# VII.C.6 Station Operational Status System (SOSS) 3.0 Implementation, SOSS 3.1 Upgrade, and Station Map Upgrade Project

Ben Xiong (Primary Contact), Nico Bouwkamp
California Fuel Cell Partnership (CaFCP)
3300 Industrial Blvd., Suite 1000
West Sacramento, CA 95691
Phone: (916) 371-2870
Email: bxiong@cafcp.org

DOE Manager: Jason Marcinkoski
Phone: (202) 586-7466
Email: Jason.Marcinkoski@ee.doe.gov

Project Start Date: October 1, 2015
Project End Date: September 30, 2016

## Overall Objectives

- Consistently and reliably report hydrogen station operational status information to fuel cell electric vehicle (FCEV) customers to increase customer satisfaction and station demand.

## Fiscal Year (FY) 2016 Objectives

- Improve user interface and data quality.
- Increase data transmission interval from stations (once every 15 minutes at minimum) and data sharing capabilities.

## Technical Barriers

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

(D) Lack of Hydrogen Refueling Infrastructure Performance and Availability Data

## Contribution to Achievement of DOE Technology Validation Milestones

This project will contribute to achievement of the following DOE milestone from the Technology Validation section of the Fuel Cell Technologies Office Multi-Year Research, Development, and Demonstration Plan.

- Milestone 2.3: Validate fuel cell electric vehicles achieving 5,000-hour durability (service life of vehicle) and a driving range of 300 miles between fuelings. (4Q, 2019)

## FY 2016 Accomplishments

- Improved SOSS interface by adding sorting capabilities and additional information for users.
- Twenty-seven total (open-retail and other non-retail) stations in California participating in SOSS and reporting data:
  - Completed integrating SOSS at 20 new open-retail hydrogen stations.
  - Continued to maintain the existing seven non-retail stations on SOSS.
- Disaster Recovery Plan (DRP) development and implementation in progress.
- Station Map upgrade complete. Transfer to a standalone site is in progress.

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## INTRODUCTION

Argonne National Laboratory and DOE are continuing partners in the California Fuel Cell Partnership. Funds are used to accomplish the goals of the Partnership and to provide critical information and data necessary for DOE to determine the status and prospects for commercialization of fuel cell technology. The Partnership supports SOSS, a mobile web application that provides status information about each of the available hydrogen stations in California

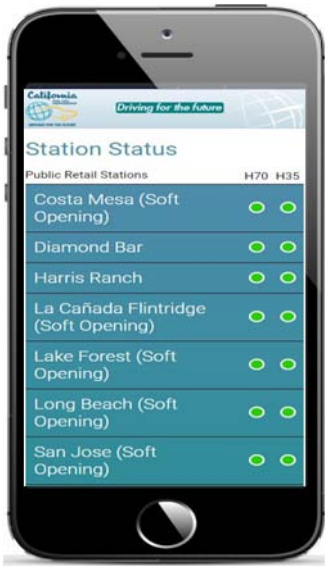


**FIGURE 1.** SOSS home page

(Figure 1). At specific intervals, each station sends a message to CaFCP's server to report the station status (online, limited, or offline), available fuel (Figure 2), and available pressures. It also provides the station address, contact number, and GPS coordinates. CaFCP will include all new stations under development and construction on SOSS. As automakers are currently launching FCEVs into the commercial market and use SOSS as the primary source of station status information, SOSS needs to operate with minimal downtime to ensure customer confidence.

## APPROACH

A primary goal is to increase FCEV customer satisfaction—and thereby station demand—by consistently providing relevant station status information for end users to better assess hydrogen station availability. This is accomplished through an upgrade of SOSS, improving the SOSS user interface by enabling users to sort stations based on their preference (Figure 3) and to receive additional information. Additional information includes an "Unknown" status to alert customers when the data connection has been lost between the station and the SOSS server; "Capacity" is also available for customers to view through a settings toggle.

