	50.0 F Capacity (tons)	85.0 F Capacity (tons)	90.0 F Capacity (tons)
40	800	450	400
42	810	470	410
44	820	490	420
46	830	510	430
48	840	530	440
50	850	550	450

gCOP vs Chilled Water Temperature

Chilled Water Temperature (F)	50.0 F gCOP	85.0 F gCOP	90.0 F gCOP
40	0.82	0.62	0.60
42	0.82	0.62	0.60
44	0.82	0.62	0.60
46	0.82	0.62	0.60
48	0.82	0.62	0.60
50	0.82	0.62	0.60

gCOP vs part load ratio

part load ratio	gCOP
0.1	0.38
0.2	0.52
0.4	0.60
0.6	0.62
0.8	0.62
1.0	0.62
1.1	0.62

MMBtu only  
 kWh, ton-hrs, and MMBtu

Total Thermal Load: 14,252 MMBtu

Lighting  
 , 609 kWh  
 Equipment  
 , 394 kWh  
 Cooling Tower  
 440 kWh  
 & Misc  
 660 kWh  
 Relation  
 Fans  
 , 543 kWh  
 Generation  
 kWh  
 lance  
 kWh  
 ing Load  
 ton-hrs  
 Heat &  
 ot Water  
 52 MMBtu

# Links Also Activate I/O Form for Utility Selections

**BCHP Screening Tool**

File Edit View Insert  
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Table Graph

**Project Cost:**  
**Operating Cost:**  
**Incremental Cost:**  
**Annual Savings:**  
**Simple Payback:**

Scenarios  
 A  E  I  
 B  F  J  
 C  G  K  
 D  H  L

**Electric Utility:**  
8,018,279 kWh

Recip-1  
1 x 9  
3,523  
26.6%  
**Annual**  
29,119 MMBtu

**Gas Utility:**  
55,541 MMBtu

Print

MMBtu only  
 kWh, ton-hrs, and MMBtu

**Electric Utility Selection**  
RateScriptEditor List Utilities with... Help About

**Electric Utility Selection**

- Chicago, Illinois
- Default Electric Utility Serving Chicago: Commonwealth Edison
- Other Electric Utilities in Illinois: Commonwealth Edison
- Rate Schedules
  - standard rates (no net metering): Rate 18 - 1,000-10,000 kW
  - buy back rate: none
- Display Details for: Rate 18 - 1,000-10,000 kW
  - effective date: 1/1/1999
  - rate type: Standby
  - calculation information:
 

Customer Charge Standby Only: \$524.61 (over 10,000 kW); \$344.39 (1,000 - 10,000 kW); \$137.93 (500 but < 1,000 kW); \$106.83 (< 500 kW)
  - notes:
 

All customers with access to electric generating facilities, not in parallel with utility, and/or using another form of energy in the
  - taxes and adjustments
    - per unit consumption.....\$0.0033/kWh
    - percent of bill.....0.6%
    - fuel cost adjustment.....\$0.0/kWh
  - conditions and requirements:
 

	Allowed	Required
(1) lighting	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(2) cooling	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(3) heating	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(4) fans	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(5) generation	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

	Minimum	Maximum
(6) energy		kWh
(7) demand	1,000	10,000 kW
(8) load factor		
(9) voltage		V
(10) misc qualifier A		
(11) misc qualifier B		
  - air pollutant emission rates (state-wide averages):
    - CO2.....2.567 lb/MWh
    - CO.....0.40 lb/MWh
    - NOx.....8.055 lb/MWh
    - SOx.....22.076 lb/MWh
- calculation parameters
 

```
bc001DemandOneStandbyCapacitySz01...1,000,000,000 kW
bc001DemandOneStandbyCapacityChg01.....$2.99/kWh
bc002DemandTwoSummerOnSz01.....1,000,000,000 kW
bc002DemandTwoSummerOnChg01.....$15.16/kWh
bc003EnergyOneOnSz01.....1,000,000,000 kWh
bc003EnergyOneOnChg01.....$0.05022/kWh
bc004EnergyTwoOffSz01.....1,000,000,000 kWh
bc004EnergyTwoOffChg01.....$0.02123/kWh
reactFrac.....0.000000
```

Future Energy Costs

Return  
Cancel

Done

Total Thermal Load: 14,252 MMBtu

# Help Facility to List Special Utility Rates in Database (e.g. electric buy-back, gas cooling)

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Electric Utility Selection

RateScriptEditor List Utilities with... Help About

Table

Project Operating Incremental Annual Simple P

Scenario

A B C D

Electric Utility: 8,018,27

Gas Util 55,541 M

Print

MMBtu kWh, to

Done

Electric Utility Selection

- Chicago, Illinois
- Default Electric Util
- Other Electric Util
- Rate Schedules
  - standard rates (r
  - buy back rate:
- Display Details for
  - effective date: 1
  - rate type: Standk
  - calculation infor
  - notes:
  - taxes and adjustm
    - per unit con
    - percent of b
    - fuel cost ad
  - conditions and re
    - lighting
    - cooling
    - heating
    - fans
    - generation
    - energy
    - demand
    - load factor
    - voltage
    - misc qualifie
    - misc qualifier B
  - air pollutant emission rates (state-wide averages):
    - CO2.....2.567 lb/MWh
    - CO.....0.40 lb/MWh
    - NOx.....8.055 lb/MWh
    - SOx.....22.076 lb/MWh

Names of Utility Rate Files and Rate Names for Special Needs

Listing of utility rate files and rate names for utility buy back rates (other than net metering rates).

Close

- AL-Elec-AlabamaPowerCompany.utl
  - P&E Option B - Single-Phase
  - P&E Option A - Three-Phase commercial industrial buy-back
  - P&E Option B - Three-Phase commercial industrial buy-back time-of-use
- AZ-Elec-ArizonaPublicService.utl
  - EPR-4 or EPR-2 - Firm Buy-Back
  - EPR-4 or EPR-2 - Non-Firm Buy-Back
- IA-Elec-IESUtilities.utl
  - CSPP - Energy & Demand
  - CSPP - Energy Only
- ID-Elec-IdahoPower.utl
  - Schedule 89
- IL-Elec-CentralIllinoisLightCompany.utl
  - Rate 28 <240V
  - Rate 28 -TOU - <240V
  - Rate 28 > 240V
  - Rate 28 >240VAC
  - Rate 28 - TOU - 240V-1320V
  - Rate 28 - TOU - 1320 - 6000V
- IL-Elec-MidAmericanEnergyIllinois.utl
  - No. 57 - Standard
  - No. 57 - Time-of-Use
- IN-Elec-IndianaMichiganPower.utl
  - COGEN SPP - Single Phase
  - COGEN SPP - Polyphase
  - COGEN SPP - Single Phase
  - COGEN SPP - Polyphase
- KY-Elec-KentuckyUtilities.utl
  - SQF
  - SQF
- KY-Elec-LouisvilleGasandElectric.utl
  - SPPC-1 - Rate A

