

A BALANCING ACT: FOSSIL AND ALTERNATIVE FUELS

Policymakers worldwide find themselves increasingly confronted by the need to balance economic development with an effective, secure yet environmentally-benign energy policy. The myriad of new alternative energy and fuels options has fundamentally changed the rules of the energy game, at the same time significantly increased the complexity of the policymaking process.

The heat arising from this challenge is most acutely felt by policymakers across Asia. The region's rapid economic growth in the past two decades has led to a sharp increase in the consumption of energy resources throughout the region. Indeed, Asia has been responsible for the majority of new demand for energy and transportation fuels witnessed in recent years.

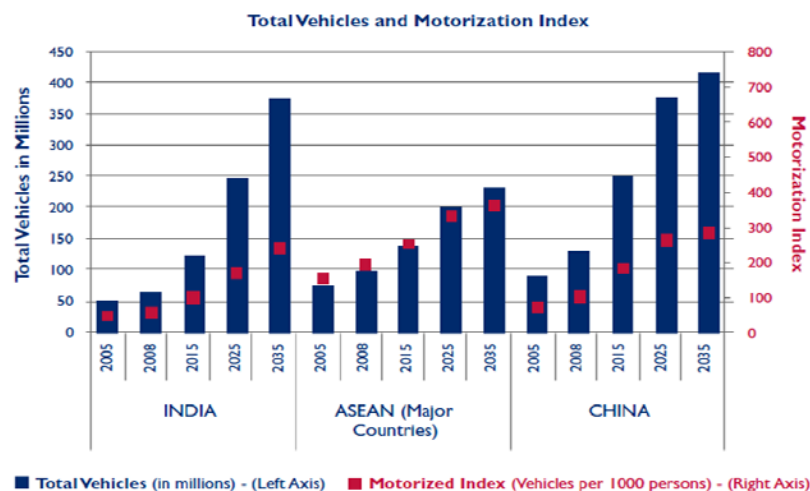
The current economic recession notwithstanding, Asia remains the crucible of economic progress with China powering the growth locomotive. The United States (US) Energy Information Administration (USEIA), in its *International Energy Outlook 2009* report, expects China, India and the other developing countries of non-OECD Asia to contribute almost one-half of the increase in world GDP from 2006 to 2030.

A Slice of the Energy Pie: Transportation Fuels

The underlying growth drivers and the rise of the middle class in Asia have propelled the strong growth in the transport vehicles population. Both China and India have become major vehicle markets. China is now THE global automotive manufacturing hub of the world, having taken over the mantle from the United States recently.

The US Agency International Development (USAID) projects the total vehicles to double in major ASEAN nations, triple in China and expand five-fold in India up to Year 2035.

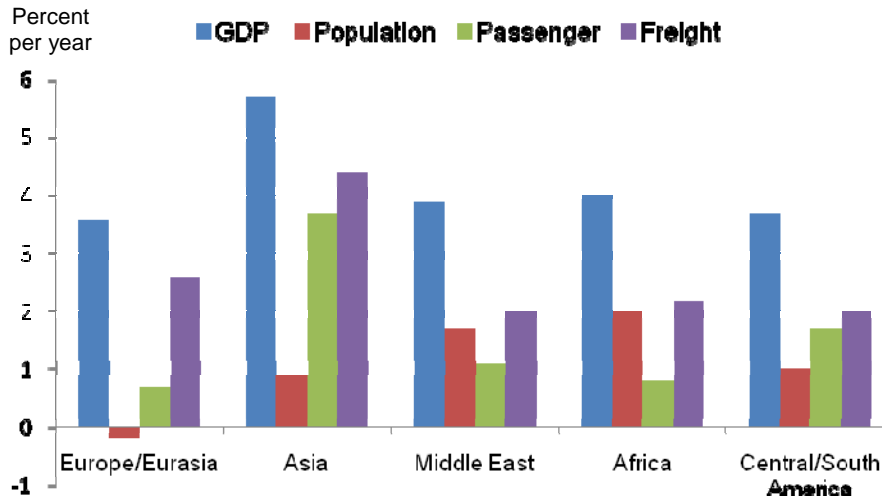
Figure 1. Growth in Number of Vehicles and Motorization Index in Asian Countries



