The WRI Center for Transport and the Environment

Fuel Cells or Fool Sell? If Hydrogen Was The Answer, What Were The Three Talks On Thursday Evening?

Lee Schipper, Ph.D.
Director of Research, EMBARQ
The Hydrogen Transition
Asilomar, July/August 2003

John Decicco, ED:

The "Chicken and Egg" Problem Writ Large

Why a hydrogen fuel cell focus is premature

- Is there a public policy paradigm shift away from markets (were we ever on markets)?
  - ZEV
  - Alternative Fuels
  - Freedom Car
- Ethanol Subsidy shows “market” policies can be profound….

- Still, effect of non-neutral, strategically oriented policies remains negligible in the marketplace: Winner picking hasn’t picked winners

EMBARQ

Rationales For Change Pertaining To Societal Concerns That Are Generally Within The Purview Of Public Policy

·Public health -- the need to reduce emissions of criteria air pollutants in order to improve air quality.

·Global warming -- the need to reduce emissions of greenhouse gases that cause climate disruption.

·Energy security -- the need to reduce consumption of petroleum products that incur economic risks and security liabilities.

EMBARQ

Two Compelling Charts of History: Air Pollution did better than Carbon

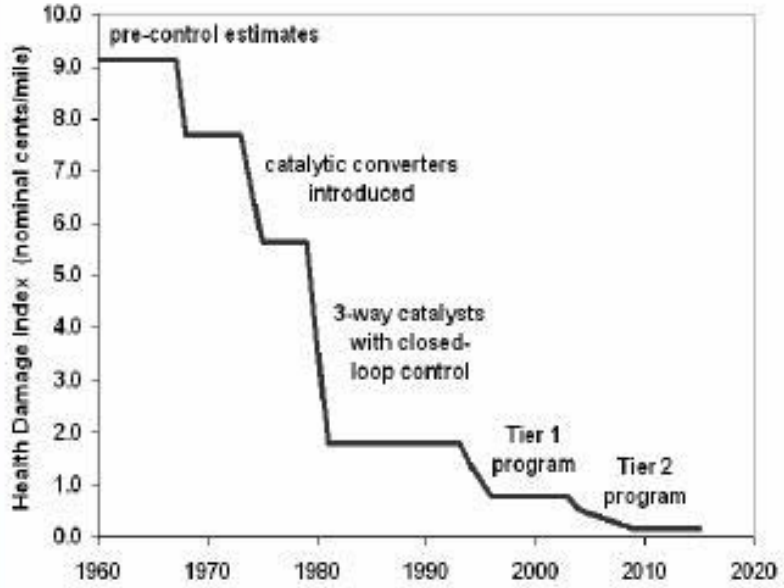

Figure 1.Progress in Regulating Air Pollution from U.S. Passenger Cars

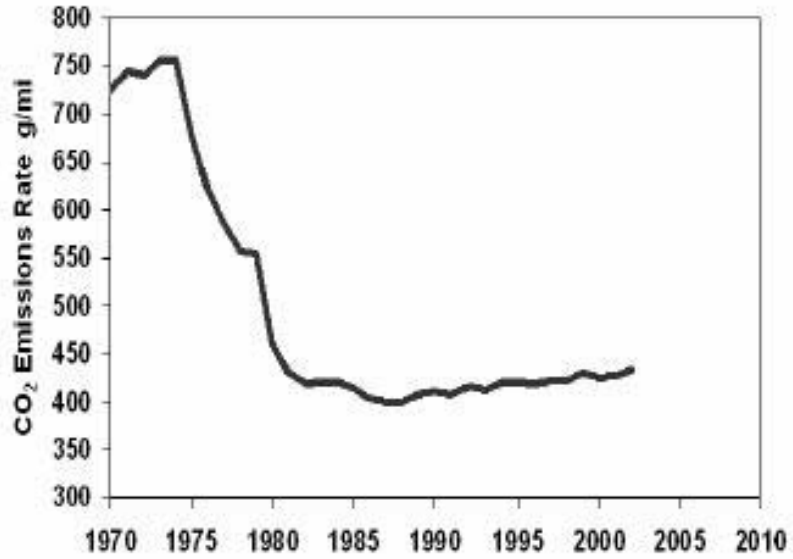

Figure 2. New Fleet Average CO_2 Emissions Rate of U.S. Cars and Light Trucks

Source: Nominal rate derived assuming constant 15% shortfall and 8800 g/gal CO_2 emissions factor, based on U.S. EPA Fuel Economy Trends data

