

Vassar College - Data Integrator Notes

Vassar College (Vassar), located in Poughkeepsie, New York, is one of the nation's leading liberal arts colleges. The college first opened its doors in 1865 and was a pioneer in women's and liberal arts education in the United States. In 1969, Vassar became coeducational and today remains at the forefront of liberal arts' institutions. The campus is an approximately 1,000-acre site with over 2.4 million square feet in buildings. Vassar has a student body of over 2,400, and 1,200 employees

Vassar has recently completed the installation of a new 250 kW back pressure steam turbine that will operate in conjunction with an existing 750 kW back pressure steam turbine for optimizing steam turbine power generation

Data Point Details

Readings from the devices are captured continuously and will be reported in intervals of 15 minutes using Vassar's Andover Continuum software. This application is currently accessible from networked PCs at both the Boiler Plant and the Buildings and Grounds Services Center.

The Andover Continuum software also features an option for exporting data directly to a comma separated text file (.CSV) format. It is recommended that Vassar College utilize this format for collecting and transferring all of its data to CDH. The .CSV format is a simple, widely accepted text file format that can be imported directly into most database applications, as well read by Excel, Word or Notepad. Using this format will also allow data from the Andover system to be transmitted directly to CDH

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 Turbine Output (total kWh)

The Turbine Output comes from the channel in the raw data file labeled, "WT1". Only the power for the new turbine is included in the data displayed on the website. The 15-minute kW reading is converted to kWh and summed into hourly data.

DG/CHP Turbine Output Demand (peak kW)

The Turbine Output Demand comes from the channel in the raw data file labeled, "WT1". Only the power for the new turbine is included in the data displayed on the website. The maximum for each hourly period is used as the demand from the generator.

DG/CHP Turbine Gas Input (cubic feet)

Not applicable to this site

Total Facility Purchased Energy (total kWh)

No data

Total Facility Purchased Demand (peak kW)

No data

Other Facility Gas Use (cubic feet)

The Other Facility Gas Use comes from the channels in the raw data file labeled, “Blr1GasFlow”, “Blr2GasFlow”, “Blr3GasFlow”, “Blr4GasFlow”, and “Blr5GasFlow”. The 15-minute data is provided in cf/h, is converted to cf, and is summed into hourly data.

Unused Heat Recovery (total MBtu)

No data

Useful Heat Recovery (total MBtu)

The Useful heat Recovery is calculated from the channels in the raw data file labeled, “TG1StmFlow” and “PLPS1”. The pressure reading is used to determine the enthalpy of the steam. The enthalpy is then used to calculate the energy content of the steam leaving the turbine for each 15-minute interval. This 15-minute data is averaged into hourly data.

Status/Runtime of DG/CHP Turbine (hrs)

The turbine is defined as being fully on for a 15-minute interval if the output is greater than 100 kW (the fully-loaded capacity is 250 kW). The status is given a value of 1 if the turbine that has an output greater than 100 kW. The 15-minute data is then averaged into hourly data for the online database.

Ambient Temperature (avg °F)

The Ambient temperature comes from the Weather Underground. The 15-minute data is averaged into hourly data.

Electrical Efficiency (%)

Is not Calculated for this site

Total CHP Efficiency (%)

Is not Calculated for this site

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 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

| Data Point | Hourly Data Method | Upper Range Check | Lower Range Check |
|---------------------------------|--------------------|-------------------|-------------------|
| DG/CHP Generator Output | Sum | 300 kWh | 0 kWh |
| DG/CHP Generator Output Demand | Maximum | 1200 kW | 0 kW |
| DG/CHP Generator Gas Use | Sum | - | - |
| Total Facility Purchased Energy | Sum | - | - |
| Total Facility Purchased Demand | Maximum | - | - |
| Other Facility Gas Use | Sum | - | - |
| Unused Heat Recovery | Sum | - | - |
| Useful Heat Recovery | Sum | 37500 MBtu | 0 MBtu |
| Ambient Temperature | Average | 130°F | -30°F |

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

Site Notes:

4/6/10:

The data has been posted on the website.

3/28/11:

Modified the site to report only the new power unit, the 250kW steam turbine. The boiler gas use is now being reported under other facility gas use. Corrected the calculation for useful heat recovery to use only the steam leaving turbine 1 rather than a value based on the output of all 5 boilers.