Fraction of Ba

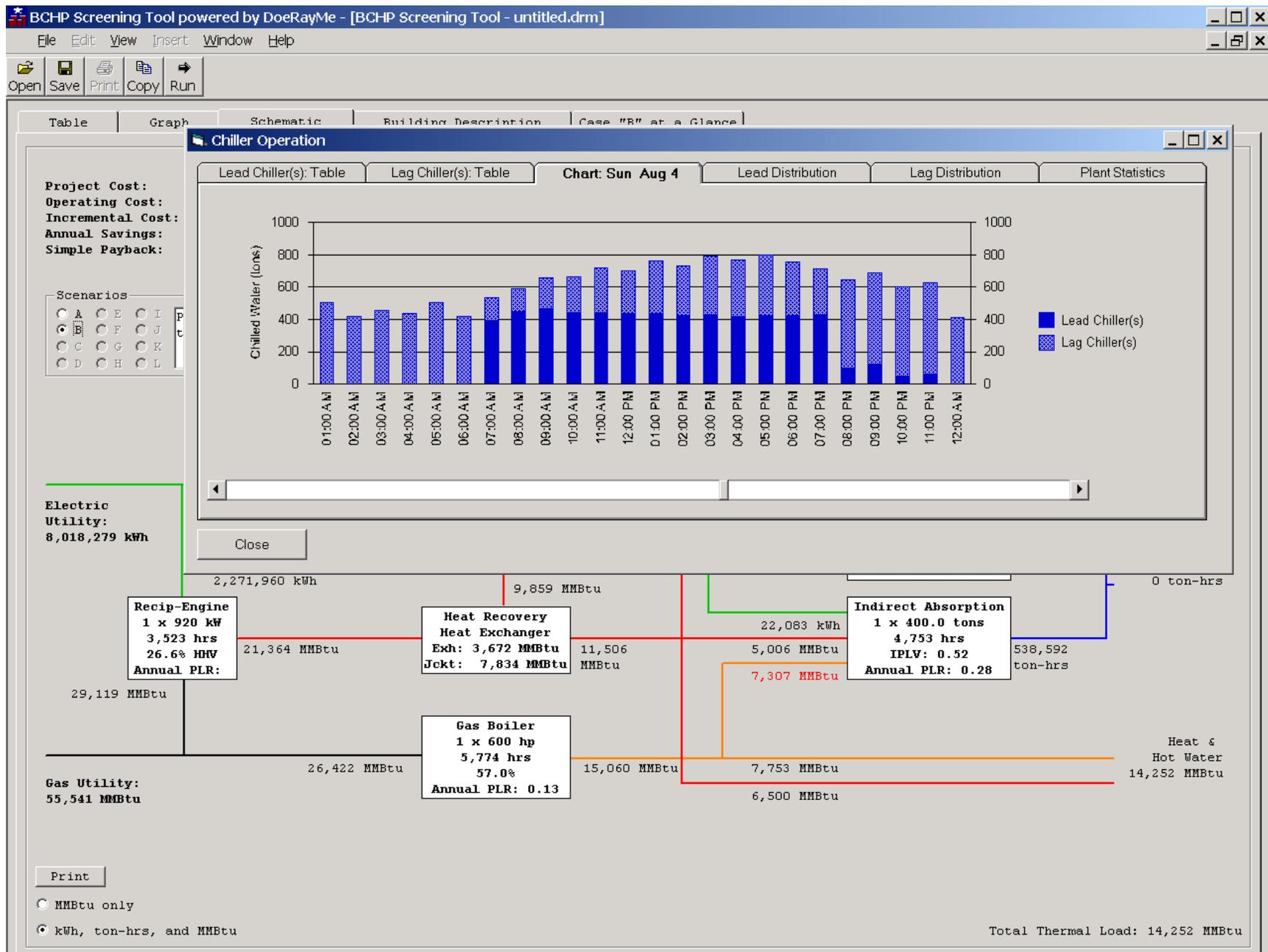
Year of Study Period

Return

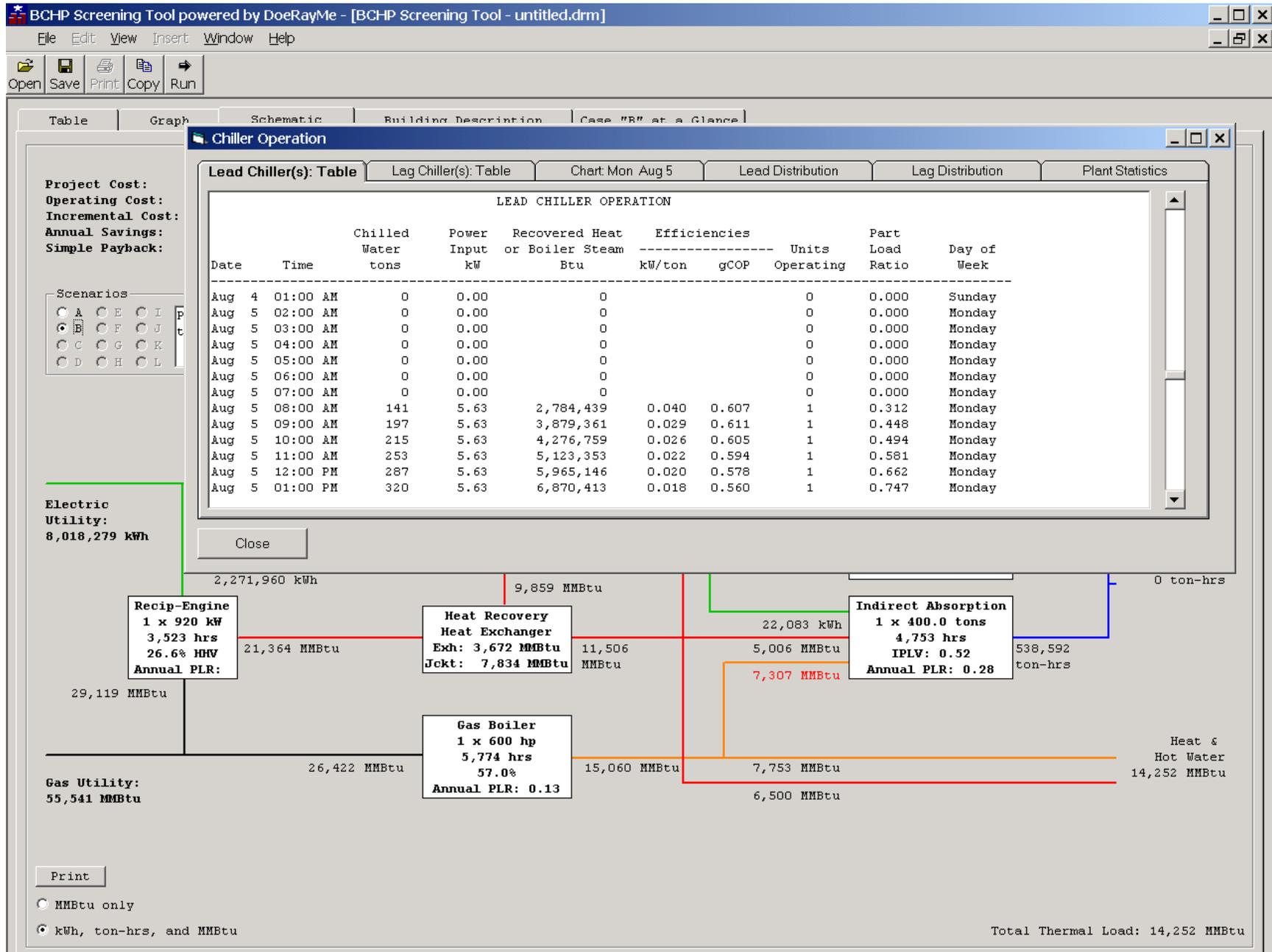
Cancel

252 MMBtu

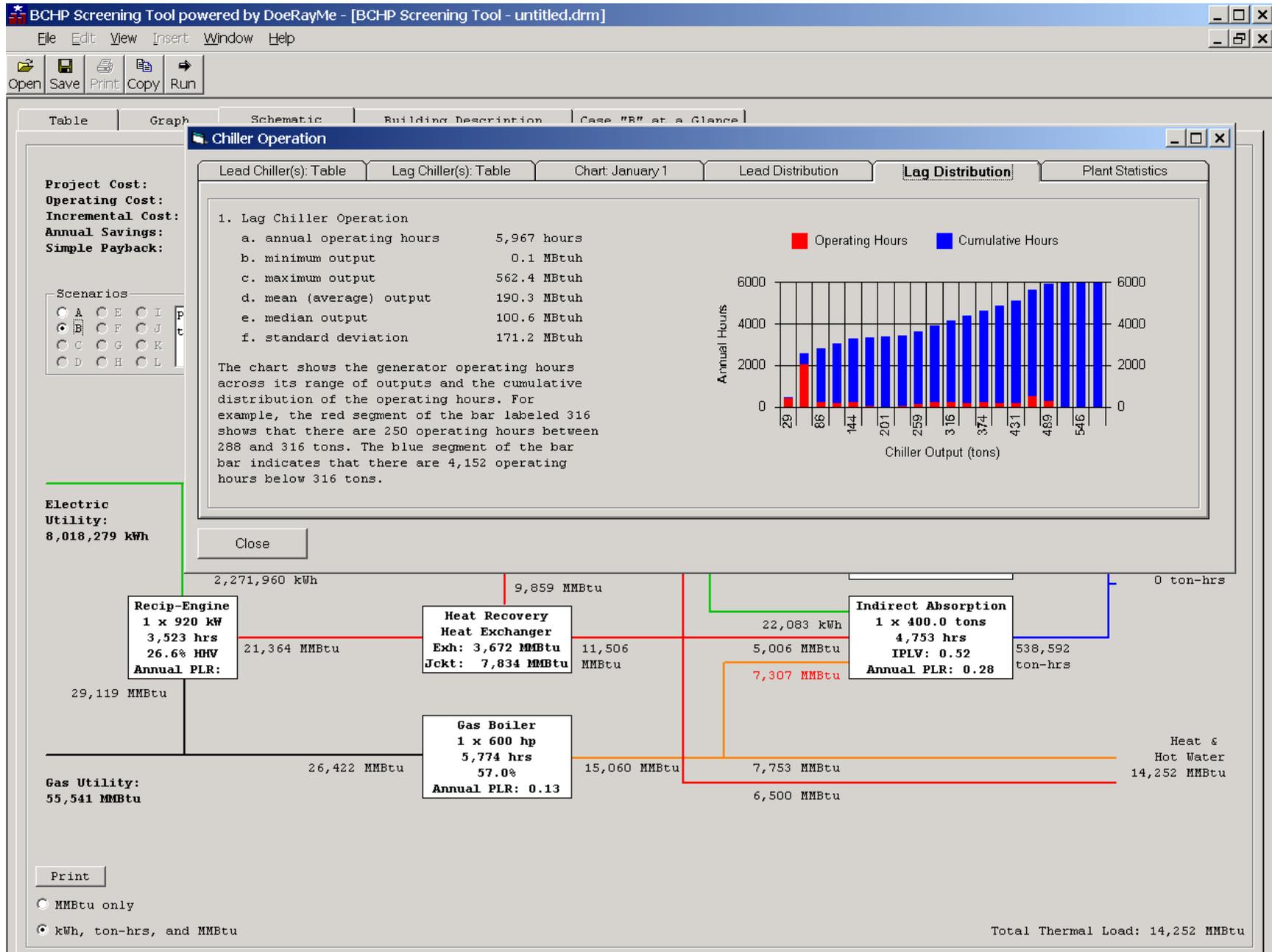
# Diagram Links to Charts of Hourly Loads “Scrollable” in 1 or 24 Hour Steps



