

Development of High Pressure Hydrogen Storage Tank for Storage and Gaseous Truck Delivery

Sig Winstryg
Lincoln Composites Inc.
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PDP23

Overview

Timeline

- Start - June 2008 (estimate)
- May 2010
- Awaiting final award

Budget

- Total project funding
 - DOE \$3M
 - Contractor share \$3.34M
- Funding received in FY07 - none
- Funding for FY08 – 2.7 M Requested, negotiations not complete

Barriers

- Barriers addressed
 - Gaseous Hydrogen Storage and Tube Trailer Delivery Costs
 - System Weight and Volume
 - Efficiency
- Targets
 - \$500/kg of H2 stored by FY2010, \$300/kg by FY2015
 - Volumetric capacity 0.03 kg/liter by FY2010, >0.035 kg/liter by FY 2015
 - Tube trailer delivery capacity 700 kg by FY2010 and 1,100 kg by FY2017

Partners

- None

Objectives

- **To design and develop the most effective bulk hauling and storage solution for hydrogen in terms of cost, safety, weight, and volumetric efficiency. This will be done by developing and manufacturing a tank and corresponding ISO frame that can be used for the storage of hydrogen in a stationary or hauling application.**
- **The objective for the first year of this program (2008) is to design and qualify a 3600 psi tank that will hold 510000 in³ (~8500L) water volume**