A DRP is being put in place so the server, database, and files can be quickly restored in the case of an event leading to the outage of the system. The DRP also consists of communication strategies to reach out to stakeholders and customers to notify of outages and resolution steps.

The CaFCP Station Map (Figure 4) is being upgraded to allow for a more customer-focused and friendly interface and is also being moved to its own website to allow for additional information that stakeholders need, but which is not essential for the customer audience.

Newly built hydrogen stations will be solicited to participate in SOSS.

## RESULTS

Implementation to update the SOSS interface has been completed to allow for an "Unknown" status, as well as a display of the current available capacity. Implementation of the DRP and Station Map upgrades are in progress and on track to be completed as planned.

Twenty-seven total hydrogen stations in California are participating on SOSS with 20 new open-retail stations and seven existing non-retail stations (as of 7/22/2016).

Status of SOSS implementation at new open-retail stations:

- First Element Fuel has completed implementation of SOSS at 13 new open-retail stations in California.
  - Campbell (First Element Fuel)
  - Costa Mesa (First Element Fuel)
  - Harris Ranch (First Element Fuel)
  - Hayward (First Element Fuel)
  - La Canada Flintridge (First Element Fuel)

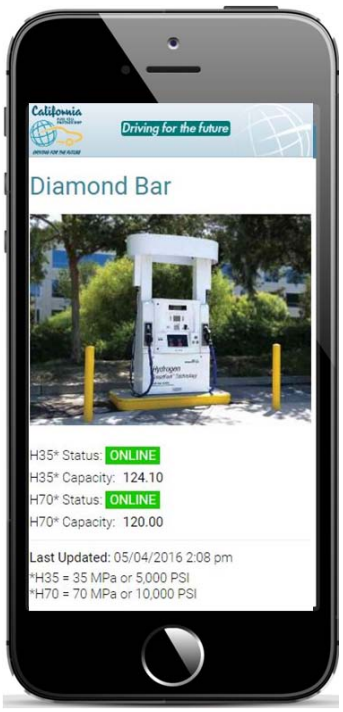


**FIGURE 2.** SOSS capacity view

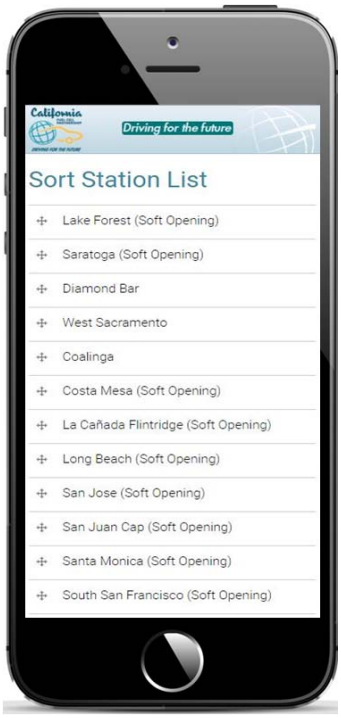


**FIGURE 3.** SOSS sort view

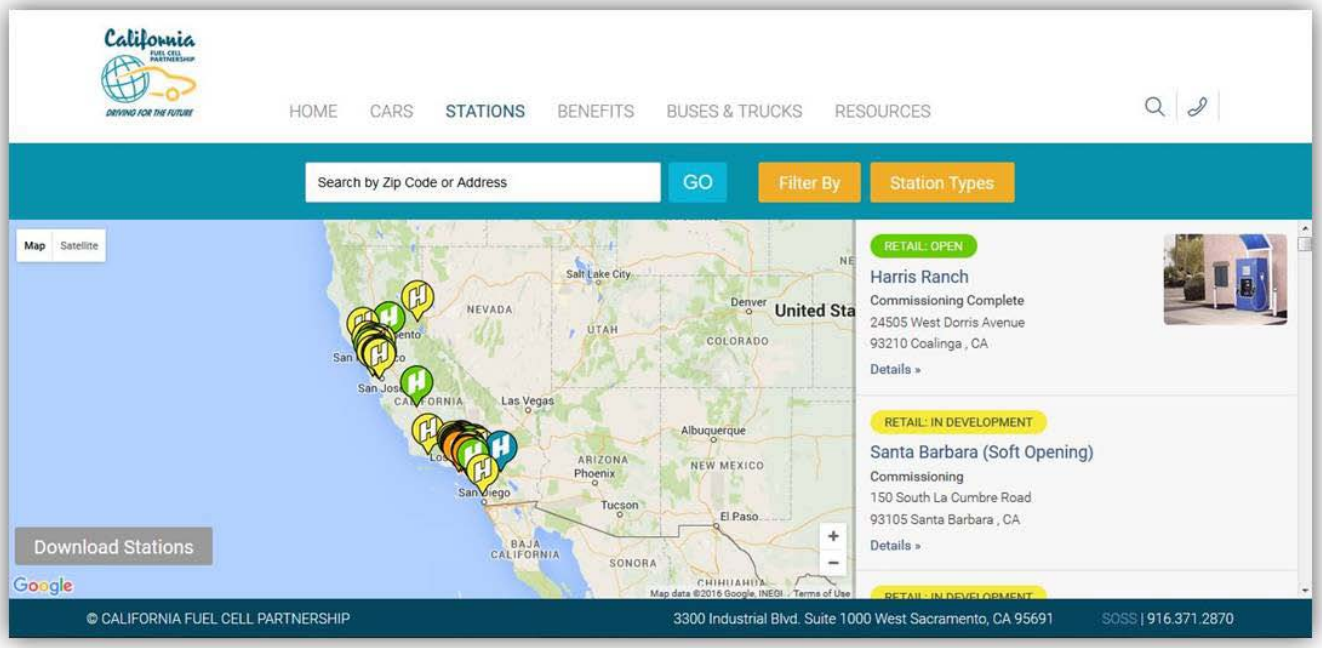


**FIGURE 4.** Station Map

  - Lake Forest (First Element Fuel)
  - Long Beach (First Element Fuel)
  - Mill Valley (First Element Fuel)
  - San Jose (First Element Fuel)
  - Santa Barbara (First Element Fuel)
  - Saratoga (First Element Fuel)
