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## VI.2 Clean Energy Supply Chain and Manufacturing Competitiveness Analysis for Hydrogen and Fuel Cell Technologies

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Subcontractors:

- Connecticut Center for Advanced Technology, East Hartford, CT
- DJW Technology, Inc., Dublin, OH
- National Renewable Energy Laboratory, Golden, CO
- National Fuel Cell Research Center, Irvine, CA

Project Start Date: September 1, 2015

Project End Date: August 30, 2018

### Overall Objectives

- Establish regional Technical Exchange Centers to increase communication between original equipment manufacturers (OEMs) and hydrogen and fuel cell component and subsystem suppliers.
- Establish a readily web-accessible database containing inputs from suppliers and OEMs along with a supplier contact lists.
- Standardize component and subsystem component specifications.
- Develop strategies for lowering cost, increasing performance, and improving durability of components and subsystem components.

### Fiscal Year (FY) 2016 Objectives

- Create four regional Technical Exchange Centers and operate supply chain exchanges to facilitate one-to-one communication between suppliers and OEMs.
- Identify participants and initiate supplier working group; select component for standardization.

- Develop projections of cost reduction based on working group activities.
- Input information from suppliers and OEMs into a web-accessible database and increase the number of suppliers registered and providing data to centers.

### Technical Barriers

This project addresses the following technical barriers from the Fuel Cells section of the Fuel Cell Technologies Office Multi-Year Research, Development, and Demonstration Plan.

- (A) Durability
- (B) Cost
- (C) Performance

This project also addresses the following technical barrier from the Manufacturing R&D section of the Fuel Cell Technologies Office Multi-Year Research, Development, and Demonstration Plan.

- (I) Lack of Standardized Balance-of-Plant Components

### FY 2016 Accomplishments

- Four regional Technical Exchange Centers were established to collect and categorize hydrogen and fuel cell information that will be included in a national web-centered database.
- Two subcontractors (Connecticut Center for Advanced Technology and National Fuel Cell Research Center) held successful supply chain exchanges in Massachusetts and California. These exchanges were partnered with larger, relevant events for additional exposure.
- Increased collaboration with partner organizations, such as the Colorado Cleantech Industries Association, Great Lakes Wind Network, and Fuel Cell and Hydrogen Energy Association. A broader cross-section of organizations was contacted to enable us to extend our reach in information for the centers.
- The OFCC database verification and updating continues, with approximately 500 entries to be added to the national database.
- Supply chain mapping in Connecticut and the Northeast has been completed.
- The OFCC participated in the DOE Clean Transportation Summit in Berkeley, California (May 2016).

- Initial key suppliers and OEMs have been contacted to participate in a working group, focusing on standardization of components and subsystems with the focus on cost reduction without loss of functionality.



## INTRODUCTION

The project goal is to facilitate the development of a robust supply chain for fuel cell and hydrogen systems that will accelerate mass production, reduce cost, and improve performance and durability of these systems. The project will accentuate the identification of critical opportunities in the hydrogen and fuel cell supply chain where the United States can achieve or maintain a competitive advantage.

This project builds on existing manufacturing infrastructure to help reverse the decline in and/or create new manufacturing jobs, as well as acts as economic lever for additional technology development. This will accelerate mass production, reduce cost, and improve performance and durability of fuel cell systems, which will facilitate commercialization of hydrogen and fuel cell technologies, and promote energy efficiency and renewable energy.

## APPROACH

Regional Technical Exchange Centers will be established to increase communication between OEMs and hydrogen and fuel cell component and subsystem suppliers. These centers will collect and catalog nonproprietary company and product information from their regional suppliers and OEMs. This information will be combined and added to a national web-centered database.

Supply Chain Exchange events will be held to promote communication between suppliers and OEMs. A supplier working group will facilitate and assess pathways to standardization of fuel cell components and subsystem components with the focus on cost reduction without loss of functionality. The project focus is two-way technology transfer between OEMs and suppliers.

## RESULTS

The establishment of the four regional Technical Exchange Centers will enable the OFCC and its subcontractors to outreach and catalog those stakeholders relevant to the hydrogen and fuel cell industry, and to eliminate any duplication in contacts or regions. Assessment of the OFCC database fields was done to determine compatibility with the Virginia Clean Cities/James Madison University database, which is where the national web-centered database will be housed. The information gained

through this collaboration will contribute to the national database, expand our domestic supply chain, as well as promote economic enhancement and communication within the industry.

Supply Chain Exchange events were a more personal, one-on-one way to facilitate communication between suppliers and OEMs. At the events, suppliers were able to meet with each OEM face-to-face to present their company's capabilities and value proposition, to determine if further communication between the two is warranted. "Matchmaking" of OEMs and suppliers helps bridge the communication gap between the two. Approximately 160 suppliers, integrators, and other stakeholders were invited and participated. These exchanges increase connections between the OEMs and suppliers to make introductions and match needs with availability. The information gathered is used in the regional Technical Exchange Centers database, and eventually become part of the national database.

Supply chain mapping in the Northeast gave us a view of where the supply chain is strongest and where gaps occur in the following areas: Maine, New Hampshire, Vermont, New York, New Jersey, Connecticut, Rhode Island, and Massachusetts. In Connecticut alone, over 400 stakeholders have been identified in the hydrogen and fuel cell industry. In New Jersey, 246 companies were identified that could be included in the Northeast supply chain database.

All of the above project work and results contribute to the United States working towards and maintaining a competitive advantage in the hydrogen and fuel cell industry. This work is the building block for developing a robust supply chain, increasing manufacturing, providing the necessary resources to advance the industry, and working to fulfill the objectives of this project.

## CONCLUSIONS AND FUTURE DIRECTIONS

We have found stakeholders, as a whole, are eager to focus and continue to strengthen the industry. We have seen how valuable our partnerships and collaborations are in working towards that goal. We were able to identify what regions are strongest with respect to the supply chain, where the gaps are that will need to be addressed, and where we can promote diversity within the manufacturing industry through our national database and standardization of components. Our next steps will be taking this information to the next level. We anticipate expansion of the number of suppliers providing data to the centers. We will be holding several additional supply chain exchanges, and focus on locations where the suppliers are concentrated. We will be examining standardization of component specifications in an effort to become more cost efficient and improve durability and performance of the components and subsystems.

**FY 2016 PUBLICATIONS/PRESENTATIONS**

1. Presentation at the Hydrogen and Fuel Cell Technical Advisory Committee meeting in Washington, D.C., October 27–28, 2015.
2. Presentation at the DOE Annual Merit Review in Washington, D.C., on June 8, 2016.