

Fuel Cells and RPSs: An Introduction

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Clean Energy States Alliance

June 9, 2011



This Webinar

- ▶ Part of a series sponsored and organized by:
 - US Department of Energy Fuel Cell Technologies Program
 - Clean Energy States Alliance
 - Technology Transition Corporation
- ▶ Also briefing papers and materials for state policymakers and others on the Hydrogen and Fuel Cells Project page at www.cleanenergystates.org
- ▶ To get on the Hydrogen listserv, send an email with your contact info to Maria@cleanegroup.org with “Hydrogen Listserv” in the subject.



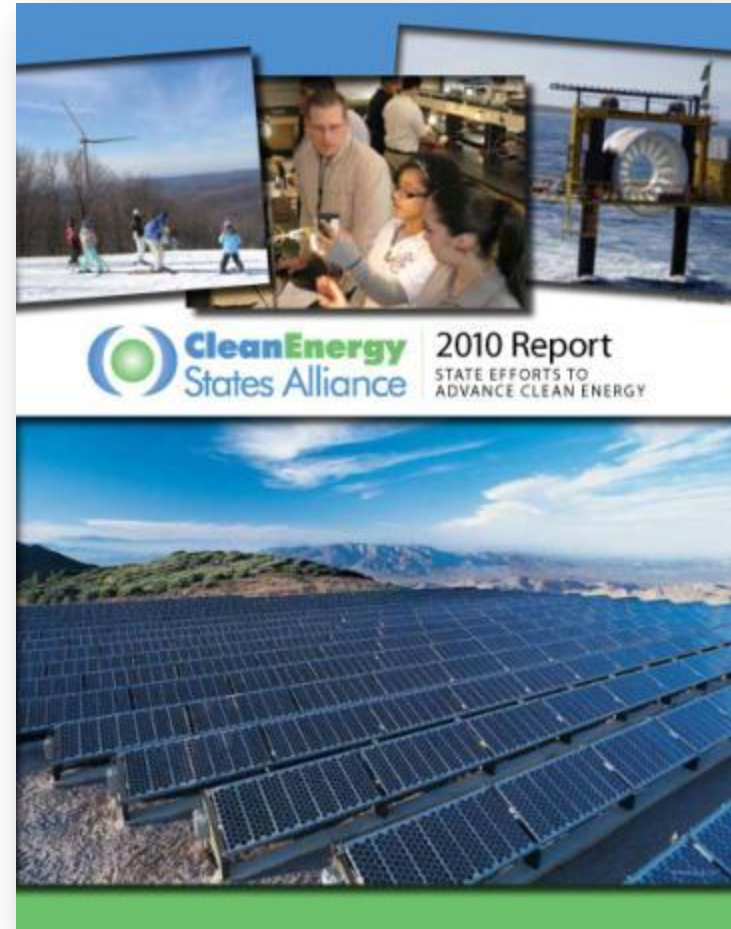
- ▶ The State-Federal RPS Collaborative
 - Webinars, monthly newsletter, annual RPS Summit
 - For state policymakers and others
 - Funded by US DOE and the Energy Foundation
- ▶ See more information on the State-Federal RPS Collaborative Project page on the CESA website (www.cleanenergystates.org).
- ▶ To get on the RPS Collaborative listserv, send an email with your contact info to Maria@cleanegroup.org with “RPS Listserv” in the subject.



What is CESA?

