# QUARTERLY PROGRESS REPORT

Assistance Award
DE-EE0000488
Accelerating Acceptance of Fuel Cell Backup Power Systems

**SUBMITTED BY**

Plug Power
968 Albany-Shaker Road
Latham, NY 12110

**PRINCIPAL INVESTIGATOR**

Jim Petrecky
518.817.9124
James_Petrecky@plugpower.com

**SUBMITTED TO**

U. S. Department of Energy
Fuel Cell Technologies Office
Reg Tyler
Reg.Tyler@go.doe.gov

**REPORTING PERIOD**

03/31/14 – 05/31/14
Final Report

**SUBMITTED ON**

July 21, 2014

## Table of Contents


1. Project Goals/Objectives ..... 1
2. Background ..... 1
3. Accomplishments ..... 2
4. Progress and Status ..... 4
5. Plans for Next Quarter ..... 12
6. Products ..... 13
   - A. Publications, Conference Papers, and Presentations ..... 13
   - B. Inventions, Patent Applications, and Licenses ..... 13
   - C. Website(s) ..... 13
7. Changes or Problems ..... 13
   - A. Scope Issues ..... 13
   - B. Schedule Delays ..... 13
   - C. Changes that have a Significant Impact on Expenditures ..... 17
8. Schedule Progress ..... 17
9. Spending Progress ..... 18

# 1. Project Goals/Objectives

**Specific Project Objectives**

1. Increase distributed power generation
2. Improve reliability and efficiency of mission critical backup power
3. Decrease fossil fuel dependencies for power generation

The team will accomplish these objectives by building and deploying twenty low-temperature PEM, LPG GenSys fuel cell systems to critical applications in DOD facilities in the US. Prior changes to the original statement of work consisted of demonstrating the system's ability to run and be controlled on hydrogen and eliminating the hydrogen start and run requirement in the twenty deployed systems. The systems will operate in grid assurance mode, backing up the grid at critical facilities on the DOD sites.

**ARRA Objectives Over Project Life**

- Create new jobs as well as save existing ones; spur economic activity
    - Plug Power - Engineering, Testing, Sales, Marketing, Program Management
- Accelerating the commercialization and deployment of fuel cells, fuel cell manufacturing, installation, maintenance, and support services
    - Plug Power - Engineering, Testing, Sales, Marketing, Program Management
    - Supply Chain - DANA, BASF, 3M, etc.
    - Other Partners – IdaTech, site installation support
- Demonstrate market viability and increase market pull of fuel cell systems within our government customers/partners
    - Increase distributed power generation - deploy 20 GenSys systems
    - Improve reliability and efficiency of mission critical backup power (>72 hours)
    - Decrease fossil fuel dependencies for power generation

# 2. Background

Since 2001, Plug Power has installed more than 800 stationary fuel cell systems worldwide. Plug Power's prime power systems have produced approximately 6.5 million kilowatt hours of electricity and have accumulated more than 2.5 million operating hours. Intermittent, or backup, power products have been deployed with telecommunications carriers and government and utility customers in North and South America, Europe, the United Kingdom, Japan and South Africa. Some of the largest material handling operations in North America are currently using the company's motive power units in fuel cell-powered forklifts for their warehouses, distribution centers and manufacturing facilities.

The low-temperature GenSys fuel cell system provides remote, off-grid and primary power where grid power is unreliable or nonexistent. Built reliable and designed rugged, low- temperature GenSys delivers continuous or backup power through even the most extreme conditions. Coupled with high-efficiency ratings, low-temperature GenSys reduces operating costs making it an economical solution for prime power requirements. Currently, field trials at telecommunication and industrial sites across the globe are proving the advantages of fuel cells—lower maintenance, fuel costs and emissions, as well as longer life—compared with traditional internal combustion engines.

## Extended Backup Power


| Backup Power | Extended Backup Power | Continuous Power |
|---|---|---|
| • Hydrogen fueled | • LPG fueled | • LPG fueled |
| • Start time < 1 minute | • Readily available backup | • Start time = 3 hours |
| • Run time = 4 hours | • **Run time = indefinite** | • Run time = indefinite |

# 3. Accomplishments

## Accomplishments Previously Reported

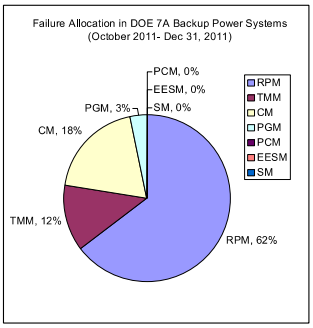
- A demonstration of 10 GenSys units in a backup application at Warner Robins, GA for approximately 16 months.
- The Warner Robins fleet achieved metrics including 13,506 operating hours, 39.07 MW-hr electricity produced, and electrical efficiency = 25.4%
- The Warner Robins fleet successfully completed a simulated network outage and provided lighting power to the facilities for 30 minutes.
- The Warner Robins site has been completely decommissioned and returned to its original condition on April 4, 2013.
- Installation of Ft. Irwin fleet on July 7, 2012. We received approval to start the fleet on October 22, 2013.
- The Ft. Irwin fleet has been operating since the first week of November.
- Failure Mode Definitiion

