

Synergy Biogas ADG Site - Data Integrator Notes

Synergy's ADG system includes one reciprocating, biogas, engine that provides electricity to run the digester plant (200 kW continuously) and exports the rest to the National Grid distribution system in Wyoming, NY.

One 1,426 kW Jenbacher engine / generator serves the facility. The genset is located in the engine room near the digester. All the recovered heat is captured in the form of hot water and used to heat the influent biogas.

Data Point Details

Data is logged at *1-minute* intervals by the facilities Grey-Logics control system which creates daily log files on a NAS (network attached storage) hard disk that is made available via FTP. CDH has set up automated processes to log into the NAS and pull data nightly. The data is aggregated into 15-minute data and uploaded to the website.

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 data point Generator power output [kW] in the log file. The kW value is averaged to calculate hourly data.

DG/CHP Generator Output Demand (peak kW)

The Generator Output Demand is from the same data point as above, Generator power output [kW]. The highest kWh value per interval is multiplied by the number of intervals per hour to calculate the peak demand for the hour.

DG/CHP Generator Gas Input (cubic feet)

The data for Generator Gas Input comes from the data point Total gas production [m³/h] in the log file. The cf/m data is summed over the hour to receive hourly data. When the generator is not producing power, the boiler turns on in order to heat the digester. The gas meter measures gas to the boiler also.

Total Facility Purchased Energy (total kWh)

No data

Total Facility Purchased Demand (peak kW)

No data

Other Facility Gas Use (cubic feet)

Other facility gas use comes from the same data point as Generator Gas Input. If the cogen unit shuts off the boiler system kicks on, in order to keep the digester heated. So if the cogen unit isn't generating power, all gas use is for the boiler system.

Total Facility Energy (total kWh) and Total Facility Demand (peak kW)

No data

Unused Heat Recovery (total MBtu/h)

No data

Useful Heat Recovery (total MBtu/h)

No data.

Status/Runtime of DG/CHP Generator (hrs)

No data.

Ambient Temperature (avg °F)

The Ambient Temperature comes from the Ithaca Airport weather station. The data is downloaded from www.wunderground.com.

Electrical Efficiency (%)

The Electrical Efficiency is calculated by dividing Generator Output (WG) in BTU's by Generator Gas Input (FG) in BTU's. The energy density of biogas used is 650 BTU/cf. The expected efficiency should range from 20%-35%.

Total CHP Efficiency (%)

Same as electrical efficiency.

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 data points fails the relational check, the data for the entire hour is marked as failed.

Table 2. Relational Checks

Evaluated Point	Criteria	Result
WG_KW	WG_KW = 0 and FG > 2,000	DQ Level for WG_KW set to 2
FG	WG_KW > 250 and FG < 2,000	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 interval data before it is converted to hourly data. If any of the 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	Average	1,600kWh/hr	0 kWh/hr
DG/CHP Generator Output Demand	Maximum	1,600 kW	0 kW
DG/CHP Generator Gas Use	Average	36,000 cf/hr	0 cf/hr
Total Facility Purchased Energy	Sum	-	-
Total Facility Purchased Demand	Maximum	-	-
Other Facility Gas Use	Sum	36,000 cf/hr	-
Unused Heat Recovery	Sum	-	-
Useful Heat Recovery	Sum	-	-
Status/Runtime of DG/CHP Generator	Sum	1 hrs	0 hrs
Ambient Temperature	Average	130°F	-30°F

Notes:

1. Data failing the Range Check has the data quality level set to 1 for “Data Exists”
2. Range checks are applied to interval data
3. This table contains the values from *range_checks.pro*