Materials and Modules for Low Cost, High Performance Fuel Cell Humidifiers

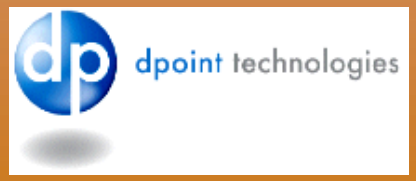
Prime Contractor: W. L. Gore & Associates

Elkton, MD

Principal Investigator: William B. Johnson

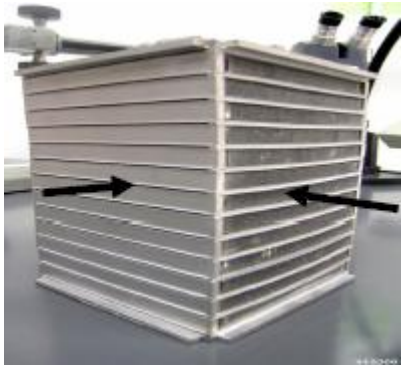
Sub-Contractor: dPoint Technologies

Vancouver, BC

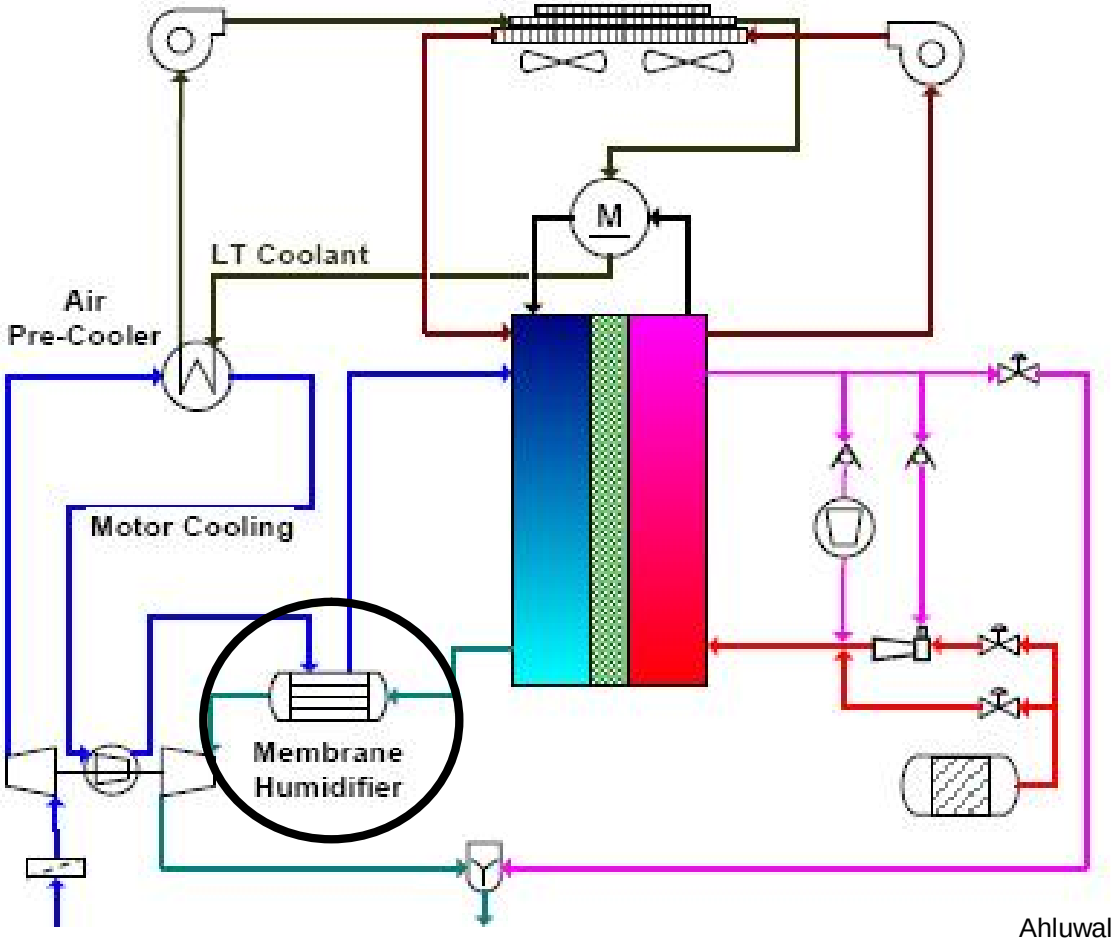


DOE Kick-off Meeting,
Wash. D.C – 10/01/2009

Background



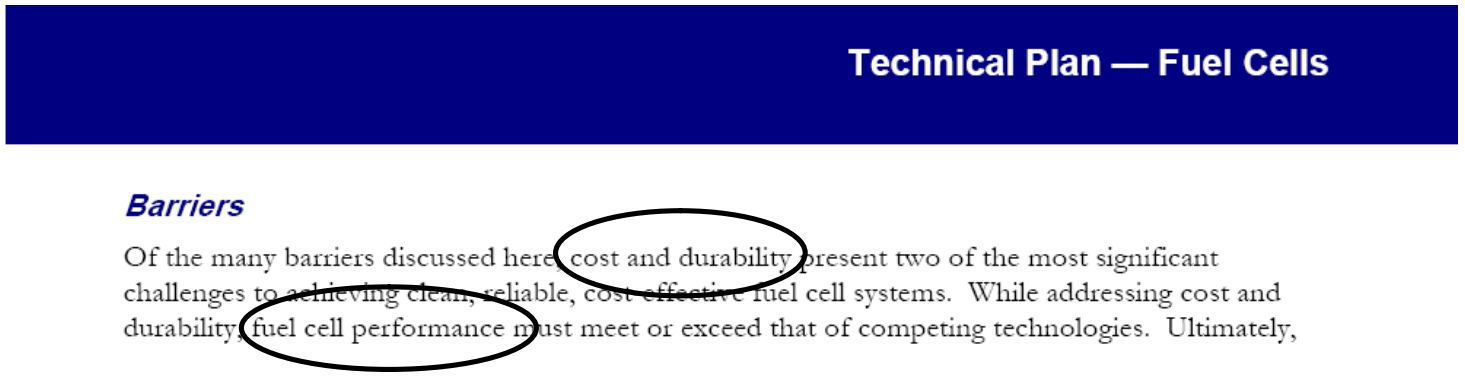