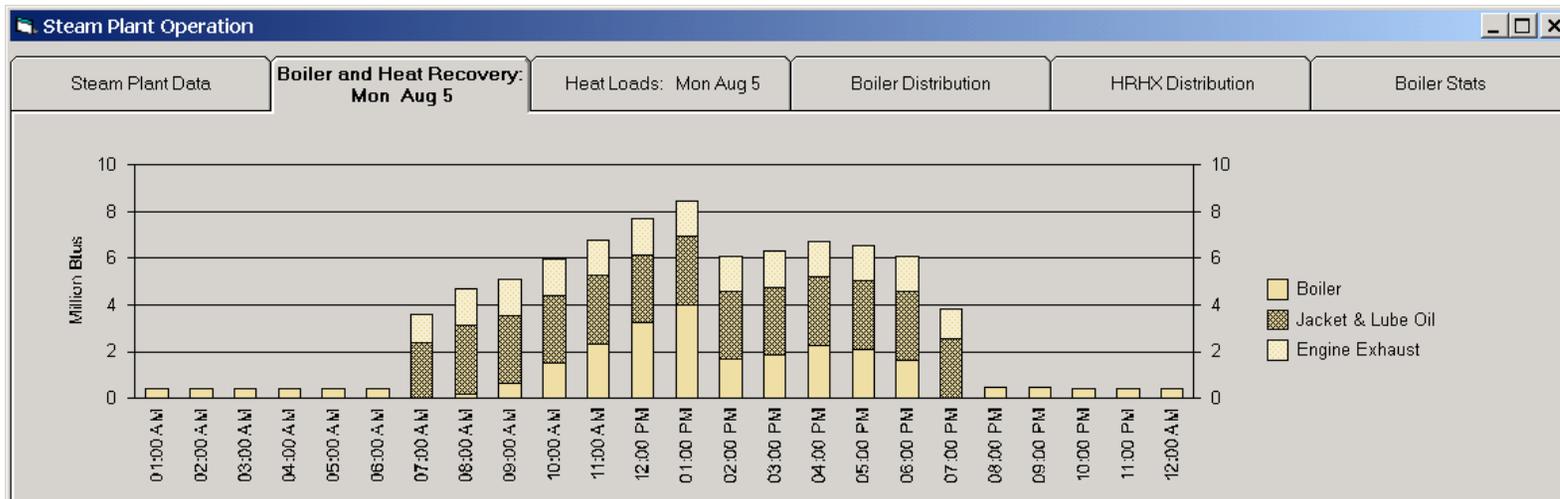
# And Tables of Hourly Loads, Energy Use, and Efficiencies “Scrollable” in 1 and 12 Hours Steps



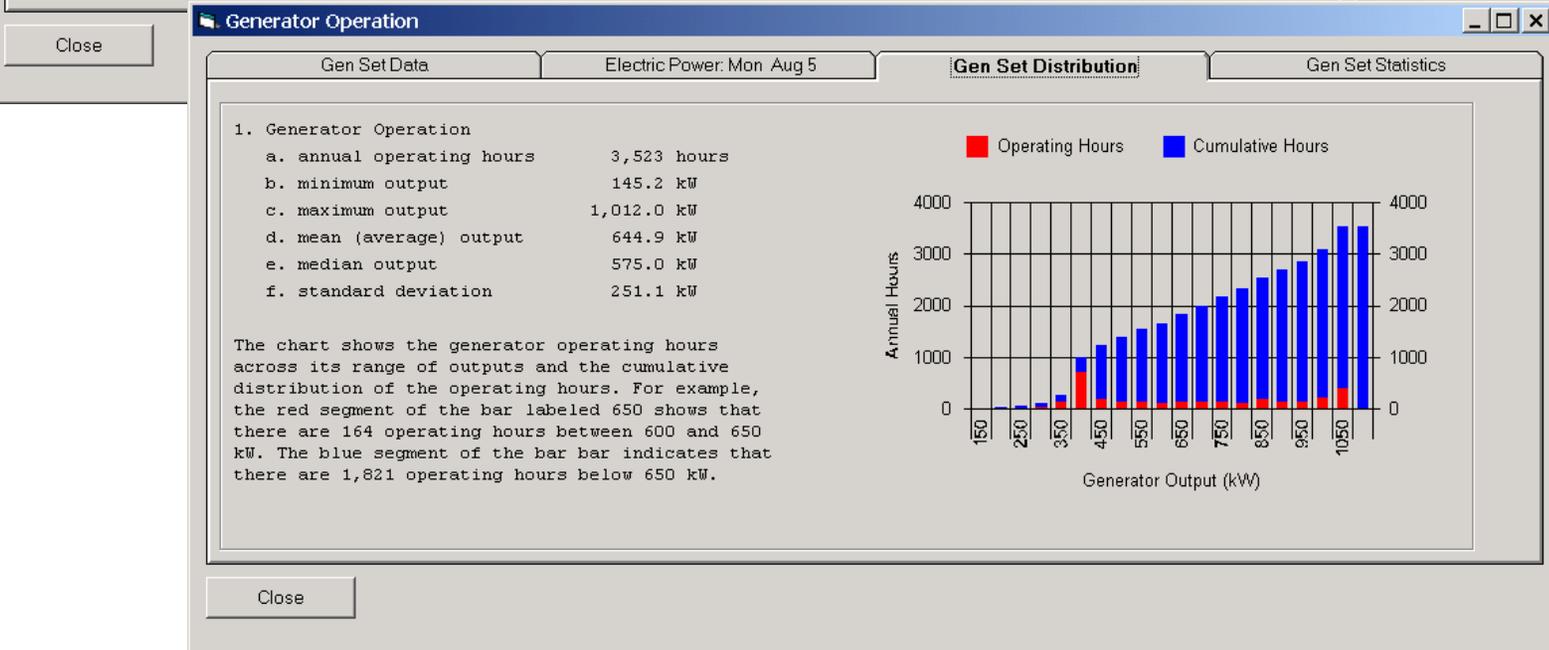
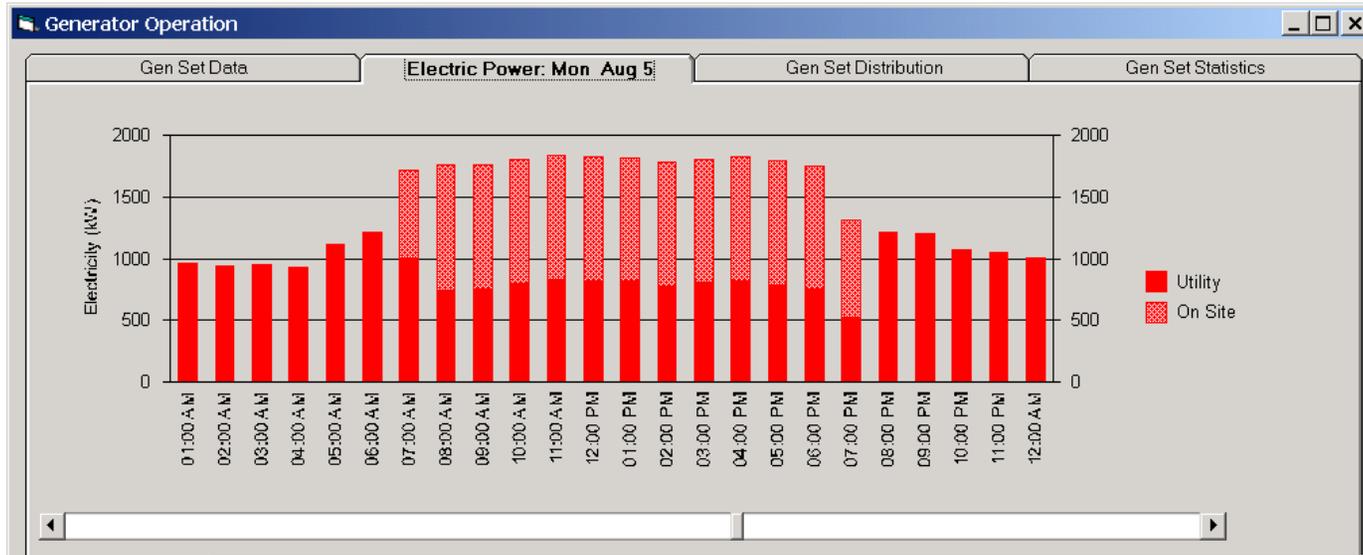
# Equipment Statistics & Distribution of Operating Hours Throughout the Year



