

Scatter Shot Reform

By Sander Cohan*

An Explosion of Transport Fuel Pathways

For nearly a century, the dominance of gasoline and diesel in the transport fuels market has remained relatively unchallenged. As motor transport has spread with economic development, these two products of the petroleum refining industry have driven global demand for petroleum. In an upcoming study entitled, *Scatter Shot Reform: Fuel Engine Pathways for Automotive Transportation*, ESAI analyzes how the status quo is changing through a haphazard effort at transport fuel reform. Competing and sometimes conflicting reform will result in a vastly different transport fuels market. Responding to developments in technology, changing attitudes towards environmental sustainability, and the tightening of global supply and demand markets for petroleum and petroleum products, a process of market transformation has begun. In addition to the complication and expansion of gasoline and diesel markets to include new formulations and specifications, new transportation fuel and automotive technology pathways are emerging (see Figure 1). Their emergence has created the beginnings of a sea change in transportation fuel markets.

The result of this transformational process over the coming 20 years will be the expansion of the potential number of fuel pathways from two, gasoline and diesel, to more than twelve, covering the gamut of technologies and environmental strategies. While some of these fuels will be agricultural in nature, deriving from energy crops, a substantial portion will be from the development of new technologies that utilize existing hydrocarbon resources, such as natural gas and coal.

Although the aim of fuels reform, most often, is ultimately to replace a substantial portion of gasoline and diesel consumption, these pathways were not developed in concert with each other. Instead, they are the result of a series of competing agendas and outlooks, a process of scatter-shot reform. Consequently, market conditions that promote the growth of some of these technologies hinder the growth of others.

Price is not the Only Driver

The collapse of oil prices through the beginning of 2009 does not mean that the development of alternative fuels will stop, or necessarily even slow down. The drivers of new fuel technologies are not uniform and are not connected exclusively to economic fundamentals. The motivation for market transformation comes from a variety of different sources. These shifting factors include:

Climate Change Concerns surrounding the contribution towards global climate change from conventional transportation fuels and the effect these fuels have on air quality have led to a widespread policy and market effort to encourage the use of fuels with lower greenhouse gas (GHG) emissions profiles. Despite the best efforts of policymakers under the Kyoto regime, the preferred approach and definition of these emissions varies substantially from country to country and by level of economic development.

Energy Security: As more of the world's expected crude oil production comes from a decreasing number of countries, there is a growing concern among consuming nations that supplies of crude oil and thus petroleum products will become more vulnerable to political and economic instability in these increasingly important producing countries.

Agriculture Market Support: The production of certain alternative fuels requires the consumption of agricultural commodities. Many markets for non-petroleum fuels were developed as a way to utilize surplus crops and sustain sagging agricultural markets. Other markets emerged to support the agricultural sector by finding uses for marginal and low yield cropland.

Domestic Market Development: Alternative fuel markets also exist as a tool for economic development. The expansion of new transportation fuels pathways opens new opportunities for the scientific community, the energy industry and

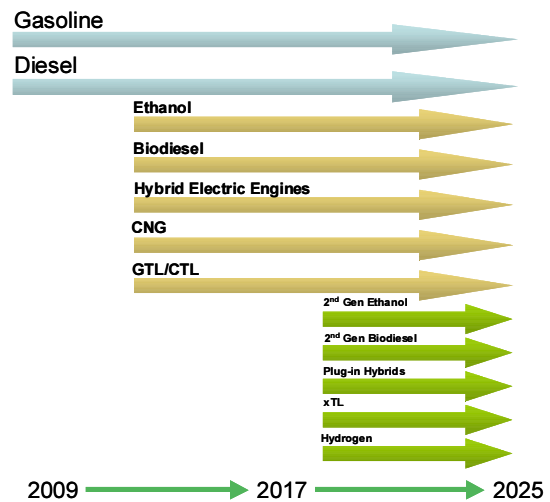


Figure 1: Scatter Shot Reform Yields an Explosion of Transport Fuel Pathways

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entrepreneurs to develop production and transport. These efforts translate into greater economic development and jobs during a time of economic hardship.

Scatter Shot Reform

The multiple drivers of alternative fuel pathways have inspired varied policy efforts to encourage their development and expansion. The policy development for new transportation fuel pathways, however, is inconsistent. The result is a process of scatter shot reform, where policies endorse market efforts in a seemingly haphazard fashion, according to regional needs and political goals.