EMBARQ

Consumer Drivers for Hydrogen

- Electric Power-train Advantages
  - Controllable and customized
  - Smooth
  - Reliable
- On-Board High Power Electricity for Accessories
- Environment? Not Strong Enough

EMBARQ

Drivers for Efficiency and Hydrogen

·Air Pollution – but we're nearly there

·Global warming – Pubic Policies are not aligned

·Energy security – Most policy makers unwilling to promulgate significant policies

EMBARQ

DeCicco Conclusions

- A singular focus on hydrogen technologies for automobiles is difficult to justify based on what is known of this technology when compared to competing options and the forces likely shape automotive design over the coming decades. Thus, initiatives like Freedom Car and the California Fuel Cell Partnership are premature, even though some level of steady, long-term research is justified.

- Notably underlying the strategy situation is the uneven status of the societal concerns that motivate hydrogen cars. Hydrogen might be an ideal joint solution to the problems of air quality, global warming, and energy security. But the roles that these considerations play are not now aligned to require a joint solution

EMBARQ

Drew Kojak, Nat. Commission on Energy Policy

Retrospective on Motor Vehicle Policies: Fuel Economy, Emission Standards, and Alternative Fuels.

- Two broad public policy goals have driven motor vehicle policies:
  - Public Health (emissions & safety standards)
  - Oil Security (fuel economy and alternative fuels programs).
- The performance of these policies has varied greatly.
- Reasons for disparate performance provide lessons to apply to future policies.

EMBARQ

Relevant Statutes

- Clean Air Act Amendments of 1965, 1970, 1977, and 1990.
- Energy Policy and Conservation Act (1975)
- Alternative Motor Fuels Act of 1988
- Energy Policy Act of 1992
- National Traffic and Motor Vehicle Safety Act (1966, et seq.)

Measuring Performance

POLICY TARGET	MEASURE	PERFORMANCE
Emissions	Reduction in NOx emissions from passenger vehicles.	94% (1970 – 2001)
Safety	Reduction in fatalities per vehicle miles driven.	72% (1967 – 2000)
Fuel Economy	Improvement in fuel economy in passenger vehicles (gal/mile).	36% (1975 – 2002)
Alternative Fuels	Alternative fuel use as fraction of U.S. transportation fuel use.	3% (1988 – 2001)

EMBARQ

Why the Disparate Performance?

Criteria	Emissions/ Safety	Fuel Economy / Alternative Fuels
Statutory Authority	Strong and Broad	Limited and Tentative
Agency Responsibility	Unified	Divided
Regulatory Approach	Technology-Forcing	Technology Laggard
Congressional Support	Sustained	Sporadic and Contradictory

EMBARQ

Implications for Future Policies

- Finding
  - *The regulatory structures (laws, rules, case law, etc.) that have evolved around fuel economy and alternative fuels policies are in need of significant modification if they are to serve as a sound foundation for future efforts to reduce oil dependence.*
- Proposed Policy Approach
  - Clarify Mission to Conserve Energy. Identify better methods of establishing goals and metrics for determining the need of the U.S. to conserve energy (e.g., other than gas prices).
  - Improve Regulatory Framework. Explore regulatory frameworks that involve state and local activities to conserve energy, perhaps based on the Clean Air Act's federal-state partnership.
  - Find Alternatives to Failed Policies. Identify and assess the impact of regulatory alternatives to CAFÉ and alternative fuels programs that uses the performance of previous policies as a useful guide to future action.