- ▶ A nonprofit coalition of state and sub-national clean energy funds and programs working together to develop and promote clean energy technologies and markets.

www.cleanenergystates.org



Renewable Portfolio Standards

- ▶ Require that a certain share of electricity come from specified clean energy sources
- ▶ Sometimes called Renewable Electricity Standards
- ▶ In 29 states, plus the District of Columbia and Puerto Rico
- ▶ Currently, the most important state-based policy mechanism for promoting clean energy generation

RPSs and Fuel Cells

- ▶ Many states allow fuel cells to qualify when they use renewable fuels
- ▶ Only six states (CT, ME, MN, NY, OH, PA) allow fuel cells that use natural gas as the fuel
- ▶ The timing may be right for more states to consider including natural gas-powered fuel cells



The Argument against Including Natural Gas Fuel Cells in an RPS

- ▶ Natural gas is a fossil fuel

The Argument for Including Natural Gas Fuel Cells in an RPS

- ▶ Can be cleaner, more climate friendly than other fossil fuel generation
- ▶ States highly interested in economic development and local jobs from clean energy
- ▶ The Commerce Clause of the Constitution can make it difficult to focus an RPS on in-state projects (see recent CESA report)
- ▶ An emphasis on distributed generation (DG) can be a way to focus on in-state projects
- ▶ Natural gas fuel cells can be a way to expand the range of eligible DG technologies
 - **Few constraints on location**
 - **A way for businesses and institutions to benefit from the RPS**
 - **Base-load power**

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FuelCell Energy

Fuel Cells and Renewable Portfolio Standards

Webinar hosted by the Clean Energy States Alliance, the US Department of Energy, and the Technology Transition Corporation

Frank Wolak, Vice President, FuelCell Energy, Inc.

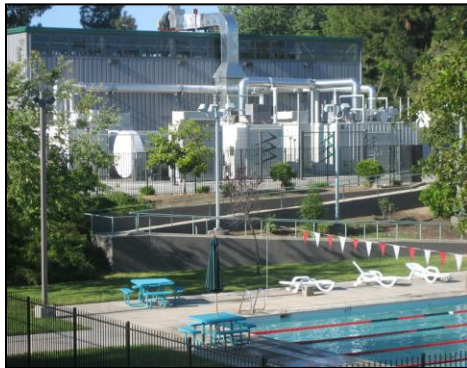
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Ultra-Clean, Efficient, Reliable Power



- FuelCell Energy (FCE)
- The Benefits of Fuel Cells
- Considerations for a Comprehensive Clean Energy Portfolio
- Q&A





