



HYDROGEN AND FUEL CELL COMPETITIVENESS SUBCOMMITTEE

Draft Report Summary to HTAC

March 19, 2019

Charter and Team

Assess the competitive international landscape for the emerging hydrogen and fuel cell industries and make recommendations for actions or further work, if needed, directed at achieving a sustainable competitive advantage.

| Name | Organization and background |
|-------------------|---|
| Dr. Kathy Ayers | VP R&D Nel Hydrogen. Electrolyzer materials and components |
| Henry Aszklar | Senior energy advisor and former CEO Globeleq |
| Gary Flood | Industry consultant; former CEO Relion |
| Hal Koyama | CEO H2 PowerTech. Hydrogen reforming, backup power fuel cell products |
| Paul Leggett | Managing Director, Mithril Capital Management LLC |
| Morry Markowitz | President and Executive Director, Fuel Cell and Hydrogen Energy Association (FCHEA) |
| Andy Marsh | CEO Plug Power, Inc. |
| John Mizroch | Managing Member John F Mizroch, LLC Consultancy |
| Dr. Daniel Nocera | Patterson Rockwood Professor of Energy Harvard University |
| Frank Novachek | Director of Corporate Planning Xcel Energy |
| Dr. Levi Thompson | Professor of Chemical Engineering University of Michigan |



In Memory of John Mizroch

John was Co-Chair of this sub-committee and had significant input into the substance of the report. He was passionate about ensuring the United States retains leadership in this area.

Focus

- Hydrogen production and infrastructure technology and development
- Low temperature PEM fuel cell technology and commercialization in stationary and motive

Process

- Identify key countries in the focus areas
- Conduct literature review
- Develop “SWOT” style assessments based on public data and individual visits and experience for each country
- Identify key trends in developing competitive capabilities relative to the USA

Executive Summary

- Historically three regions have led the bulk of technological advancement in hydrogen and fuel cells: North America, the EU and Japan
- The industry has gone through a long period of gradual commercialization, straining the resources of companies leading the development
- The United States has lagged Japan and some countries in the EU in broad commercialization efforts
- China has undertaken a massive program to absorb hydrogen and fuel cell technology and to spur domestic, commercial market development
- The USA is at a “tipping point” for key decisions to secure its competitive technical and commercial position

1. Projects to tip the scales back in favor of domestic investment and manufacturing.

DOE to launch an effort to identify the top handful of large-scale commercialization demonstration and deployment initiatives, comparable in scale to the most significant offshore deployment initiatives, which will lead to significant investment in manufacturing and job creation in the United States. This study should focus on the already identified leading hydrogen and fuel cell applications including hydrogen for industrial use and fueling infrastructure for FCVs, FCV transit buses, FCV material handling, and commercial scale cell stack and MEA production. The study should clearly identify what is required to a) elevate the focused segment to a sustainable commercial level and b) attract the type of investments to build and retain USA technology and manufacturing know-how onshore in support of target market segments.

Potential Project Examples*

- 1000 fuel cell transit buses on the road by 2022
- 1000 long haul fuel cell trucks on the road by 2022
- Utility scale H2 generation, storage and power generation facility by 2023

These kind of projects and scale could

- Stimulate MEA, stack, electrolyzer, H2 storage and other key component production capacity
- Establish critical mass of large FC vehicles to pave the way to smaller delivery and utility vehicles
- Achieve synergistic production benefits to drive the cost curve for high cost parts downward and establish attractive export potential
- Create multi-state / cross country fueling network backbone
- Provide a blueprint for large scale uses of H2 generation and storage

* Assumes strict requirements for domestic content of targeted materials / components.

2. Stimulate demand in and outside the USA

DOE to determine what “tools” or approaches are available to the U.S. government, States and public-private organizations to provide financial incentives and market stimulus to encourage investments in domestic large-scale manufacturing of fuel cell/electrolyzer stack and MEA for both domestic and export markets. As part of this analysis, DOE should consider the evolution and experiences of similar technologies such as solar photo voltaic, wind, and battery which were developed principally in the U.S. and Europe, only to eventually be manufactured in large-scale in China

Potential Stimulus Examples

“G to G” programs. Government to government programs directed at integrating hydrogen fuel cells into the clean energy and energy assistance programs in countries with high potential demand or aspirations for H₂ and fuel cells, such as India, Indonesia and Sub-Saharan Africa. A specific task force could be created for each country and linked to domestic H₂ and fuel cell companies.

In the USA, incentives could be created which target domestic production of specific high value components such as MEAs, bipolar plates, etc. Such incentives could focus on the component cost, or cost of developing and locating commercial scale production in the USA.

3. Track Competitiveness Progress

DOE to conduct an initial competitiveness review and assessment to include progress on commercial demonstration and deployment initiatives; the development of intellectual property as well as the movement and transfer of intellectual property and manufacturing capacity; and the level of commercial and government investment rate to measure the effectiveness of this initiative. The initial review would recommend ongoing metrics and “dashboard” assessment and recommendations for frequency and involvement of other agencies and stakeholders.

- Consider military implications
- Consider commercial confidentiality
- Should be high enough level to avoid compromising competitive information, but still convey progress and gaps

4. Open Codes and Standards

Codes and Standards are recognized as an important part of ensuring a level competitive playing field, especially in a developing industry. DOE should play an active role to ensure that international codes and standards are implemented which encourage free trade and competitiveness.

Suggested alternative "...DOE to play an active role to ensure that appropriate international codes and standards are developed to avoid jeopardizing domestic manufacturers and to foster a global market and robust supply chain."

Next Steps

- Receive and discuss input from HTAC
- Incorporate feedback
- Submit for HTAC ratification