Hydrogen Program Presentation at US/China Forum

Sig Gronich
U.S. Department of Energy
Hydrogen Program Team Leader

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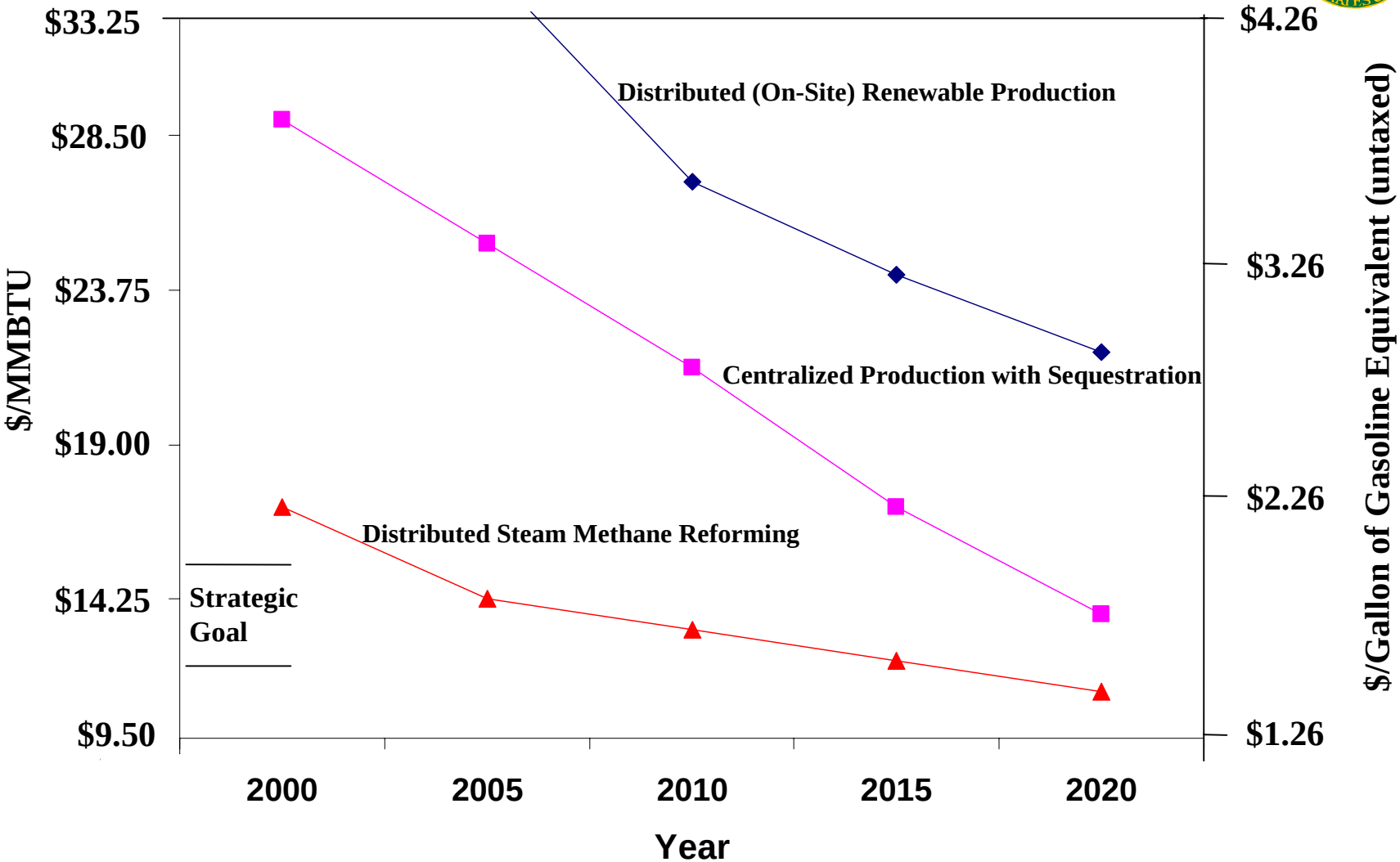
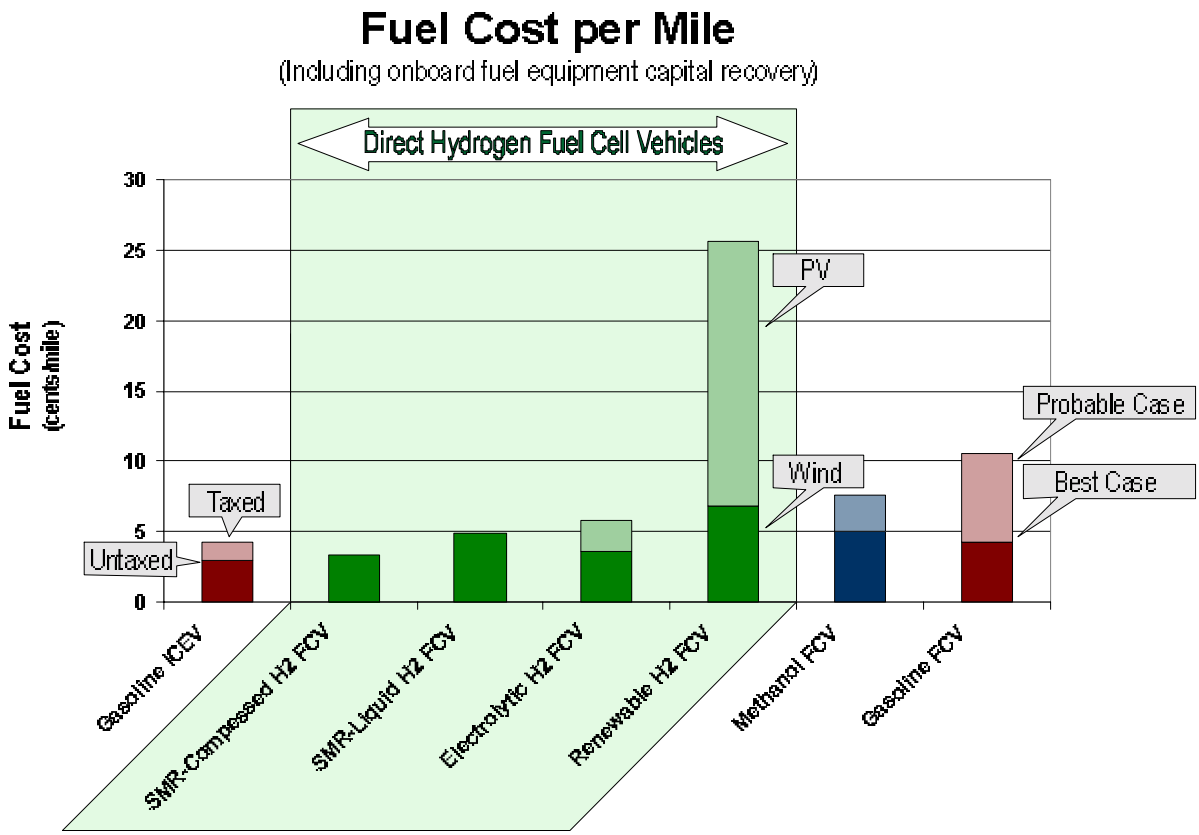
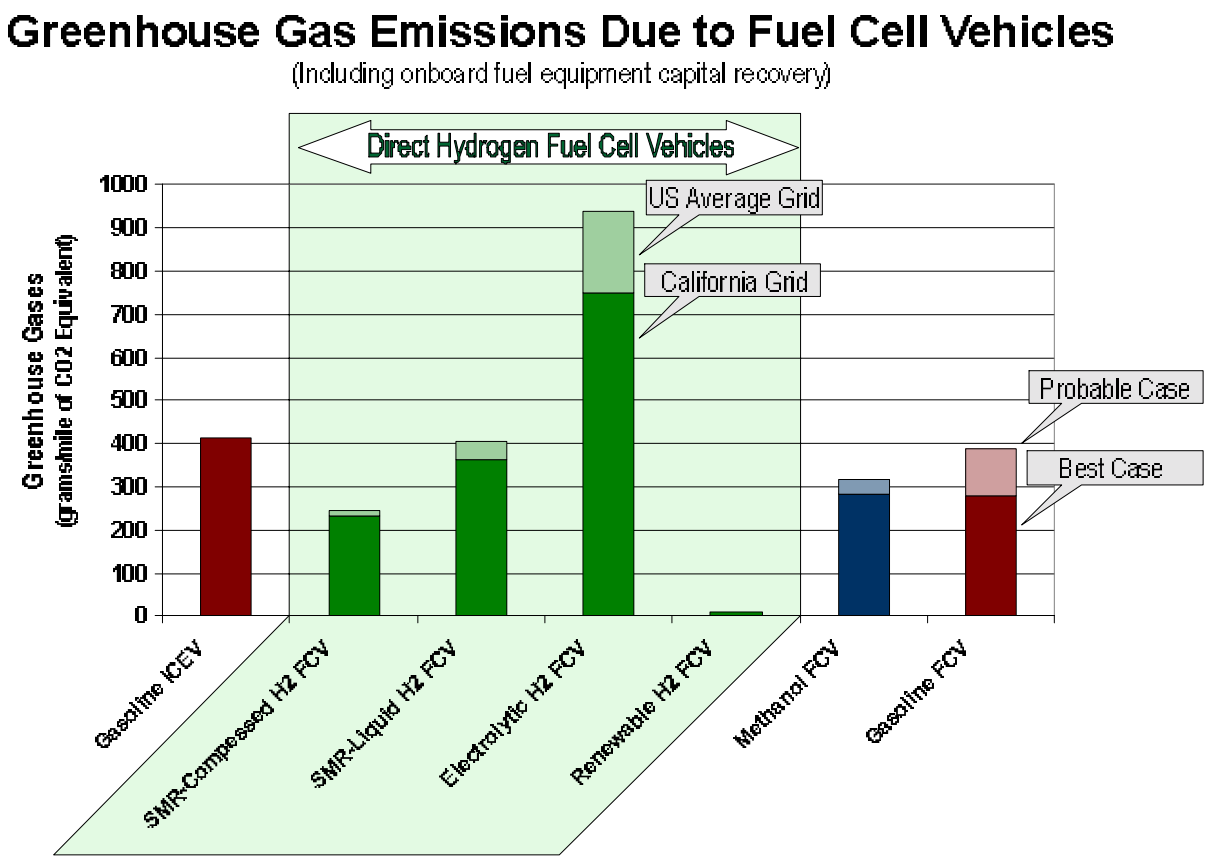
Hydrogen Program Vision

