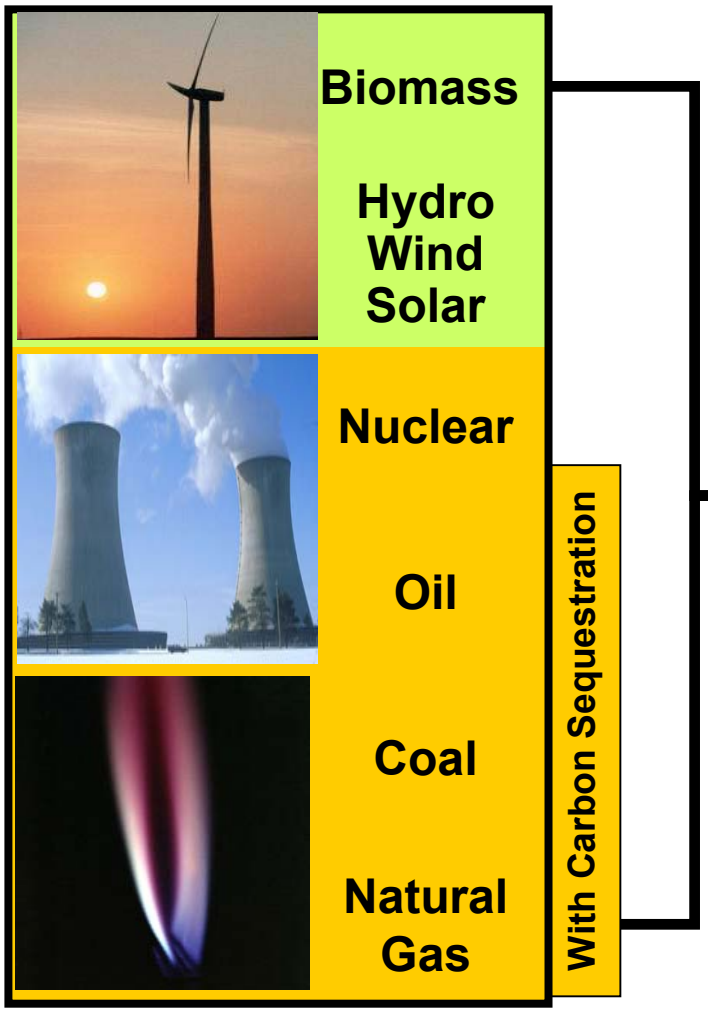

Fossil-Based Hydrogen Production

Distributed Natural Gas

H_2

Arlene Anderson

Barriers

Fossil-Based Hydrogen Production

- Capital Costs
- O&M
- Separation Technology
- Control and Safety
- Feedstock and Water Issues

Targets and Status

Distributed Hydrogen from Natural Gas or Liquid Fuels

Characteristics	Units	2003 status	2005	2010
Reforming				
Natural gas cost	$/kg H_2	0.66	0.62	0.58
Other costs	$/kg H_2	3.08	1.36	0.24
Primary energy efficiency	% (LHV)	70	72	75
Total				
Total cost	$/kg H_2	5.06	3.00	1.50
Primary energy efficiency	% (LHV)	62	68	75

Targets and Status

Separation Membranes for H_2 Production with Palladium Membranes

Characteristics	Units	2003 status	2005	2010
Flux rate	Scfh/ft^2	60	100	200
Cost	\$/ft^2	150-200	100-150	<100
Durability	Hrs	<1000	50,000	100,000
Operating temp.	°C	300-600	300-600	300-600
Parasitic power	kWh/ 1K scfh	3.2	3.0	2.8

Projects
Fossil-Based Hydrogen Production

• Thermocatalytic CO_2-free Production of H_2 from Hydrocarbon Fuels	Florida Solar Energy Center
• Novel Catalytic Fuel Processing Using Micro-channel Steam Reforming & Advanced Separations Technology	InnovaTek
• ITM Syngas & ITM H_2: Ceramic Membrane Reactor Systems for Converting Natural Gas to H_2 & Syngas for Liquid Transportation Fuels	Air Products & Chemicals, Inc.

Projects (Continued)
Fossil-Based Hydrogen Production

• Integrated Ceramic Membrane System for H_2 Production	Praxair
• Low Cost H_2 Production Platform	Praxair
• Defect-free Thin Film Membranes for H_2 Separation & Isolation	SNL
• Hydrogen Technical Analysis	TIAX

Posters

Fossil-Based Hydrogen Production

• Reformer Model Development for Hydrogen Production	NASA Jet Propulsion Lab
• Separation Membrane Development	Westinghouse Savannah River Technology Center
• Internal Combustion Engines	SNL
• Reduced Turbine Emission Using H2-Enriched Fuels	SNL
• Water-Gas Shift Membrane Reactor Studies	NETL

Discussion Points

- WHY - Jump Start H_2 Economy
- HOW – Diverse Portfolio of Fundamental and applied cooperative RD&D
- DIRECTION – Technical Targets
- ISSUES – Feedstock Costs…..