Hydrogen and Fuel Cells for Resiliency: Fuel Cells for Telecom (Renewable H2)

March 17, 2016
Housekeeping

All participants are in “Listen-Only” mode. Select “Use Mic & Speakers” to avoid toll charges and use your computer’s VOIP capabilities. Or select “Use Telephone” and enter your PIN onto your phone key pad.

Submit your questions at any time by typing in the Question Box and hitting Send.

This webinar is being recorded.

You will find a recording of this webinar, as well as previous Resilient Power Project webinars, online at:

www.resilient-power.org
Resilient Power Project

- Increase public/private investment in clean, resilient power systems
- Engage city officials to develop resilient power policies/programs
- Protect low-income and vulnerable communities
- Focus on affordable housing and critical public facilities
- Advocate for state and federal supportive policies and programs
- Technical assistance for pre-development costs to help agencies/project developers get deals done
- See [www.resilient-power.org](http://www.resilient-power.org) for reports, newsletters, webinars, and more.
RESILIENT POWER PROJECT

To reduce impacts and dangers of power outages in communities now and in the future, the Resilient Power Project works to provide technology and policy solutions to address three challenges: Community Resiliency, Climate Adaptation, and Climate Mitigation.

With the Resilient Power Project, Clean Energy Group and Meridian Institute are working to accelerate market development of clean energy technologies for resilient power applications that serve low-income communities and vulnerable populations during disasters and power disruptions, and to address climate adaptation and mitigation goals through expansion of reliable renewable energy deployment. To reduce impacts and dangers of power outages in communities now and in the future, the Resilient Power Project works to provide technology and policy solutions to address three challenges facing the country: Community Resiliency, Climate Adaptation, and Climate Mitigation.

Clean Energy Group's role in this process is to help inform, coordinate, and support federal, state, and local officials, policy makers and developers with the goal of deploying resilient power projects in communities across the country. In addition to providing program guidance to policy makers and limited technical assistance funding for project development, we also process grants and maintain an online resource.
Northeast Electrochemical Energy Storage Cluster (NEESC)

NEESC is a network of industry, academic, government and non-governmental leaders working together to help businesses provide energy storage solutions.

www.neesc.org
Today’s Guest Speakers

• **Corinne Vita**, Sales Director, Major Accounts, Altergy

• **Thomas Browning**, Sr. Manager, Engineering Field, T-Mobile
Alteryg Systems

Fuel Cells for Onsite – On Demand Telecom Power

Corinnae Vita
NEECS Webinar
March 2016
Climate Change Brings More Severe Weather

- In New York, 60 Altergy Systems fuel cells successfully backed up cell sites after hurricane Sandy knocked out utility power to 8.1 million customers.
- Snowstorms, tornados, thunderstorms
- Earthquakes – 20 Altergy fuel cells provided cell site power during Napa earthquake
Challenges for Telecom and Cable Networks

- Avoid power outages and disruption of service to customers
- FCC 8 hour backup power regulations after Katrina for cell sites, broadband networks for internet and VoIP phones
- Long runtime needs to fit site space/weight requirements
- Attractive Total Cost of Ownership
  - Federal Investment Tax Credits
  - State utility incentives
- Sustainable, clean, low environmental impact
- No Maintenance – reduce operational costs
What Are Industry Professionals Saying?

- Reported issues with batteries
  - Unpredictable and short run times
  - Prone to capacity and performance degradation
  - Temperature sensitivity
  - Power output is mass-dependent
    - High capacity batteries are extremely large and heavy
    - Weight/space limitations
  - High disposal costs
  - Recurring costs for replacement cycles

Compared with battery systems, fuel cells offer longer continuous run times. They also don't need to be recharged, and they're more durable in harsh environments.

Photo courtesy of the National Renewable Energy Laboratory
What Are Industry Professionals Saying?

- Reported issues with generators
- High maintenance costs
- Toxic emissions
- Noise
- Mechanical failure
- Reliability/Failure to start
- Permitting difficulties for rooftop deployments
- Emissions/Regulatory Permits and costs

Compared with generators, fuel cells are easier to maintain because they have fewer moving parts and can be monitored remotely. They’re also quiet and produce fewer emissions.