Worlds Leading Manufacturer and Operator of Fuel Cell Systems

Founded 1969, Public Offering 1992

Global Client Base, Strong Global Partners

Strong Support of Institutional/Mutual Fund Holders

Component of Six Financial Indexes

Corporate Office, Research & Engineering

Research and Design Center

Global Operations and Service Center

450 Total Employees

Manufacturing

Cell Production, Module Assembly

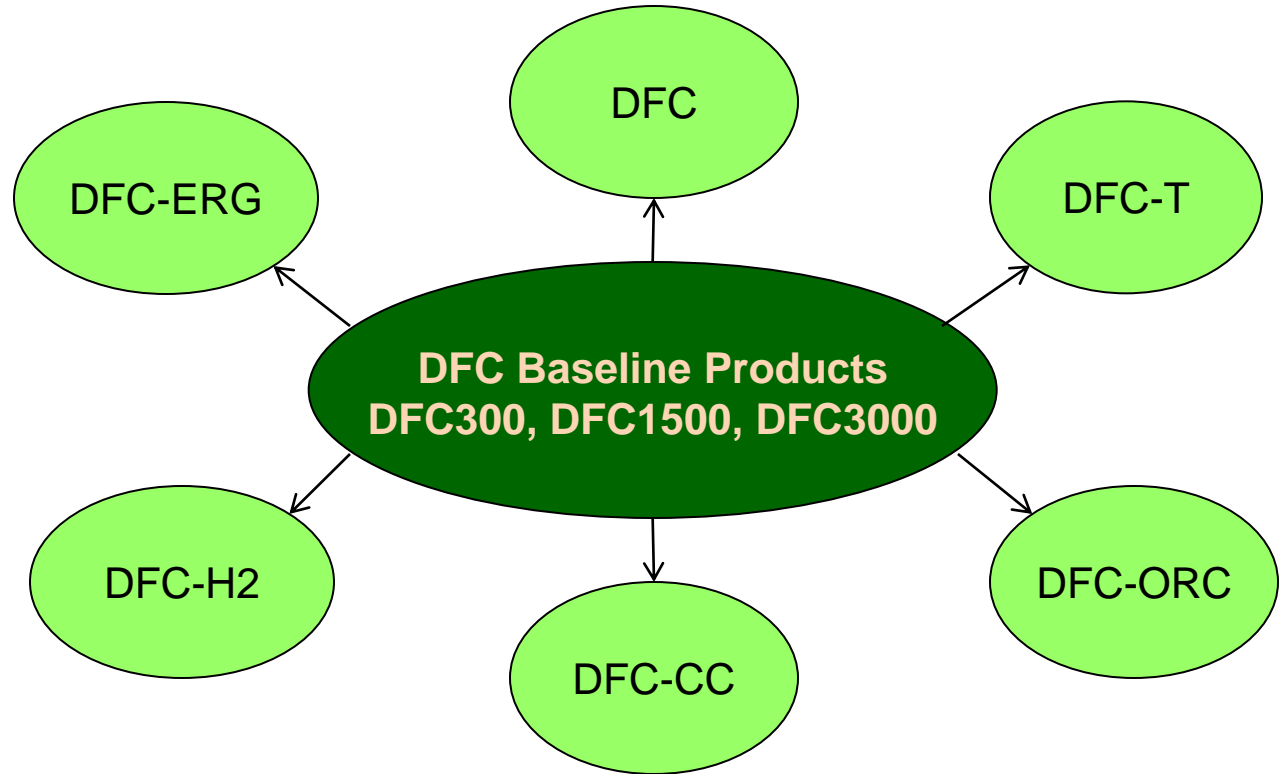
65,000 ft² Facility, Opened in 2001

90 MW Capacity, Expandable to 150 MW





Fuel Cells – A Technology Platform



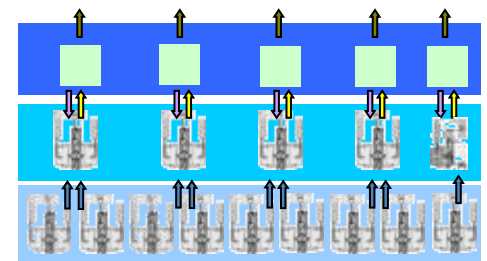
DFC-ERG



DFC-ERG



DFC-H2



DFC-CC



Fuel Cell Benefits to a Portfolio

- Ultra-clean, efficient and reliable power
 - > Continuous and secure baseload power
 - > Complements intermittent wind and solar
 - > Does not require transmission grid
- Near-zero NO_x, SO_x and particulate matter emissions
 - > Allows siting in congested/urban areas
- Higher electrical efficiency than competing technologies
 - > 47% to 70% electrical efficiency, up to 90% with combined heat & power (CHP)
 - > Efficiency drives economics
- Distributed generation - power where needed
 - > Enables smart grid



1.4 MW power plant



2.8 MW power plant



11.2 MW power plant



- Operation on Renewable Fuels – Multiple Benefits
- DFC plants convert waste problems into ultra-clean power



End market:	Wastewater	Food & Beverage	Agriculture	Landfill Gas
Applications:	Municipal water treatment facilities	Food processing and breweries	Ranches & farms using animal and plant waste	Landfills
Key attributes:	Emissions, Sustainability, Reliability, Support RPS	Waste disposal solution, Sustainability, Energy security	Waste disposal solution, Sustainability, Energy security	Waste disposal solution, Emissions, Supports RPS



