East Rochester School District – East Rochester, NY

Data Integrator Initial Data Summary

Data Description

Beginning on June 11, 2008, ATSI began submitting data to CDH Energy data for the East Rochester School District fuel cell plant located in East Rochester, NY. The data is uploaded to CDH once a day and contains 15-minute data for generator power output, facility power import, gas use, and heat recovery use. This document summarizes the data being collected and the remaining questions.

DG/CHP Integrated Data System Channels

Table 1 shows the processed data channels from rawdata used in the DG/CHP Integrated Data System for the CHP system.

Table 1. Data Integrator Database Mapping for East Rochester School District

| Integrated Data System Channel	Units of Measure	Raw Data Row Description [Label][1]	Raw Data Units	Calculation Formula
DG/CHP Generator Output	kWh/int	Fuel Cell output [WFC_kW]	kW	= (WFC_kW) / (60 min/hour ÷ 15 min/int)
DG/CHP Generator Output Demand	kW	Fuel Cell output [WFC_kW]	kW	= WFC_kW
DG/CHP Generator Gas Input	cuft/int	Cumulative Natural Gas consumed [FG]	cf	= FG
Total Facility Purchased Energy	kWh/int	Grid Power [WT_kW]	kW	= (WT_kW) / (60 min/hour ÷ 15 min/int)
Total Facility Purchased Demand	kW	Grid Power [WT_kW]	kW	= WT_kW
Other Facility Gas Use[3]	cuft/int	N/A		
Total Facility Energy	kWh/int	Calculated		
Total Facility Demand	kW	Calculated		
Useful Heat Recovery	MBtu/int	Domestic Hot Water Heat Recovery [QDHW], Boiler Heat Recovery [QB]	Btu	= QDHW + QB
Unused Heat Recovery[3]	MBtu/int	N/A		
Status/Runtime of DG/CHP Generator	Hours	Calculated		
Ambient Temperature[3]	°F	N/A	°F	
Total CHP Efficiency	% LHV	Calculated	N/A	
Electrical Efficiency	% LHV	Calculated	N/A	

[1] – The Raw Data Row Description listed is from the ATSI CSV files, the label, in square brackets, is assigned by CDH Energy and used for reference in the calculation formula.

[2] – Hourly Temperature from wunderground.com for the Rochester Airport in Rochester, NY has been used for the ambient temperature

[3] – There is no data available for this channel from the ATSI data

Data Verification

Figure 1 shows a time series of the Domestic Hot Water Heat Recovery data collected from ATSI. The reported DHW heat recovery has been zero for most of the data collection period, with the exception of a several day period in July (and two shorter periods). It is not known whether the sparse nature of the data is due to an instrumentation issue or is a normal feature of the system operation

Rochester Fuel Cell - Rochester, NY - QDHW - Domestic Hot Water Heat Recovery
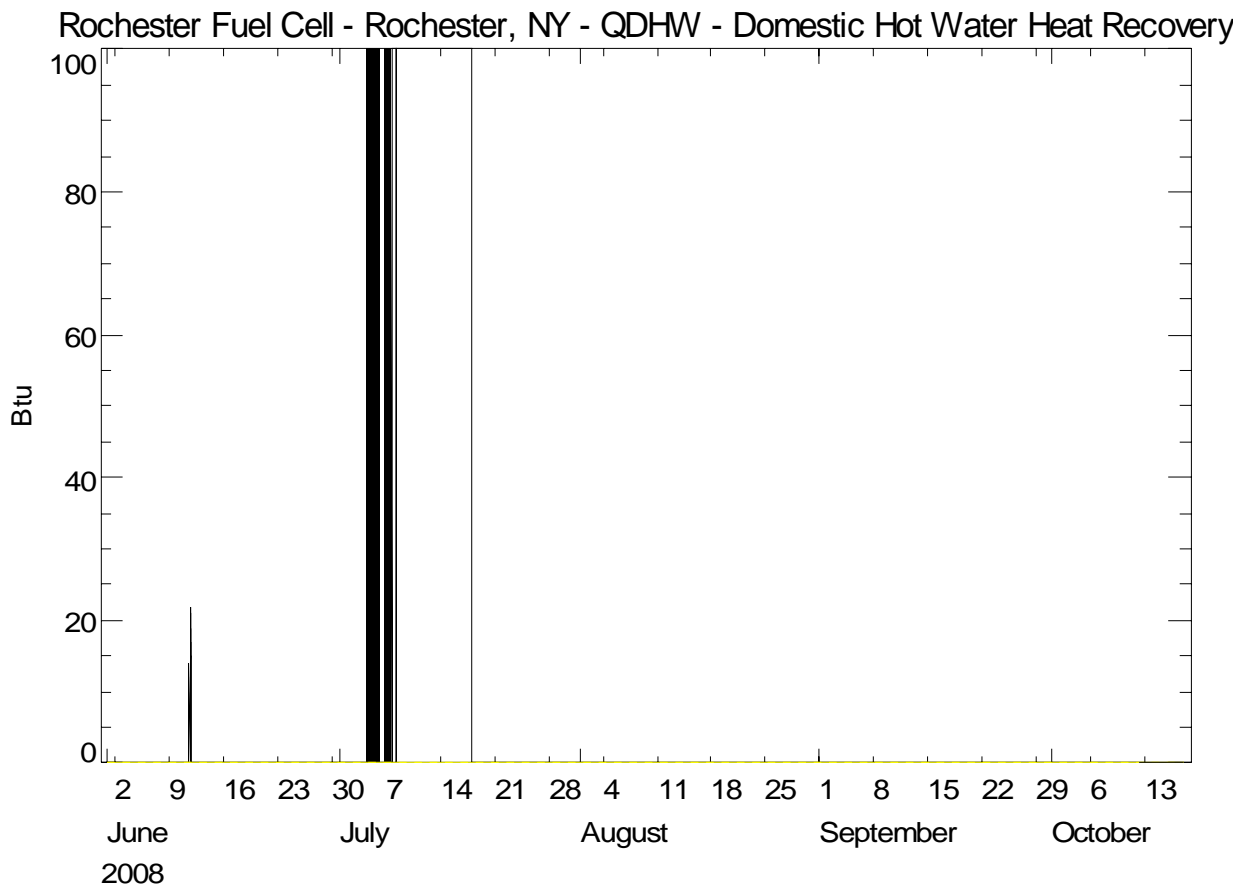
Min: -99.00 Max: 100.00 High Limit: 1000.00 Low Limit: 0.00 # Out Of Range: 6445