Mirza, Z. DOE Hydrogen Program Review, June 9-13, 2008; Washington, DC



Ahluwalia, et. al, ibid.

Objective and Technical Barriers Addressed

<u>OBJECTIVE:</u> Demonstrate a durable, high performance water transport membrane; and a compact, low-cost, membrane-based module utilizing that membrane for use in an automotive, stationary and/or portable fuel cell water transport exchangers.

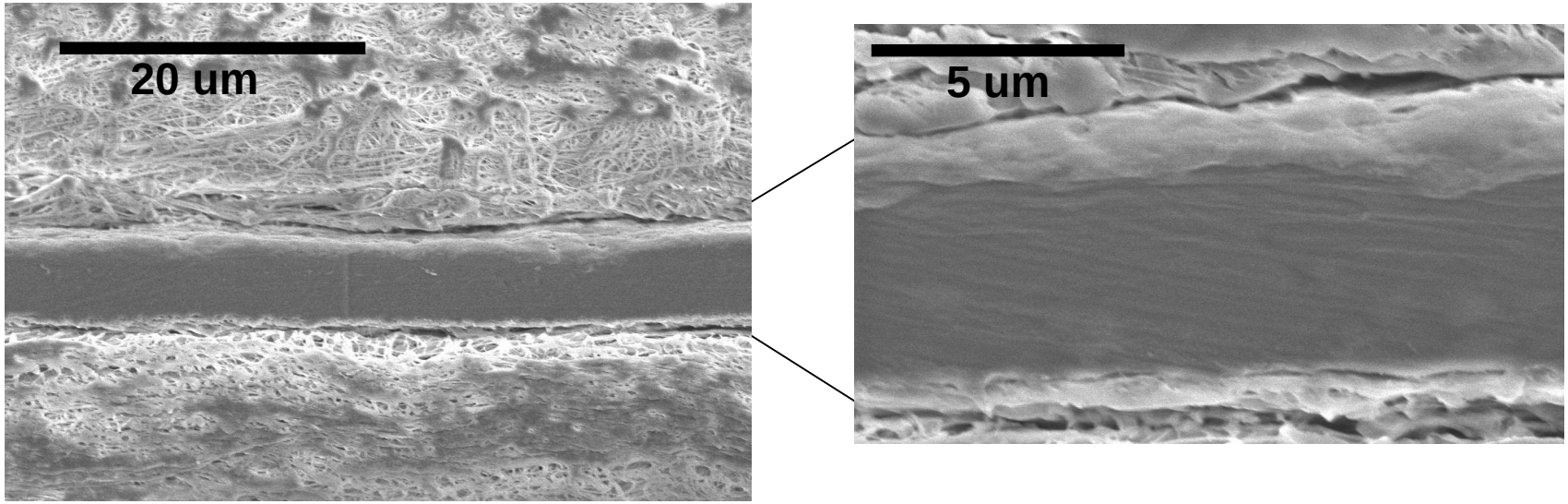


More efficient, low-cost humidifiers can increase fuel cell inlet humidity:

