Toren Condominium Site - Data Integrator Notes

The Toren Condominium CHP plant consists of 5 Tecogen CM – 100 cogeneration units capable of a total output of 500kw. The central plant also includes six 1700 MBH natural gas fired modular hot water boilers to supplement the heat recovery if needed. The heat recovery will be used for temperature control and domestic hot water.

Data Point Details

Energy Concepts Engineering PC logs data at 15-minute intervals. The data is emailed to the CDH energy collection address where it is processed. The data is then aggregated into hourly data and uploaded to the web site.

The timestamp in the raw data files is in Eastern Standard Time. All data on the website is presented in Eastern Standard Time.

DG/CHP Generator Output (total kWh)
The Generator Output comes from the columns labeled "Plant Power Output (kW)" in the data files from Energy Concepts. This 15-minute interval energy data is summed into hourly data.

DG/CHP Generator Output Demand (peak kW)
The Generator Output Demand comes from the columns labeled "Plant Power Output (kW)" in the data files from Energy Concepts. The generator output is then multiplied by the data interval to determine the demand. The maximum for each hourly period is used as the demand from the generator.

DG/CHP Generator Gas Input (cubic feet)
The data for Generator Gas Input comes from the data point "Plant Total Gas Use (scf)" in the data files from Energy Concepts. This data is provided in standard cubic feet for each 15-minute interval and summed into hourly data.

Total Facility Purchased Energy (total kWh)
The Total Facility Purchased Energy comes from the column labeled "Utility Import (kW)" in the data files from Energy Concepts. This 15-minute interval energy data is summed into hourly data.

Total Facility Purchased Demand (peak kW)
The Total Facility Purchased Demand comes from the column labeled "Utility Import (kW)" in the data files from Energy Concepts. The Total Facility Energy is then multiplied by the data interval to determine the demand. The maximum for each hourly period is used as the demand from the generator.

Other Facility Gas Use (cubic feet)
No data

Unused Heat Recovery (total MBtu/h)
Unused Heat Recovery comes from the column labeled "Total Heat Rejected (BTU): in the data files from Energy Concepts. The 15-minute interval data is summed into hourly data

Useful Heat Recovery (total MBtu/h)
The Useful heat Recovery is obtained from the columns of data labeled "HX-3 Primary Entering Temp", "HX-3 Primary Entering Temp", and "HX-3 Primary Leaving Temp" in the files obtained from Energy Concepts. These points are used to calculate the heat recovery for each interval. This 15-minute data is summed into hourly data.

Status/Runtime of DG/CHP Generator (hrs)
The generator is defined as being fully on for a 15-minute interval if the generator output is greater than 25 kWh / interval (the fully-loaded capacity is 125 kWh / interval). The status is given a value of 0.25 if the generator output is above 25 kWh. The 15-minute data is then summed into hourly data for the online database.

Ambient Temperature (avg °F)
The Ambient temperature comes from the Weather Underground using the JFK airport as a reference location. The 15-minute data is averaged into hourly data.

Electrical Efficiency (%)
The Electrical Efficiency is calculated by dividing Generator Output (WG) in BTU's by Generator Gas Input (FGE) in BTU's. The lower heating value of natural gas used is 930 btu/cf. The expected efficiency should range from 25%-35%.

Total CHP Efficiency (%)
The Total CHP Efficiency is calculated by dividing the Generator Output and Useful Heat Recovery by the Generator Gas Input. The lower heating value of natural gas used is 930 btu/cf and the expected efficiency should range 75-90%

Data Quality Checks

The Data Quality Checks consist of three levels of verification:

- the data exist (flag=1),
- the data pass range checks (flag=2)
- the data pass relational checks (flag=3).

The methodology for applying the data quality begins by creating a contiguous database. We initially assume all data are good (flag=3) and 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 values which conflict with other data in 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 interval data before it is converted to hourly data. If any of the interval data points fails the relational check, the data for the entire hour is marked as failed.

Table 2. Relational Checks

Evaluated Point	Criteria	Result
FG	WG > 200 and FGE<=0	DQ Level for FG set to 2

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

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

Data Point	Hourly Data Method	Upper Range Check	Lower Range Check
DG/CHP Generator Output	Sum	125 kWh	0 kWh
DG/CHP Generator Output Demand	Maximum	500 kW	0 kW
DG/CHP Generator Gas Use	Sum	1350 cf	0 cf
Total Facility Purchased Energy	Sum	250 kWh	0 kWh
Total Facility Purchased Demand	Maximum	1000 kW	0 kW
Other Facility Gas Use	Sum	-	-
Unused Heat Recovery	Sum	3000 Mbtu	0 MBtu
Useful Heat Recovery	Sum	3000 MBtu	0 MBtu
Ambient Temperature	Average	130°F	-30°F

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

Site Notes:

2/16/2010:
The data has been posted on the website.

3/26/2010:
The dumped heat recovery is now using the value that is calculated by Energy Concepts and is sent in the raw data file. The flow rate for hx-3 is not present in the raw data file to allow this calculation to be made from the raw data file.

11/30/2010:
Data has transfer has been down since 7/24/2010. It has now been restored.

3/14/2010:
Fixed an issue which was preventing natural gas use from being shown on the website after the data transfer had been restored.