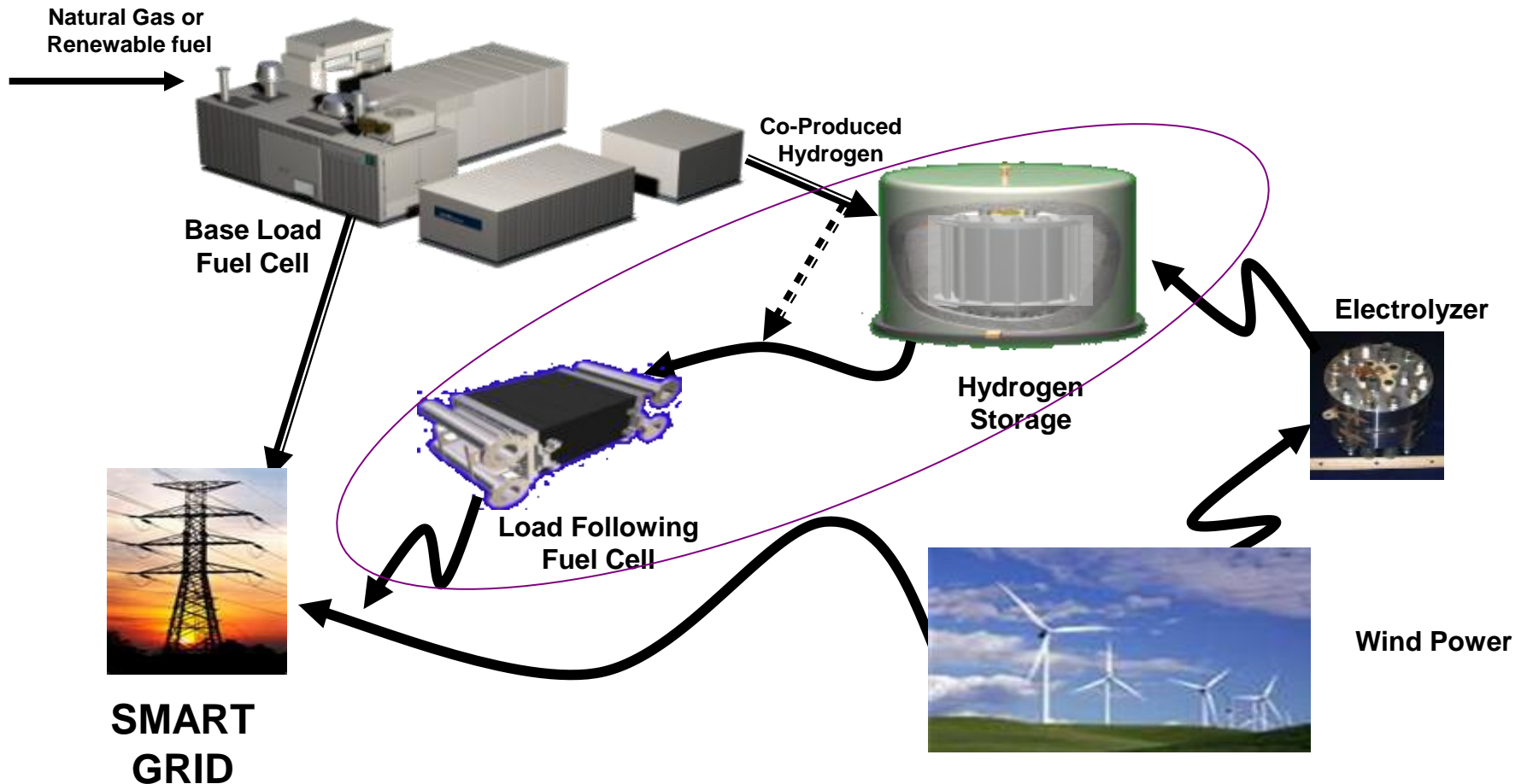
- **RPS' are progressive policy:** Evolution and Improvement are essential to achieve political, environmental, economic and technology goals.
- **Traditional Renewable Technologies do not always meet the multiple RPS goals.** Renewable is not always clean, or practical in localized applications.
- **We are becoming more electric intensive:** Renewable energy, efficient of production electricity and grid factors will be more intertwined.