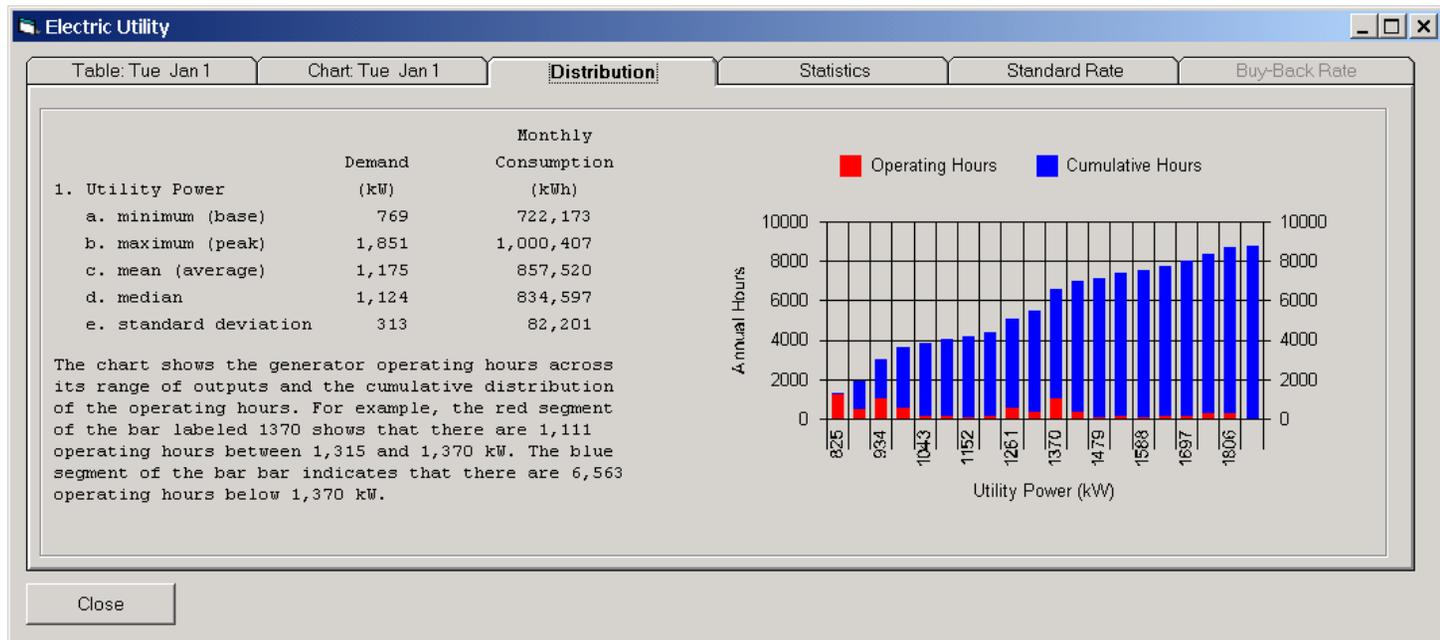
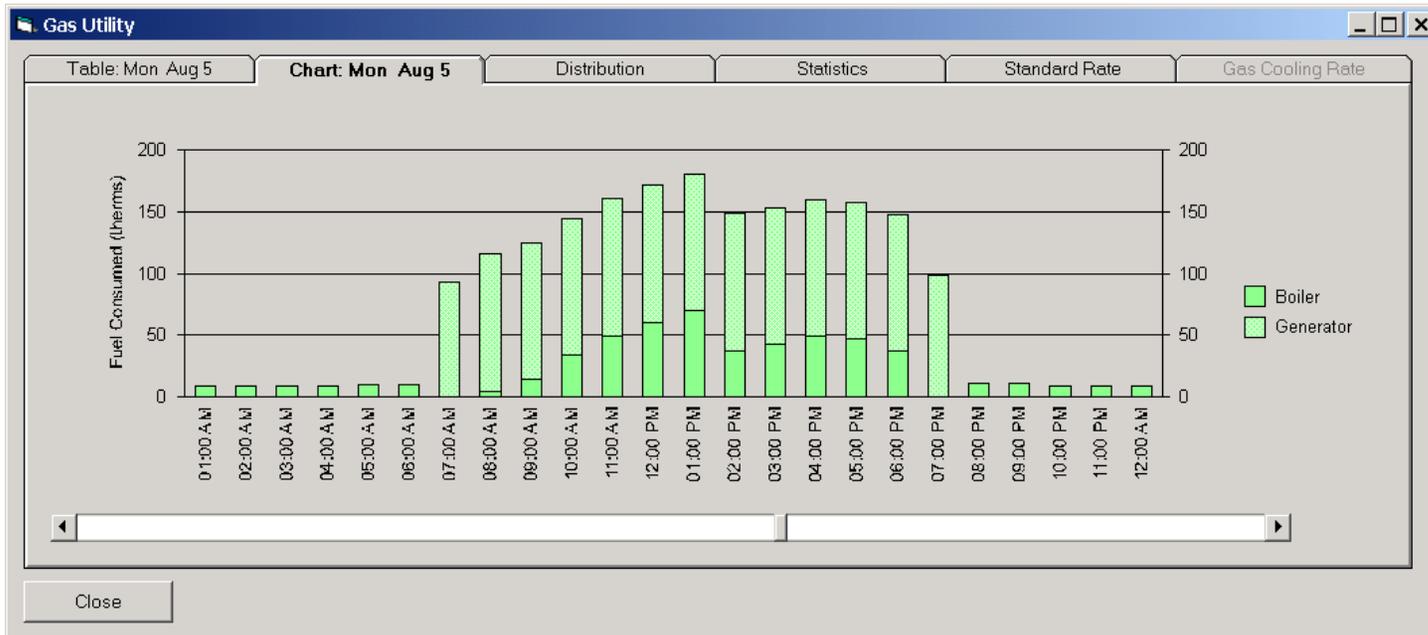
# Corresponding Information for Heat Loads and Applications



# Generator Operation



# And Utility Services



# With Breakdown of Monthly Demand & Consumption Charges for Power and Gas

Electric Utility

Table: Tue Jan 1    Chart: Tue Jan 1    Distribution    Statistics    **Standard Rate**    Buy-Back Rate

Parameter Name	April	May	June	July
-----	-----	-----	-----	-----
costOfbc002DemandTwoSummerOnTotal	\$0	\$0	\$20,901	\$21,171
usedbc003EnergyOneOnInBlock01	235,637	313,034	302,974	317,693
costOfbc003EnergyOneOn01	\$11,834	\$15,721	\$15,215	\$15,955
costOfbc003EnergyOneOnTotal	\$11,834	\$15,721	\$15,215	\$15,955
usedbc004EnergyTwoOffInBlock01	384,059	431,322	473,579	485,470
costOfbc004EnergyTwoOff01	\$8,154	\$9,157	\$10,054	\$10,307
costOfbc004EnergyTwoOffTotal	\$8,154	\$9,157	\$10,054	\$10,307
-----	-----	-----	-----	-----
costOfAllBlocks	\$24,004	\$29,038	\$50,946	\$52,318
NumberOfBillingPeriods	12.00	12.00	12.00	12.00
SummerReport	0.0	0.0	1.000000	1.000000
costService	\$344	\$344	\$344	\$344
costSubTotal	\$24,348	\$29,382	\$51,290	\$52,662
costTaxPerUnit	\$2,045	\$2,456	\$2,563	\$2,650
costTaxPercent	\$158	\$191	\$323	\$331

Close

Gas Utility

Table: Tue Jan 1    Chart: Tue Jan 1    Distribution    Statistics    **Standard Rate**    Gas Cooling Rate

Parameter Name	June	July	August	September
-----	-----	-----	-----	-----
simDem	223.93	242.39	213.28	175.64
usedbc001GasOneInBlock01	223.93	242.39	213.28	175.64
costOfbc001GasOne01	\$44	\$48	\$42	\$35
costOfbc001GasOneTotal	\$44	\$48	\$42	\$35
usedbc002GasTwoInBlock01	44,109	51,374	48,415	36,972
costOfbc002GasTwo01	\$1,321	\$1,538	\$1,450	\$1,107
costOfbc002GasTwoTotal	\$1,321	\$1,538	\$1,450	\$1,107
costOfAllBlocks	\$1,365	\$1,586	\$1,492	\$1,142
NumberOfBillingPeriods	12.00	12.00	12.00	12.00
SummerReport	1.000000	1.000000	1.000000	1.000000
costOfECA	\$37,440	\$43,606	\$41,095	\$31,382
-----	-----	-----	-----	-----
costService	\$300	\$300	\$300	\$300
costSubTotal	\$39,105	\$45,492	\$42,886	\$32,824
costTaxPercent	\$39	\$45	\$43	\$33