In the next twenty years, concerns about global climate change and energy security will create the platform for the penetration of hydrogen into several niche markets. Ultimately, hydrogen and electricity will come from sustainable renewable energy resources, but fossil fuels will be a significant transitional resource during this period. The growth of fuel cell technology will provide a basis for the establishment of the hydrogen option into both transportation and electricity supply markets.

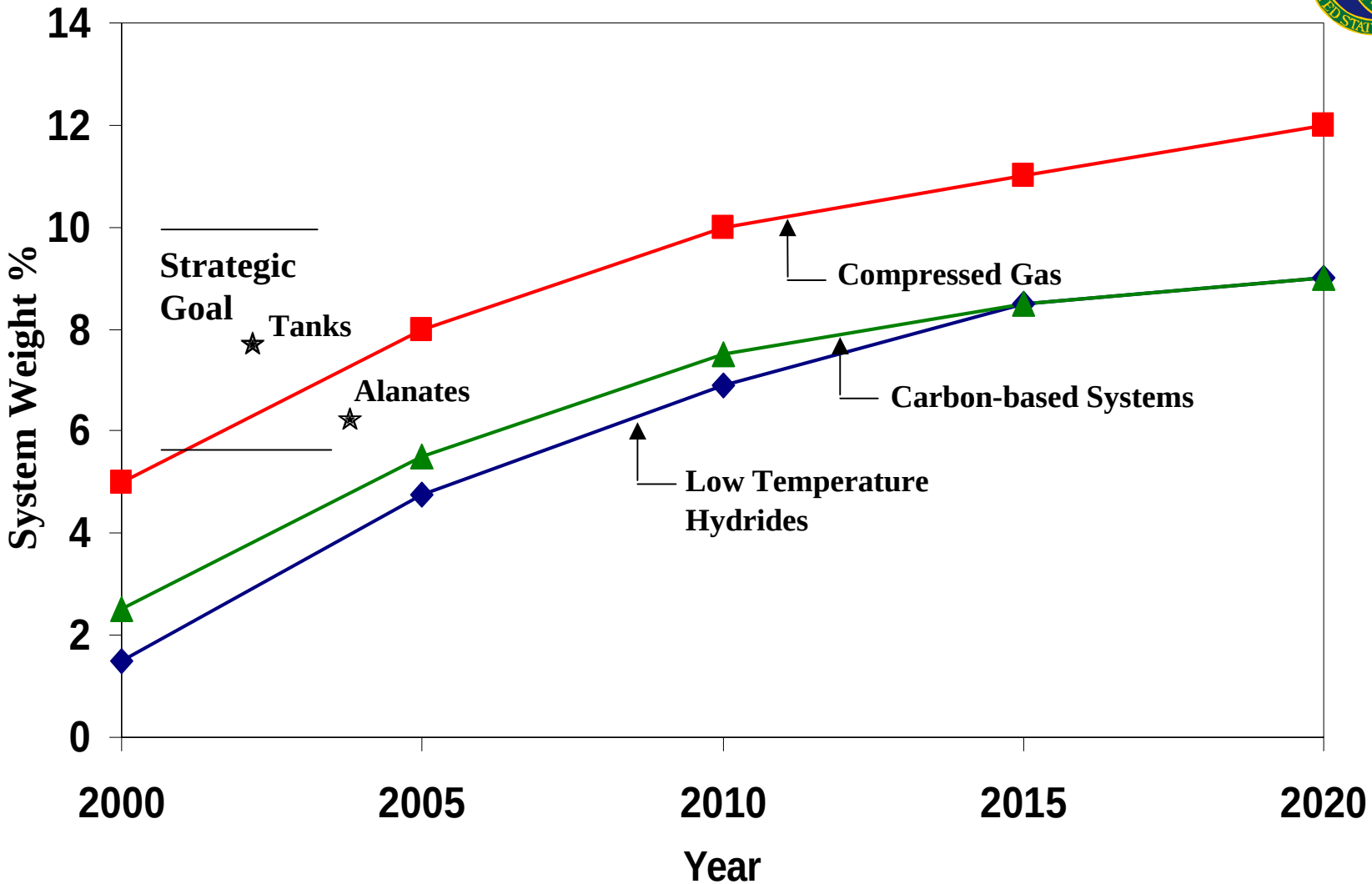
Cost of Delivered Hydrogen




Fuel Cost per Mile
(Including onboard fuel equipment capital recovery)
Direct Hydrogen Fuel Cell Vehicles
Fuel Cost
(cents/mile)
30
25
20
15
10
5
0
PV
Probable Case
Wind
Best Case
Taxed
Untaxed
Gasoline ICEV
SMR-Compressed H2 FCV
SMR-Liquid H2 FCV
Electrolytic H2 FCV
Renewable H2 FCV
Methanol FCV
Gasoline FCV


Greenhouse Gas Emissions Due to Fuel Cell Vehicles
(Including onboard fuel equipment capital recovery)
Direct Hydrogen Fuel Cell Vehicles
Greenhouse Gases
(grams/mile of CO2 Equivalent)
1000
900
800
700
600
500
400
300
200
100
0
US Average Grid
California Grid
Probable Case
Best Case
Gasoline ICEV
SMR-Compressed H2 FCV
SMR-Liquid H2 FCV
Electrolytic H2 FCV
Renewable H2 FCV
Methanol FCV
Gasoline FCV