- **Among the spectrum of technologies available to an RPS, fuel cells on natural gas offer compelling attributes:**
 - Lower cost and predictable energy delivery
 - Contributes to lowering total carbon and carbon separation
 - Distributed generation benefits not available at the bulk or wholesale level
 - Federal Tax Treatment that leverages precious State monies
 - Generation that is cleaner than biofuel or biomass combustion



DFC-H2[®] Peaker - Compliments Smart Grid





- Korean Model of New and Renewable Portfolio Standard
 - Recognizes the mix of national economic and renewable energy desires
 - Fuel cells on Natural Gas (LNG) are included
 - Base market RPS rate plus a technology multiplier
 - Similar features in Federal Clean Energy Standard proposed legislation
- Floor Price for all technologies with Additional Price Components for specific economic or environmental attributes
 - A Cents/kwh for Economic Content
 - B Cents/kwh for Zero Emissions
 - C Cents/kwh for Low Emissions (California CARB 2007 Standards)
 - D Cents/kwh for power provided during peak periods
 - E Cents/kwh for Minimum CHP efficiency
 - F Cents/kwh for Other Features (i.e. Brownfields, Economic Zones, State/Public facilities)



FuelCell Energy

Thank you for your participation!

Questions & Answers

**Contact: Frank Wolak
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Ultra-Clean, Efficient, Reliable Power

NYSERDA's RPS Customer Sited Tier Fuel Cell Program



NYSERDA Programs to Support Fuel Cells

- Power Systems Research, Technology and Product Development Program
 - Experimental Fuel Cell Systems
 - Lab Scale
 - Early Stage Prototypes
- Manufacturing Technology Development and On-Site Power Applications Program
 - Early Stage Commercially Available Systems
 - Certified Fuel Cells

NYSERDA Programs to Install Fuel Cells

- Increase Customer Awareness
 - Distributed Generation as Combined Heat and Power
 - Risk Sharing
 - Early Stage Commercially Available Systems
 - Renewable Portfolio Standard (RPS) Customer Sited Tier (CST) Fuel Cell Program
 - Resource Acquisition
 - Certified Fuel Cell Systems

Rationale for Including Fuel Cells in NY State RPS Customer Sited Tier (CST) Program

- Efficient Means of Electric Generation (~40-50%)
- Very Low Emissions
- Continuous and Dispatchable Power
- Can be Sited in Sizeable Quantities in Load Pocket Areas
- Provides Some Geographic Balance

New York's RPS CST Fuel Cell Program

- PON 2157 available at www.nyserda.org
- Program Details
 - \$21.6 Million through 2015
 - Programs for Large and Small Continuous Duty Fuel Cells
 - 25 kW or less is considered a small fuel cell
 - ANSI Certified Fuel Cell Systems
 - Appendix E: List of Eligible Fuel Cell Systems
 - Appendix F: Request to Added to the List of Eligible Systems
 - Commercial Warranty (3 Year Minimum)
 - Sites Must Pay the RPS Surcharge
 - Continuous Enrollment

CST Large Fuel Cell Program

- \$1 Million Funding Cap for Systems Larger than 25kW
- Capacity Incentives
 - \$1,000 per kW
 - Up to \$200,000 per Project Site
- Bonus Capacity Incentive for Sites of Essential Public Service
 - \$500 per kW
 - Up to \$100,000 per Project Site
- Performance Incentives (3 Annual Payments)
 - Annual Capacity Factor Must be Greater than or Equal to 50%
 - \$0.15 per net kWh
 - Up to \$300,000 per Year per Project Site

NYSERDA Fuel Cell Program

Essential Public Services

- Emergency Services
 - Fire
 - Police
 - Ambulance/Emergency Medical Services
- Health Care Services
 - Hospitals
- Communication Services
- Food Distribution/Retail
- Fuel Distribution/Retail

