Coop City – Riverbay Corp. Site - Data Integrator Notes

Riverbay Corporation manages the Co-op City Complex located in the Bronx that includes more than 15,000 apartment units. The physical plant complex for complex is located on the corner of Bartow Ave and Co-op City Blvd (Figure 1). Riverbay has submitted an application to the NYSERDA CIPP program to install a 38 MW Combined Cycle CHP system at their campus in the Bronx, New York. The Plant will include two 12.5 MW Siemens Combustion Turbines (CTs), two Once-Through Steam Generators (OTSGs) to generate 850 psig steam, and a 13 MW steam turbine generator. The steam exiting the turbine at 150 psig will be used to meet campus heating loads in the winter and to drive steam-turbine centrifugal chillers in the summer. The combustion turbines can operate on natural gas or fuel oil. A Siemens T-3000 digital control system is being installed to operate and monitor plant performance.

Data Point Details

Riverbay Corp. logs data at 15-minute intervals into 6 separate files. The data is manually 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 Daylight Time. All data on the website is presented in Eastern Standard Time.

DG/CHP Turbine Output (total kWh)
This value comes from 3 columns in the first file (columns 2,4, and 5), which represents the power output for all three turbines. The data is given in kW for the combustion turbines and MW for the steam turbine. These 3 values are summed and converted into kWh using the interval length. This 15-minute interval energy data is summed into hourly data.

DG/CHP Turbine Output Demand (peak kW)
This value comes from 3 columns in the first file (columns 2,4, and 5), which represents the output for all the turbines. The maximum for each hourly period is used as the demand from the generator.

DG/CHP Turbine Gas Input (cubic feet)
The data for Turbine Gas Input comes from files 3 and 4 (columns 1,4 and 3,5,7 respectively). These 5 channels include the gas consumption for the two combustion turbines, the two duct burners, and the high pressure boiler. This data is provided as 1000 cubic feet per hour or as lbs per hour for each 15-minute interval. It is converted into standard cubic feet of natural gas and summed into hourly data.

Total Facility Purchased Energy (total kWh)
The Total Facility Purchased Energy comes from files 1 and 2 (columns 7, and 2,4, and 6 respectively) for the four substation feeds at the facility. The data is given in MW, which is converted into kWh using the interval length. This 15-minute interval energy data is summed into hourly data.

Total Facility Purchased Demand (peak kW)
The Total Facility Purchased Demand comes from files 1 and 2 (columns 7, and 2,4, and 6 respectively). The maximum for each hourly period is used as the demand from the generator.

Other Facility Gas Use (cubic feet) ** Fuel Oil Consumption of the Turbines and Boiler **
This variable is used to provide the alternate (fuel oil) consumption of the combustion turbine and boiler. The data comes from from files 3 and 4 (columns 2,5 and 6 respectively). This data is provided in gallons per minute for each 15-minute interval. It is converted into the equivalent energy content of natural gas in standard cubic and summed into hourly data.

Unused Heat Recovery (total MBtu/h)
This data value is left blank.

Useful Heat Recovery (total MBtu/h)
Useful heat recovery comes from files 4 (columns 1, 2, 4) and represents the high pressure steam output of the Once Through Steam Generators (OTSGs) and the High Pressure Boiler , The data is provided in 1000 lbs per hour for each 15 minute interval and represents the steam which leaves the high pressure side of this system. This data is converted into MBtus (using a factor of 1159.5 Btu/lb) and summed into hourly data.

Status/Runtime of DG/CHP Generator (hrs) ** Number of Turbines ON **
This value provides the number turbines that are fully on for a 15-minute interval. The combustion turbines are considered on if the turbine output is greater than 5 MW. The Steam turbine is on if its ouput is over 5.5 MW. 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 LGA 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 > 2000 and FG and FT<=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	9500 kWh	0 kWh
DG/CHP Generator Output Demand	Maximum	38000 kW	0 kW
DG/CHP Generator Gas Use	Sum	50000 cf	0 cf
Total Facility Purchased Energy	Sum	20000 kWh	0 kWh
Total Facility Purchased Demand	Maximum	80000 kW	0 kW
Other Facility Gas Use	Sum	360 cf	0 cf
Unused Heat Recovery	Sum	300000 Mbtu	-98 MBtu
Useful Heat Recovery	Sum	230000 MBtu	-98 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:

3/30/2010:

The data has been posted on the website.

3/30/2011

The calculation of Useful Heat Recovery was Changed

The weather data was changed from JFK to LGA

Lowered the lower range check for heat recovery.