

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Overview: DOE Fuel Cell Technologies and H2@Scale

Dr. Dimitrios Papageorgopoulos, Program Manager, Fuel Cell Technologies Office

Hydrogen and Fuel Cells for Data Center Applications Project Meeting March 20, 2019 – Seattle Washington



Hydrogen is Part of an All of the Above Portfolio



Clean, sustainable, versatile, and efficient energy carrier

An exciting time for hydrogen and fuel cells

650 Fuel Cell Power Shipped (MW) worldwide in 2017*



Sales in 2017

- 70,000 fuel cell units shipped*
- Global sales for electrolyzers estimated at over 100MW/year**

*DOE and E4tech

**Courtesy of NOW, E4tech and partners: A collaborative effort to assess electrolyzer market potential

Over 6,500 fuel cell cars sold or leased in the United States. Over 360 mi driving range.



Long-Range, Heavy Duty Applications Emerging



Fuel cell delivery and parcel trucks starting deliveries in CA and NY



Fuel cell buses in CA surpass 19M passengers



Industry demonstrates first heavy duty fuel cell truck in CA



More stationary and mobile applications

Fuel cells provided backup power during Hurricane Sandy in the U.S. Northeast



Increasing orders of fuel cell forklifts by warehouses and stores in the U.S.



Fuel cells used to power new World Trade Center in NYC



Over 240 MW of fuel cell stationary power installed across more than 40 US states



International Commitment Ramping Up



Source: IPHE

Applications and Funding of Hydrogen and Fuel Cells



Update on FCTO Focus Areas

| Applied research, development and |
|--------------------------------------|
| innovation in hydrogen and fuel cell |
| technologies leading to: |

- Energy security
- Energy resiliency
- Strong domestic economy

Early R&D Areas



Early R&D

Focus





Fuel Cells

- Cost, durability
- Components catalysts, electrodes, etc.
- Increase focus beyond LDVs

LDV: Light Duty Vehicle

Cost of production across pathways

Hydrogen

Fuel

 Cost and capacity of storage, including bulk/ energy storage Infrastructure R&D

- Cost and reliability of infrastructure
- Delivery components, supply chain
- Safety

Enabling CONSCIENT OF Energy

Leveraging industry and labs through the **Consortia Approach**



DOE Cost Status and Targets for R&D



H₂@Scale: Enabling affordable, reliable, clean, and secure energy across sectors



Potential: High capacity and long term energy storage

 Hydrogen can offer long duration and GWh scale energy storage Analysis shows potential for hydrogen to be competitive at > 10 hours



Source: Hydrogen Council

Source: NREL (preliminary)

Strategy: Partnerships to enable H₂@Scale





H₂@Scale Consortium

Analysis and R&D Projects Underway



H2@Scale Consortium Over 20 projects with DOE Labs, Industry, States



Nearly 30 million metric tons of potential hydrogen demand in the U.S. Source: Elgowainy, et al, ANL

Just Announced: Funding for H₂@Scale and Trucks



H2@Scale - Up to \$31M

H₂ production, storage and utilization concepts

Concept Papers due 4/8 Full Apps due 5/29

Trucks – Up to \$15M H₂ storage, refueling technologies and fuel cell R&D Concept Papers due 3/29 Full Apps due 5/15



More information on the EERE Exchange Website or Grants.gov

Collaboration: New H₂ Safety Partnership

Leverages new partnership to promote collaboration on safety





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April 1-2, AICHE Meeting, LA

Stakeholder Engagement to support early stage R&D

| Celebrate |
|-------------------|
| Hydrogen & Fuel |
| Cell Day |
| October 8 or 10/8 |

Use Safety Information and Training Resources

Attend workshops enabling H2@scale



H2tools.org



INCREASE YOUR

- Datacenters: March 20 in Seattle, WA
- H2@Rail: March 26-27 in Lansing MI
- H2@Ports: Oct 2019, San Francisco, CA (tentative)



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Learn more at: energy.gov/eere/fuelcells

Download for free at:

energy.gov/eere/fuelcells/downloads/ increase-your-h2ig-training-resource

Save the Date

2019 Annual Merit Review

April 29 - May 1, 2019 Washington, DC

hydrogen.energy.gov

Thank you

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