- **Reduce system cost and size of balance of plant;**
- **Improve fuel cell performance;**
- **Improve fuel cell durability.**

Approach: High Performance Membranes

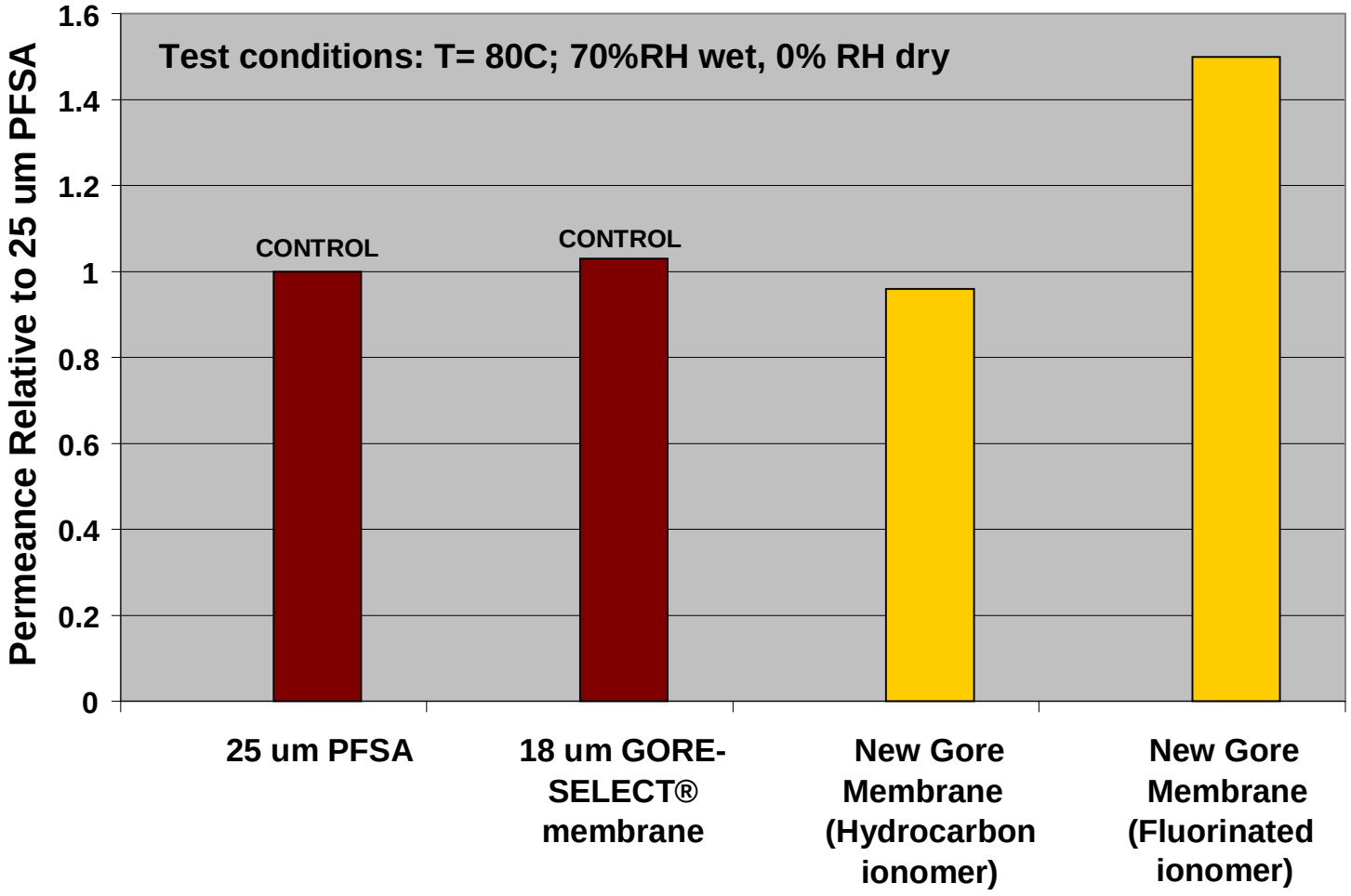
GORE™ Humidification Membrane



Images courtesy of Judy Rudolph, W. L. Gore & Associates, Inc.

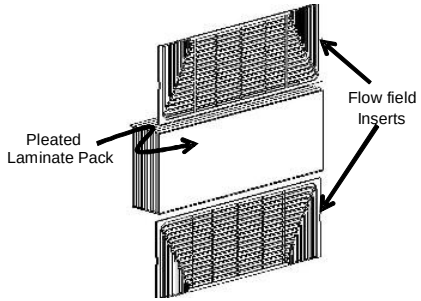
Optimize ionomer and microporous layer types and thickness to maximize permeance and durability, and minimize cost.

