Tudor Gardens (2 Tudor City Place) Data Integrator Notes

Tudor Gardens is a multi-family residence located in New York City. The building has two Tecogen CM-75 engines running on natural gas. Heat is recovered from the generators for domestic hot water and space heating through a makeup air unit. Data is received for this site periodically from Aegis Energy Services.

Data Point Details

The data at this site was provided in the form of a Microsoft Excel spreadsheet containing hourly data. The details for each individual data point are outlined below.

DG/CHP Generator Output (total kWh)
The data for Generator Output comes from hourly values for the two generators separately. The columns of origin for this data point are labeled "Unit 1 kWhr" and "Unit 2 kWhr" in the hourly data file. This energy data is added together for the hourly online database.

DG/CHP Generator Output Demand (peak kW)
This data point is the same as DG/CHP Generator Output.

DG/CHP Generator Gas Input (cubic feet)
The data for Generator Gas Input comes from hourly values for natural gas consumption of the two units in MBtu. The columns of origin for this data point are labeled "Unit 1 Natural Gas Consumed MBtu" and "Unit 2 Natural Gas Consumed MBtu". The fuel energy is converted to cubic feet of gas using the Lower Heating Value (LHV) of Natural Gas (920 Btu/cubic foot) for the online database.

Total Facility Purchased Energy (total kWh)
There is no data available for this data point from the data files.

Total Facility Purchased Demand (peak kW)
There is no data available for this data point from the data files.

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

Total Facility Energy (total kWh/h) and Total Facility Demand (peak kW)
Due to facility purchased energy and demand being unavailable, there is no data for these data points.

Unused Heat Recovery (total MBtu/h)
The data for Unused Heat Recovery comes from hourly values for radiator heat dissipated. The column of origin for this data point is labeled "Heat Dissipated to Radiator MBtu." These values are used for the online database.

Useful Heat Recovery (total MBtu/h)
The data for Useful Heat Recovery comes from hourly values for total heat utilization. The column of origin for this data point is labeled "Total Heat Utilized MBtu." This column equals the sum of the "Heat Supplied DHW MBtu" and "Heat Supplied Makeup Air MBtu" columns in the spreadsheet; these columns are the individual totals for heat recovery for the two methods (domestic hot water and space heating) at this site. These values are used for the online database.

Status/Runtime of DG/CHP Generator (hrs)
The runtime of the generators comes from the individual unit power values for the two generators. A generator is defined as being fully on for the hour if the generator power is greater than 45 kW for the period (the fully-loaded capacity is 75 kW). The status is given a value of 1 if the generator output is above 45 kW and the generator output is divided by 45 kW if it is below. These values are calculated for both units and then summed for the online database.

Ambient Temperature (avg °F per hour)
The Ambient Temperature comes from hourly sampled conditions at JFK International Airport available at http://www.wunderground.com. The hourly data from the weather underground (which is often recorded at irregular time intervals) is assigned to the closest hour for the Ambient Temperature in the 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 (LHV) of the fuel which is 0.920 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 (LHV) of the fuel which is 0.920 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 a hourly database. 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" or 1 for "Data Exists".

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

There are no relational checks that have been applied at this site.

Range Checks

These checks are applied to the hourly data.

Table 2. Range Checks for Oakwood Health Care

Data Point	Upper Range Check	Lower Range Check
DG/CHP Generator Output	160 kWh	0 kWh
DG/CHP Generator Output Demand	160 kW	0 kW
DG/CHP Generator Gas Use	2400 cubic feet	0 cubic feet
Total Facility Purchased Energy	N/A	N/A
Total Facility Purchased Demand	N/A	N/A
Other Facility Gas Use	N/A	N/A
Unused Heat Recovery	1,000 MBtu	0 MBtu
Useful Heat Recovery	1,000 MBtu	0 MBtu
Status/Runtime of DG/CHP Generator	2 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 does not adhere fully to the ASERTTI Long-Term Monitoring Protocol. All required performance parameters are being collected. The data is sampled and averaged or summed into hourly intervals, which is more coarse than what the protocol calls for. Also, ambient temperature is being recorded in lieu of the generator air intake temperature.

Monitoring Notes

November 18, 2005

CDH received a spreadsheet of hourly data spanning from July 1 – November 17, 2005.