Figure 1. Time Series plot of Domestic Hot Water Heat Recovery

Similar to Figure 1, Figure 2 shows a time series of the Boiler Heat Recovery data collected from ATSI. The reported Boiler heat recovery has been zero for most of the data collection period, with the exception of a brief period in June. It is not known whether the sparse nature of the data is due to an instrumentation issue or is a normal feature of the system operation
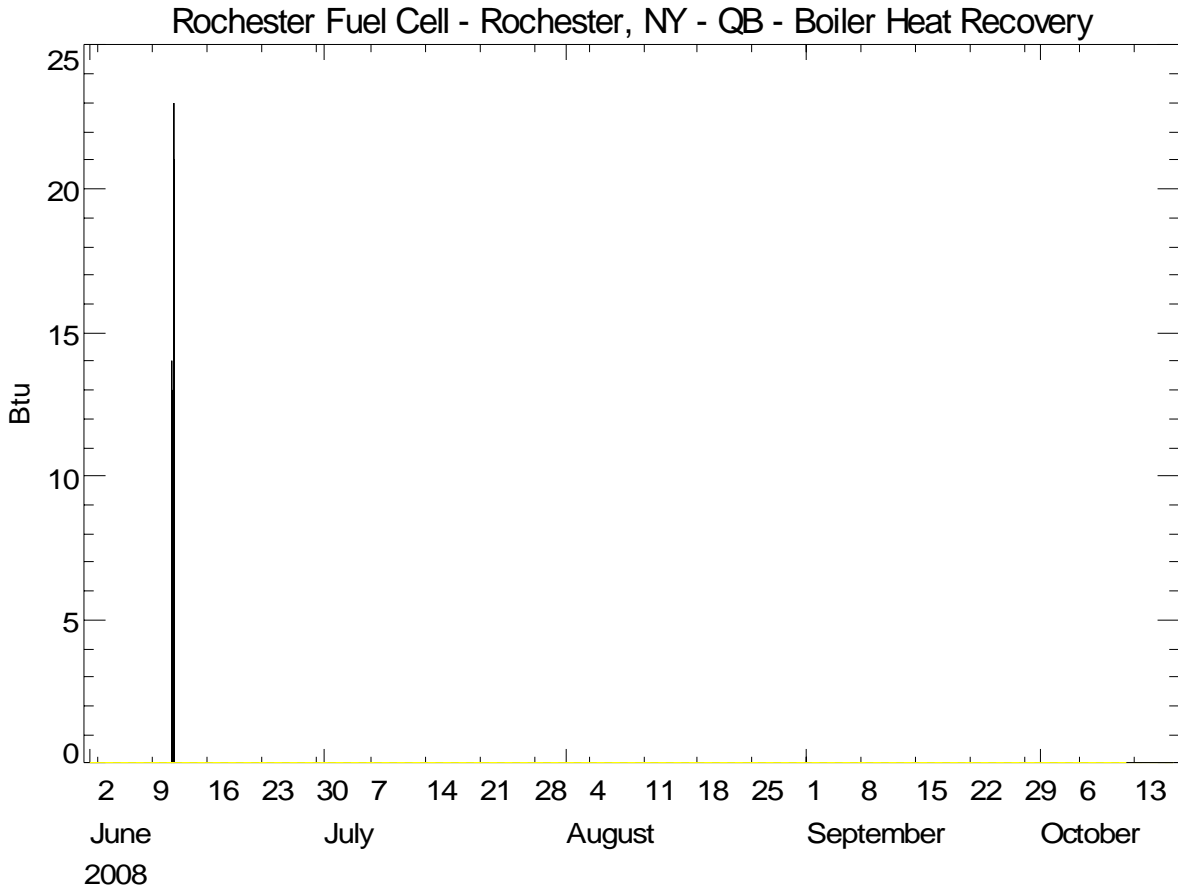
Min: -99.00 Max: 23.00 High Limit: 1000.00 Low Limit: 0.00 # Out Of Range: 6445

