Burrstone Energy Center, LLC, Utica College Data Integrator Notes

The Burrstone Energy Center's cogeneration plant includes four engine-generators that serve the electrical services for three separate facilities near Burrstone Road in Utica, NY:

- Utica College,
- St Lukes Hospital,
- St. Lukes Home.

One 1100 kW engine serves the college, two 1100 kW units serve the hospital, and a 334 kW engine serves the home. All four engines are located in a new facility near the hospital's boiler house. Each engine includes a heat recovery steam generator (HRSG) as well as heat exchangers to transfer heat from the engine jacket water to meet hot water loads in the hospital. Steam from the HRSG offsets boiler steam loads, including summertime loads for a steam-driven absorption chiller (a new steam-fired chiller was recently installed). Engine jacket water heat is used to offset service hot water loads in the hospital facility as well as drive a newly installed hot-water driven 100 ton absorption chiller in Area 7. Dump radiators reject excess heat to ambient when the return water temperature entering the engine HX is too high.

Data Point Details

The data listed above will be made available at www.becchp.com. This server uses the Niagara Ax/Obix Framework, which is supplied by Tridium. Data are logged at 15-minute intervals and is averaged or totaled for that period.

The timestamp in the raw data files is in Eastern Standard Time. All graphical figures on the website are presented in Eastern Standard Time. This means that during the Daylight Savings Time period from the first Sunday in April until the last Sunday in October the monitored data plots, CSV output and standardized PDF reports are in Eastern Standard Time and do not obey Daylight Savings time rules. Presenting data in Standard Time throughout the year is common practice for graphical time series plotting because it eliminates skipping an hour in April and duplicating an hour in October.

DG/CHP Generator Output (total kWh)
The data for Generator Output comes from an accumulator of power use throughout the day. The column of origin for this data point is labeled "Home Genset kWH Export" in the data files received from the TBS server. The difference between consecutive records is calculated for the energy use during the interval. This 15-minute interval energy data is summed into hourly data.

DG/CHP Generator Output Demand (peak kW)
The Generator Output Demand comes from 15-minute data. The column of origin for this data point is labeled "Home Genset Demand Total" in the data files received from the TBS server. The highest value from the 15-minute data during an hour is used for the Output Demand in the online database.

DG/CHP Generator Gas Input (cubic feet)
The data for Generator Gas Input comes from 15-minute data. The column of origin for this data

point is labeled “CG-4 Gas Flow F-5” in the data files received from the TBS server. The data is averaged into hourly data for the online database.

Total Facility Purchased Energy (total kWh)
The data for Facility Purchased Energy comes from an accumulator of power use throughout the day. The column of origin for this data point is labeled “Home Utility kWH Import” in the data files received from the TBS server. The difference between consecutive records is calculated for the energy use during the interval. This 15-minute interval energy data is summed into hourly data.

Total Facility Purchased Demand (peak kW)
The data for Facility Purchased Demand comes from 15-minute data. The column of origin for this data point is labeled “Home Utility Demand Total” in the data files received from the TBS server. The data is averaged into hourly data for the online database.

Other Facility Gas Use (cubic feet)
There is no data available for this point from the WSP Flack + Kurtz data.

Total Facility Energy (total kWh) and Total Facility Demand (peak kW)
These two data points are the sum of the DG/CHP Generator Output and Total Facility Purchased data points.