Source: USAID Asia report "Biofuels in Asia: An Analysis of Sustainability Options" March 2009

The USEIA separately forecasts transportation energy consumption in non-OECD Asia (for both passenger and freight transportation) to increase more rapidly than in the other non-OECD countries from 2006 to 2030.

Figure 2. Transportation Energy Use (Average Annual Change in Gross Domestic Product, Population and Energy Consumption for Transportation by non-OECD region, 2006-2030)



Source: 2006 - Derived from Energy Information Administration (EIA), *International Energy Annual 2006 (Jun-Dec 2008)*. Projections – EIA *World Energy Projections Plus (2009)*

What does this mean for policymakers?

In line with the phenomenal growth in the vehicular pool, transportation fuels have become an integral part of Asian countries and a country's energy policy mix. Improved mobility has made possible a wide array of lifestyle enhancements, a continuous flow of trade/goods and higher levels of commercial activity, particularly in auto-producing nations such as China, Japan, South Korea, Thailand and India. On the other hand, the costs of affluence in this form include vehicle pollution, poorer air quality and environment, higher medical healthcare costs, higher oil prices and traffic congestions.

Policymakers have to deal with the shift in consumer expectations (which are increasingly sophisticated and demanding) and understand the weight of such expectations on policy decisions. The challenge is to strike a balance between economic expansion, rising vehicle demand, pollution control, the use of conventional and alternative fuels/energy, energy security needs and prices of transportation fuels in the market.

A confluence of factors is in play when one considers transportation energy and fuels policy: cost and benefit to the consumer, producer and the government, energy security, crude oil prices, environmental protection (think air quality and greenhouse gases), current and future fuels/energy options (including domestic production capacity), technology and infrastructure readiness and political considerations.

Developments of vehicle transportation fuels/energy in Asia are not homogenous. Asian countries have achieved varying degrees of success and each one has to focus on country-specific priorities and issues. The crux is to identify the key policy drivers for each country and recognizing that every nation has specific needs and resource endowments/limitations.

Consumers expect the government to do the right thing for the people and the country. The best bet governments have to ensure its political longevity is to adopt a thorough and fact-based approach to examining the viability of various transportation fuel options without sacrificing the environment. This requires the presentation of such scientific and economic facts and data that can withstand scrutiny by all stakeholders in the government and private sectors.

The Relevance of Traditional Fuels (vs Alternative Fuels)

Up until the 1970s, policymakers primarily focused on gasoline and diesel when it comes to deliberations about transportation fuels. Over the past few decades, a plethora of alternative transportation energy options have surfaced and captured the imagination of policymakers. These include biofuels, liquefied petroleum gas (LPG), compressed natural gas (CNG), electric, gas to liquids (GTLs), biomass to liquids (BTLs), methanol to gasoline (MTG) and solar, to name a few.

These alternative fuels have been the subjects of intense interest, discussion and debate. The enthusiasm about the potential benefits of these options has, at times, overshadowed one important aspect of reality.

Oil is the world's vital source of energy and will remain so for many more years to come, even under the most optimistic of assumptions about the pace of development and deployment of alternate technology. Conventional fuels are the lowest-cost option to the consumer as the production and supply infrastructure is already well established, mature and available on a large scale.

Major developed economic bodies such as the European Union (EU), the US and Japan have indicated that fossil fuels will remain the primary choice of transportation fuels by up to 80% of their energy mix till Year 2030, even as they steadily increase the role of alternative fuels.