Photo courtesy of the National Renewable Energy Laboratory
Fuel Cells - Abundant Clean and Green Power

• Fuel Cell - An electrochemical device that combines hydrogen and oxygen to produce electricity - PEM Proton Exchange Membrane
  • No combustion, no emissions
  • Clean, Quiet
• Reliable - No moving parts
• Quick start operation – used in data centers, telecom, cable networks, and cars Toyota, GM, Honda, fork lifts, buses
• Low Maintenance, much lighter and compact than battery generator equivalents, install on rooftops
• Environmentally Friendly – hydrogen is simplest most abundant element in the universe
• No temperature sensitivity like batteries, runs -40oC to +40oC
• Long runtime, small footprint
• Incentives, Grants, Rebates
Hydrogen – Simplest, Most Abundant Element

- A clear, odorless gas. Excellent energy carrier
- Non polluting - when consumed its only emission is pure water
- Lightest element - highest energy content per weight
  - Pound for pound, it contains almost three times as much energy as natural gas
- Economically competitive – can be 60% less expensive than diesel fuel
- Safe - 50 year use history and safety record
  - Diffuses rapidly -14 x lighter than air
  - Gasoline 22X more explosive, natural gas 5X
- Produced in any country, from variety of sources
  - Renewable: Solar, wind, geothermal, hydro, biomass, algae
  - Traditional: Natural gas, gasoline, nuclear, coal, water
- Used in oil production, chemical, foods, electronics industries
- Transported by truck, rail, barge and pipeline

» Widely available
Hydrogen is widely available

- The availability profile for Air Gas
- There are at least 4 other national suppliers with even greater distribution
Altergy Freedom Power – The New Standard
55kW Rooftop Placement of Fuel Cells and Hydrogen Storage
Data Center Powered by Multiple Altergy FPSs

Altergy’s *Freedom Power* System mounted to top of rack replaces grid and eliminates backup, infrastructure and conversion.
Alteryg’s Market Leading Freedom Power Systems

- Revolutionary Fuel Cell **Design and Robotic Assembly**: 
  - Design breaks the **reliability** and **cost** barrier to commercialization 
  - Robotic factory assembled and tested 
  - Provides for durable, robust construction 
  - Allows production on world’s first and only automated, robotic fuel cell assembly line 
    - Individual cell every ~ 30 seconds 
    - Complete fuel cell engine in minutes 
    - Assures consistent high quality 
    - Assures capacity for your needs 
  - Meets stringent US/International certification and listing requirements 
  - Modular design powers kW to MW 
  - Trusted in critical applications
Thank You!

- We have the largest deployed fleet in telecom
  - More than 8.3 million watts deployed
  - Field operating time exceeds 32 million hours

**Altergy Freedom Power™**

*The most reliable, cost effective power solution available*

www.altergy.com
MetroPCS (Now T-Mobile) South Florida Fuel Cell Project

Thomas Browning
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March 17th, 2016
The FCC Mandate

- The Katrina Panel
- The FCC Mandates 8 hours of backup
- Exceptions allowed, but not defined
The Problem

● High call volumes + Low cost service provider =
  ● High power consumption
  ● Space constraints
● Power consumption approaching 15KW
● Rooftop sites and the weight considerations
● 140 Mph Wind Load requirement (now 170+ Mph)
● 8 Hour mandate put on hold, but moved forward anyway
Challenging Dimensions

- **Requirements:**
  - Must fit in two 26” x 26” spaces
  - Must provide 15KW of nominal power
- 100+ candidates identified
- Altergy Systems awarded contract
- 300+ hydrogen systems purchased for 100+ sites
Project Challenges

- One of the largest (if not the single largest) deployment of fuel cells at the time
- Educating the jurisdictions
- Getting the first permit through
- Moving candidates to friendlier jurisdictions
- You want me to put a lightning rod where?
Refueling Considerations

- Fill in place or bottle swaps?
- Rent or purchase bottles?
- High or low pressure?
- Composite or steel tanks?
- 6 and 9 bottle steel tank configurations
- What about the rooftops?
- Creating a bottle swap process
Operation Considerations

- Altergy alarmed at 40% fuel capacity
- Typical costs for maintenance and refueling have been low ($571 per site for 2010)
- Power outages have been primary contributor to fuel consumption
- Quite and seamless integration
- Generators have been considerably more expensive and significantly less reliable to maintain ($1,024 per site during 2010)
- Run times have been exceptional
- Worked with Altergy to train local contractors:
  - Repair / reconfigurations
  - Refueling and maintenance
- Completed 40+ reconfigurations without incident
Moving Forward

- Converted most sites to a dual voltage fuel cell that would support both CDMA and 4G LTE requirements
- Scalability and tank configurations
- Cell site power demands are generally declining
- More tax incentives please
Questions?
Q&A

**Moderator**: Todd Olinsky-Paul, Project Director, Clean Energy Group

- **Corinne Vita**, Sales Director, Major Accounts, Altergy
- **Thomas Browning**, Sr. Manager, Engineering Field, T-Mobile
- **Rick Burant**, Vice President of Sales, Altergy
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