Approach: High Performance Membranes



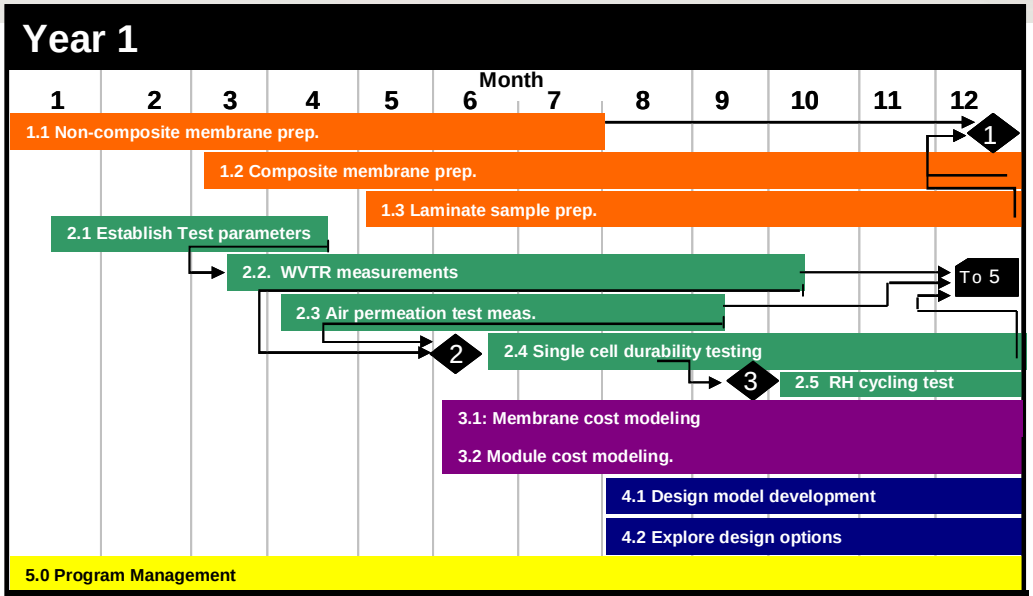
Approach: Low-Cost Modules

dpoint technologies

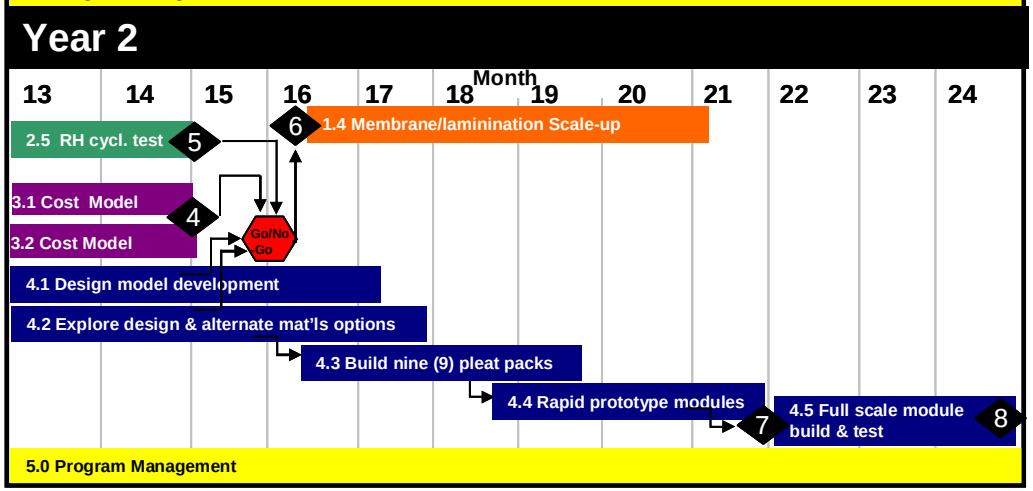


Optimize flow field, pleat geometry and module design to take advantage of very high transport rate materials, while maintaining low-cost assembly process.

Timeline, Go/No-Go, and Budget



DOE: $943K
Cost-share: $236K
Total: $1.18 MM



DOE: $731K
Cost-share: $183K
Total: $0.91 MM

Final Thoughts….

- **Water transport rates through these membranes can be VERY high, especially for the fluoronated ionomer-based materials.**
- **Transport measurements of these high-rate materials are a challenge.**
- **We will be soliciting input from various automotive and stationary fuel cell OEMs and from national labs about expected humidifier conditions.**
- **Output of this program may also lead to non-fuel cell energy saving applications for these and related materials.**