**Definition of failure modes, failure signatures / symptoms for early detection and recover**

- RPM: ATO timeout waiting for catalyst activation
- CM: Electronic board failures, some possible connection to software.
- RPM: Loss of fuel flow (related to flow meter/valve issues)
- TMM: Coolant Leak, loss of coolant
- RPM: Anode Air Pump failed to start, known issue
- RPM: Gas leak during commissioning
- CM: Unknown, attributed to electronic boards
- RPM: Fuel Flow, issue with occasional dropout or flow spikes
- PGM: Max Low Cell Trips, stack protection due to either CO or cell performance
- RPM: Desulfurization needed excessive time for conditioning/equilibration.
- CM: Firmware update and boot failure

**Module Acronyms**

| | |
|---|---|
| RPM | Reactive Processing |
| TMM | Thermal Management |
| CM | Controls & Electronics |
| PGM | Power Generation |
| PCM | Power Controls |
| EESM | Electrical Energy Storage |
| SM | Structure |



- Plug Power obtained permitting from Southern California Edison.
- The Ft. Irwin fleet was started in the first week of November and has been running since.

| Ft. Irwin Q1 2014 Metrics | | | |
|---|---|---|---|
| **Month** | **Fuel Consumption** | **Power Produced** | **Operation** |
| | **liters propane** | **kW-hr** | **Hrs** |
| January 2014 | 1,595,672.7 | 4,234.7 | 4,440.3 |
| February 2014 | 2,131,906.2 | 6,136.5 | 5,526.8 |
| March 2014 | 1,968,738.2 | 5,201.3 | 5,219.8 |
| **Totals** | **5,696,317.1** | **15,572.4** | **15,186.9** |

| | | |
|---|---|---|
| **Gallons LP** | 5,642.7 | |
| **kW-hr per gal LP** | 2.8 | Includes startup/purge |

## Accomplishments This Quarter

The following chart shows the system status and power output for the 10 GenSys units for the second quarter of 2014:

| Ft. Irwin Q1 2014 Metrics | | | |
|---|---|---|---|
| **Month** | **Fuel Consumption** | **Power Produced** | **Operation** |
| | **liters propane** | **kW-hr** | **Hrs** |
| April 2014 | 965,846.18 | 2658.47 | 2549.14 |

- Fort Irwin fleet has been decommissioned as of April 30, 2014
- Fort Irwin site has been completely restored and all equipment removed

The following chart shows the system status and power output for the 10 GenSys units for the full demonstration:

| Ft. Irwin Demonstration Metrics | | | |
|---|---|---|---|
| **Month** | **Fuel Consumption** | **Power Produced** | **Operation** |
| | **liters propane** | **kW-hr** | **Hrs** |
| November 2013 | 1,266,282.6 | 3,726.2 | 3,282.3 |
| December 2013 | 1,431,396.4 | 4,300.3 | 3,533.0 |
| January 2014 | 1,595,672.7 | 4,234.7 | 4,440.3 |
| February 2014 | 2,131,906.2 | 6,136.5 | 5,526.8 |
| March 2014 | 1,968,738.2 | 5,201.3 | 5,219.8 |
| April 2014 | 965,846.18 | 2658.47 | 2549.14 |
| **Totals** | **9359842.26** | **26257.43** | **24551.37** |

| | | |
|---|---|---|
| **Gallons LP** | 9,271.8 | |
| **kW-hr per gal LP** | 2.83 | Includes startup/purge |

| | | |
|---|---|---|
| Gas Conversion | 35.7 | cu ft gas / gallon LP |
| | 1,009.5 | Liters gas / gallon LP |

**Key Outcomes, Findings, Developments, Conclusions**

- Permitting can vary GREATLY from site to site. Plug Power experienced no issues setting up the Warner Robins site and running the units in a grid parallel configuration. The permitting process in Georgia was very straightforward with simple answers to the scope, safety, and purpose. The permitting process in California was a wild goose chase that ultimately ended with the utility company stating that we had to adhere to a policy that had not been published. In the end we modified the method that the units were connected to the building in a grid independent configuration.

## 4. Progress and Status

The following outlines the activities conducted against each current task:

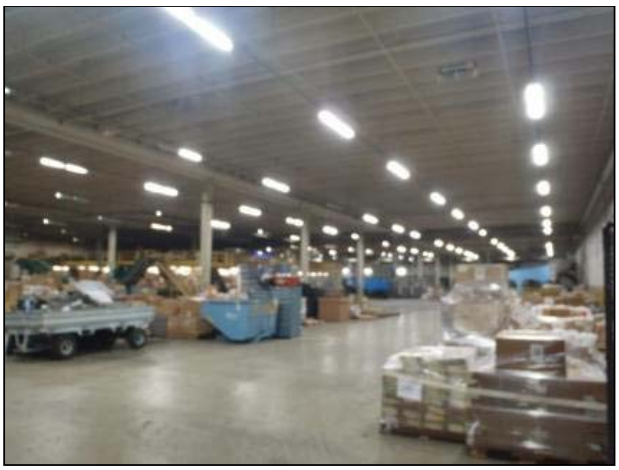
**Tasks 1, 6&7: Project Management, Reporting and Closeout**

Complete. Program is closed.

