Schenectady Water Pollution Control Plant

The Schenectady Water Pollution Control site has one 280 kW, turbocharged, lean burn engine generator. The engine generator system is a packaged unit and will be located inside a new Cogeneration Building at the WPCP. Waste heat recovered from the engine will be used to generate hot water which will in turn be used to provide heat for the new Cogeneration Building; a portion of the adjacent Auxiliary Sludge Disposal Building; and to maintain proper sludge temperatures for the anaerobic digestion process via heat exchangers located in the existing Digester Control Building.

Data Point Details

Data is submitted to CDH on a daily basis. The data from the site comes from csv data files which are uploaded to the CDH web server, while the utility import data is collected from National Grid's EPO Website. 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 is determined using the data channels WD1, WD2, WS, WF, and WG. WG is the gross generator output while the other channels are parasitic loads. The net generator output is determined by subtracting the parasitic loads from the gross output. The data is then summed to obtain hourly data.

DG/CHP Generator Output Demand (peak kW)
The Generator Output demand is determined using the data channels WD1, WD2, WS, WF, and WG. WG is the gross generator output while the other channels are parasitic loads. The net generator output is determined by subtracting the parasitic loads from the gross output. The maximum value for each hour is used as the demand for that hour.

DG/CHP Generator Gas Input (cubic feet)
The Generator Gas Input is determined by using the data channel FGE. The data is averaged across each hour.

Total Facility Purchased Energy (total kWh)
Total Facility Purchased Energy is collected from National Grid's EPO website. The data is collected as kWh interval data and is summed into hourly data.

Total Facility Purchased Demand (peak kW)
Total Facility Purchased Energy is collected from National Grid's EPO website. The data is collected as kWh interval data and is converted into kW. The maximum is taken for each hour.

Other Facility Gas Use (cubic feet)
The Generator Gas Input is determined by using the data channel FGF. The data is averaged across each hour.

Unused Heat Recovery (total MBtu/h)
Unused Heat Recovery is calculated from FD, TDR, TDS, FDA, TDAR, and TDAS. The equation below is used to calculate the useful heat recovery from these data channels. The data is then averaged into hourly data.

QD = .5 * FHW * (TDS – TDR) + .5 * FDA * (TDAS – TDAR)

Useful Heat Recovery (total MBtu/h)
The Useful heat Recovery is calculated from FHW, THWR, and THWS. The equation below is used to calculate the useful heat recovery from these data channels. The data is then averaged into hourly data.

QHR = .5 * FHW * (THWS – THWR)

Status/Runtime of DG/CHP Generator (hrs)
Runtime is determined based on the generator output. If the output is greater than 50 kW, the interval is assigned a value of 1. This data is averaged across the hour.

Ambient Temperature (avg °F)
Ambient Temperature is obtained from The Weather Underground Web Site using the airport code SCH.

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 600 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 600 btu/cf and the expected efficiency should range 50-80%

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

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	100 kWh	0 kWh
DG/CHP Generator Output Demand	Maximum	400 kW	0 kW
DG/CHP Generator Gas Use	Average	8000 cf/h	0 cf/h
Total Facility Purchased Energy	Average	400 kWh	0 kWh
Total Facility Purchased Demand	Maximum	1600 kW	0 kW
Other Facility Gas Use	Average	8000 cf/h	0 cf/h
Unused Heat Recovery	Average	5000 Mbtu	0 MBtu
Useful Heat Recovery	Average	5000 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”

Table 4. CDH Tags and Raw Data Tags

CDH Tag	Raw Tag
TDS	TIT_530A
TDR	TIT_530B
TDAR	TIT_531A
THWR	TIT_560a
THWS	TIT_560B
FGF	FIT_370
FGBN	FIT_470
FGBD	FIT_480
FGE	FIT_490
FD	FIT_530
FDA	FIT_531
TDAS	TIT_531B
FHW	FIT_560
WF	JY_640
FB	B_550
WD1	JY_311
WD2	JY_312
WS	JY_360
FG1	FIT_350
FG2	FIT_351
THWS2	TIT_520
WG	JY_630

Site Notes:

5/30/2012:
Data is being sent to the NYSERDA CHP website. The flow meter for FHW has not been reading properly since 4/23/2012, useful heat recovery is not being calculated after this time. Waiting for the site to repair the meter.