

the Energy to Lead

Performance Evaluation of Delivered Hydrogen Fueling Stations

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Gas Technology Institute
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Project ID: TV025

This presentation does not contain any proprietary, confidential, or otherwise restricted information

Overview

Timeline

- Start: 03 / 2013
- End: 01 / 2018
- Progress: 25% Complete

Budget

- Total Spent: \$130,844*
- Total Project Value: \$800,000
 - BP-1 Funded Value: \$195,000
- Cost Share Percentage: 50%

* as of 3/31/2015

Barriers

- D. Lack of Hydrogen Refueling Infrastructure Performance and Availability Data
- E. Codes and Standards

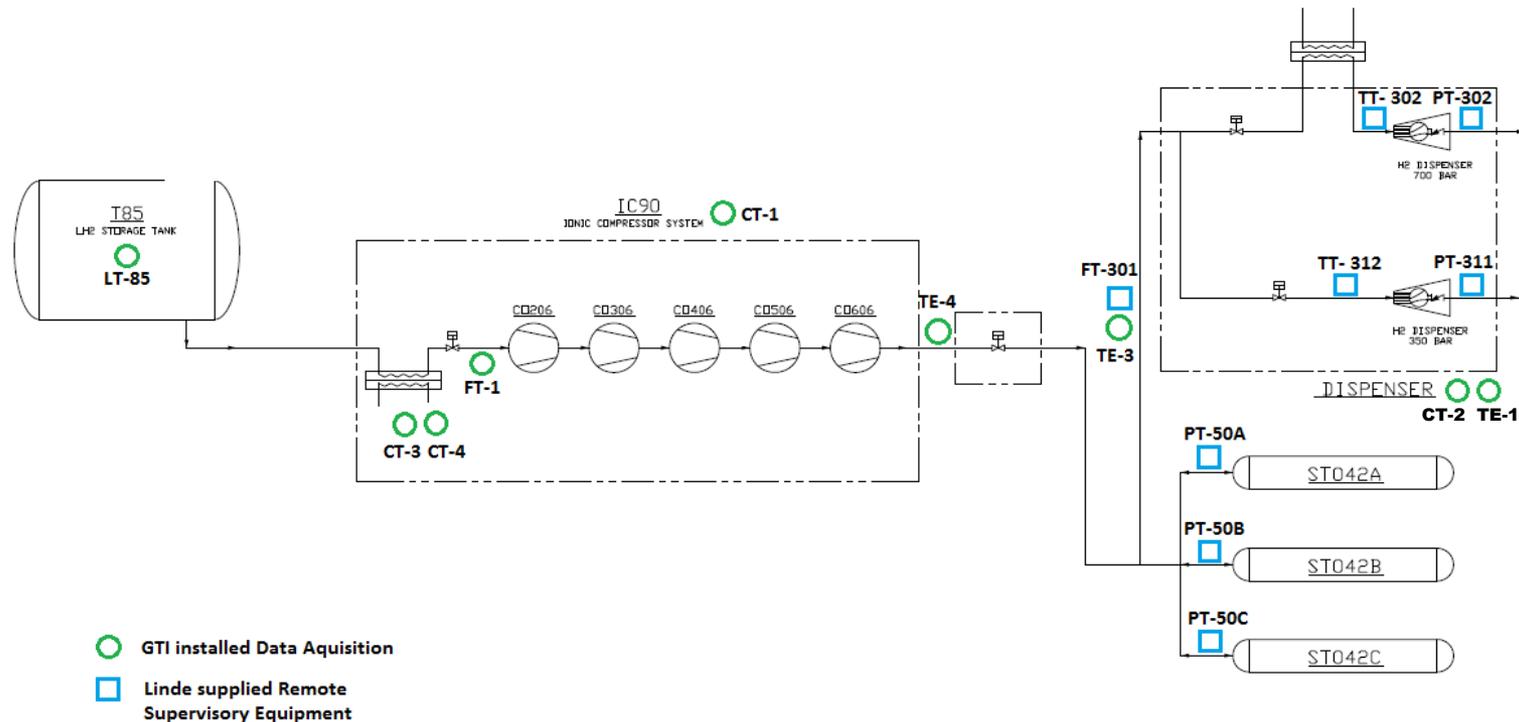
Partners

- Gas Technology Institute (GTI)
- Linde, LLC.