Challenges in the Use of Alternative Fuels

While it is clear that alternative fuels present a broad range of opportunities and potential benefits to the transportation sector, countries in Asia still have some ways to go before the large scale adoption of these fuels can be realised. Each of the alternatives comes with its unique set of challenges set within country-specific contexts.

Biofuels transformed from a niche energy source to a globally traded commodity that is a magnet for billions of investment dollars within a few years after the US and EU announced policies and incentives to support its increased use in 2004-2005. Asian

governments were quick to follow in their footsteps and announced ambitious plans to promote biofuels production for both domestic consumption and export.

A recent report by USAID summarising the benefits and risks of biofuels development in Asia estimated total biofuels production in Asia to have grown more than five-fold since 2004, from just over two billion litres to almost 12 billion litres in 2008. Despite this accelerated growth biofuels only accounted for three percent of the region's transport fuel mix.

The report pointed out that even at this scale it is evident that biofuels incur significant trade-offs and economic and environmental risks. Critics of biofuels argue that biofuels compete with food crops for land, water and agrichemicals, which aggravate food insecurity issues, contribute to higher food prices and adversely impact biodiversity. Biofuels also do not deliver cost effective carbon emissions reduction.

From a technical perspective, studies have shown biofuels to have lower calorific value (i.e. they have lower energy content) compared to conventional fuels. Agriculture uncertainty renders supply availability (of ethanol) unpredictable. In practice, the implementation of a biofuels mandate is not economically viable without substantial fiscal support in the form of government subsidies and financial incentives. Massive investments in the production and delivery infrastructure may also be needed to accommodate direct ethanol blended gasoline products, depending on the mandated level of ethanol in gasoline.

The USAID report purports that large scale production of biofuels is unlikely to make a significant contribution to Asia's future transport energy demand. By 2030 biofuels is expected to account for an estimated 3-14 percent of the total transport fuel mix in China, India, Indonesia the Philippines, Thailand and Vietnam. This projection is predicated on the premise that these countries will rapidly expand cultivation of efficient first-generation biofuels crops on under-utilised land while promoting second-generation "cellulosic ethanol" using agricultural residues.

Electrical energy sources have their fair share of challenges to overcome. Infrastructural readiness is the immediate concern, as well as its feasibility over short distance travel. The gradual electrification of a light duty transportation fleet and the development of low-cost, affordable light-duty vehicles will require time. **Battery** technology advancements look promising but it is too early to tell if this can be applied on a broad-based basis.

LPG and **CNG**-compatible vehicles are already available but yet to become mainstream options due to costs constraints, as like **solar**-powered vehicles which have to successfully achieve miniaturisation of solar panels. There is also the issue of emissions of LPG and CNG compared to high quality clean conventional fuels.

Other alternatives under serious considerations include GTLs, BTLs and MTG. **GTLs** are synthetic liquid fuels derived from natural gas. While they burn cleaner than conventional fuels, current production volume is a fraction of demand and natural gas sources need to be available.

BTL fuels may be produced from almost any type of low-moisture biomass, residue or organic waste. This is the primary advantage as almost any type of biomass can be used, with little pre-treatment other than moisture control. However, high cost of production and low yield factor do not support its mass commercial application.

MTG converts crude methanol directly to low-sulfur, low-benzene gasoline that can be sold directly or blended with conventional refinery gasoline. Originally commercialised by ExxonMobil 20 years ago, production was discontinued in 1996 due to economics. However, escalating crude oil prices have revived interest in MTG products.

Asian countries continue to face persistent, broad challenges related to energy and environmental issues of varying degrees. The process of exploring, evaluating and deliberating the suitability of various transportation fuels options is highly complex. It involves many decision variables and thus cannot be lent to generalization. Policymakers need to understand their country-specific context in deciding an effective energy policy mix for their respective country.

The real policy challenge is to determine the optimal combination of fossil fuels and alternative fuels, after thoroughly considering macroeconomic drivers and conditions relevant to the country, and how to use conventional fuels to the country's maximum advantage.