EMBARQ

Implications for Future Policies

- Finding:
  - *Future motor vehicle programs (e.g., hydrogen, ethanol, fuel economy standards) that seek to justify themselves based on oil security concerns are likely to need additional rationales in order to receive sustained government support.*
- Technology Observations
  - Hydrogen -- Until hydrogen is produced from renewable resources (2030+), the environmental performance of hydrogen fuel cell vehicles on par with emerging conventional technologies (i.e., diesels and hybrids).
  - Cellulosic Biomass -- Ethanol produced from cellulosic biomass may become commercially available on the same timescale as hydrogen from renewable resources, but does not have the same magnitude of infrastructure requirements (same distribution and refueling infrastructure, same vehicles).
  - Fuel Economy Standards -- Provide significant, near term oil-security benefits combined with some environmental benefits and consumer payback of at least a portion of the additional vehicle cost.

EMBARQ

Schipper: What Do We Get for The Effort? Neat Cars, but What Else, at What Cost?

- No Significant Relief For Oil Imports In 20 Years
  - De-SUV-ing, efficiency, hybrids offer much more
- No Guarantee of Any GHG Benefits
  - No Carbon Taxes
  - Coal - > Hydrogen a great temptation
  - After Kyotus Interrupts, who cares?
- "Dramatic" or "Trivial" Improvement in Local Air
  - ZEV sparked enormous development
  - Are the last few molecules of pollution worth that much?

EMBARQ

Steps To Solving Energy Problems

- Understand why US has been unable to develop a far-reaching energy or climate policy
  - All alternatives cost more than today's?
  - Policy process fatally weakened by lobbies, sob-stories, etc.
  - Unable to make compromises
- Decide if market forces or market farces are basic drivers
  - Market farces - the US tradition of everything *but* pricing, usually reducing welfare, by picking winners
  - Economists' advice: :Tax bads, not goods" means pick losers, not winners
  - Use pricing to maximize welfare and the speed towards a solution.
- Market is far from perfect: Where does H2 need help?

EMBARQ

What Else Can Accomplish The Goals In Transport At Lower Cost?

- Modal Shifts, less mobility, changed settlement patterns contribute if losers are picked, through taxation
  - Example - ZEV mandates have no impact on modal choice, car use, etc.
  - Fuel externalities in Los Angeles in early 1990s would have added 60 cents/gallon (Small and Kazimi)
- Energy efficiency
- Use of fuel cells in other applications -- home energy, power generation, etc.
  - Transport is not the only part of the economy
  - Hydrogen is not the only interesting alternative

EMBARQ

Where Hydrogen/Fuel Cells Could Make A Big Difference

- Production from off-peak electricity (compare with energy storage)
- Production with sequestered CO2 (make the coal lobby happy)
- Production from remote renewables (make the environmentalists happy)

Will an Apollo Program or International Push Help?

- Crash energy programs have not succeeded
- Markets need to be established -- Europe and Japan use standards, prices, we don't
- Subsidies can be helpful, but hard to remove in the US (ethanol).
- There is an impressive program today
  - Shell, BP, Texaco;
  - Ford, Toyota, GM, etc.
  - UNDP Program for Fuel Cell Buses in Developing Countries

EMBARQ

An alternative strategy could be...

- Price energy right now -- and acknowledge that this is a necessary first step
- Develop a program that lets many “sources” to achieve goals compete
- Judge in five years the likely landing spots and prepare what the market cannot do

Conclusions: Road Map Desperately Needed to Avoid Synfuels, Ethanol Debacles

- Clear consensus on what problems hydrogen will solve, who will solve them
- Attitude towards prices and pricing, and policy process must change
- Decide on role of government, private sector across the board (not just for hydrogen).

No consensus on these issues in the 1970s (energy) or 1990s (climate) or 2003 (Energy Bill)
Will Hydrogen era be different?

EMBARQ

- *Created by Shell Foundation*
- *Mission to work closely with empowered forces in urban areas to solve transport/environment problems*
- *Working with empowered local authorities in in Mexico City and Shanghai , and helping other cities (in Asia) find out hw sustainable their transport systems really are.*

Visit us at
www.embarq.wri.org