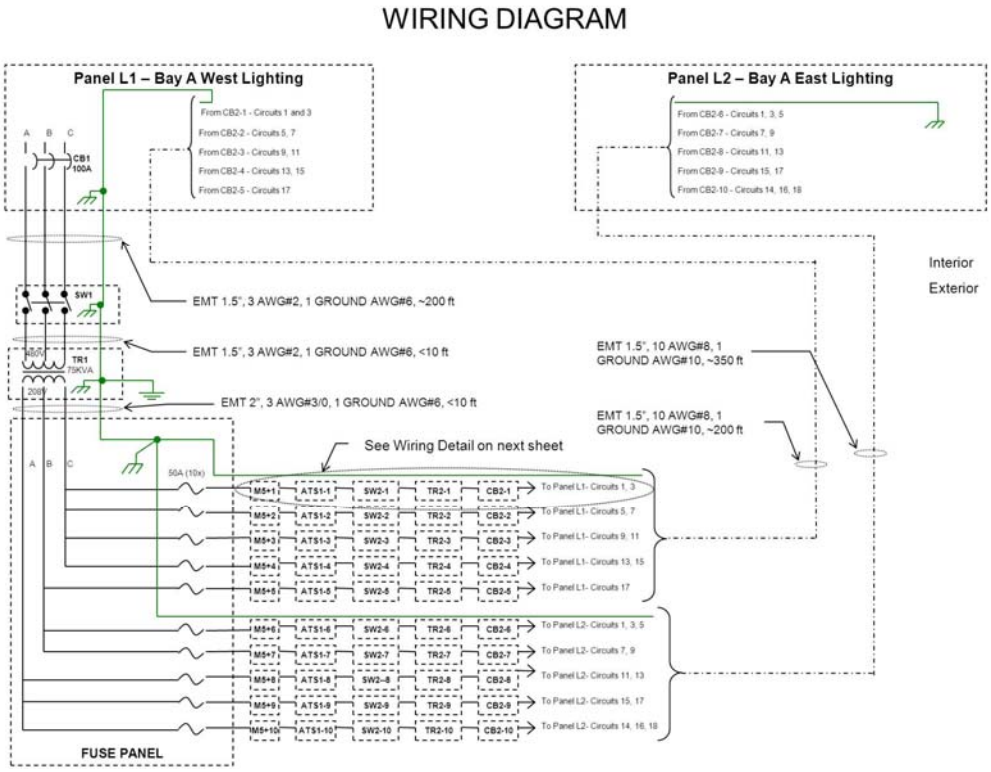
**Tasks 2&3: Site Specific Planning and Engineering**

***Robins Air Force Base (RAFB) – Site Identification***

The site that was chosen was the Defense Distribution Depot. The fleet was intended to provide backup lighting at the Air Logistics Center.

Systems provided backup to all overhead lighting circuits in Bay A, as outlined below.

