

## ***Patterson Farms - Existing Generator - Data Integrator Notes***

Patterson Existing consists of the old engine-generator that helps meet the electrical needs for the farm located in Auburn, NY.

The single 180 kW Cat engine serves the farm. It is located in the pole barn, near the digester. All recovered heat is captured in the form of hot water and is used to heat the digester.

### **Data Point Details**

Data is logged at *15-minute* intervals by the Obvius AcquiSuite data-logger. It is then aggregated into hourly data and uploaded to the website.

The timestamp in the raw data files is in Eastern Standard Time. All graphical figures on the website are presented in Eastern Standard Time.

#### DG/CHP Generator Output (total kWh)

The data for Generator Output comes from the data point WG1. The data is accumulated so 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 comes from the same data point as above, WG1. Instead of accumulating the kWh data, the highest kWh / interval value 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 labeled FGF. The data is accumulated so the difference between consecutive records is calculated for the gas flow during the interval. This flow data is then summed into hourly data.

#### Total Facility Purchased Energy (total kWh)

There is no data available for this point.

#### Total Facility Purchased Demand (peak kW)

There is no data available for this point.

#### Other Facility Gas Use (cubic feet)

There is no data available for this point.

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

There is no data available for this point.

#### Unused Heat Recovery (total MBtu/h)

There is no data available for this point.

Useful Heat Recovery (total MBtu/h)

There is no data available for this point.

Status/Runtime of DG/CHP Generator (hrs)

The generators are defined as being fully on over an interval if the generator output is greater than 5 kW (the fully-loaded capacity is 45 kW per interval). The status is given a value of 0.25 if the generator output is above 5 kW. The data is then summed into hourly data for the online database.

Ambient Temperature (avg °F)

The data for Ambient Temperature comes from hourly data from recorded data at <http://www.wunderground.com/>, for Skaneateles, New York (PWS).

Electrical Efficiency (%)

The Total CHP Efficiency is calculated from the online hourly database by dividing the DG/CHP Generator Output, converted from kWh to MBtus, by the DG/CHP Generator Gas Input. The gas input is converted to MBtus using the Lower Heating Value (LHV) of the fuel which is 0.550 MBtu/cubic foot (Natural Gas).

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**

<b>Data Quality Levels</b>	<b>Description</b>	<b>Definition</b>
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**

<b>Evaluated Point</b>	<b>Criteria</b>	<b>Result</b>
FG	WG > 5 and FG <3	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**

<b>Data Point</b>	<b>Hourly Data Method</b>	<b>Upper Range Check</b>	<b>Lower Range Check</b>
DG/CHP Generator Output	Sum	250 kWh/hr	0 kWh/hr
DG/CHP Generator Output Demand	Maximum	250 kW	0 kW
DG/CHP Generator Gas Use	Sum	5500 cf/hr	0 cf/hr
Total Facility Purchased Energy	-	-	-
Total Facility Purchased Demand	-	-	-
Other Facility Gas Use	-	-	-
Unused Heat Recovery	-	-	-
Useful Heat Recovery	-	-	-
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*