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FuelCell Energy

Ultra-Clean, Efficient, Reliable Power

Renewable H_2 Fuel PLUS - Electricity and Heat

Pre-Solicitation Workshop on Implementation Strategies for Production of Renewable Hydrogen in California

California Energy Commission – Sacramento - January 30th, 2017

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Integrated Fuel Cell Company

Research & Development

Design megawatt–class distributed power generation solutions

- *Global fuel cell platform*
- *Robust intellectual property portfolio*
- *Developing hybrid applications of existing technology for new markets*

Sales, Manufacture & Project Execution

Project development
- *Direct sales*

Global manufacturing profile
- *North America*
- *Asia via partner*
- *Europe*

Engineering, Procurement and Construction
- *Project Financing*

Services

Operate & Maintain power plants

- *Over 100 DFC® plants operating at more than 50 sites in 9 countries*
- *> 4.5 billion kWh ultra-clean power produced*

Providing turn-key distributed power generation solutions

NASDAQ: FCEL

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FuelCell Energy Operations

Danbury, CT – Corporate, Engineering, R&D

- Research Labs
- Design Center
- Operations and Service Support
- Stack Conditioning

Torrington, CT - Technology Manufacturing

- Stack Production
- Module Assembly
- 65,000 ft^2 facility opened in 2001
- 90,000 ft^2 facility expansion started in 2016

International Operations

Ottobrun, Germany
Capacity for European market

Pohang, South Korea
Capacity for Asian market

CO, USA/Calgary, Canada
SOFC Research

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Direct Fuel Cells (DFC)

Carbonate Fuel Cell Platform – Scale Enhances Economics

Individual fuel cell
&
350 kW fuel cell stack

Four-Stack Module
1.4 megawatts

Completed Module
1.4 megawatts

1.4 MW DFC1500®
- *Utilizes one module*
- *Adequate to power 1,400 homes*

2.8 MW DFC3000®
- *Utilizes two modules*
- *Adequate to power 2,800 homes*

59 MW FC Park
- *Utilizes 21 DFC3000 plants*

Renewable H_2 Generation with DFC

Technology Readiness

- 3-year demo at Orange County Sanitation District (OCSD)

Improves Fuel Cell Performance

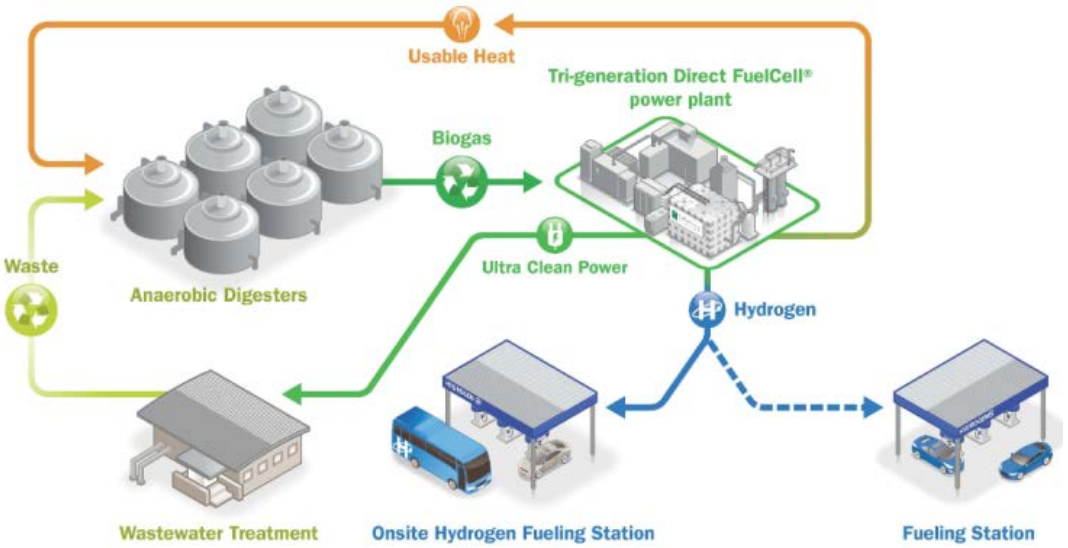
- Lower cell losses
- Higher overall efficiency