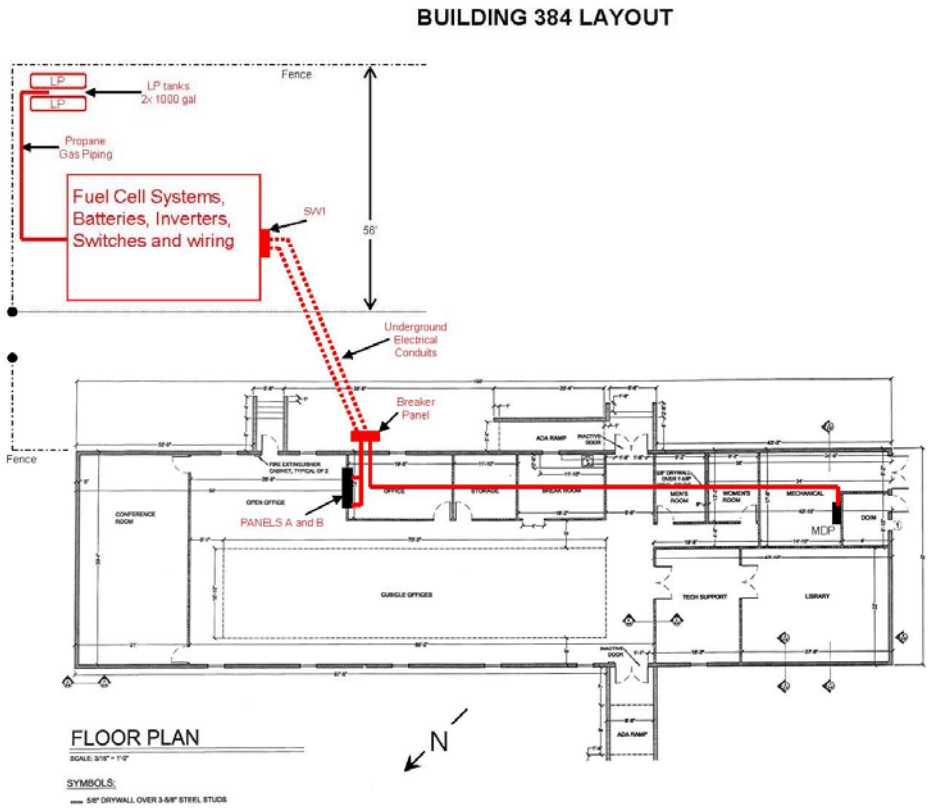


### *Fort Irwin National Training Center (FINTC) – Site Identification*

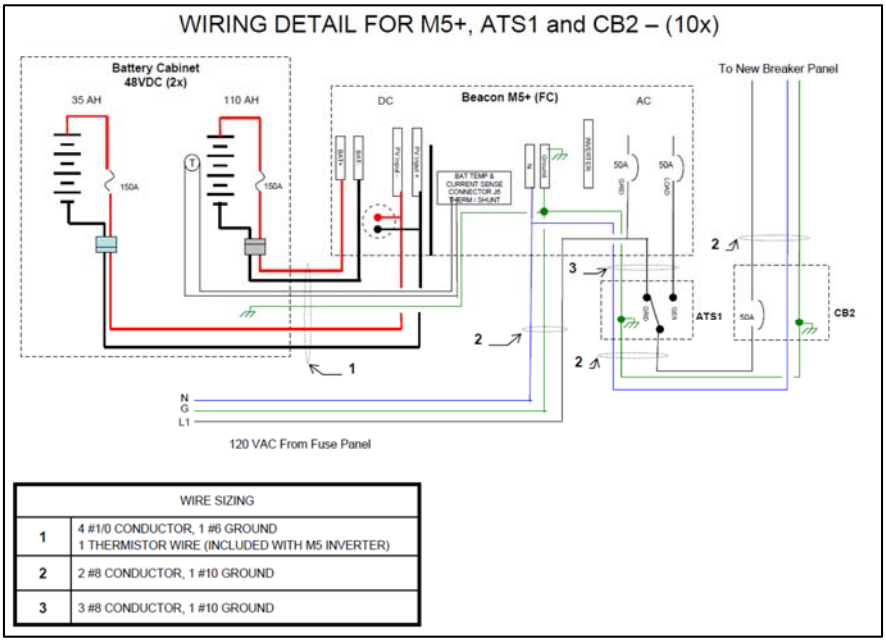
The site that was chosen was Building 384, an Engineering building which is mission critical if there is an emergency. There is an interest for this building to have the lowest environmental footprint. It has already been designed to include high efficiency lighting and solar light pipes.

### *FINTC – Site Planning*

The following drawing shows the location of the fuel cell fleet, the electrical connections, and the fueling infrastructure.



Additionally, the inverter wiring diagram was provided to plan for interconnection with the grid infrastructure at the site.




| WIRE SIZING | |
|---|---|
| 1 | 4 #1/0 CONDUCTOR, 1 #6 GROUND<br>1 THERMISTOR WIRE (INCLUDED WITH M5 INVERTER) |
| 2 | 2 #8 CONDUCTOR, 1 #10 GROUND |
| 3 | 3 #8 CONDUCTOR, 1 #10 GROUND |

## Task 4: Build, Test, Ship

Complete. All 20 systems were built, successfully tested, and shipped.

## Task 5: Fleet Operation

### *RAFB – Installation*

Installation occurred as pictured below.

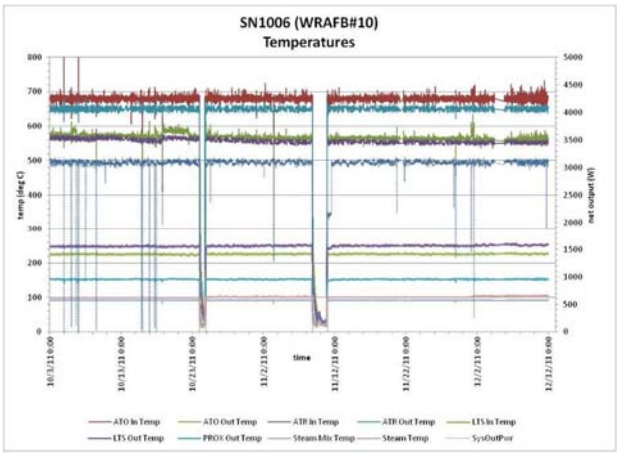
### *RAFB – Operation*

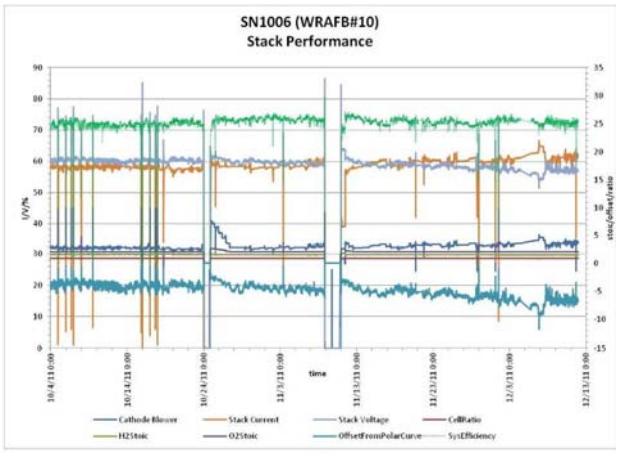
The final operating numbers for RAFB were:

- 13,506 operating hours
- 39.07 MW-hr electricity produced
- Electrical efficiency = 25.4%

### *RAFB - Demonstration / Maintenance*

Over the program, the stack performance and reformer performance was monitored using onboard data collection. We were able to identify failure signatures to aid in recovery before shutdown.

