Low Cost, Durable Seal

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LOW COST, DURABLE SEAL

Outline

- Project Objective
- Technical Approach
- Timeline
- Team Roles
- Budget
- Q&A

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Project Objective

Develop advanced, low cost, durable seal materials and sealing techniques amenable to high volume manufacture of PEM cell stacks.

DOE Targets/Goals/Objectives	Project Goal
Durability Transportation: 5,000 hr Stationary: 40,000 hr	Durability Improve mechanical and chemical stability to achieve 40,000 hr of useful operating life.
Low Cost	Low Cost A material cost equivalent to or less than the cost of silicones in common use.

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Project Approach - Background

Material Choice:

Material Category	Stress Relaxation	Chemical Stability	Processing (Low Temp, Pressure)	Low Cost
LIM Silicones	–	–	+	+
Fluoropolymers	O	+	O	–
Existing Hydrocarbons	+	+	O	O
LIM Hydrocarbon	+	+	+	+

+ Excellent
O Fair
– Poor

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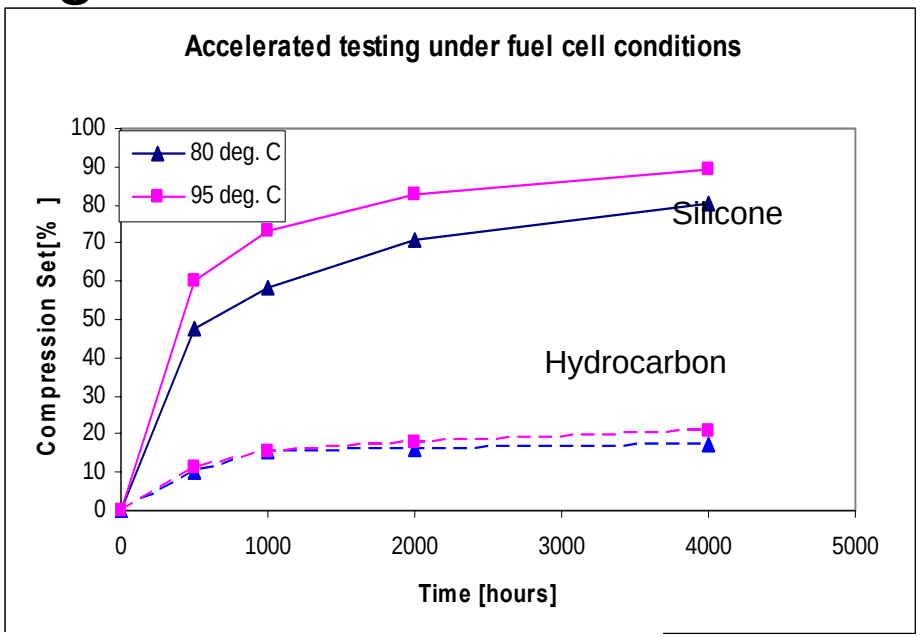
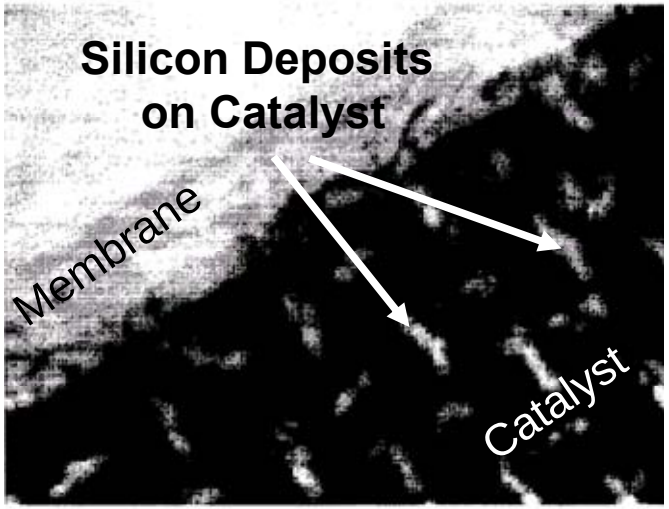
Project Approach - Background

- Experience indicates hydrocarbon elastomers can retain load better than silicones in PEM environments



- Silicones are known to breakdown and migrate to adjacent fuel cell components potentially causing water and reactant and ionic transport issues.



