



Sorbents for Natural Gas Vehicles

ARPA-E NG Vehicles Workshop
Morning Breakout

1/26/2012

Session Readout, Group 4: Natural Gas Sorbent Materials

Suggested FOA Metrics

- Deliver enough NG to drive 300 miles at 25 mpg, including enough acceleration at low pressure
- A conformal tank with size and weight XX% better than to mid-size car's CNG tank
- Don't specify pressure. Let different approaches compete and go with what costs the least
- <100°C desorption
- <\$150-250/GGE stored
- Lifetime: Project: < XX% working capacity degradation over 1,000 cycles. Ultimate goal: 15 years

Potential Technology Pathways

- MOFs and COFs
- Facilitated adsorption
- Carbons
- High throughput computational screening & testing for faster materials discovery
- Materials that expand and collapse pore space for higher delivered capacity
- Ability to design pore size and structure
- DOE hydrogen program: example of system-level analysis as a template

Readout Questions, Group 4: Natural Gas Sorbent Materials

What can be done with \$3-4M in 2-3 yrs?

- Answer “will it work?” and “will it last?” The latter is a tougher question.
- Will not be a vehicle demonstration

What are appropriate yr 1 metrics? yr 3 metrics?

- Year 1: will it NOT work?
- Year 2: will it work? Do lab measurements extrapolate to a certain % of the ultimate system targets?
- Year 3: It works, and there’s less than XX% degradation in working capacity over 1,000 cycles

Is there value in funding seedlings <\$1M?

- Yes – new material concepts
 - e.g: methane chemistry and different physics of porous solids

Session Highlights, Group 4: Natural Gas Sorbent Materials

- **Additional Comments on Technical Areas**

- Part of program could be doing the systems-level modeling to inform the other teams

- **Additional Comments on Suggested FOA Metrics**

- System-level more important than sorbent-specific. Don't over specify the FOA

- **Key Questions to Ask**

- Need to bring together chemists with system analysts. Need to design a system that can compete with CNG, and then use those specs to define material properties needed (HEATS as template)
- Thermal management is non-trivial
- Are metrics compatible with consumer preferences?
- Will not be able to define exact material properties, but can define trade-offs that inform what advances are needed
- Is the home re-fueling model appropriate?