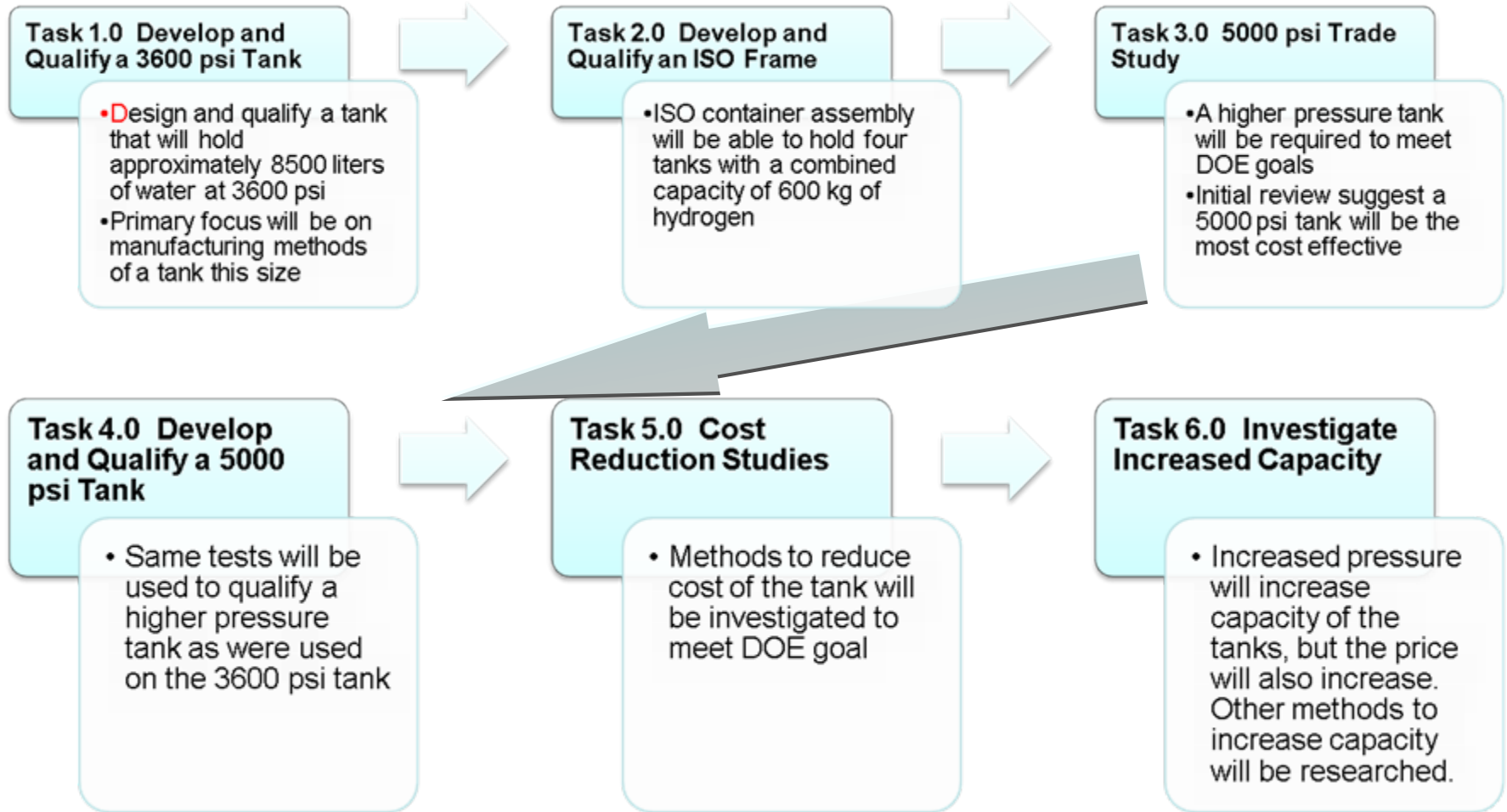
Objectives

Goals	ISO container with four 3600 psi tanks (2008 Work Scope)
\$500/kg of hydrogen stored by FY2010, \$300/kg by FY2015	The baseline ISO assembly, with four tanks installed, will store about 600 kg of compressed hydrogen gas at 3600 psi with a safety factor of 2.25. It is estimated that the cost will be \$500 - \$650 per kg of hydrogen.
Volumetric capacity 0.03 kg/liter by FY2010, >0.035 kg/liter by FY 2015	<p>The baseline tank will have a capacity of 150 kg hydrogen in a volume of 8500 liters, achieving a performance of 0.018 kg/liter.</p> <p>This performance measure can be increased to 0.024 kg/liter by increasing the service pressure to 5000 psi, and to 0.035 kg/liter by increasing the service pressure to 8300 psi.</p>
Tube trailer delivery capacity 700 kg by FY2010 and 1,100 kg by FY2017	<p>The baseline ISO assembly, with four tanks installed, will contain about 600 kg of hydrogen.</p> <p>This can be increased to about 800 kg by increasing the service pressure to 5000 psi, and to about 1150 kg by increasing the service pressure to 8300 psi.</p>