Source: M. Schulze, et. al., Journal of Power Sources 127 (2004) 222-229

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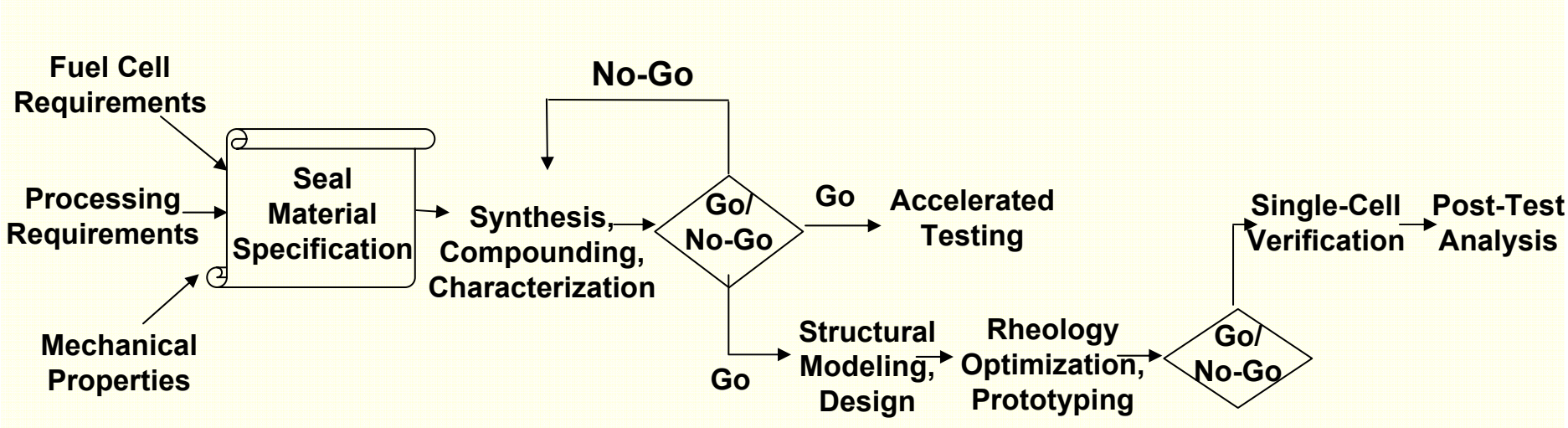
Project Approach



Material Specification and Development	Seal Modeling and Prototyping	Single-Cell Verification

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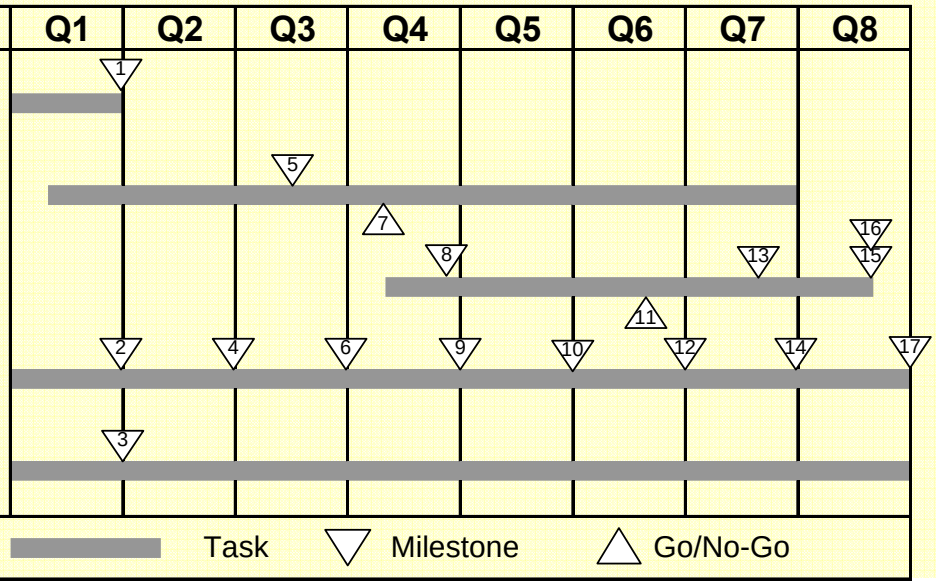
Project Timeline

Task	Task/Subtask Name
1.0	PEM Fuel Cell Specification
2.0	Seal Material Development and Characterization
3.0	Seal Verification
4.0	Project Management and Reporting
5.0	Safety



M/S	Milestone
1	Complete Seal Specification
3	Complete Safety Plan
5	Complete 1st Round Synthesis and Characterization
7	Complete 1st Round Material Screening
8	Finalize seal design
11	Complete 1st Round LIM prototype characterization
13	Begin single cell validation
15	Complete accelerated life testing and predict life
16	Complete single cell verification testing and analyses
17	Final Technical Report to DOE
2, 4, 6, 9, 10, 12, 14	Quarterly Progress Reports