Lightweight and Safe Storage Systems

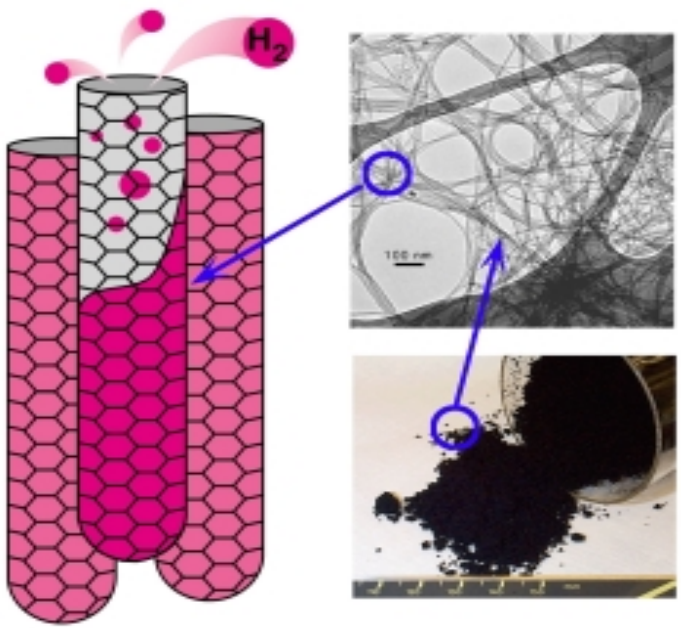


Hydrogen Storage Systems

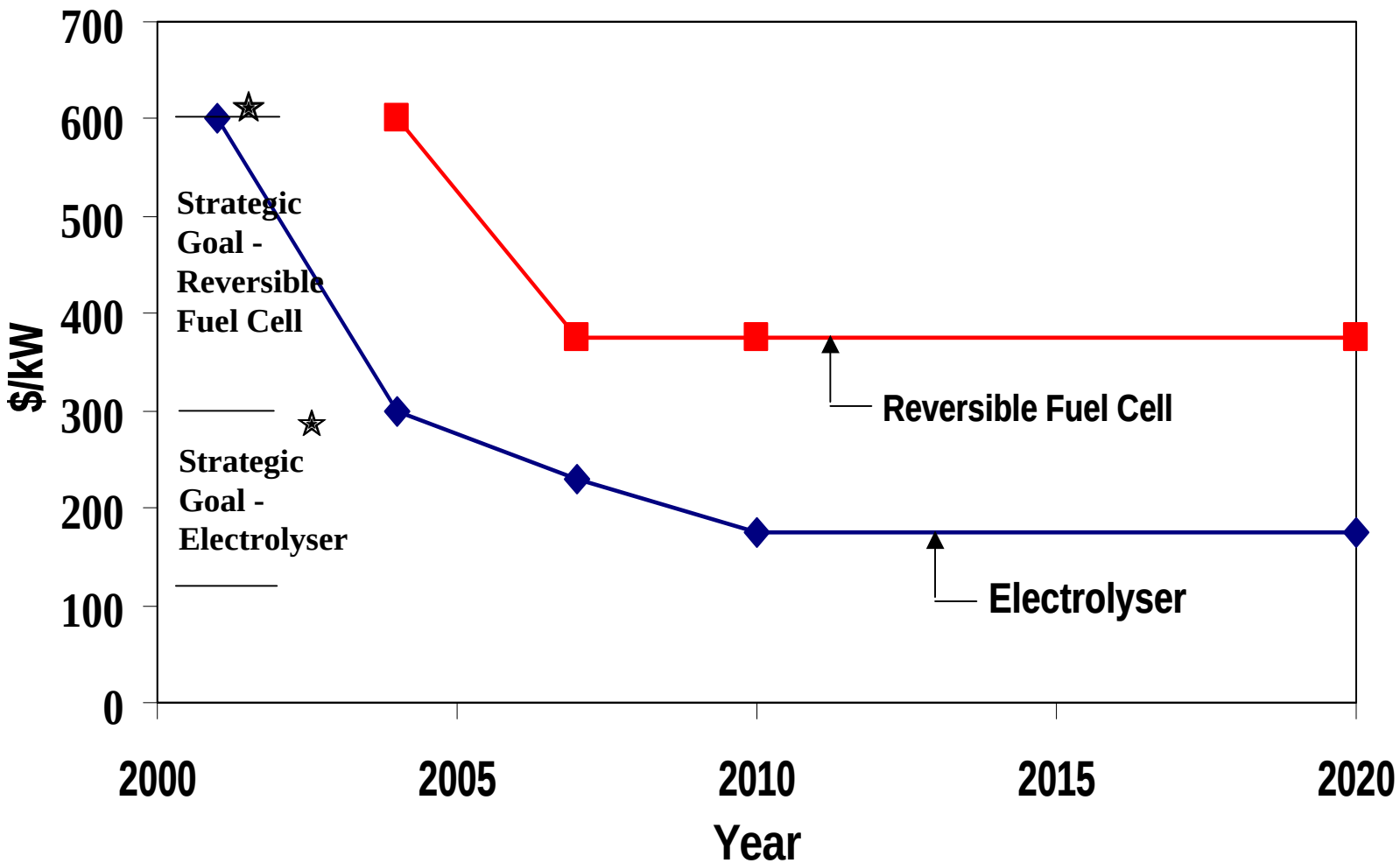
Carbon Nanotubes

Storage:

Researchers at NREL developed a process to purify carbon nanotubes using sonification in concentrated acid and have successfully achieved 4.5% hydrogen adsorption at room temperature.



Electrolyser and Reversible Fuel Cell Cost Reductions to Enhance Renewable Systems

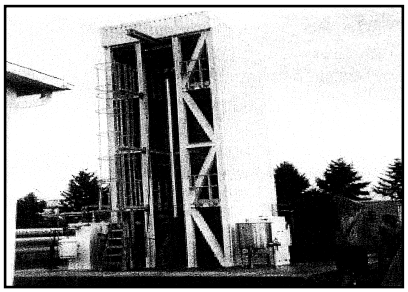


Hydrogen Production Systems

Electrolyzer

Photo courtesy of SunLine Transit

Technology Summary



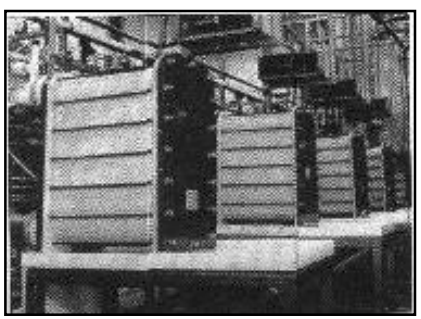
Production

Storage

Electrolyzer

The Hydrogen R&D Program is concentrating on a set of "hydrogen appliances" that can be used at any point along the electric transmission or natural gas pipeline systems for distributed electric generation and transportation applications.

Distributed Generation



Reversible Fuel Cell