East Irondequoit Central School District - Data Integrator Notes

East Irondequoit Central School District has installed a co-generation (co-gen) system which combines cooling, heat, and power (CCHP) using five (5) 65kW microturbines. The basis-of-design system is the UTC Power Pure Comfort Solution Model 325M CARB. (The CARB suffix indicates the "low emissions" option). The electricity generated by the co-gen system will supplement the existing utility provided electrical power, and also be used for emergency power. The waste heat from the microturbine exhaust is captured to power an absorption chiller that provides heating and cooling capacity to specific building HVAC and plumbing systems.

Data Point Details

Data is uploaded to the CDH Energy server every night. The file contains 15 minute interval data for the last seven days.

DG/CHP Microturbine Output (total kWh)
The data for the microturbine output comes from the data channel associated with point W1. This 15 minute energy data is summed across each hour.

DG/CHP Microturbine Output Demand (peak kW)
The microturbine output demand is calculated using the data channel associated with point W1. The power is calculated for each interval and the maximum value is taken for each hour.

DG/CHP Microturbine Gas Input (cubic feet)
The microturbine gas input comes from the data channel associated with point F3. This 15 minute gas data comes in units of ccf and is converted to cf. The data is then summed across each hour.

Total Facility Purchased Energy (total kWh)
The Total Facility Purchased Energy comes from the data channel associated with point W2. This 15 minute energy data is summed across each hour.

Total Facility Purchased Demand (peak kW)
The Total Facility Purchased Demand comes from the data channel the data channel associated with point W2. The power is calculated for each interval and the maximum value is taken for each hour.

Other Facility Gas Use (cubic feet)
No data

Unused Heat Recovery (total MBtu/h)
The unused heat recovery is calculated from the data channels associated with points, F1, F2, T1, T2, T3, T4, and DV. The flow and temperatures are used to calculate the total useful heat recovery. The position of the diverter valve (DV) is used to determine the portion of the total heat output that is represented by the useful heat recovery. The difference is designated as unused heat recovery.

Useful Heat Recovery (total MBtu/h)
The useful heat recovery is calculated from the data channels associated with points, F1, F2, T1, T2, T3, and T4. The useful heat recovery which is used for heating and cooling is calculated separately and added together as a rate. This rate is averaged across each hour.

QHW = .5*F1*(T1-T2)
QCH = .5*F2*(T4-T3)
QU = QHW + QCH

Status/Runtime of DG/CHP Microturbine (hrs)
This is determined based on the value of W1. If the power is greater than 8 kW for an interval, the status is set to 1. The status is then averaged across an hour.

Ambient Temperature (avg °F)
The Ambient temperature comes from data channel associated with point T6. The ambient temperature is averaged across each hour.

Electrical Efficiency (%)
The Electrical Efficiency is calculated by dividing Microturbine Output (WG) in BTU's by Microturbine Gas Input (FGE) in BTU's. The lower heating value of natural gas used is 927 btu/cf. The expected efficiency should range from 20–35%.

Total CHP Efficiency (%)
The Total CHP Efficiency is calculated by dividing the Microturbine Output and Useful Heat Recovery by the Microturbine Gas Input. The lower heating value of natural gas used is 927 btu/cf and the expected efficiency should range 65–80%.

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
None		

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	120 kWh	0 kWh
DG/CHP Generator Output Demand	Maximum	450kW	0 kW
DG/CHP Generator Gas Use	Average	1400 cf	0 cf
Total Facility Purchased Energy	Sum	400 kW	0 kW
Total Facility Purchased Demand	Maximum	1200 kW	0 kW
Other Facility Gas Use	Sum	-	-
Unused Heat Recovery	Average	2000 MBtu	0 MBtu
Useful Heat Recovery	Average	2000 MBtu	0 MBtu
Ambient Temperature	Average	120°F	-30°F

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

Table 4, CDH Point Names Related to Data File Headings

Point	file Heading
T4	eastirondequoiteastridgecchp.absorber.twrabschwewt
T3	eastirondequoiteastridgecchp.absorber.twrabschwlwt
T2	eastirondequoiteastridgecchp.absorber.twrabshwewt
T1	eastirondequoiteastridgecchp.absorber.twrabshwlwt
DV	eastirondequoiteastridge.cchpdivertervalve
W2	eastirondequoiteastridgecchp.meterser_e_t_kwh15min
F2	eastirondequoiteastridgecchp.metersflowmtrchw
F1	eastirondequoiteastridgecchp.metersflowmtrhw
T6	eastirondequoiteastridgeoutair
W1	eastirondequoiteastridgecchp.meterstp_e_t_kwh15min
F3	eastirondequoiteastridgecchp.meterstp_g_t_ccf15min
T5	eastirondequoiteastridgecchp.absorber.twrturbineexhtemp

Site Notes:

3/28/2013: Data has been received and is being submitted to the NYSERDA CHP website.