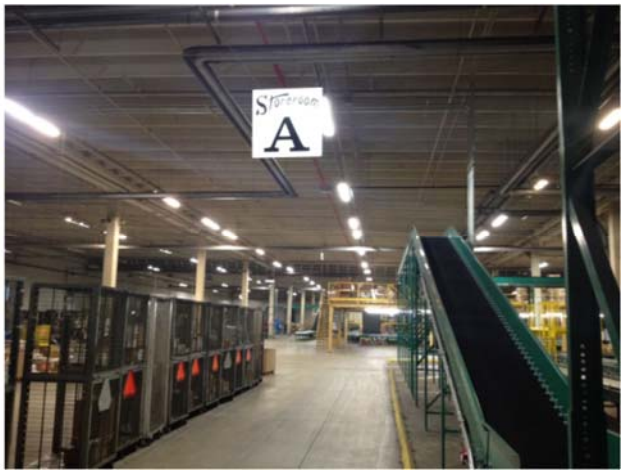


### *RAFB – Network Outage Simulation*

A network outage simulation occurred on Saturday, Jan 19th, 2013 at 5:00 PM. The details are below:

- Fuel cells powered the lighting in the building without issue.
- Commercial utility power was turned off - main disconnect switch SW1
- Within ~20s, the relays transferred and lighting was restored by fuel cell system power
- Network outage simulation was roughly 30 minutes



### *RAFB – Site Decommissioning*

As of April 4th, the site has been completely restored. The site was operating for 16 months.



### *Ft. Irwin National Training Center (FINTC) – Installation*

Installation occurred as pictured below.


### *FINTC – Operation*

The final operating numbers for Warner Robins were:

- 15,187 operating hours
- 15.6 MW-hr electricity produced
- Overall availability >77%

### *FINTC - Demonstration / Maintenance*

Over the program, system operation was monitored in real time using remote service interface software. We were able to identify failure signatures and respond proactively to increase overall reliability.

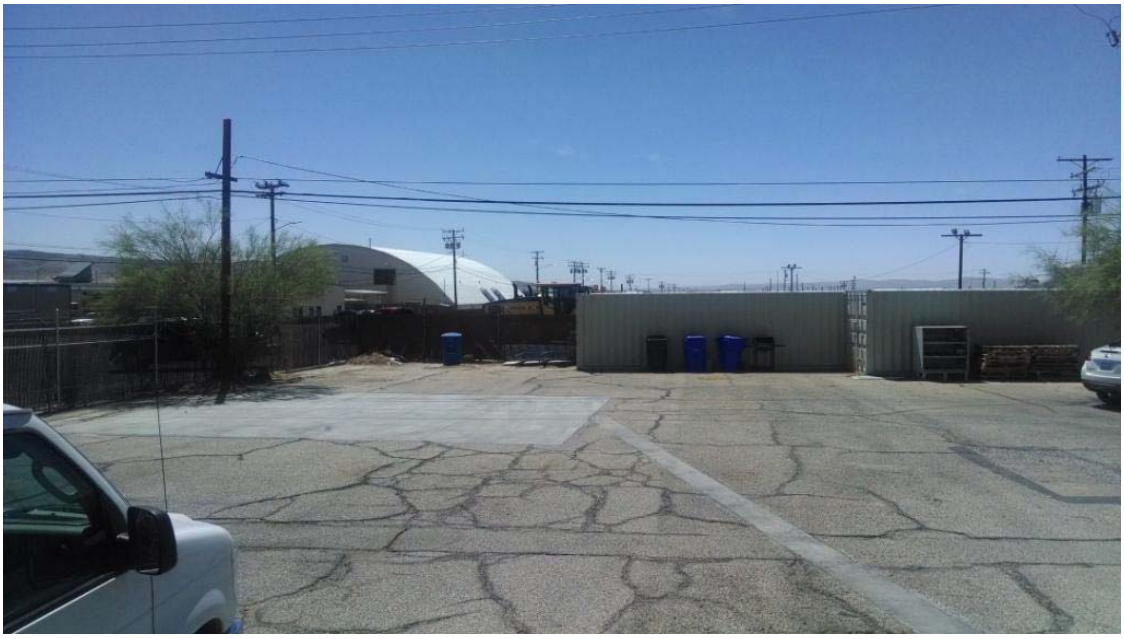

### *FINTC – Network Outage Simulation*

A network outage simulation occurred on Tuesday, April 8th at 11 AM. The details are below:

- Fuel cells powered the lighting in the building without issue.
- Commercial utility power was turned off - main disconnect switch SW1
- Within ~20s, the relays transferred and lighting was restored by fuel cell system power
- Network outage simulation was roughly 30 minutes

***FINTC – Site Decommissioning***

As of May 9th, 2014, the site has been completely restored. The site was operational for 6 months.