Improves Economics

- H_2 is a more valuable product
- LCFS

Market Growth Renewable H_2

- Transportation, FCEV (CA SB1505)
- Refineries



Renewable Transportation Fuel

Affordable efficient hydrogen, heat and power systems

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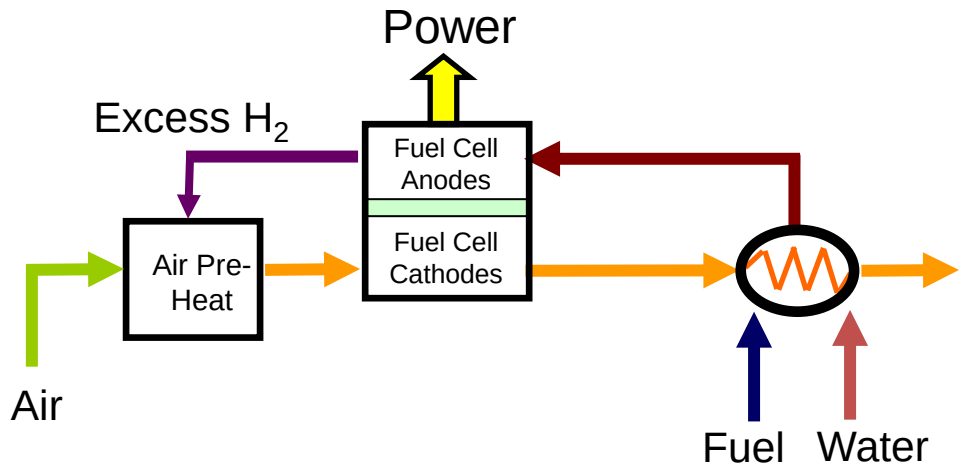
Modified DFC to generate H_2

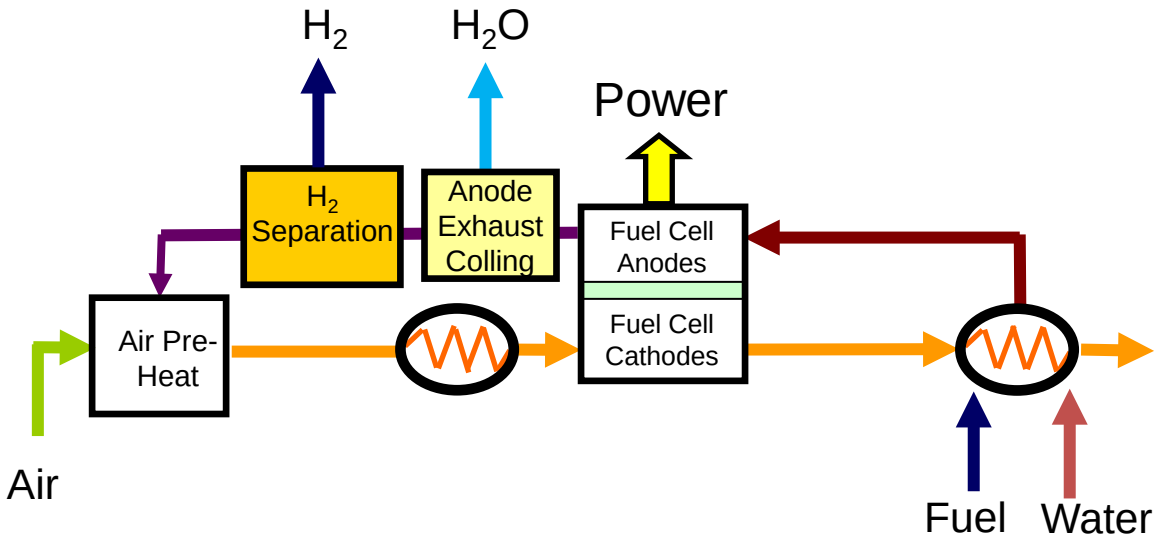
Standard System:

- CH_4-rich fuel is converted to H_2 inside Direct FuelCell stack
- Most H_2 used to produce power
- Excess H_2 used to pre-heat air



Tri-Gen System:

- Excess H_2 is extracted and purified for external use.
- H_2 is produced very efficiently, using waste heat and water produced by anode reactions.
- Air pre-heating is done by heat exchange with exhaust gas and residual H_2



Tri-Gen Plant

Economies of Scale allow Lower Price of Power and Hydrogen

Standard Output	2,800 kW
Tri-Gen Output	2,350 kW
Hydrogen Production	1,270 kg/day

Plant layout is ~ 100' x 100', with flexibility for equipment location

Enough H_2 for a fleet of ~1800 passenger vehicles

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State Wide Deployment

Tri-Gen Roll-out:

- 5,000-6,000 kg/day of renewable H_2 generation infrastructure with 4-5 Tri-Gen plants (i.e., 1,200 kg/day each)
  - Two/three in Los Angeles Basin
  - One/two in the Bay Area
- First unit available in early 2019
- Next units online starting in mid 2019, bringing renewable H_2 production capacity to 5,000-6,000 kg/day

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Potential Stakeholders

Looking for commercial opportunities with:

Onsite Biogas

- Wastewater treatment plants
- Dairy farms
- Landfills
- Organic and municipal waste gasifiers

Directed Biogas

- Industrial and Commercial

FuelCell Energy provides:

- 100% financed turnkey installation including biogas conditioning
- Energy savings under Power Purchase Agreements (PPA) and Hydrogen Purchase Agreements (HPA)

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Thank you!

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