
X.0 Market Transformation Sub-Program Overview

INTRODUCTION

The purpose of the Market Transformation sub-program is to spur market growth for domestically produced hydrogen and fuel cell systems. The Market Transformation sub-program is conducting activities to help promote and implement commercial and pre-commercial hydrogen and fuel cell systems in real-world operating environments and to provide feedback to research programs, United States industry manufacturers, and potential technology users. By supporting increased technology operations testing and use in key early applications, this sub-program helps to identify and overcome non-technical barriers to commercial deployment and to reduce the life-cycle costs of fuel cell power by helping to achieve manufacturing economies of scale. These early market deployments will also address other market acceptance factors, resulting in further expansion of technology opportunities.

The Market Transformation sub-program aims to replicate past successes in material handling equipment (MHE) (e.g., lift trucks) and emergency backup power applications that were part of the American Recovery and Reinvestment Act of 2009 (Recovery Act). For example, Market Transformation has projects in applications like fuel-cell-powered airport ground support baggage tractors and fuel cell electric medium-duty hybrid trucks for parcel delivery applications. These projects are highly leveraged, with an average of more than half of the projects' funds being provided by DOE's partners. Partners providing resources and financial investment to these projects show their high level of interest in continuing to explore these applications and markets, and this level of industry interest is very promising for the potential growth of the domestic fuel cell industry. Market Transformation also partners with other federal agencies and various stakeholders to deploy new applications such as auxiliary power for ships in port and onboard ocean-going vessels in collaboration with the U.S. Department of Transportation Maritime Administration.

GOAL

Market Transformation activities provide financial and technical assistance for the use of hydrogen and fuel cell systems in early market applications, with the key goals of achieving sales volumes that will enable cost reductions through economies of scale, supporting the development of a domestic industry, and providing feedback to testing programs, manufacturers, and potential technology users.

OBJECTIVES

The objectives of the Market Transformation sub-program are as follows.

- Evaluate the status against target performance metrics for commercially available emergency backup, MHE, and other systems and provide feedback to component suppliers regarding cost reduction opportunities
- Test emerging approaches to grid management using renewable hydrogen
- Advance the knowledge and expertise of waste-to-energy fuel, shipboard, and truck auxiliary power units (APUs), fuel cell electric truck parcel delivery, and aviation ground support applications through targeted testing and evaluation efforts in coordination with the Technology Validation sub-program and in partnership with the U.S. Navy, the U.S. Marine Corps, and civilian agencies such as the U.S. Department of Transportation's Maritime and Federal Aviation Administrations
- Identify lessons learned from promulgated policies and regulations and promote the development of the most effective and applicable incentives for hydrogen and fuel cell technologies
- Conduct market transformation deployment projects to enable life-cycle cost and performance of fuel-cell-powered lift trucks and emergency backup power systems to be on par with conventional technologies

FISCAL YEAR (FY) 2015 TECHNOLOGY STATUS AND ACCOMPLISHMENTS

Fuel cells have been enjoying growing success in key early markets, particularly in MHE and backup power applications. The sub-program's early market deployment efforts, including Market Transformation funding and Recovery Act funding, have successfully catalyzed a significant level of market activity in these areas, which has been accompanied by substantial reductions in the price of fuel cells. For example, material handling and backup power

orders are up 18% this year (see DOE Records 15003 and 15004) from the cumulative total orders in 2009 through 2014. Ongoing activities and additional areas of interest include the following.

- **Hydrogen Energy Storage Project:** This project is supporting the demonstration of a hydrogen energy storage system as a grid management tool. While hydrogen produced from the system could be used in a variety of value-added applications, the initial phase of the project will use the hydrogen in fuel cell buses operated by the County of Hawaii Mass Transportation Agency and the National Park Service. This year, site planning and preparation were finalized in preparation for installing and operating the system. (Naval Research Laboratory and the State of Hawaii)
- **Ground Support Equipment (GSE) Demonstration Project:** This project is demonstrating the value proposition of using fuel-cell-powered tow tractors as a cost-competitive and more energy efficient solution compared to incumbent internal combustion engine (ICE)-powered vehicles. This effort will address concerns regarding the weatherproofing of fuel-cell-powered GSE and enable end users at a Federal Express terminal to accomplish their daily tasks while reducing consumption of gasoline and diesel fuels. This project commissioned a fleet of 15 GSE units, which are now operating at the Federal Express hub at the airport in Memphis, Tennessee. (Plug Power)
- **Maritime Fuel Cell Generator Project:** This project is demonstrating the use of fuel cell power for refrigeration APUs onboard sea vessels and at pier side to reduce petroleum use and greenhouse gas emissions. Design development has been accomplished and a prototype unit has been assembled and installed and is now in active operations at the Honolulu, Hawaii, port. (Sandia National Laboratories)
- **Fuel Cells in Hybrid Electric Trucks Project:** This project is demonstrating the value of using fuel-cell-powered parcel delivery trucks as a more energy efficient solution compared to incumbent ICE-powered vehicles. This year, the project completed the modeling of duty cycle and a power system preliminary design for the prototype truck. (Center for Transportation and the Environment)

