Long Island Jewish Medical Center Data Integrator Notes

Long Island Jewish Medical Center's combined heat and power (CHP) system consists of Two 1500 kW gas engines generate all electric power needed. Heat recovered from gas engines provides hot water to pre-heat steam condensate return and steam to supplement the campus steam needs. Data for this site is collected by WSP Flack + Kurtz and provided daily to CDH Energy.

Data Point Details

The data at this site is provided by WSP Flack + Kurtz in the form of comma-separated value (CSV) files. There is one file for each day containing 15-minute data for 41 data points. From these 15 minute values, the hourly database is formed. It is unclear whether the 15-minute data is sampled or averaged across the interval. It is also unclear whether the heat recovery rates are integrated across the 15-minute interval, averaged or sampled. The details for each individual data point are outlined below.

The timestamp in the raw data files is in GMT, which is converted to 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 columns of origin for this data point are labeled "LIJ.GEG.CG.1:TOT ACT OUT" and "LIJ.GEG.CG.2:TOT ACT OUT"in the data files received from WSP Flack + Kurtz. 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 columns of origin for this data point are labeled "LIJ.GEG.CG.1:GEN PWR" and "LIJ.GEG.CG.2:GEN PWR" in the data files received from WSP Flack + Kurtz. 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 an accumulator of gas use throughout the day. The column of origin for this data point is labeled "EC.GEN.GAS.METER" in the data files received from WSP Flack + Kurtz. The difference between consecutive records is calculated for the gas use during the interval. This 15-minute interval gas data is summed into hourly data.

Total Facility Purchased Energy (total kWh)
There is no data available for this point from the WSP Flack + Kurtz data.

Total Facility Purchased Demand (peak kW)
There is no data available for this point from the WSP Flack + Kurtz data.

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)
This is not being calculated at this time.

Useful Heat Recovery (Average MBtu/h)
The Useful Heat Recovery comes from 15-minute data. The total heat recovery for the system is calculated as follows:

QHR =E*(G1SF +G2SF)+K*(G1WRF*(G1WST-G1WRT)+G2WRF*(G2WST-G2WRT)

QHR = Total Heat Recovery
E = 1000. btu/lb
K = 438
G1SF = Steam flow from generator 1
G2SF = Steam flow from generator 2
G1WRF = Cogen 1 water flow rate
G1WST = Cogen 1 water supply temperature
G1WRT = Cogen 1 water return temperature
G2WRF = Cogen 2 water flow rate
G2WST = Cogen 2 water supply temperature
G2WRT = Cogen 2 water return temperature

The resulting 15-minute data is averaged into hourly data. (see table 4 for point names in raw data file)

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 1500 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 Ambient Temperature comes from Weather Underground using the JFK airport as a reference. The values from the 15-minute data are averaged across the hour for the Ambient Temperature in 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 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 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 > 300 and FG <=0	DQ Level for FG set to 2
QHR	WG >= 200 and QHR < 10	DQ Level for QHR set to 2

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

Data Point	Hourly Data Method	Upper Range Check	Lower Range Check
DG/CHP Generator Output	Sum	2000 kWh	0 kWh
DG/CHP Generator Output Demand	Maximum	3500kW	0 kW
DG/CHP Generator Gas Use	Average	50000 cubic feet/hour	0 cubic feet
Total Facility Purchased Energy	Sum	N/A	N/A
Total Facility Purchased Demand	Maximum	N/A	N/A
Other Facility Gas Use	Sum	N/A	N/A
Unused Heat Recovery	Sum	9000 MBtu	-50 MBtu
Useful Heat Recovery	Average	35000 MBtu	-50 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.

Table 4. Relationship between CDH tags and raw data tags

CDH Tag	Raw Data Tag
G1RT	LIJ.COGEN.CG.1.RET.TEMP
G1ST	LIJ.COGEN.CG.1.SUP.TEMP
G2RT	LIJ.COGEN.CG.2.RET.TEMP
G2ST	LIJ.COGEN.CG.2.SUP.TEMP
G1SF	LIJ.COGEN.HRSG.CG.1.STM.FLOW
G2SF	LIJ.COGEN.HRSG.CG.2.STM.FLOW
G1WRF	LIJ.COGEN.PHX.CGHS1.HWR.FLOW
G1WRT	LIJ.COGEN.PHX.CGHS1.HWR.TEMP
G1WST	LIJ.COGEN.PHX.CGHS1.HWS.TEMP
G2WRF	LIJ.COGEN.PHX.CGHS2.HWR.FLOW
G2WRT	LIJ.COGEN.PHX.CGHS2.HWR.TEMP
G2WST	LIJ.COGEN.PHX.CGHS2.HWS.TEMP
FG	EC.GEN.GAS.METER
G1STO	LIJ.COGEN.HRSG.CG.1.STM.TOTAL
G2STO	LIJ.COGEN.HRSG.CG.2.STM.TOTAL
G2L3N	LIJ.GEG.CG.2:GEN VLT L3 N
G2L2N	LIJ.GEG.CG.2:GEN VLT L2 N
G2L1N	LIJ.GEG.CG.2:GEN VLT L1 N
G2L3L1	LIJ.GEG.CG.2:GEN V L3 L1
G2L2L3	LIJ.GEG.CG.2:GEN V L2 L3
G2L1L2	LIJ.GEG.CG.2:GEN V L1 L2
WG2RE	LIJ.GEG.CG.2:GEN REACT PW
WG2	LIJ.GEG.CG.2:GEN PWR
G2CURL3	LIJ.GEG.CG.2:GEN CURR L3
G2CURL2	LIJ.GEG.CG.2:GEN CURR L2
G2CURL1	LIJ.GEG.CG.2:GEN CURR L1
WG2APP	LIJ.GEG.CG.2:GEN APP PWR
G1L3N	LIJ.GEG.CG.1:GEN VLT L3 N
G1L2N	LIJ.GEG.CG.1:GEN VLT L2 N
G1L1N	LIJ.GEG.CG.1:GEN VLT L1 N
G1L3L1	LIJ.GEG.CG.1:GEN V L3 L1
G1L2L3	LIJ.GEG.CG.1:GEN V L2 L3
G1L1L2	LIJ.GEG.CG.1:GEN V L1 L2
WG1RE	LIJ.GEG.CG.1:GEN REACT PW
WG1	LIJ.GEG.CG.1:GEN PWR
G1CURL3	LIJ.GEG.CG.1:GEN CURR L3
G1CURL2	LIJ.GEG.CG.1:GEN CURR L2
G1CURL1	LIJ.GEG.CG.1:GEN CURR L1
WG1APP	LIJ.GEG.CG.1:GEN APP PWR
G1TOACT	LIJ.GEG.CG.1:TOT ACT OUT
G2TOACT	LIJ.GEG.CG.2:TOT ACT OUT
QHR	Heat recovery
QHD	Heat dumped
TAO	Ambient Temperature

Monitoring Notes

9/10/2009

The site has been posted, Calculation of heat recovery data will be done at a later time when schematics have been provided.

12/10/2009:
Obtained system schematic, heat calculations are now being carried out.

3/18/2011:
Substantially increased range checks and modified relational checks. Fixed an issue with the calculation for useful heat recovery that caused the heat recovered from the water loops to be greater than it should have been. There is also an issue with the water flow data for the first loop that causes the data to continuously read -.11 throughout the data. The second loop periodically drops to -.06. These issues cause the contribution of hot water heat recovery to be much smaller than it should be or negligible in some cases.