Close

# Also a Concise Summary of Building Construction and Use Parameters

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Table Graph Schematic Building Description Case "B" at a Glance

**B. Hospital**  
**Chicago, Illinois**  
**339,840 sq ft (236 x 240 ft; 6 Stories)**  
**rotated 0 degrees from cardinal directions**  
**without a basement**

**Wall & Roof Construction**

Wall Construction  
a. 3/4 inch Gypsum  
b. 8 inch HW concrete  
c. 11 sq ft-F-hr/Btu (inside)  
d. 4 inch Face brick

Roof Construction  
a. 8 inch HW concrete  
b. 17 sq ft-F-hr/Btu (outside)

**Ceiling, Windows, Schedule**

Ceiling: Acoustic Tile and airspace  
Windows  
a. Single Pane Clr 3mm  
b. 0 inch overhang

Building Occupancy Schedule  
a. weekdays.....24 hrs  
b. Saturdays.....24 hrs  
c. Sundays.....24 hrs

Scenarios

A  G  
 B  H  
 C  I  
 D  J  
 E  K  
 F  L

	North East Zone	North Central Zone	North West Zone
1. Use.....Lobby/Corridor	1. Use.....Kitchen/Laundry	1. Use.....Hospital Room	1. Use.....Hospital Room
2. Floor Space	2. Floor Space	2. Floor Space	2. Floor Space
a. percent.....15% bldg area	a. percent.....5% bldg area	a. percent.....30% bldg area	a. percent.....30% bldg area
b. absolute.....50,976 sq ft	b. absolute.....16,992 sq ft	b. absolute.....101,952 sq ft	b. absolute.....101,952 sq ft
3. Window Area.....15% of wall area	3. Window Area.....5% of wall area	3. Window Area.....25% of wall area	3. Window Area.....25% of wall area
4. Zone Occupancy.....255 people	4. Zone Occupancy.....85 people	4. Zone Occupancy.....1,020 people	4. Zone Occupancy.....1,020 people
5. Internal Loads	5. Internal Loads	5. Internal Loads	5. Internal Loads
a. total heat.....127,500 Btu/h	a. total heat.....63,750 Btu/h	a. total heat.....459,000 Btu/h	a. total heat.....459,000 Btu/h
b. sensible heat...63,750 Btu/h	b. sensible heat...23,375 Btu/h	b. sensible heat...255,000 Btu/h	b. sensible heat...255,000 Btu/h
c. lighting.....91.8 kW	c. lighting.....37.4 kW	c. lighting.....122.3 kW	c. lighting.....122.3 kW
d. plug loads.....12.7 kW	d. plug loads.....68.0 kW	d. plug loads.....102.0 kW	d. plug loads.....102.0 kW
6. Outside Air.....3,825 cfm	6. Outside Air.....1,700 cfm	6. Outside Air.....25,500 cfm	6. Outside Air.....25,500 cfm
7. Thermostat Settings	7. Thermostat Settings	7. Thermostat Settings	7. Thermostat Settings
a. heating.....70	a. heating.....70	a. heating.....70	a. heating.....70
b. cooling.....75	b. cooling.....75	b. cooling.....75	b. cooling.....75
8. Humidity Controls	8. Humidity Controls	8. Humidity Controls	8. Humidity Controls
	<b>South East Zone</b>	<b>South Central Zone</b>	
1. Use.....Clinic/Exam/Therapy	1. Use.....Surgery	1. Use.....Enclosed Offices	1. Use.....Enclosed Offices
2. Floor Space	2. Floor Space	2. Floor Space	2. Floor Space
a. percent.....35% bldg area	a. percent.....10% bldg area	a. percent.....5% bldg area	a. percent.....5% bldg area
b. absolute.....118,944 sq ft	b. absolute.....33,984 sq ft	b. absolute.....16,992 sq ft	b. absolute.....16,992 sq ft
3. Window Area.....15% of wall area	3. Window Area.....0% of wall area	3. Window Area.....30% of wall area	3. Window Area.....30% of wall area
4. Zone Occupancy.....396 people	4. Zone Occupancy.....340 people	4. Zone Occupancy.....68 people	4. Zone Occupancy.....68 people
5. Internal Loads	5. Internal Loads	5. Internal Loads	5. Internal Loads
a. total heat.....198,000 Btu/h	a. total heat.....255,000 Btu/h	a. total heat.....30,600 Btu/h	a. total heat.....30,600 Btu/h
b. sensible heat...99,000 Btu/h	b. sensible heat...93,500 Btu/h	b. sensible heat...17,000 Btu/h	b. sensible heat...17,000 Btu/h
c. lighting.....237.9 kW	c. lighting.....254.9 kW	c. lighting.....29.7 kW	c. lighting.....29.7 kW
d. plug loads.....142.7 kW	d. plug loads.....85.0 kW	d. plug loads.....12.7 kW	d. plug loads.....12.7 kW
6. Outside Air.....9,900 cfm	6. Outside Air.....10,200 cfm	6. Outside Air.....1,360 cfm	6. Outside Air.....1,360 cfm
7. Thermostat Settings	7. Thermostat Settings	7. Thermostat Settings	7. Thermostat Settings
a. heating.....72	a. heating.....65	a. heating.....70	a. heating.....70
b. cooling.....75	b. cooling.....70	b. cooling.....75	b. cooling.....75
8. Humidity Controls	8. Humidity Controls	8. Humidity Controls	8. Humidity Controls

# With Links on Diagram Activate I/O Forms for Building Parameters

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Table Graph

**B. Hospital**  
Chicago, Illinois  
339,840 sq ft (236  
rotated 0 degrees  
without a basement)

Scenarios  
 A  
 B  
 C  
 D  
 E  
 F

**Building Construction Data**

**Building Description**

Type: Hospital

Location

a. State: Illinois

b. City: Chicago

Dimensions

a. Width: 240 feet

b. Length: 236 feet

c. Number of Floors: 6

d. Story Height: 12 feet

Basement: No

Rotation from N-S-E-W: 0

Return Cancel

**Construction Details**

Wall Construction

a. Inside Surfaces: 3/4 inch Gypsum

b. Wall Structure: 8 inch HW concrete

c. Insulation: 11 #2 F h/Btu

d. Insulation Location: Inside of Structure

e. Outside Surfaces: 4 inch Face brick

Ceiling: Acoustic Tile and airspace

Roof Construction

a. Roof Structure: 8 inch HW concrete

b. Insulation: 17 #2 F h/Btu

c. Insulation Location: Below Structure

Window Specifications

a. Type: Single Pane Clr 3mm

b. Overhang: 0 inches

**South East Zone**

- Use.....Clinic/Exam/Therapy
- Floor Space
  - percent.....35% bldg area
  - absolute.....118,944 sq ft
- Window Area.....15% of wall area
- Zone Occupancy.....396 people
- Internal Loads
  - total heat.....198,000 Btu/h
  - sensible heat...99,000 Btu/h
  - lighting.....237.9 kW
  - plug loads.....142.7 kW
- Outside Air.....9,900 cfm
- Thermostat Settings
  - heating.....72
  - cooling.....75
- Humidity Controls

**South Central Zone**

- Use.....Surgery
- Floor Space
  - percent.....10% bldg area
  - absolute.....33,984 sq ft
- Window Area.....0% of wall area
- Zone Occupancy.....340 people
- Internal Loads
  - total heat.....255,000 Btu/h
  - sensible heat...93,500 Btu/h
  - lighting.....254.9 kW
  - plug loads.....85.0 kW
- Outside Air.....10,200 cfm
- Thermostat Settings
  - heating.....65
  - cooling.....70
- Humidity Controls

**Enclosed Offices**

- Use.....Enclosed Offices
- Floor Space
  - percent.....5% bldg area
  - absolute.....16,992 sq ft
- Window Area.....30% of wall area
- Zone Occupancy.....68 people
- Internal Loads
  - total heat.....30,600 Btu/h
  - sensible heat...17,000 Btu/h
  - lighting.....29.7 kW
  - plug loads.....12.7 kW
- Outside Air.....1,360 cfm
- Thermostat Settings
  - heating.....70
  - cooling.....75
- Humidity Controls

# “At a Glance” Summary of CHP Economics During Utility Rate Periods

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Table Graph Schematic Building Description Case "B" at a Glance

