Wyoming County Community Hospital Data Integrator Notes

Wyoming County Community Hospital (WCCH) has a cogeneration system with a capacity of 560 kW running on natural gas. The generator can run in parallel with the grid or in isolation. Heat is recovered using jacket water and exhaust heat to provide energy to the boiler pre-heat, absorption chiller and domestic hot water systems.

Data Point Details

The data at this site was provided in the form of two Microsoft Excel spreadsheets: one spreadsheet containing daily data and the other containing 15-minute data. The data from September 2001 – February 2002 at this site in the hourly online database is created from daily data and is best viewed on either a daily or monthly interval for this period. The details for each individual data point are outlined below. After February 12, 2002, all values in the hourly online database come from 15-minute data.

DG/CHP Generator Output (total kWh)

The data for Generator Output comes from daily and 15-minute values for the cogeneration system. The columns of origin for this data point are labeled "Seirra Real Power (kwH)" in the daily data file and "Sierra Real Power (kWh)" in the 15-minute data file. The daily interval energy data was divided evenly into hourly data between the current and the previous record for the hourly online database. The 15-minute energy data was an accumulator and the difference between records was calculated for the 15-minute data. These values were then summed into hourly data for the online database.

DG/CHP Generator Output Demand (peak kW)

The data for Generator Output Demand comes from 15-minute data. The column of origin for this data point is labeled "Sierra Real Power (kW)" in the 15-minute data file. The maximum value from the 15-minute data for a given hour was assigned as the output demand in the hourly online database.

DG/CHP Generator Gas Input (cubic feet)

The data for Generator Gas Input comes from daily and 15-minute values for the cogeneration system. The columns of origin for this data point are labeled "Cogen Gas Meter (Dkth)" for the daily data file and "Cogen Gas Meter (Therms)" in the 15-minute data file. The daily interval gas data was converted to cubic feet by using the Higher Heating Value (HHV) for the fuel which is 1.030 MBtu per cubic foot (Natural Gas). It was then divided evenly into hourly data between the current and the previous record for the hourly online database. The 15-minute energy data was an accumulator and the difference between records was calculated for the 15-minute data. These values were converted to cubic feet using the HHV of the fuel and were then summed into hourly data for the online database.

Total Facility Purchased Energy (total kWh)

The data for Facility Purchased Energy comes from daily and 15-minute values for the cogeneration system. The columns of origin for this data point are labeled "NYSEG Building Pulse Meter (kWh)" in the daily data file and in the 15-minute data file. The daily interval energy data was divided evenly into hourly data between the current and the previous record for

the hourly online database. The 15-minute energy data was an accumulator and the difference between records was calculated for the 15-minute data. These values were then summed into hourly data for the online database.

Total Facility Purchased Demand (peak kW)
The data for Facility Purchased Demand comes from 15-minute data. The column of origin for this data point is labeled "NYSEG Building Pulse Meter (kW)" in the 15-minute data file. The maximum value from the 15-minute data for a given hour was assigned as the output demand in the hourly online database.

Other Facility Gas Use (cubic feet)
There is no data available for this point from the data files.

Total Facility Energy (total kWh) and Total Facility Demand (peak kW)
These two points are the sum of the DG/CHP Generator Output and Total Facility Purchased data points.

Unused Heat Recovery (total MBtu/h)
The data for Unused Heat Recovery comes from daily and 15-minute values for Heat Recovery. The columns of origin for this data point are labeled "HR Generator (Therms)", "HR Exhaust (Therms)", "HR Hot Water Loop (Therms)", "HR Glycol Loop (Therms)", "HR Domestic Loop (Therms)", "HR Absorber Loop (Therms)" and "HR Peet Loop (Therms)" in the daily data file. For the daily data, the columns for HR Generator and HR Exhaust were added together for the available Heat Recovery. The other columns were then summed for the Useful Heat Recovery. The difference between the available and Useful Heat Recovery was calculated for the Unused Heat Recovery. The daily interval heat recovery data was divided evenly into hourly data between the current and the previous record for the hourly online database.

The columns of origin for this data point are labeled "Generator Calculation (BTU)", "Exhaust Heat Calculation (BTU)", "Hot Water Calculation (BTU)", "Glycol Calculation (BTU)", "Domestic Calculation (BTU)", "Absorber Calculation (BTU)", "Peet Calculation (BTU)" in the 15-minute data file. For the 15-minute data, the columns for Generator Calculation and Exhaust Heat Calculation were added together for the available Heat Recovery. The other columns were then summed for the Useful Heat Recovery. The difference between the available and Useful Heat Recovery was calculated for the Unused Heat Recovery Rate. These 15-minute values were then converted to energy and summed into hourly data for the online database.

Useful Heat Recovery (total MBtu/h)
The data for Useful Heat Recovery comes from daily and 15-minute values for Heat Recovery. The columns of origin for this data point are labeled "HR Hot Water Loop (Therms)", "HR Glycol Loop (Therms)", "HR Domestic Loop (Therms)", "HR Absorber Loop (Therms)" and "HR Peet Loop (Therms)" in the daily data file. For the daily data, the columns were summed for the daily Unused Heat Recovery. The daily interval heat recovery data was divided evenly into hourly data between the current and the previous record for the hourly online database.

The columns of origin for this data point are labeled “Hot Water Calculation (BTU)”, “Glycol Calculation (BTU)”, “Domestic Calculation (BTU)”, “Absorber Calculation (BTU)”, “Peet Calculation (BTU)” in the 15-minute data file. For the 15-minute data, the columns were summed for the 15-minute Useful Heat Recovery Rate. These 15-minute values were then converted to energy and summed into hourly data for the online database.