Relevance

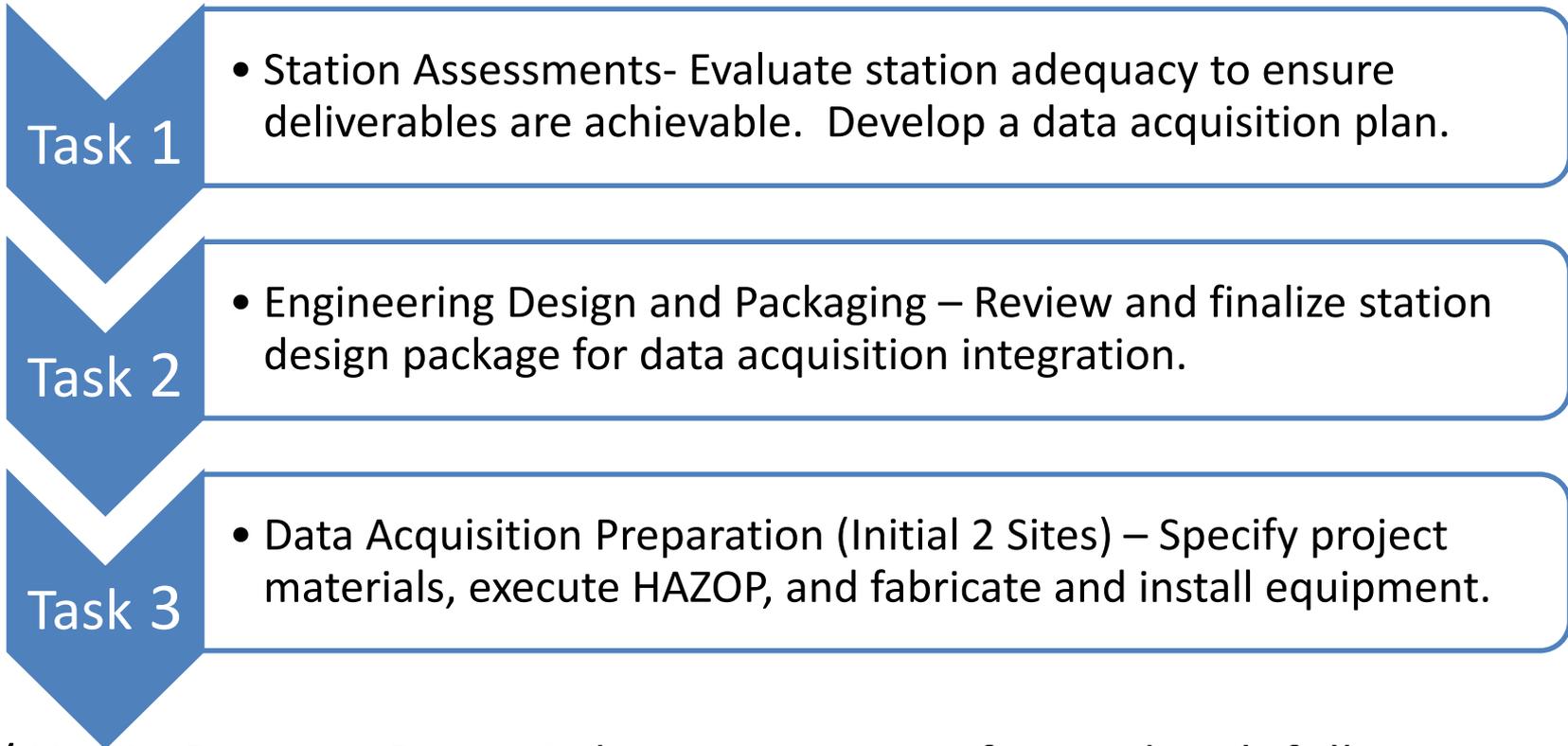
DOE Technical Objectives	Project Team Goals	Period Goals
1. Confirm performance of systems in real world applications through data collection.	<ul style="list-style-type: none">• Install data collection systems at (5) 100 kg/day delivered hydrogen fueling stations in CA for 24 month period.	<ul style="list-style-type: none">• Complete data system installation at 2 fueling stations
2. Provide the public with aggregated data presented in composite data products, and secure confidential data in National Fuel Cell Technology Evaluation Center (NFCTEC).	<ul style="list-style-type: none">• Submit station data specified in the NREL Hydrogen Station Data Templates.	<ul style="list-style-type: none">• Submit station data to NREL for 2 active fueling stations
3. Benchmark station capacity, utilization, maintenance, and safety.	<ul style="list-style-type: none">• Provide useful data to accurately characterize stations' performance.	<ul style="list-style-type: none">• Begin collecting high quality data on 2 stations