The landscape, therefore, is characterized by several policies that prioritize radically different agendas, relevant to geography and politics. As a result, the future for alternative transportation fuel pathways is

	Policy	First Priority	Second Priority	Third Priority
United States	RFS I	Security of Supply	Agricultural Support	Climate Change
	RFS II	Market Development	Climate Change	Agricultural Support
	California LCFS	Climate Change	Market Development	
EU	EC Biofuels Directive	Security of Supply	Climate Change	Market Development
	20 and 20 by 2020	Climate Change	Market Development	Security of Supply
	German Biofuels	Climate Change	Market Development	Agricultural Support
Brazil	Proálcool	Security of Supply	Agricultural Support	Market Development
South Africa	GTL/CTL	Security of Supply	Market Development	

Table 1: Drivers of Alternative Fuels Markets

extremely varied. In some circumstances, the policy drivers work together, suggesting a consistent adoption path and a unified technology. In other circumstances, the drivers of policy and approach to market development conflict. Table 1 describes some alternative fuel policies in terms of their

primary, secondary, and tertiary drivers.

ESAI's preliminary research shows that the language of transportation fuel reform is very similar across markets. Most regions, for example, are concerned with security of supply. Yet beyond this common nomenclature, what each market emphasizes, results in different paths of development. A focus on security of supply, for example, will give an advantage to fuels that are derived from domestically produced sources. Combine this factor with an emphasis on agricultural support, and one finds a growing market and taste for corn-derived ethanol in the United States, or sugarcane ethanol in Brazil. On the other hand, while security of supply concerns drove the development of South Africa's coal-to-liquids policy, stronger emphasis on climate change might result in the development of fuel pathways with lower carbon impact and greenhouse gas emissions. Its market strength and support behind coal-to-liquid fuels

	First Driver	Second Driver	Third Driver
Advanced Diesel Technology	Climate Change	Market Development	Security of Supply
Advanced Gasoline Technology	Climate Change	Market Development	Security of Supply
Plug In Hybrids	Climate Change	Security of Supply	Market Development
Ethanol, First Generation	Security of Supply	Agricultural Support	Climate Change
Ethanol, Second Generation	Market Development	Climate Change	Agricultural Support
Biodiesel, First Generation	Security of Supply	Agricultural Support	Climate Change
Biodiesel, Second Generation	Market Development	Climate Change	Agricultural Support
Compressed Natural Gas	Security of Supply	Market Development	Climate Change
Hydrogen	Climate Change	Security of Supply	Market Development
Coal To Liquid/Gas to Liquid	Security of Supply	Market Development	Climate Change
Biomass to Liquid	Climate Change	Market Development	Security of Supply

Table 2: Drivers of Alternative Fuels

would wane in the face of that technology's lower effectiveness at providing an economic, low-carbon fuel. Table 2, elaborates this concept further, describing emerging and existing alternative fuel technologies in terms of the drivers that promote their development.

A global survey of the various alternative fuel reforms combined with a discussion of the drivers behind the individual technologies

themselves yield a map of potential market opportunities for a wide variety of alternative fuel pathways. As the above tables suggest, the results do not inform the development of a most fit technology; there is no clear winner. Instead, the result of the co-evolution of alternative fuel policy with alternative fuel technology results in a highly balkanized market where a fuel that will flourish in one region might not in others. Further, in markets that might foster similar technologies, nuances in the regional landscape will affect the ultimate size and growth pattern of a technology pathway.

This landscape has important implications for refiners and fuel marketers. Although alternatives will play a substantial role in global fuel supply and demand, the overall impact of individual actors and individual technologies might yield an unexpected outcome. There does not appear to be any indication of convergence across technologies or policies in the near or even medium term. As a result, it is likely that the current fracturing of the transportation fuels markets from two clear pathways, gasoline and diesel, will continue to split and develop further. If the policies of the OECD regions are any indication, the relatively clear policies of developing nations will become more complicated as economic growth continues, national priorities change, and shifting global attitudes begin driving changes in national energy policies. The pattern of scatter shot reform leading to varied and potentially conflicting fuel pathways will become the norm, rather than the exception.