Monitoring and Verification Plan
For

SUNY Polytechnic Institute
College of Nanoscale Science and Engineering

March 30, 2015

Submitted to:

New York State Energy Research and Development Authority

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Submitted by:

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Introduction

ASI Energy is in the process of installing a fuel cell at the SUNY Polytechnic Institute campus in Albany, NY. The system is based on a Fuji Electric FP-100i, natural gas fueled, phosphoric acid fuel cell with a nominal electrical output rating of 100 kW. The site's electrical demand is sufficient to keep the system operating at its rated capacity on a continuous basis.

The fuel cell is currently installed without useful heat recovery, and all heat is dumped to the atmosphere through a dump radiator installed above the fuel cell container. The installer indicated that useful heat recovery loops may be installed in the future.

Peak operation of the fuel cell will result in the following performance:

Gross Electrical Output:	100 kW
Electrical Efficiency:	42% LHV

Instrumentation

In order to quantify the performance of the proposed fuel cell, the fuel input and gross electrical output must be measured. To capture these energy flows, an instrumentation plan was developed by CDH Energy (CDH) based on system configuration and information provided by the applicant, ASI Energy.

The instrumentation listed below in Table 1 will be installed for use in meeting the NYSERDA fuel cell program monitoring requirements.

Table 1. Instrumentation and Full Data Point List Used for the NYSERDA Website

No.	Data Point	Description	Eng Units	Instrumentation	Output	Location
1	WG	Gross Generator Output	kWh	GE kv2c Meter w/ 400A CTs	KYZ pulse 2-wire 0.16 kWh / pulse	Mechanical Building
2	WG_KW		kW	Calculated		
3	FG	Gas Consumption	cf	Itron Delta 2M Meter	Pulse 1CF / Pulse	Mechanical Building

15-minute data will be collected for the installed instrumentation and will be recorded by an Obvius AcquiLite data logger provided and installed by CDH.

Based on the number of monitored data points, the logger will have sufficient memory to store 30-days of data if communications with the logger are interrupted. The data will be downloaded from the data logger once per day via an internet connection provided by CDH. The data will be loaded into a database, checked for validity, and posted on the NYSERDA web site.

On Site Installation

CDH shall install the data logger equipment inside a 16-inch x 14-inch fiberglass panel. The panel shall be installed by ASI Energy contractors as part of the fuel cell installation effort, be outfit with a 120 VAC 15-amp circuit, and necessary conduit to support communication wiring with the power and gas meters.

Communications

The data logger will connect to the internet via a 3G cellular modem. A dedicated external static IP address will allow access to the logger remotely for configuration purposes. The logger will upload data every night to the CDH servers.

Data Analysis

The collected data will be used to determine the electrical efficiency.

Calculated Quantities

The electrical efficiency of the fuel cell system, based on the lower heating value of the fuel, will be defined as:

$$EFF_{ele} = \frac{3{,}413 \cdot WG}{LHV_{gas} \cdot FG}$$

Where:

- WG - Net generator output (kWh)
- FG - Generator gas consumption (Std CF)
- LHV_{gas} - Lower heating value for natural gas (~927 Btu/CF).