## 5. Plans for Next Quarter

None. Program is closed

## 6. Products

### A. Publications, Conference Papers, and Presentations

A presentation entitled "H2RA007_PETRECKY_2013_o" was given at the 2013 Annual Merit Review in Washington, DC. The DOE has a record of this presentation.

### B. Inventions, Patent Applications, and Licenses

None.

### C. Website(s)

None.

## 7. Changes or Problems

### D. Scope Issues

Permitting

### E. Schedule Delays

The permitting interconnection process with the utility has taken longer than expected. This permitting process for Ft. Irwin has been a very different experience from Warner Robins. Plug Power will prepare lessons learned following the permit. (**Note:** This summary is from mid-2013.)

After a very lengthy permitting application process, Southern California Edison has been unwilling to allow the fuel cell fleet to be grid parallel as many other programs in other locations have been configured. The fuel cells were commissioned for over a year.

**Ft. Irwin Application Rejection**

Chris Ashley (Plug Power employee managing the installation and service of this site) talked with Peter Gianotti on 6/14. Peter explained that there is a problem with our configuration because there are batteries tied in parallel with the grid. He said this is a problem because there is the potential for batteries to be charged at a low rate overnight and then discharged during peak times during the day. If established as a precedent it could adversely impact rates to all customers in California. Chris had never heard of this requirement in >10 years of installing grid parallel systems. Chris was told that this is in Rule 21 and NEM guidelines but we could not find any documents or references.

Chris provided additional information about the site setup to specifically answer the questions posed about exporting power from the batteries to the grid ---- The Beacon M5 Plus Inverter is not designed to feed battery power to the grid. While the grid is on the batteries are connected only so that they can be charged and properly maintained so that they are ready to provide backup power in the event of grid failure and a subsequent fuel cell failure. The batteries are used for 2 purposes and only while in critical backup mode (when grid is off): (1) To quickly absorb transients in load power. The fuel cell is load following but transitions very slowly when compared to batteries. For example, when the load changes

from 1kW to 3kW, it takes the fuel cell up to 5 minutes to ramp up and make the transition. Battery power is readily available so it is used while the fuel cell is ramping up. (2) To provide additional power to critical loads in the event of a fuel cell failure. The batteries are sized to provide about 1 hour of critical backup at 4kW. Most of the critical load circuits at Bldg 384 are about 2kW so we anticipate the batteries will be able to handle these loads for about 2 hours on average.

We volunteered many times to meet SCE at the site to discuss the details in person. The application was rejected on 6/18/13.

## Ft. Irwin POC's Response to the Rejection

Hossam Kassab, Engineering Directorate of Public Works Resource Efficiency Manager, has been very helpful in making our case to SCE. On 6/20, Hossam wrote to SCE "Fort Irwin is contesting SCE's rejection of our interconnect application for the 50 KW fuel cell in building #384. Fort Irwin is in disagreement with SCE whom are enforcing a rule which is not yet published in any of the PSC's NEM guidelines, nor in Rule 21. Fort Irwin do not understand how SCE can expect compliance with a rule that has no written guidelines to follow. Also, this issue which is not a rule was mentioned very late in the application process. Our interpretation of this issue is that when batteries are tied in parallel with the grid, there is a potential for the batteries to be charged at off-peak rates overnight and then discharged during peak times overnight. This can never happen with our system… The batteries, which are technically tied in parallel with the grid, will not ever export directly to the grid. The inverter is not designed to export power from the batteries; it is designed to use the batteries as a secondary backup power source in the event of grid failure and a subsequent fuel cell failure. The size of the battery banks are only 110 amp hours, which will only provide 1-2 hours of backup time if the grid and the fuel cell are both unavailable. Again, the inverter will not ever use battery power for grid export." Muhammad A. Bari, Director Public Works made the same assessment. Both emails are attached.

## Resubmission of Interconnect Application

We are in process of resubmitting the interconnect application to show that we will not produce power in parallel with the grid. Peter Giannotti sent an application template for Plug Power to fill out. We submitted a Generating Facility Interconnection Application (GFIA). This new approach will not allow the fuel cells, batteries or inverter to synchronize or export to the grid. All generation devices will be isolated by the EGS100 Automatic Transfer Switch. SCE responded and stated that we need to resubmit through the Rule 21 application. Since nothing to this point has been acceptable, we've pursued discussing the proposed changes with Peter Giannotti to make sure that what is included in the application will be acceptable to SCE. However, SCE would not review anything unless there is an official application. Plug Power prepared the application with the following information.