  - South San Francisco (First Element Fuel)
  - Truckee (First Element Fuel)
- Linde has completed implementation of SOSS at two new open-retail stations in California.
  - San Juan Capistrano (Linde)
  - West Sacramento (Linde)
- Air Products has completed implementation of SOSS at five new open-retail stations in California.
  - Diamond Bar (Air Products)
  - Fairfax-LA (Air Products)
  - Santa Monica (Air Products)
  - University of California, Irvine (Air Products)
  - West LA (Air Products)
- ITM Power and Powertech have completed implementation of SOSS at the Riverside station. Testing of SOSS connectivity is complete. Waiting on finalization of commissioning to set the station live.
- California State University, Los Angeles completed implementation of SOSS and connectivity testing. The station is still undergoing commissioning before being listed on SOSS.

## CONCLUSIONS AND FUTURE DIRECTIONS

SOSS is increasingly serving the customer need for station availability data, leading to more satisfied and informed FCEV customers, per direct reports from vehicle original equipment manufacturers. Delays in station implementation and rollout continues to be a limiting factor for the increase of the number of new stations participating on SOSS. Despite these delays, station operators, developers, automakers, and other stakeholders agree that SOSS continues to be critical for the early market launch of fuel cell vehicles and customer satisfaction. An initial proposal of future improvements to SOSS includes the following:

- Solicit new hydrogen stations to participate on SOSS.
- Implement user interaction and feedback system.
- Research mobile native app capabilities and implement if economically feasible.
- Implement real-time reporting.
- Implement a mobile map interface.
- Expand data collection opportunities.
- Develop reporting capabilities.