Approach: General



- A combination of the techniques and coordination between Linde's station controls and GTI's data acquisition system are required to meet project objectives.

Approach: Budget Period 1



Go/ No Go Decision Point: A decision to move forward with full project scope will depend on project team's ability to supply complete sets of data for initial 2 sites.

Approach: Budget Period 2

Task 4

- Data Acquisition Preparation (Remaining 3 Sites) – Specify project materials, participate in HAZOP, and fabricate and install equipment.

Task 5

- Data Collection– Collect data on each station over full performance period (2 years). Maintain equipment and system integrity through periodic inspections and maintenance.

Task 6

- Data Analysis and Reporting – GTI will compile data from equipment and Linde operations and submit to the HSDC on a quarterly basis throughout the life of the project.

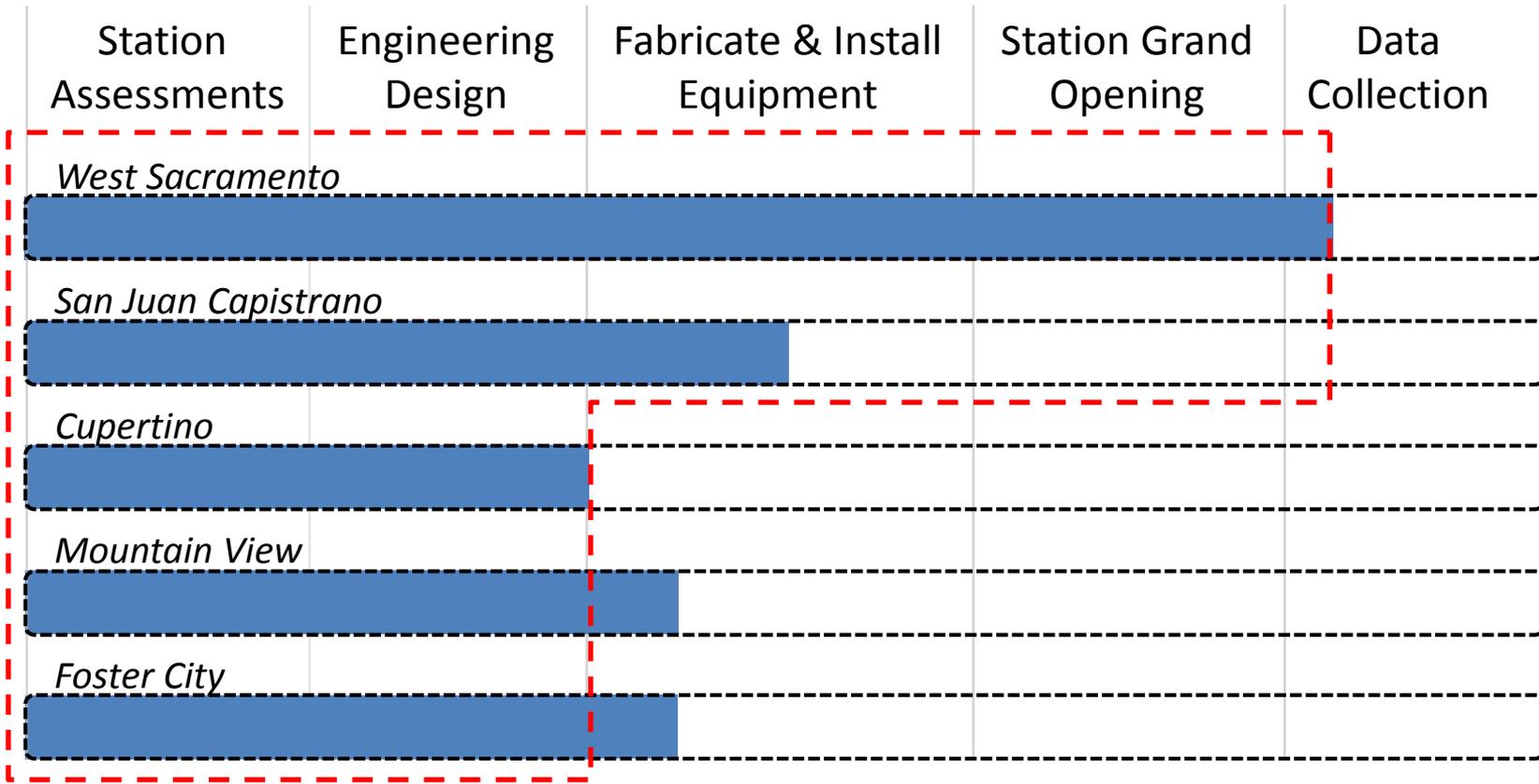
Accomplishments and Progress

- Data Acquisition system design complete
- System installed at West Sacramento site. Data collection has begun.

Station Assessments	Engineering Design	Fabricate & Install Equipment	Station Grand Opening	Data Collection
<i>West Sacramento</i>				
[Progress bar: ~85% complete]				
<i>San Juan Capistrano</i>				
[Progress bar: ~45% complete]				
<i>Cupertino</i>				
[Progress bar: ~30% complete]				
<i>Mountain View</i>				
[Progress bar: ~40% complete]				
<i>Foster City</i>				
[Progress bar: ~40% complete]				

Accomplishments and Progress

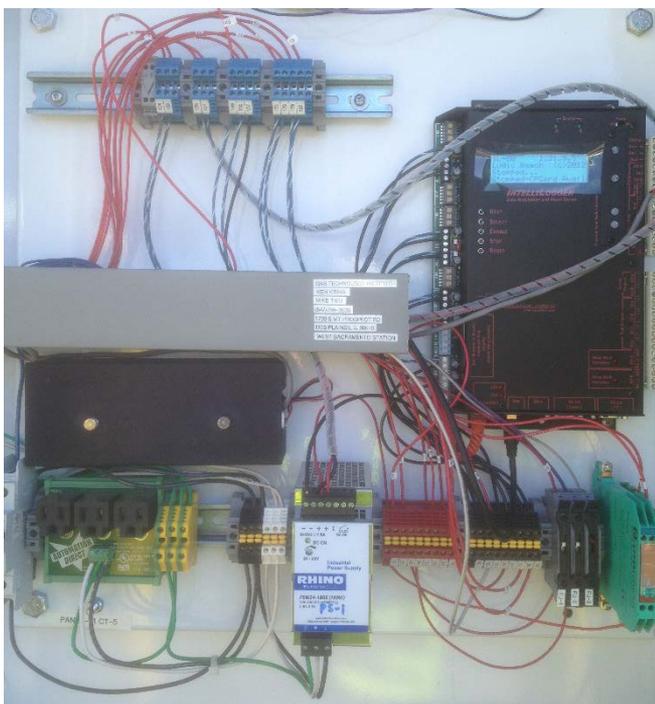
Work to be done under budget period 1:



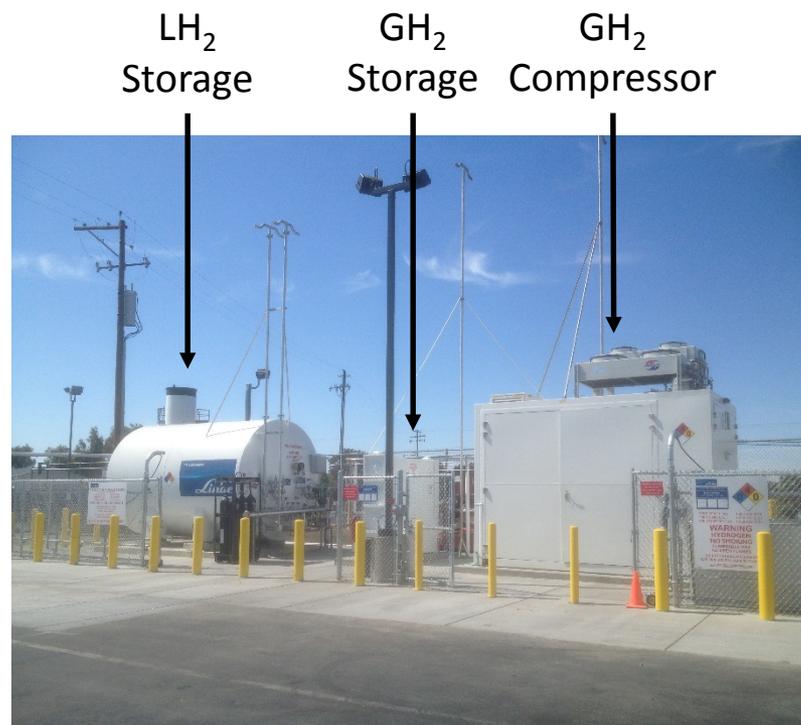
Budget Period 1

Accomplishments and Progress

Successful installation of data acquisition system at West Sacramento fueling station:



GTI Data Panel Installed at Site



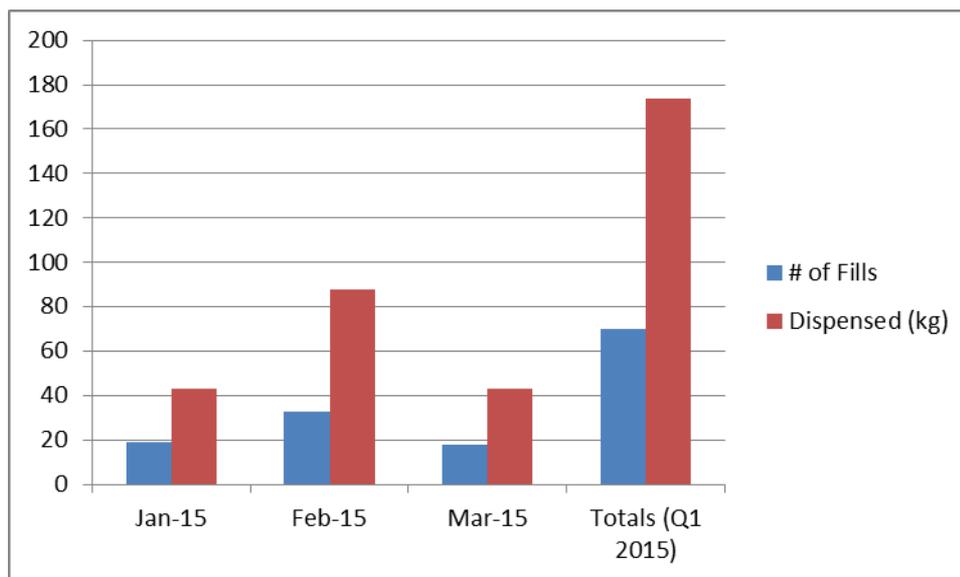
Linde Hydrogen Storage and Compression Equipment