## Information Provided by Plug Power during Initial Application

- SCE Generating Facility Interconnection Application
- Scope of Work for Fuel Cell Installation
- Project Scope
- Description of Work
- Proposed Location and Building Layout
- Concrete Pad Detail
- Equipment Grounding Detail
- Location of Fuel Cell Systems, Gas Piping, and Electrical Components
- Site Electrical Wiring Diagram

- Inverter Electrical Wiring Diagram
- Equipment List and Specification
- Contractor Requirements
- Building Plans for Original Construction of Building 384
- Map of Existing Renewable Energy Currently Installed at Fort Irwin
- Safety Plan and Emergency Procedure for GenSys Fuel Cell Fleet at Fort Irwin Building 384

## Information Requested by SCE After Application Submission

(Note: The following is a request from SCE.)

- Entire map of Fort Irwin's interconnected generation
- As indicated in your application: The basic level of detail which will be required to proceed with the technical review of this application can be summarized by the following statement, which can be found towards the bottom of that page (5 of 14): "If the answer is operating mode option 1, "parallel operation," please supply all of the information requested for the Generating Facility. Be sure to supply adequate information including diagrams and written descriptions regarding the protective relays that will be used to detect faults or abnormal operating conditions on SCE's Distribution System." A complete and comprehensive single line diagram of the entire generating facility's electrical configuration will be required. Once we have these documents, Field Engineering can proceed with the technical review, at which point we will be able to ascertain if additional information will be required.

  **The application indicates that this is for *inadvertent export* option and will therefore require substantially more detailed information to ensure compliance of all tariffs and standards. The items below provide insight as to the minimum level of detail that will be required before Field Engineering can proceed with the technical review:**

- For the inadvertent export option it will be required to demonstrate how the unscheduled and uncompensated export of real power from a Generating Facility (GF) for a duration exceeding two seconds but less than 60 seconds will be accomplished. The application indicates that the power factor range is 0.8 min to 0.8 max. Please note that a 0.9 power factor may be required and validation of such requirement may be requested.

- **Single Line Diagram**
  This should be a comprehensive diagram of the complete electrical configuration of the entire facility; including all connected loads; make and model information of all pertinent electrical components. Means of AC disconnect should be clearly identified as well.
  AC directional overcurrent protection and a ground detector or grounding bank may be required when selecting Inadvertent Export option; all of these components must be included in diagrams.

- **Three Line Diagram**
  The three Line Diagram may be required for detailed protection study and is essentially the three line representation of the Single Line Diagram with phase and polarity identification details.

- **Elementary Diagram**
  The Elementary Diagram should also be a comprehensive representation of the entire facility containing information of all components electrically connected.

- **Plot Plan Drawing**
  The drawings previously submitted contain some information but the Plot Plan will need to be updated to include physical location and distances of all components.

- **Relay Diagram**
  As specifically stated in the application, "If the answer is operating mode option 1, 'parallel operation,' please supply all of the information requested for the Generating Facility. Be sure to supply adequate information including diagrams and written descriptions regarding protective relays that will be used to detect faults or abnormal operating conditions on SCE's Distribution System."

- **Proposed Relay Settings**
  For the *inadvertent export* option it will be required to demonstrate how the unscheduled and uncompensated export of real power from a Generating Facility (GF) for a duration exceeding two seconds but less than 60 seconds will be accomplished. Please refer to section H, Protective Function Requirements, of Rule 21 to ensure compliance of settings' requirements.
  The application states, "An automatic transfer switch will be installed to facilitate the transfer of power from grid parallel to grid independent mode." Details to ensure that the automatic transfer switch and scheme comply with Rule 21 requirements will be required.

- **Relay test report** will be required once the proposed relay settings have been reviewed and approved by Protection Engineering.

  After many rounds of communications with SCE, they responded with "Due to the type of operation for GFID 7205, which is an isolated operation, the commissioning test will not be necessary. Therefore, SCE approves the documentation of the operation and compliance with Rule 21 for this project."

  The application was resubmitted August 22nd, 2013. It was reviewed by SCE and deemed complete September 6th, 2013. New information in the application includes the following:

- Generating Facility Interconnect Application for fuel cells installed at Building 384, Fort Irwin.
- Fort Irwin 384_FC As Built_20130801.pdf – details of the installation including functional descriptions and wiring diagrams
- EGS100 Transfer Switch.pdf – Operation and Maintenance Manual for the EGS100 Automatic Transfer Switch (ATS)
- These fuel cells will act as the primary power source to all circuits in Building 384 except for the HVAC systems. The fuel cells will be isolated from the grid and never operate in parallel with the grid. The grid will be used as the secondary power source or as backup; the EGS100 ATS will facilitate the transfer from fuel cell power to grid power.

  The permit was provided October 22nd, 2013.

### F. Lessons learned from permitting process

***Lesson #1: Misinterpretation of site configurations can heavily stall alt power sites***

- The permitting process was held up by non-compliance to a rule that was not published or in Rule 21, which calls out Net Metering situations.
- The grid-parallel configuration (with transfer switch) was not acceptable because the utility believed the site would take 40 car batteries' worth of power off the grid at night (low cost) and put it on the grid during the day (high price).
- We were given a list of drawings/reports that could not be collected or generated for the site.