<b>1. Gen Set Parameters</b>						
a. electrical capacity	500 kW	c. heat recovery rate				
b. fuel rate (HHV)		(1) jacket & lube oil cooling	2.23 MMBtu/h	4,466 Btu/kWh		
(1) hourly rate	5.97 MMBtu/h	(2) exhaust gases	0.44 MMBtu/h	877 Btu/kWh		
(2) per kWh generated	11,934 MMBtu/h	(3) total heat recovery	2.67 MMBtu/h	5,343 Btu/kWh		
<b>2. Approximate Savings or Loss</b>						
	Peak Rates	MidPeak Rates	Shoulder Rates	Low Rates	Off Peak Rates	
a. avoided cost of power	\$0.1052 /kWh	N/A	N/A	N/A	\$0.0258 /kWh	
b. space heating & hot water						
(1) average boiler efficiency	0.71	N/A	N/A	N/A	0.71	
(2) avoided boiler fuel	7,525 Btu/kWh	N/A	N/A	N/A	7,525 Btu/kWh	
(3) average cost of fuel	\$8.87 /MMBtu	N/A	N/A	N/A	\$8.87 /MMBtu	
(4) avoided costs	\$0.0667 /kWh	N/A	N/A	N/A	\$0.0667 /kWh	
c. single-effect absorption chiller						
(1) assumed gCOP	0.62	N/A	N/A	N/A	0.62	
(2) chilled water production	0.276 ton-hr/kWh	N/A	N/A	N/A	0.276 ton-hr/kWh	
(3) electric chiller efficiency	0.85 kW/ton	N/A	N/A	N/A	0.85 kW/ton	
(4) avoided purchased power	0.235 kWh/kWh	N/A	N/A	N/A	0.235 kWh/kWh	
(5) average cost of power	\$0.1052 /kWh	N/A	N/A	N/A	\$0.0258 /kWh	
(6) avoided costs	\$0.0247 /kWh	N/A	N/A	N/A	\$0.0061 /kWh	
d. double-effect absorption chiller						
(1) assumed gCOP	1.21	N/A	N/A	N/A	1.21	
(2) chilled water production	0.088 ton-hr/kWh	N/A	N/A	N/A	0.088 ton-hr/kWh	
(3) electric chiller efficiency	0.85 kW/ton	N/A	N/A	N/A	0.85 kW/ton	
(4) avoided purchased power	0.075 kWh/kWh	N/A	N/A	N/A	0.075 kWh/kWh	
(5) average cost of power	\$0.1052 /kWh	N/A	N/A	N/A	\$0.0258 /kWh	
(6) avoided costs	\$0.0079 /kWh	N/A	N/A	N/A	\$0.0019 /kWh	
<b>3. Approximate Costs of Operation</b>						
a. generator fuel	\$0.1058 /kWh	N/A	N/A	N/A	\$0.1058 /kWh	
b. repairs & maintenance	\$0.0104 /kWh	N/A	N/A	N/A	\$0.0104 /kWh	
c. total operating costs	\$0.1162 /kWh	N/A	N/A	N/A	\$0.1162 /kWh	
<b>4. Estimated Net Savings or Loss</b>						
a. power only (DG)	-\$0.0110 /kWh	N/A	N/A	N/A	-\$0.0904 /kWh	
b. power, heat & hot water	\$0.0557 /kWh	N/A	N/A	N/A	-\$0.0237 /kWh	
c. power & single-effect chiller	\$0.0136 /kWh	N/A	N/A	N/A	-\$0.0844 /kWh	
d. power & double-effect chiller	-\$0.0031 /kWh	N/A	N/A	N/A	-\$0.0885 /kWh	

Summer Rates   
 Winter Rates   
 250 kW Microturbine   
 500 kW Recip   
 3,500 kW Gas Turbine

# “At a Glance” Summary of Equipment Capacities, Loads, Efficiencies, Operating Schedules, Utility Rate Periods, and Approximate Costs of Power

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Table Graph Schematic Building Description Case "B" at a Glance

1. Equipment Summary:

	Boiler	Lead Chiller	Lag Chiller	Generator
a. capacity	1 x 600 HP	1 x 400 tons	1 x 550 tons	1 x 920 kW
b. peak load	389 HP	506 tons	562 tons	1,012 kW
c. base load	0 HP	29 tons	0 tons	145 kW
d. average load	60 HP	113 tons	190 tons	645 kW
e. average part load ratio	0.16	0.26	0.43	0.70
f. average efficiency	49.7%	0.491	1.024 kW/ton	25.7% HHV
g. annual operating hours	5,774 hrs	5,967 hrs	4,753 hrs	3,523 hrs

2. Operating Schedules:

a. summer

	Boiler	Lead Chiller	Lag Chiller	Generator
(1) weekdays	24 hrs	8 am to 8 pm	as needed	8 am to 10 pm tracking thermal demand other hours don't run
(2) Saturdays	24 hrs	8 am to 8 pm	as needed	off Saturday and Sunday
(3) Sundays & Holidays	24 hrs	8 am to 8 pm	as needed	off Saturday and Sunday

b. winter

	Boiler	Lead Chiller	Lag Chiller	Generator
(1) weekdays	24 hrs	8 am to 8 pm	as needed	8 am to 10 pm tracking thermal demand other hours don't run
(2) Saturdays	24 hrs	8 am to 8 pm	as needed	off Saturday and Sunday
(3) Sundays & Holidays	24 hrs	8 am to 8 pm	as needed	off Saturday and Sunday

3. Utility Rate Billing Periods:

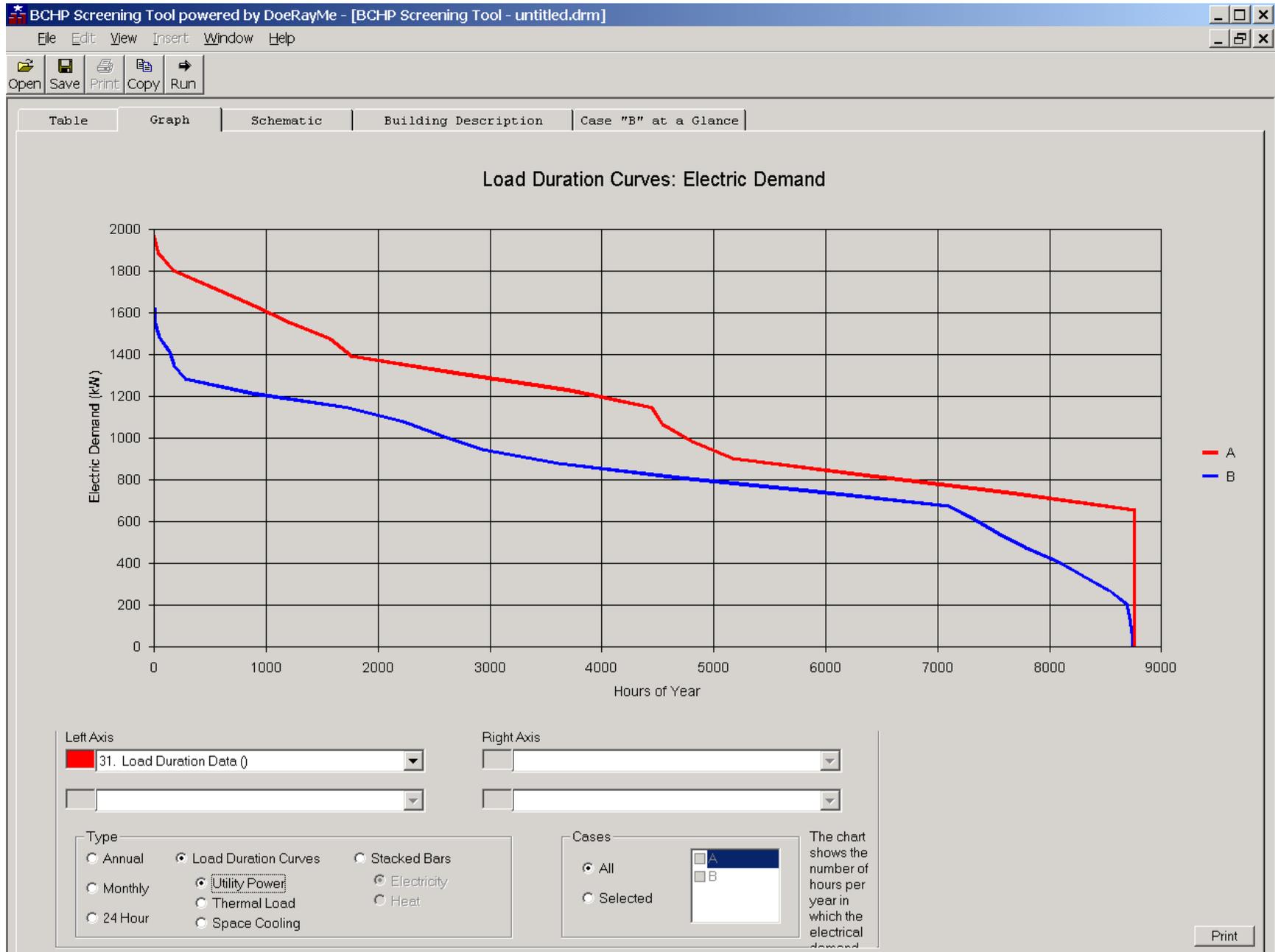
	Monday - Friday	Saturdays	Sundays & Holidays	Approx. Cost of Power
a. summer (Jun-Sep):				
(1) peak	9 am-10 pm	-	-	\$0.1052/kWh
(2) midpeak	-	-	-	N/A
(3) shoulder	-	-	-	N/A
(4) low	-	-	-	N/A
(5) off peak	1 am-8 am and 11 pm-midnight	1 am-midnight	1 am-midnight	\$0.0258/kWh
b. winter (Jan-May and Oct-Dec):				
(1) peak	9 am-10 pm	-	-	\$0.0679/kWh
(2) midpeak	-	-	-	N/A
(3) shoulder	-	-	-	N/A
(4) low	-	-	-	N/A
(5) off peak	1 am-8 am and 11 pm-midnight	1 am-midnight	1 am-midnight	\$0.0260/kWh

