ANG, CNG and LNG storage tanks, Morning Breakout Session

ARPA-E's goals are to

1. Validate or improve our strawman metrics to be technically audacious but possible with sufficient stretching
2. Identify and understand potential new materials and processes that could result in dramatically lower tank prices 5-15 years from now.

Tank metrics:

- Price of tank to end user is $170 / DGE at both 70 DGE and 8 DGE scales
- Same weight as Type IV carbon fiber CNG tank
- Same safety: crash-testing, chemical hardiness, etc.
- CNG Secondary: built in thermal management to thermalize to ambient during fill to achieve fill capacity > 0.95.
- LNG Secondary: thermal loss rate of 1%/day at 50% capacity

Working assumptions:

- 2 year payback required for rapid fleet turnover
- 60,000 mi / yr; 360 mi range; $1.50 / DGE fuel price differential
- tank price target = $170 / DGE = $10/L

Questions:

1. What is the state-of-the-art for CNG tank manufacturing? What is the state of the art for LNG Manufacturing? What makes these difficult and/or expensive?
2. Are our high level strawman techno-economic metrics appropriate to enable commercially successful products? Are our strawman CNG and LNG tank materials and process performance metrics appropriate to enable commercially successful products or handoffs to OEMs at program end? Have we left out any primary or secondary metrics essential for commercial adoption? Do any numbers need to be adjusted up or down?
3. What advances/breakthroughs have there been in the last 10 years that might make these targets achievable now? Why?
4. What novel/unique technical approaches could achieve these goals? What materials and process challenges, if overcome, would make these approaches possible? Which offer the greatest opportunity? Why? Have they been tested at any scale?
5. Is there ARPA-E white space? Are there technology pathways that can put us on new learning curves? Long term, why might these be successful?
6. Is there a way to integrate thermal management into the CNG tank to improve fueling tank capacity > 0.95?
7. Is there a way to increase the thermal insulation of the LNG tank without adding mass and without reducing mechanical integrity?
8. How would designs change if CNG tank pressure was 500 psi instead of 3600 psi, for example if cheap ANG became a reality?
9. What can be done with $3-4M, 2-3yrs? What is the largest prototype that could be built under this budget? Is there any value to funding seedlings <$1M? What are appropriate targets 1-yr? 3-yrs?