BUDGET

The FY 2015 appropriation was \$3 million, and \$3 million was requested again for FY 2016 (Figure 1).

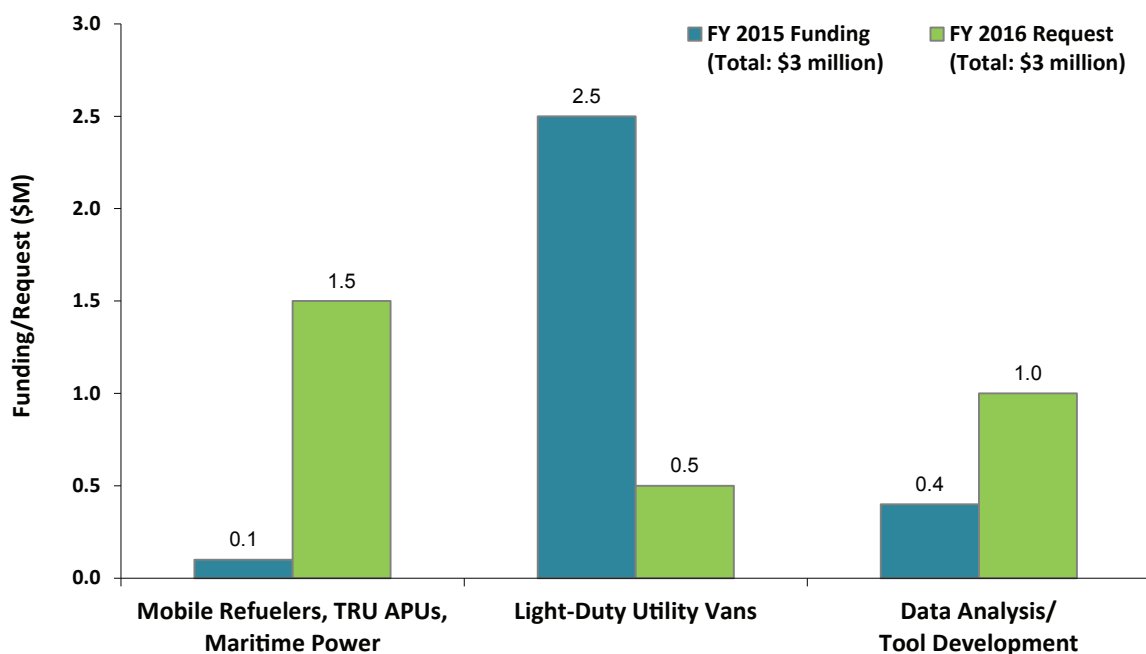


FIGURE 1. Market Transformation R&D Funding. Subject to appropriations, project go/no-go decisions, and competitive selections. Exact amounts will be determined based on research and development progress in each area and the relative merit and applicability of projects competitively selected through planned funding opportunity announcements.

FY 2016 PLANS

In FY 2016, the sub-program will continue to collect and analyze data for on-going and completed projects. A new activity will be initiated to design and deploy fuel-cell-battery-powered hybrid light-duty vehicles for commercial uses such as dispatch utility applications. Strategies for road vehicle market entry and refueling station development, including risk management with respect to safety, environmental, and siting requirements, will be a priority. Business analysis and case studies for newly developed applications will be developed. Collection and evaluation of data from these projects will provide the basis for verifying the business cases for various early market fuel cell systems, as well as providing an assessment of the performance of these integrated systems. Data will be made publicly available so that more potential customers will become aware of the benefits of integrated hydrogen and fuel cell systems. In addition, a near-term priority will be to continue collaborating with other federal agencies—in accordance with existing interagency cooperative agreements such as the DOE-Department of Defense memorandum of understanding—to increase the use of fuel cells in market-ready applications and to increase awareness of the benefits of these deployments. A potential new activity that could be initiated subject to Congressional appropriations is the deployment of mobile refueling trucks subscription refueling use to support the commercialization of fuel-cell-battery-powered light-duty automobiles in various part of the country.

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