Summer & Winter     Spring & Fall

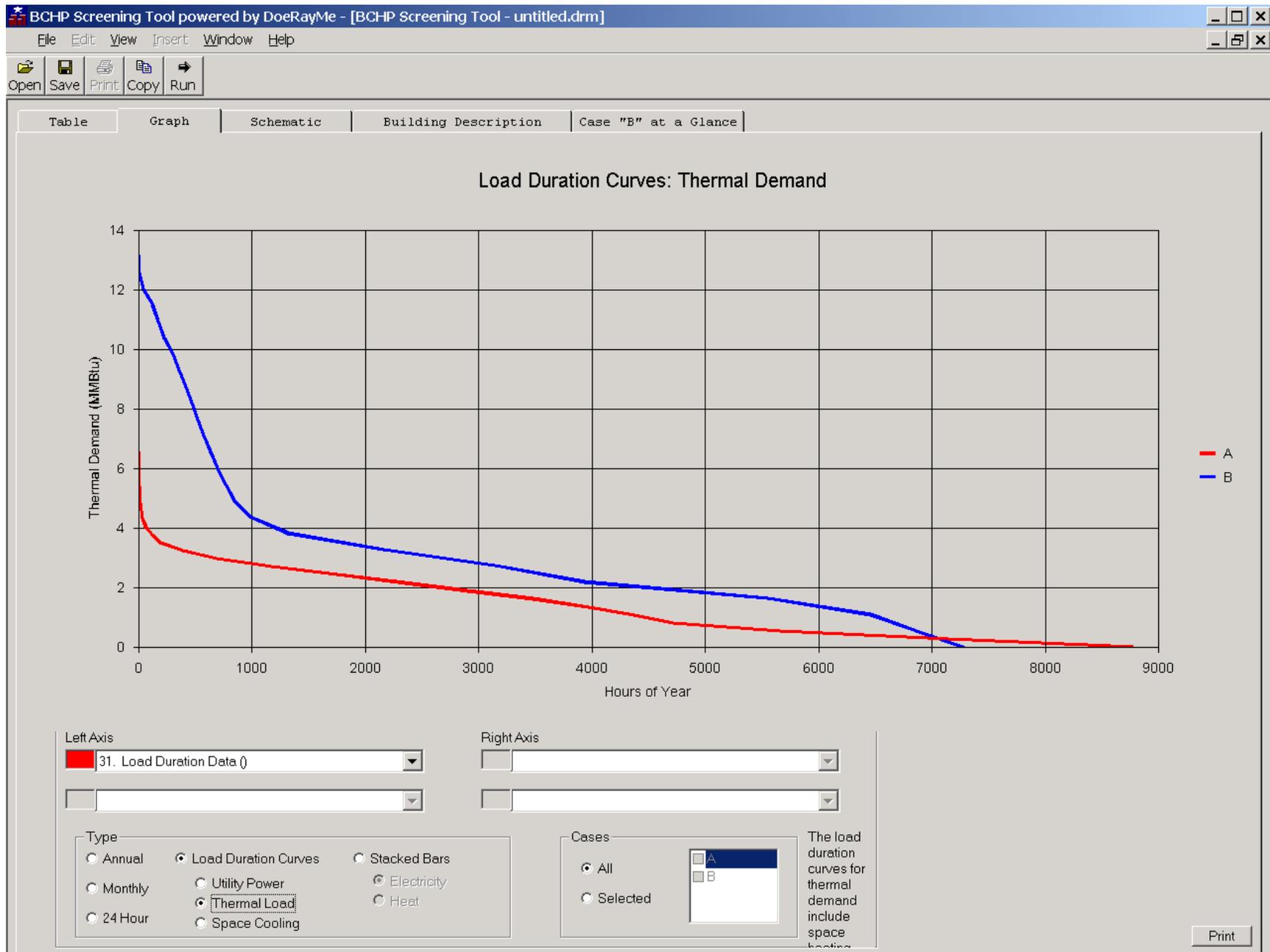
CHP Summary

Equipment Summary

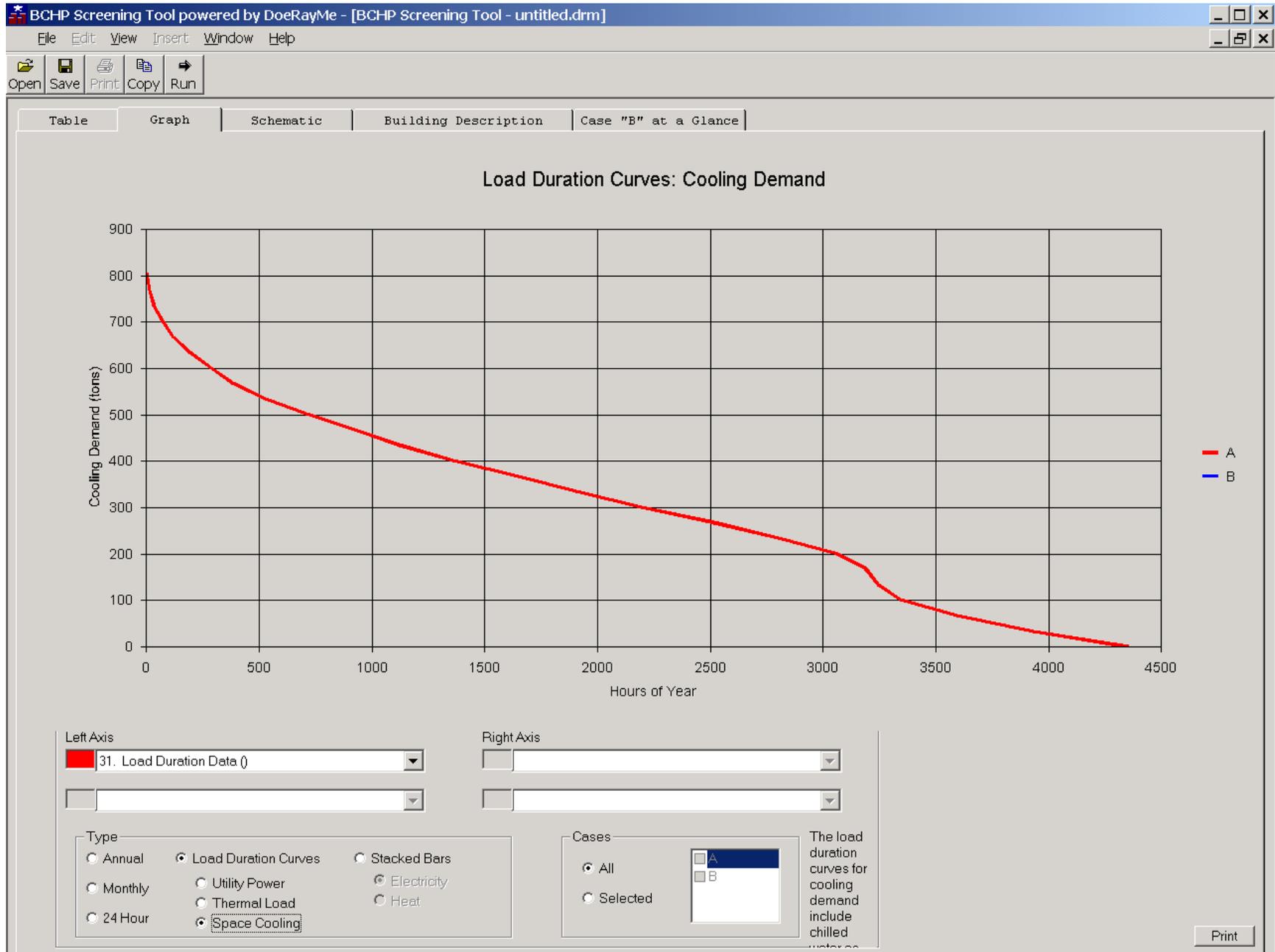
# Finally, Load Duration Curves of Utility Power