Status/Runtime of DG/CHP Generator (hrs)

The runtime of the generators comes from both 15-minute and daily data. The column of origin for this data point is labeled “Cogen Run Time (hours)” in the daily data file and the 15-minute data file. The daily interval runtime data was divided evenly into hourly data between the current and the previous record for the hourly online database. The 15-minute runtime data was an accumulator and the difference between records was calculated for the 15-minute data. These values were then summed into hourly data for the online database.

Ambient Temperature (avg °F)

The data for Ambient Temperature comes from daily and 15-minute data. The columns of origin for this data point are labeled “Average OAT (°F)” in the daily data file and “Avg OAT (°F)” in the 15-minute data file. For the daily data, the values were assigned to all hourly data between the current and the previous record for the hourly online database. For the 15-minute data, the average of the 15-minute values during an hour was assigned as the ambient temperature for the hourly online database.

Total CHP Efficiency (%)

The Total CHP Efficiency is calculated from the online hourly database as the sum of the Useful Heat Recovery and the DG/CHP Generator Output, converted from kWh to MBtus, divided by the DG/CHP Generator Gas Input. The gas input is converted to MBtus using the Lower Heating Value (HHV) of the fuel which is 0.930 MBtu/cubic foot (Natural Gas).

Electrical Efficiency (%)

The Electrical Efficiency is calculated from the online hourly database as the DG/CHP Generator Output, converted from kWh to MBtus, divided by the DG/CHP Generator Gas Input. The gas input is converted to MBtus using the Lower Heating Value (HHV) of the fuel which is 0.930 MBtu/cubic foot (Natural Gas).

Data Quality Checks

The Data Quality Checks consist of three levels of verification: does the data exist, does the data pass reasonable range checking and does the data pass relational checks. The methodology for applying the data quality begins by creating a contiguous database. This is necessary to maintain compatibility between the many sites on the server. Next, the data received for this site is fit into the database, in this case we are using 15-minute data. For any period where there is data, the data quality level is set to 3 for “Passes Relational Checks”. We then work backwards to identify data that does not meet Relational and/or Range Checking.

The next step is to apply the relational checks. Relational checks attempt to identify data which is uncorroborated by the rest of the data set. For instance, data received indicating a DG/CHP

Generator output when the gas use is zero is suspect. For data failing a relational check, the data quality level is set to 2 for "Data Passes Range Checks".

The last step is evaluating the range checks. The range checks consist of reasonable high and low values based on facility and DG/CHP Generator information. Data that falls outside the defined range for the database value has its data quality level set to 1 for "Data Exists."

It is necessary to work backwards when applying data quality checks to insure that data gets set to the lowest applicable data quality level. It is possible for data to pass the relational check and fail the range check and such data will be set to a data quality level of 1 for "Data Exists."

Table 1. Data Quality Definitions

Data Quality Levels	Description	Definition
3	Passes Relational Checking	This data passes Range Checks and Relational Checks. This is the highest quality data in the data set.
2	Passes Range Checks	This data passes the Range Checks but is uncorroborated by Relational Checks with other values.
1	Data Exists	This data does not pass Range Checks. This data is found to be suspect based on the facility and/or CHP equipment sizing.
0	Data Does Not Exist	This data is a placeholder for maintaining a contiguous database only.

Details on the Range and Relational Checks are found below.

Relational Checks

These checks are applied to the 15-minute data before it is converted to hourly data. If any of the 15-minute data points fails the relational check, the data for the entire hour is marked as failed.

Table 2. Relational Checks for Wyoming County Community Hospital

Evaluated Point	Criteria	Result
FG	WG > 10 and FG <=0	DQ Level for FG set to 2
WG_KW	WG_KW > 5 and WG = 0	DQ Level for WG_KW set to 2

Notes: FG – DG/CHP Generator Gas Use
WG – DG/CHP Generator Output
WG_KW – DG/CHP Generator Demand

Range Checks

These checks are applied to the 15-minute data before it is converted to hourly data. If any of the 15-minute data points fails the range check, the data for the entire hour is marked as failed.

Table 3. Range Checks for Wyoming County Community Hospital

Data Point	Upper Range Check	Lower Range Check
DG/CHP Generator Output	175 kWh	0 kWh
DG/CHP Generator Output Demand	600 kW	0 kW
DG/CHP Generator Gas Use	1500 cubic feet	0 cubic feet
Total Facility Purchased Energy	225 kWh	0 kWh
Total Facility Purchased Demand	900 kW	0 kW
Other Facility Gas Use	N/A	N/A
Unused Heat Recovery	1,400 MBtu	0 MBtu
Useful Heat Recovery	1,400 MBtu	0 MBtu
Status/Runtime of DG/CHP Generator	0.25 hrs	0 hrs
Ambient Temperature	130°F	-30°F

Notes: Data failing the Range Check has the data quality level set to 1 for "Data Exists"

ASERTTI Protocol Adherence

This site adhered fully to the ASERTTI Long-Term Monitoring Protocol from February 8 through September 30, 2002. All required performance parameters were collected. The data is sampled and averaged or summed into 15-minute intervals per the monitoring protocol. The ambient temperature was recorded in lieu of the generator intake temperature.

From September 29, 2001 through February 8, 2002, the data was recorded in hourly intervals, which does not adhere to the protocol.

Monitoring Notes

August 2004

We received a daily data file spanning from September 26, 2001 to February 12, 2002 and a 15-minute data file spanning from February 12 – September 30, 2002.