Unused Heat Recovery (total MBtu/h)
The Unused Heat Recovery comes from 15-minute data for the dumped steam and dumped heat from hot water. The steam is calculated by converting the lb/hour rate into btus water is converted from gallons per minute and multiplied by the temperature difference between the supply and return to the dump radiator. The columns of origin for these points are “CG-1 Steam Flow S-1”, “CG-2 Steam Flow S-2”, “CG-3 Steam Flow S-3”, “CG-4 Steam Flow S-4”, “CG-4 Water Flow H-4”, “CG-4 Sec ENT Temp TE-406”, and “CG-4 Loop ENT Temp TE-413B”. The 15-minute data is totaled for the hourly online database

Useful Heat Recovery (total MBtu/h)
The Useful Heat Recovery comes from 15-minute data for the useful steam and useful heat from hot water. The steam is calculated by converting the lb/hour rate into btus water is converted from gallons per minute and multiplied by the temperature difference between the supply and return to the hospital. The columns of origin for these points are “CG-1 Steam Flow S-1”, “CG-2 Steam Flow S-2”, “CG-3 Steam Flow S-3”, “CG-4 Steam Flow S-4”, “CG-4 Water Flow H-4”, “CG-4 Sec ENT Temp TE-406”, and “CG-4 Sec LVG Temp TE-407”. The 15-minute data is totaled for the hourly online database
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Status/Runtime of DG/CHP Generator (hrs)
The generators are defined as being fully on for a 15-minute interval if the generator output is greater than 100 kW for the period (the fully-loaded capacity is 1100 kW). The status is given a

value of 0.25 if the generator output is above 100 kW. The 15-minute data is then summed into hourly data for the online database.

Ambient Temperature (avg °F)
The data for Ambient Temperature comes from 15-minute data. The column of origin for this data point is labeled "Local Outside Dry Bulb" in the data files received from the TBS server. The data is averaged into hourly data for the online database.

Total CHP Efficiency (%)
The Total CHP Efficiency is calculated from the online hourly database as the sum of the Useful Heat Recovery and the DG/CHP Generator Output, converted from kWh to MBtus, divided 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 0.930 MBtu/cubic foot (Natural Gas).

Electrical Efficiency (%)
The Electrical Efficiency is calculated from the online hourly database as the DG/CHP Generator Output, converted from kWh to MBtus, divided 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 0.930 MBtu/cubic foot (Natural Gas).

Data Quality Checks

The Data Quality Checks consist of three levels of verification: does the data exist, does the data pass reasonable range checking and does the data pass relational checks. The methodology for applying the data quality begins by creating a contiguous database. This is necessary to maintain compatibility between the many sites on the server. Next, the data received for this site is fit into the database, in this case we are using 15-minute data. For any period where there is data, the data quality level is set to 3 for "Passes Relational Checks". We 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 which is uncorroborated by the rest of 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	Description	Definition

Quality Levels		
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 15-minute data before it is converted to hourly data. If any of the 15-minute data points fails the relational check, the data for the entire hour is marked as failed.

Table 2. Relational Checks for Arrow Linen

Evaluated Point	Criteria	Result
FG	WG > 100 and FG <=0	DQ Level for FG set to 2
QHR	WG > 100 and QHR <=0	DQ Level for QHR set to 2

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

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 for Burrstone

Data Point	Hourly Data Method	Upper Range Check	Lower Range Check
DG/CHP Generator Output	Sum	500 kWh	0 kWh
DG/CHP Generator Output Demand	Maximum	2000 kW	0 kW
DG/CHP Generator Gas Use	Average	15000 cubic feet/hour	0 cubic feet
Total Facility Purchased Energy	Sum	800 kWh	0 kWh
Total Facility Purchased Demand	Maximum	2500 kW	0 kW
Other Facility Gas Use	Sum	N/A	N/A
Unused Heat Recovery	Sum	4500 MBtu	0 MBtu
Useful Heat Recovery	Sum	4500 MBtu	0 MBtu
Status/Runtime of DG/CHP Generator	Sum	0.25 hrs	0 hrs
Ambient Temperature	Average	130°F	-30°F

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

ASERTTI Protocol Adherence

This site adheres fully to the ASERTTI Long-Term Monitoring Protocol. All required performance parameters are provided. The data is averaged and summed into 15-minute intervals as per the protocol. In addition, most of the optional parameters are available at this site.

Monitoring Notes

9/28/2009

The site has been posted.