Sunrise Bakery - Data Integrator Notes

The CHP system at Sunrise Bakery consists of a single 525 kW Waukesha Model VHP-3600 GSI natural gas fired engine. The CHP system generates up to 525 kW, and provides steam production through ebullient cooling to the 13-psig steam header. Steam produced is used to offset steam production by a natural gas boiler. Steam is used in the production of baked goods, as well as for space heating. An excess steam condenser located above the roof is used to reject excess heat when the CHP system steam production exceeds the bakery thermal load.

Data Point Details

CDH has supplied an Obivus AcquiSuite datalogger to record the required data. The logger will sample each data point every 1-second and record 15-minute average data (for analog points) or total data (for digital points). Data are uploaded to the CDH Energy servers via an HTTP "push" connection twice per day. Data will be collected each night and loaded into a database for further verification, energy calculations, and uploading to the NYSERDA CHP Integrated Data System.

All data on the website is presented in Eastern Standard Time.

DG/CHP Generator Output (total kWh)
The Generator Output comes from the data channel called WT_KW. Presently the assumed channel based on the monitoring plan for generator power and utility import is reversed. This is resolved within the data processing. The power is given as a rate, which is converted to a 15-minute quantity and summed across each hour.

DG/CHP Generator Output Demand (peak kW)
The Generator Output comes from the data channel called WT_KW. Presently the assumed channel based on the monitoring plan for generator power and utility import is reversed. This is resolved within the data processing. The power is given as a rate, which has the maximum value taken across each hour.

DG/CHP Generator Gas Input (cubic feet)
The Generator Gas Input has not been verified yet.

Total Facility Purchased Energy (total kWh)
The Total Facility Purchased Energy has not been verified yet.

Total Facility Purchased Demand (peak kW)
The Total Facility Purchased Demand has not been verified yet.

Other Facility Gas Use (cubic feet)
No data

<u>Unused Heat Recovery (total MBtu/h)</u>
The unused heat recovery has not been verified yet.

<u>Useful Heat Recovery (total MBtu/h)</u>
The useful heat recovery has not been verified yet.

<u>Status/Runtime of DG/CHP Generator (hrs)</u>
This is determined based on the generator power. If the power is greater than 250kW for an interval, the status is set to .25. The status is then summed across an hour.

<u>Ambient Temperature (avg °F)</u>
The Ambient temperature comes from the raw data file. The 15-minute data is averaged into hourly data.

<u>Electrical Efficiency (%)</u>
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 927 btu/cf. The expected efficiency should range from 30–45%.

<u>Total CHP Efficiency (%)</u>
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 927 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

Notes: FG – DG/CHP Generator Gas Use
WG – DG/CHP Generator Output

Range Checks

These checks are applied to the 1-minute data before it is converted to hourly data. If any of the 1-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	150 kWh	0 kWh
DG/CHP Generator Output Demand	Maximum	600 kW	0 kW
DG/CHP Generator Gas Use	Average	5000 cf	0 cf
Total Facility Purchased Energy	Sum	300 kW	0 kW
Total Facility Purchased Demand	Maximum	1200 kW	0 kW
Other Facility Gas Use	Sum	-	-
Unused Heat Recovery	Average	6000 Mbtu	0 MBtu
Useful Heat Recovery	Average	6000 MBtu	-500 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"

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Site Notes:

9/12/2011:
Data was posted on the website