CST Small Fuel Cell Program

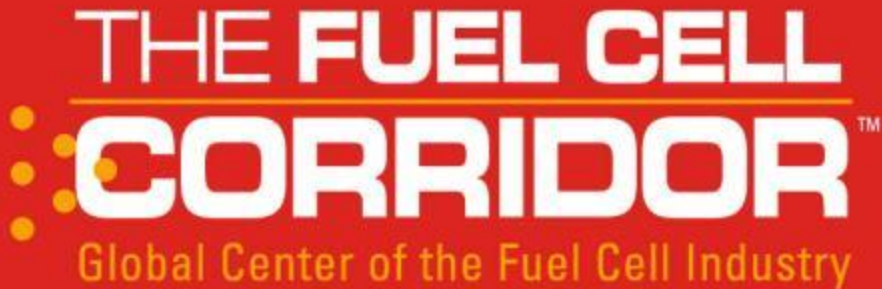
- \$50K Funding Cap for Systems 25kW or Less
- Performance Incentives Only (3 Annual Payments)
 - Annual Capacity Factor Must be Greater than or Equal to 50%
 - \$0.15 per net kWh
 - Up to \$20,000 per Year per Project Site

RPS CST Regional Program

- PON 2156
- \$150 Million Available thru 2015
- Renewable Biogas Fueled Systems
 - Includes, but is not Limited to Fuel Cells
 - Pipeline Directed
 - Locally Sourced
- NYISO Zones G,H, I and J (Hudson Valley and NYC region)
- Contact Paul Vainauskas (518) 862-1090 ext. 3554

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Fuel Cells & Renewable Portfolio Standards



Webinar - Jun 9th, 2011



Ohio Fuel Cell Coalition

Ohio Fuel Cell Coalition

- **Mission**

- The Ohio Fuel Cell Coalition is a united group of industry, academic, and government leaders working collectively to strengthen Ohio's fuel cell industry and to accelerate the transformation of industry to **global leadership in fuel cell technology and applications**

- **Activities**

- Networking and Collaboration
- Education
- Marketing and Communications
- Advocacy

Ohio Fuel Cell Coalition

- More than 80 members consisting of companies, universities, government entities, and non-profits/other
 - 21 member board representing all stakeholders
- Annual Ohio Fuel Cell Symposium
 - Networking, exhibitors, technical posters
 - Over 200 attendees each year
- www.fuelcellcorridor.com
 - Member and industry news
 - Advocacy, information sources

Ohio Named One of the Top Five Fuel Cell States in the Country

- COLUMBUS, Ohio, April 30 /PRNewswire/ -- **Ohio is one of the top five fuel cell states in 2009**, according to a new report published by Fuel Cells 2000, a nonprofit outreach organization. The report, titled "State of the States: Fuel Cells in America" outlines Ohio's aggressive and innovative focus on business attraction and business development as well as the state's strategies for building its fuel cell supply chain and world-class manufacturing base as reasons for the top ranking.

History of Ohio RPS

- **Senate Bill 221 passed in May 2008**
- **Requires 25% of electricity sales to be produced from alternative energy sources by 2025.**
 - **Non solar renewable energy - 12%**
 - **Solar energy – 0.5%**
 - **Advanced energy - 12.5%**

Why fuel cells and RPS

- **Ohio's robust fuel cell industry in 2008 was showing a positive trajectory.**
- **Strength in Solid Oxide FC integrators.**
- **OFCC was key in including fuel cells in the Renewable Electricity Standard including PEM, PAFC, SOFC, MCFC**
- **President of Ohio Senate was strong advocate for fuel cells**

Addressing the challenges of RPS to date...

- **New Governor's staff at that time was not convinced that fuel cells should be included in the Renewable Electricity Standard.**
- **In spite of that Senate Bill 221 was passed on May 1st 2008.**
- **2008 – 09 market downturn affected fuel cell involvement in RPS**
- **Spark spread hinders growth**
- **As of May 31st, 2011 total RPS is only at 1% of target**
- **New Governor, new PUCO Director could be challenging RPS in 2011**

Ohio's Fuel Cell Industry



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