Town of Lewiston ADG Site - Data Integrator Notes

The Town of Lewiston's cogeneration plant, which includes two 30 kW Capstone natural gas micro-turbines, serves the electrical needs for the wastewater treatment facility located in Lewiston, NY. Only one of the turbines are included in the NYSERDA ADG program. The turbines are all located in the structure, adjacent to the digester building. All recovered heat is captured in the form of hot water and is used for digester heating and space heating.

Data Point Details

Data is logged at ***15-minute*** intervals by an Obvius AcquiLite data-logger. The data is 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.

Town of Lewiston Turbines

DG/CHP Generator Output (total kWh)
The Generator Output is from the data point WG. The difference between consecutive records is calculated for the energy use during the interval. This energy data is then summed into hourly data.

DG/CHP Generator Output Demand (peak kW)
The Generator Output Demand is from the same data point (WG) as above. Instead of accumulating the kWh data, the highest kWh / interval value is multiplied by the number of intervals per hour in order to calculate the peak hourly demand.

DG/CHP Generator Gas Input (cubic feet)
The Generator Gas Input is calculated from the data point FGE. The difference between consecutive records is calculated for the gas flow during the interval. This gas flow data is then summed into hourly data.

Total Facility Purchased Energy (total kWh)
No data

Total Facility Purchased Demand (peak kW)
No data

Other Facility Gas Use (cubic feet)
No data

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)
A micro turbine is considered to be fully on over an interval if the generator output is greater than 2 kWh./ interval (fully loaded capacity is 7.5 kW / interval). The status is given a value of 0.25 if the generator output is above 2 kW. The interval data is then summed into hourly data for the online database.

Ambient Temperature (avg °F)
No data

Electrical Efficiency (%)
Calculated by dividing the Generator Output in BTU's by the Generator Gas Input in BTU's (biogas energy density of 600 btu/cf used). This calculated efficiency is lower than actual due to the fact that total gas flow is used (Existing and New turbine) while only the Existing Turbines power output is used.

* Combined Electrical Efficiency (WG new and WG existing) graph at end of document.

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.

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
N/A	-------	All points pass relational checks
WG	WG >2 and FGE <100	WG flagged as 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 4. Range Checks

Data Point	Hourly Data Method	Upper Range Check	Lower Range Check
DG/CHP Generator Output	Sum	40 kWh/hr	0 kWh/hr
DG/CHP Generator Output Demand	Maximum	40 kW	0 kW
DG/CHP Generator Gas Use	Sum	1,000 scf/hr	0 scf/hr
Total Facility Purchased Energy	Sum	-	-
Total Facility Purchased Demand	Maximum	-	-
Other Facility Gas Use	Sum	-	-
Unused Heat Recovery	Sum	-	-
Useful Heat Recovery	Sum	-	-
Status/Runtime of DG/CHP Generator	Sum	1 hr	0 hr
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*