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Team Roles

	Qualifications	Project Role
UTC Power, A United Technologies Company	**Fuel Cell Experience:**	•Material specification •Seal interactions •Modeling •Seal design •Stack design
Henkel Technologies	**Polymer Synthesis**	•Materials development, support and consulting
Freudenberg NOK	**Precision Molding**	•Seal concept evaluation •Rapid prototyping •Process development
Virginia Tech, Virginia Polytechnic Institute and State University	**Material characterization**	•Material characterization •Accelerated testing

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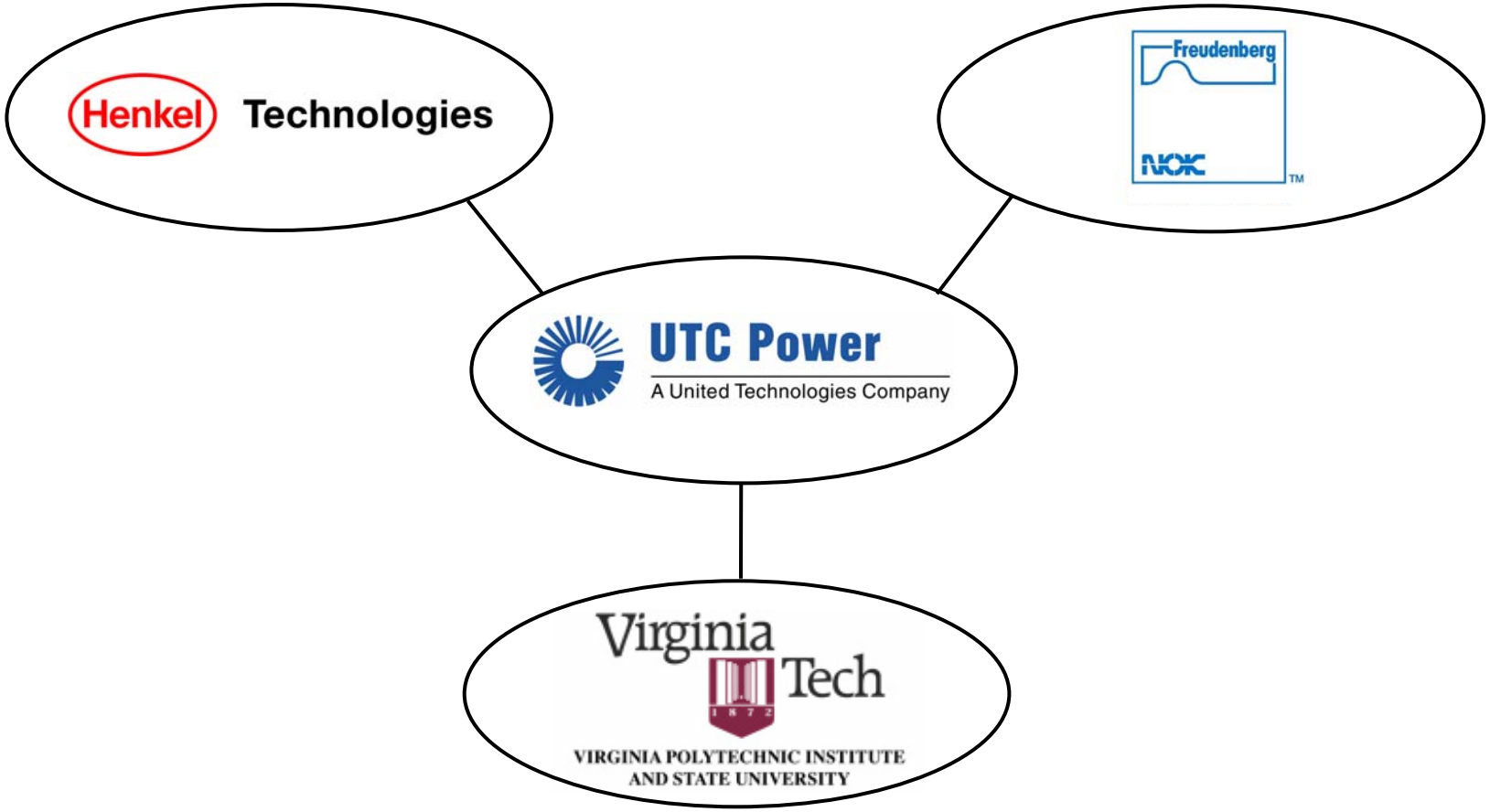
Program Budget (total program)

GFY ’07	$1,427,717
GFY ’08	$1,530,088
GFY ’09	$341,925

Total: $3,299,730

(includes 40% cost share)

Q & A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