



7B: GENCO Fuel Cell Powered Lift Truck Fleet Deployment

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GENCO Infrastructure Solutions, Inc.
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Project ID: ARRAH2011

Project Overview

■ Timeline

Start: October 1, 2009

Finish: September 30, 2013

17% complete

■ Budget

Total Project Funding

- DOE: \$6,102,941
- Cost-share: \$6,103,001

■ Barriers

- Represents a change in technology, which is met with reluctance
- Uncertain power unit reliability due to lack of widespread performance data
- Safety and expense of hydrogen and fueling equipment
- Difficult to obtain permits and approvals for hydrogen fueling stations

■ Partners

- Plug Power – GenDrive power unit and service provider
- Air Products – Hydrogen supplier
- Linde – Hydrogen supplier



Relevance

OBJECTIVES

- Support American Recovery and Reinvestment Act goals of long-term economic growth by successfully demonstrating a new technology
- Promoting the economic and environmental benefits of hydrogen fuel cell technology

TACTICS

- Demonstrate the economic benefits of large fleet conversions of lift trucks from batteries to fuel cell power units by measuring, analyzing and reporting on the performance, operability and safety of the systems that will spur further fuel cell lift truck fleet conversions
- Convert electric-drive fork lift truck fleets to fuel cell use in five large distribution centers and manufacturing facilities
- Provide affordable and reliable hydrogen
- Establish a proving ground for hydrogen fueling technology that will promote the future adoption of fuel cells in other applications, such as cars, and help drive the use of fuel cell technology in the United States

Approach

OBJECTIVE

Develop a track record by installing 357 GenDrive power units at five commercial distribution and manufacturing centers

	Wegmans	Whole Foods	Coca-Cola	Sysco Phil.	Kimberly-Clark	TOTAL
Class 1 GenDrive	0	45	40	0	25	110
Class 2 GenDrive	36	14	0	25	0	75
Class 3 GenDrive	100	2	0	70	0	172
TOTAL	136	61	40	95	25	357
Hydrogen Supplier	Air Products	Linde	Linde	Linde	Air Products	



Approach

Critical Path Toward Lift Truck Fleet Conversions

- **Build GenDrive Power Units**
 - Complete the construction of GenDrive fuel cell power units
- **Obtain National Environmental Policy Act (NEPA) Approvals**
- **Install Fueling Stations**
 - Install hydrogen handling and dispensing equipment consistent with merchant liquid hydrogen supply
- **Commission Equipment and Train Personnel**
 - Commission and start up the fueling station and GenDrive power units and train site personnel in their use and maintenance
- **Operate Distribution Centers**
 - Provide operational and maintenance support for the power units and the hydrogen handling and dispensing equipment and evaluate their performance over the duration of the project



Approach

Project Milestones

	Wegmans	Whole Foods	Coca-Cola	Sysco Phil.	Kimberly-Clark
Fueling Station Operational	Phase 1 Complete	7/31/2010	11/15/2010	3/31/2011	7/1/2010
▶ GO/NO GO	GO	7/31/2010	11/15/2010	3/31/2011	7/1/2010
GenDrive Power Units Delivered	59 of 136	7/31/2011	11/15/2010	10/31/2011	7/31/2010
▶ GO/NO GO	59 of 136	6/30/2010	10/31/2010	9/30/2011	6/30/2010
Distribution Center Fully Operational	6/31/2011	8/15/2011	11/30/2010	10/31/2011	7/31/2010
Project Complete	9/30/2013	9/30/2013	9/30/2013	9/30/2013	9/30/2013

Accomplishments and Progress

WEGMANS

- Department of Energy (DOE) contract signed in January 2010
- NEPA environmental forms have been approved and the fueling station is operational, logging almost 2,000 hydrogen fills during first quarter 2010
- 59 GenDrive power units are running and have logged 24,375 operating hours during the first quarter of 2010
- 9 of the GenDrive power units were delivered 2 months ahead of schedule
- Wegmans has achieved all project milestones and is pleased with performance of GenDrive power units
- 2 jobs were maintained in first quarter of 2010 in New York

SYSCO PHILADELPHIA

- Sysco contractors have completed the concrete pad for the hydrogen fueling station
- The remainder of the fueling station will be completed concurrent with building construction
- Project currently ahead of scheduled milestones



Accomplishments and Progress

COCA COLA

- NEPA environmental forms have been approved
- Linde fueling station contracts under final negotiation

KIMBERLY-CLARK

- Lease arrangement completed
- Air Products fueling station contracts under final negotiation
- GenDrive power units are on schedule for delivery

WHOLE FOODS

- Linde fueling station contracts under final negotiation
- Permit application ready for submission
- GenDrive power units are on schedule for delivery



Collaborations

■ Partners

- Plug Power (Industry) – GenDrive power unit and service provider
- Air Products (Industry) – Hydrogen supplier
 - Kimberly-Clark
 - Wegmans (not part of DOE contract)
- Linde (Industry) – Hydrogen supplier
 - Coca Cola
 - Sysco Philadelphia
 - Whole Foods (not part of DOE contract)

■ Technology Transfer

- Collaboration with Plug Power for commissioning of GenDrive power units and service
- Collaboration with Air Products and Linde for installation of hydrogen fueling systems



Future Work

		Wegmans	Whole Foods	Coca-Cola	Sysco Phil.	Kimberly-Clark
FY10	Fueling Station Operational	Completed	✓	✓		✓
	▶ GO/NO GO	Completed	✓	✓		✓
	GenDrive Power Units Delivered	✓	✓	✓		✓
	▶ GO/NO GO	✓	✓	✓		✓
	Distribution Center Operational		✓	✓		✓
FY11	Fueling Station Operational				✓	
	▶ GO/NO GO				✓	
	GenDrive Power Units Delivered	✓			✓	
	▶ GO/NO GO	✓			✓	
	Distribution Center Operational	✓			✓	



Summary

- Relevance:** Develop safe hydrogen material handling operations to demonstrate economic benefits and spur future distribution and manufacturing center conversions
- Approach:** Install Air Products or Linde hydrogen fueling stations at each site, deliver Plug Power GenDrive power units and evaluate operation
- Accomplishments:** GenDrive power units logged 24,375 operating hours and completed 2,000 hydrogen fills at Wegmans
- Technology Transfer/Collaborations:** Plug Power, Air Products and Linde
- Future Work:** Fueling station installations, GenDrive power unit deliveries, commissioning, training, operation and evaluation