Milestones

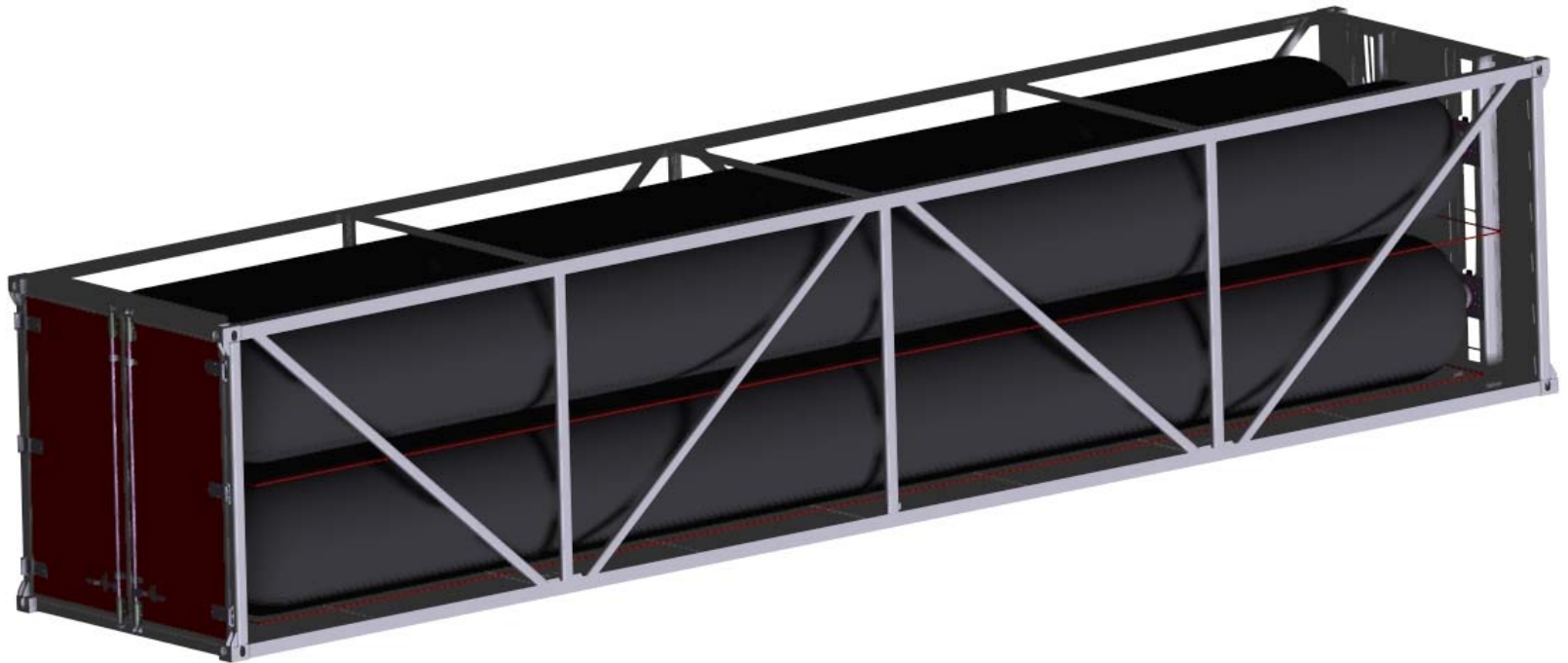
Date	Milestone - Go/No-Go
Summer 2008	Milestone – successful completion of qualification test for 3600 psi tank. Test include: strength testing (such as burst and pressure cycling), environmental testing (such as exposure to environmental fluids, extreme temperatures, and bonfire), durability testing (such as flaw tolerance, penetration, and impact), and special tests (such as cold fast fill and blowdown).
Fall 2008	Go/No-Go – Based on results of 3600 psi tank testing, a study will be completed to determine the best pressure and size of tank going forward. The 3600 psi tank is a lower pressure tank than is necessary to meet future DOE goals.

Approach



Technical Accomplishments/ Progress/Results

- Project is still under negotiations leading to award



Future Work

- **FY 08**

- **Complete design of 3600 psi tank and qualification testing**
 - **Determine best method for manufacturing tank of this size**
 - **Burst test to 2.25 factor of safety**
 - **Cycle testing (Ambient and Extreme Temperature)**
 - **Bonfire**
 - **Penetration (Gunfire)**
 - **Flaw Tolerance – Induced flaw then cycle testing**
- **Complete design and qualification of ISO frame that will hold four 3600 psi tanks**
- **Complete trade study of higher pressure tank to meet DOE goals. Emphasis will be on meeting goals of efficiency and cost**

- **FY 09**

- **Complete design and qualification of higher pressure tank based on results from trade study. Initial calculation indicate this will be a 5000 psi tank**

Summary

- **Hydrogen delivery and storage are key to the development for the advancement technologies**
- **Developing a bulk storage unit that can be transported on an ISO frame will help to solve the current problem of hydrogen storage and delivery**

Summary Table

Technical Targets

DOE Goals	FY 2008 Estimated Results
\$500/kg of hydrogen stored by FY2010, \$300/kg by FY2015	An ISO frame with four tanks is estimated to store hydrogen at \$500 - \$650 per kg of hydrogen
Volumetric capacity 0.03 kg/liter by FY2010, >0.035 kg/liter by FY 2015	The baseline tank is estimated to have capacity of 150 kg hydrogen in a volume of 8500 liters, achieving a performance of 0.018 kg/liter.
Tube trailer delivery capacity 700 kg by FY2010 and 1,100 kg by FY2017	The baseline ISO assembly, with four 3600 psi tanks installed, will contain about 600 kg of hydrogen.
Tube trailer operating pressure goal is <10,000 psi by FY2012	Tank design for FY 2008 will be 3600 psi.