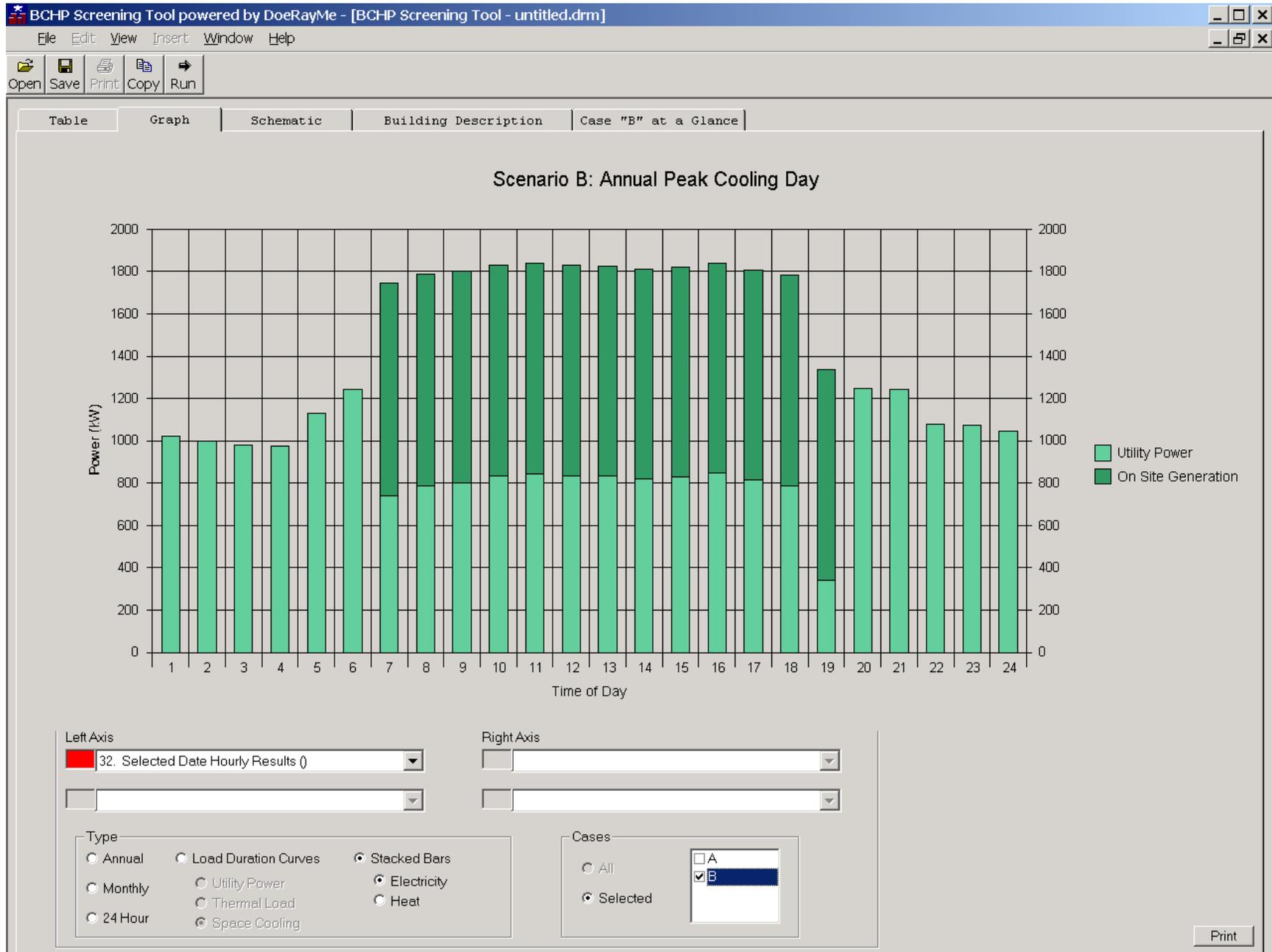
# Boiler Loads for Space Heating, Service Hot Water, and Absorption Chillers



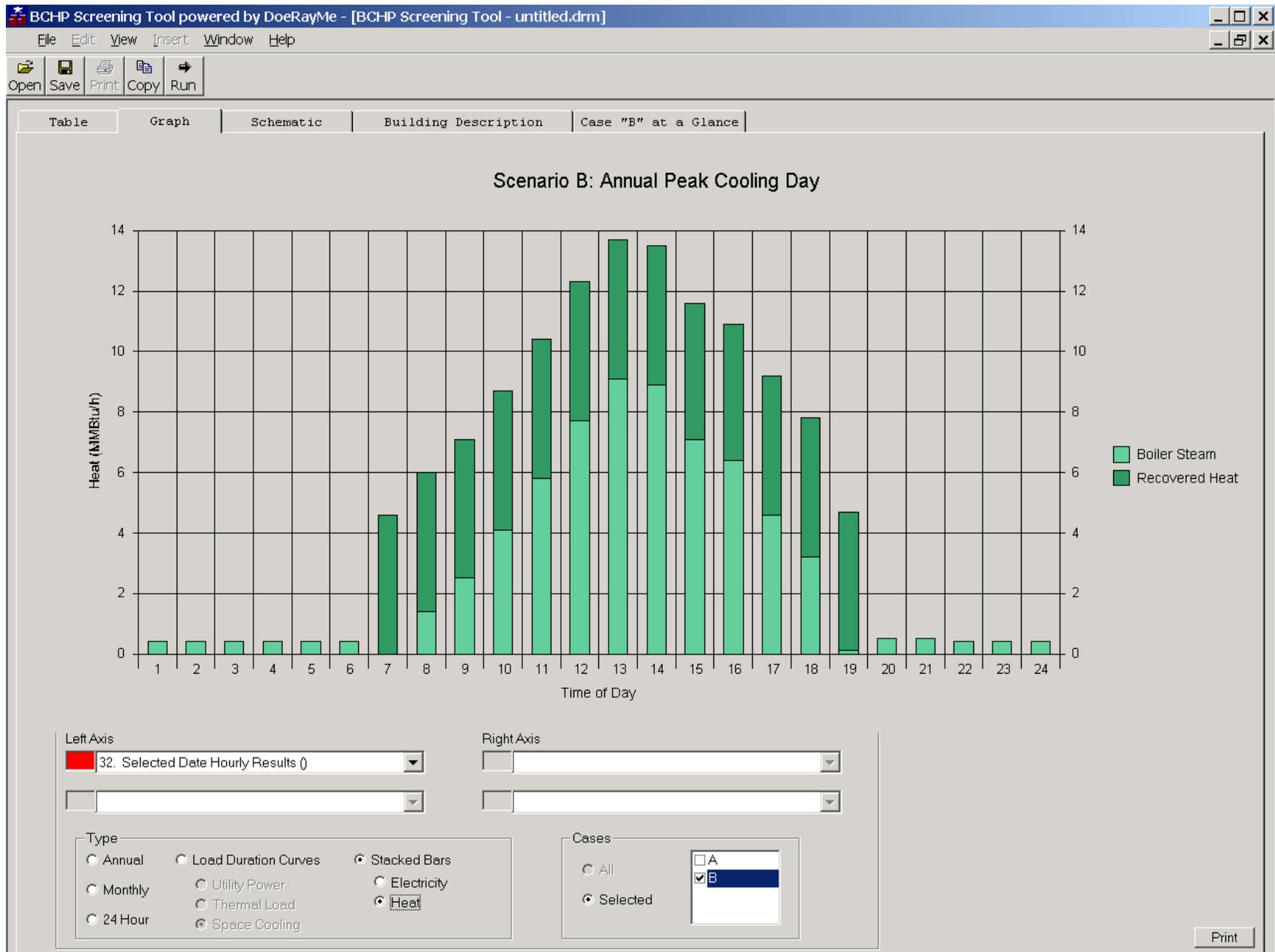
# And Air Conditioning Load



# 24 Hour Load Chart for Peak Heating / Cooling Day for Power (or any other User Selected Date)



# 24 Hour Load Chart for Peak Heating / Cooling Day and Heat



# Program Available from DOE through Oak Ridge National Laboratory Free of Charge

- Program Package Distributed on CD
  - BChP-Screening-Tool.EXE CHP simulation code
  - RateScriptEditor.EXE utility rate editing code
  - DOE2.EXE and Documentation
  - Equipment Databases
    - Generators
    - Chillers, Rooftop A/C, Heat Pumps
    - Boilers & Water Heaters
  - Utility Rate Databases
    - 130 Electric Utilities
    - 120 Gas Utilities
    - Over 3100 Individual Rate Tariffs
    - Utility Rate Documentation (PDF & HTML Files)
  - Weather Files
    - 239 Files of TMY2 Data for U.S. Cities
- Program Requests & User Support
  - [fischersk@ornl.gov](mailto:fischersk@ornl.gov)
  - Please include Name & Full Mailing Address and Telephone Number in e-mail Messages