Figure 2. Time Series plot of Boiler Heat Recovery

Figure 3 shows time series plots of both the fuel cell output and natural gas consumption.

Fuel Cell output
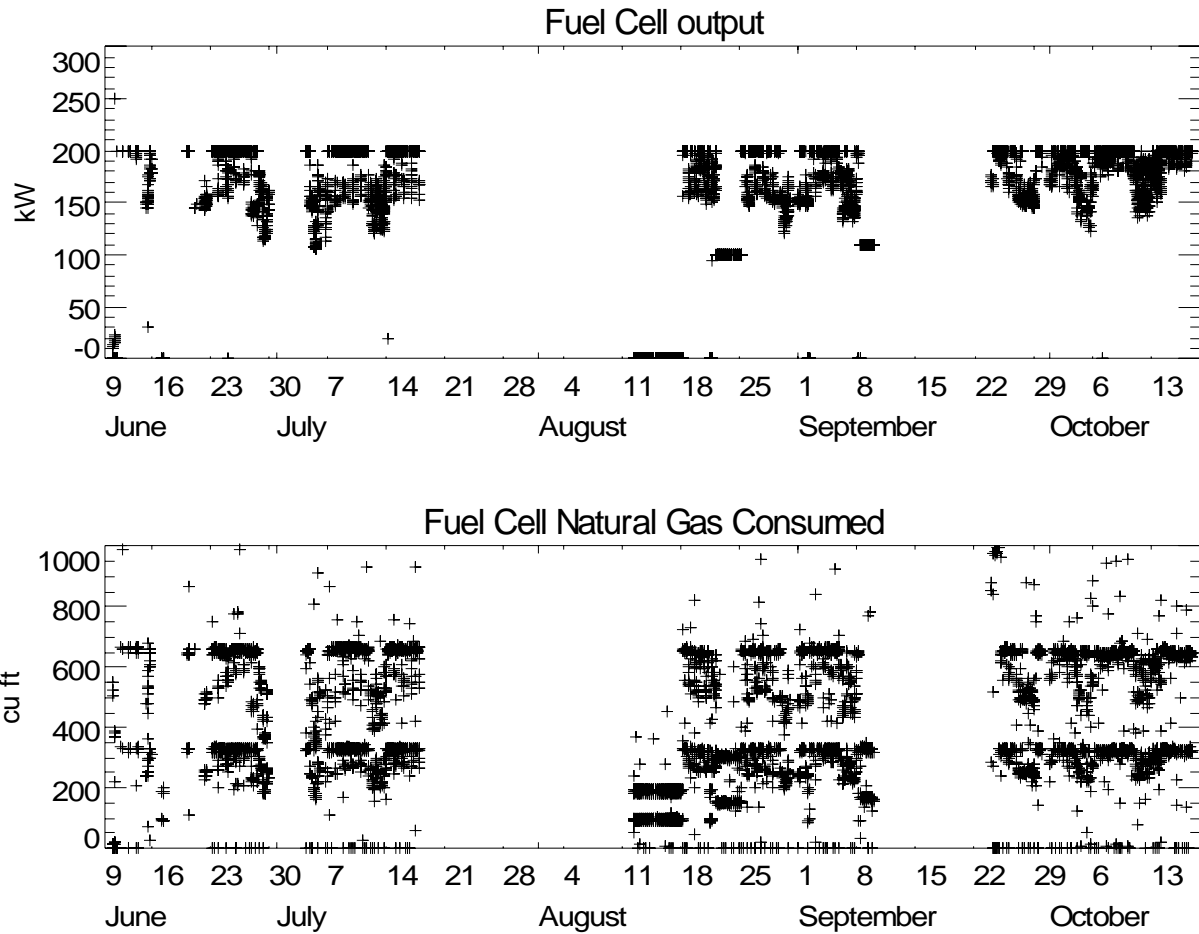

Fuel Cell Natural Gas Consumed

Figure 3. Time Series of Fuel Cell Power Generation and Natural Gas Consumption

The natural gas data at this site is reported as an accumulator. To calculate the gas use per interval, the difference between accumulator values must be calculated. Figure 4 shows a typical daily plot of the raw accumulator data. We see that in the accumulator channel does not continuously increase as is expected. The data file appears to have issues with truncation of accumulator leading digits and also the periodic addition of an extra zero at the end of the accumulator, which makes it look like an order-of-magnitude change from record-to-record.
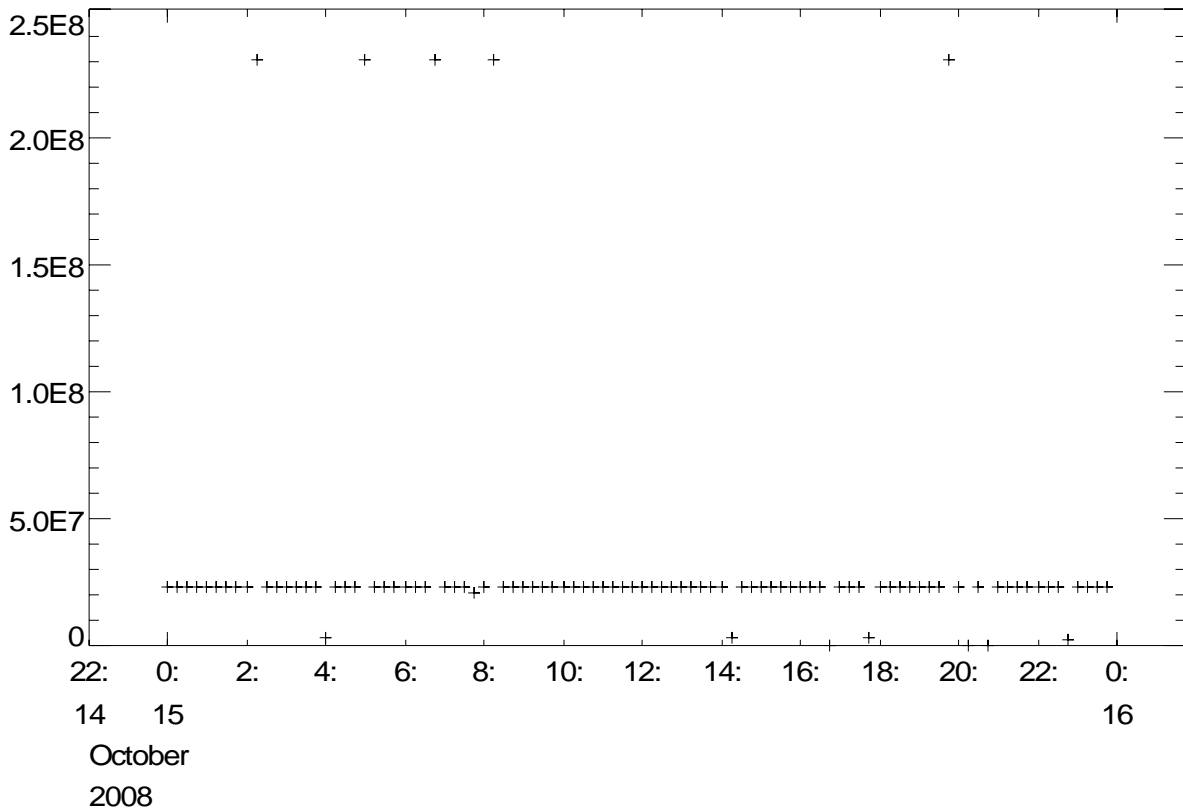

Figure 4. Natural Gas Accumulator Data for a Typical Day (October 15, 2008)

Assumptions

There are no assumptions for this site.

Summary Questions

Here is a summary of the questions from a review of the data set:
1. Is the data collected so far for Domestic Hot Water Heat Recovery and Boiler Heat Recovery correct or is there an instrumentation issue?
2. The Natural Gas accumulator channels reports inconsistent data, can this be fixed?

Recommendations

Data for this site has been added to the DG/CHP Integrated Data System. If ATSI determines there is a problem with either of the heat recovery channels, that data will be marked with a data quality check on the website. The bad natural gas data is currently being trapped by data quality checks.

Data Channel Summary

Table 2. Summary of Data Channels from ATSI

ATSI Data Channel	Units	Column Label	Accumulator	Min	Max	Avg
Fuel Cell output	kW	B	No	0	250.18	161.16
Grid Power	kW	C	No	0	556.91	113.74
Domestic Hot Water Heat Recovery	Btu	D	No	0	100	15.49
Boiler Heat Recovery	Btu	E	No	0	23	0.02
Cumulative Natural Gas consumed	cu ft	F	Yes	0	998	392.47