***Lesson #2: More charges may impact grid-parallel backup value propositions.***

- Utilities are now charging a standby charge.
    - Customer Charge (flat)
    - Energy Charge – different rates for time of use (on peak, mid peak, off peak)
    - Demand Charge – related to the maximum amount of energy used
    - Standby Charge – "…represents the entire reserved capacity needed for SCE to serve the customer's load regularly served by the customer's generating facility when such facility experiences a partial or complete outage." [Reserve Capacity]
- This Standby Charge will likely affect the value propositions for backup, intermittent, or potentially other alternative power sources by adding another charge to what is expected to be removed from the grid.

### G. Changes that have a Significant Impact on Expenditures

Permitting had a very significant impact on the expenditures of the program. Plug Power spent over 15 months trying to obtain permitting from Southern California Edison. Additional expenditures included labor for creating documents that were requested by the utility.

## 8. Schedule Progress

The budget has been consumed.

| Task | Project Milestones | Milestome Completion Date | | | | DOE Funding | | Progress Notes |
|---|---|---|---|---|---|---|---|---|
| | | Original Planned | Revised Planned | Actual | Percent Complete | Original Planned | Cumulative Actual | |
| 1 | Project Management, Reporting and Closeout, Tasks 1, 6 & 7 | 7/31/12 | | | 100% | $283,790 | $283,790 | Ongoing |
| 2 | Site Specific Planning and Engineering, Tasks 2 & 3 | 6/30/10 | 5/1/12 | | 100% | $405,397 | $405,397 | Ongoing |
| 4a | Fleet 1A, Build, Test, Ship | 7/31/10 | 10/1/11 | | 100% | $391,884 | $391,884 | Complete |
| 4b | Fleet 1B, Build, Test, Ship | 1/31/11 | 10/1/11 | | 100% | $391,884 | $391,884 | Complete |
| 4c | Fleet 2A, Build, Test, Ship | 6/30/11 | 4/25/12 | | 100% | $391,884 | $391,884 | Complete |
| 4d | Fleet 2B, Build, Test, Ship | 12/31/11 | 4/25/12 | | 100% | $391,884 | $391,884 | Complete |
| 5 | Fleet Operations and Reporting, Task 5 | 6/30/12 | | | 100% | $445,936 | $445,936 | Ongoing |

## 9. Spending Progress

The budget has been consumed.

| Quarter | From | To | Federal Share of Outlays | Recipient Share of Outlays | Cumulative Recipient Share of Outlays | Cumulative for Project |
|---|---|---|---|---|---|---|
| 2Q09 | Start | 6/30/09 | $2,884 | $2,884 | $2,884 | $5,768 |
| 3Q09 | 1/1/10 | 9/30/09 | $157,251 | $157,251 | $160,135 | $320,270 |
| 4Q09 | 4/1/10 | 12/31/09 | $512,625 | $509,740 | $672,759 | $1,345,518 |
| 1Q10 | 7/31/10 | 3/31/10 | $174,638 | $174,638 | $847,397 | $1,694,794 |
| 2Q10 | 10/1/10 | 6/30/10 | $67,802 | $67,802 | $915,199 | $1,830,398 |
| 3Q10 | 1/1/11 | 9/30/10 | $34,671 | $34,671 | $949,870 | $1,899,740 |
| 4Q10 | 4/1/11 | 12/31/10 | $60,801 | $60,801 | $1,010,669 | $2,021,338 |
| 1Q11 | 7/31/11 | 3/31/11 | $160,033 | $160,033 | $1,170,702 | $2,341,404 |
| 2Q11 | 10/1/11 | 6/30/11 | $283,682 | $283,682 | $1,454,384 | $2,908,768 |
| 3Q11 | 1/1/12 | 9/30/11 | $315,695 | $315,695 | $1,770,079 | $3,540,158 |
| 4Q11 | 4/1/12 | 12/31/11 | $114,739 | $114,739 | $1,884,821 | $3,769,641 |
| 1Q12 | 7/1/12 | 3/31/12 | $240,796 | $240,796 | $2,125,617 | $4,251,233 |
| 2Q12 | 10/1/12 | 6/30/12 | $173,596 | $173,596 | $2,299,212 | $4,598,424 |
| 3Q12 | 1/1/13 | 9/30/12 | $112,279 | $112,279 | $2,411,491 | $4,822,981 |
| 4Q12 | 10/1/13 | 12/31/12 | $59,957 | $59,957 | $2,467,458 | $4,942,896 |
| 1Q13 | 1/1/13 | 3/31/13 | $75,539 | $75,539 | $2,546,986 | $5,093,973 |
| 2Q13 | 4/1/13 | 6/30/13 | $45,086 | $45,086 | $2,592,072 | $5,184,144 |
| 3Q13 | 7/1/13 | 9/30/13 | $54,869 | $54,869 | $2,646,941 | $5,293,882 |
| 4Q13 | 10/1/13 | 12/31/13 | $55,718 | $55,718 | $2,702,659 | $5,405,318 |

Plug Power continued to operate this demonstration without government funding in Q1 and Q2 2014.