Accomplishments and Progress

- > Data collection from West Sacramento Station has been completed for Q1 2015.
- > Permits granted for San Juan Capistrano site. Construction should begin in mid-2015.
- > Remaining 3 sites are progressing. Equipment is being fabricated. Construction dates will likely depend on permitting.

Accomplishments and Progress

Data collection from West Sacramento Station is complete for Q1 2015.



Responses to Previous Year Reviewers' Comments

Reviewer Comment	Response
1. Based on the information presented, the \$800,000 budget only seems enough to cover budget period 1.	<ul style="list-style-type: none">• Budget period 1 uses total DOE funds of \$195,000. The balance of the DOE funding (\$205,000 for a total of \$400,000) represent budget period 2.
2. The barriers provided in the overview slide do not align with those in the MYRDDP.	<ul style="list-style-type: none">• Barriers have been changed to align with MYRDDP.
3. Project should evaluate whether a data collection period of two year is possible for each station given the delays in station construction.	<ul style="list-style-type: none">• Project has been extended to Jan 2018. GTI will continue to monitor installation progress to ensure this is feasible.

Awardee

Project Team:

Gas Technology Institute (Prime) – Current projects:

- Design and build of a landfill gas to hydrogen reformation and refueling demonstration in South Carolina.
- Operations and maintains 50kg/day hydrogen generation, compression, and dispensing station at University of Texas-Austin.



Collaborations

Project Team (Continued):



Linde Hydrogen Fueling (Subcontractor) –

- Linde, LLC. is a global supplier of industrial gases and is committed to developing fueling infrastructure in the U.S.
- In 2012, Linde designed, built, and currently operates Emeryville, CA Station for AC Transit.
- Working with Lawrence Livermore National Laboratory to demonstrate liquid hydrogen pumping technologies.

Collaborations

Team Member	Roles
GTI	Oversees and manages the project; designs, builds, and installs data collection system; processes data and reports to NREL; maintains data collection unit throughout performance period.
Linde	Technical advisor and Coordinator of site design information; coordinates site utilities, communications, and power for data collection effort, submits transactional, utility, safety, and operations data to GTI, maintains the station throughout performance period.

Remaining Challenges and Barriers

Permitting

- Largest challenge continues to be obtaining permits to build the hydrogen stations. Linde is managing the permitting process and working diligently with local authorities to move this process forward.

Technology Transfer Activities

This project does not include development of any new technology. Therefore there are no technology transfer plans to be addressed.

Proposed Future Work

- Continue data collection activities for the West Sacramento site and report to NREL.
- Install instrumentation and electrical panel at San Juan Capistrano site.
- Installation at remaining 3 station sites possible before the end of 2015.



Summary

Relevance: GTI aims to compile, analyze, and submit pertinent data to meet technology validation objectives and goals set forth by the Fuel Cell Technologies Program through its multi-year research, development, and demonstration plan.

Approach: Develop, integrate, and maintain non-intrusive data collection systems to produce meaningful observations and data collection for the NFCTEC.

Accomplishments: Instrumentation installed at West Sacramento site. Data has been collected and submitted to NREL. Prepared for installation at the next Linde site.

Summary

Collaborations: Project team and structure have been assembled. Key team members from both organizations have been identified and roles have been defined, and are working together well.

Future Work: Continue to conduct data collection activities for the West Sacramento site and report to NREL. Install instrumentation and electrical panel at San Juan Capistrano site in mid 2015. Installation at Foster City, Mountain View, and Cupertino sites in Q4 2015.