Bio-fuels – The Wave of the Future

The devastation caused by Hurricane Katrina has once again brought into sharp focus the world's energy vulnerability. Global over dependence on oil is now possibly the single biggest risk to economies everywhere.

Oil prices shot beyond $70 per barrel in recent weeks. Consumer prices of gasoline have reached record $4 a gallon in Chicago, and nearly $5 in Atlanta. For the first time since oil became a major source of energy, demand matches the refining capacity, at about 82.5 million barrels a day. And the global spare capacity of oil production is now at a 20 year low, only about 1-2 million barrels per day. No wonder, the US National Commission on Energy Policy assessed that if only 4% of the world's oil supply is disrupted by natural calamities like Hurricane Katrina, the crude prices could shoot up to a frightening $160 a barrel. If a massive terrorist attack destroys vital oil infrastructure in OPEC countries, the price escalation and the global economic consequences will be horrendous.

Clearly, the global economy is in the grip of a tantalizing paradox. The past two decades have witnessed robust growth, particularly in the emerging economies. At the same time this very rapid growth has led to an unprecedented surge in oil demand, and made global economy precariously balanced. Growth and recession, opportunity and crisis, hope and fear – all these have never been so evenly matched before.

The world has become dangerously addicted to oil because of its fungibility and easy use. Predictably, the motorcar, using gasoline has become the preferred mode of transport. It is no surprise that the automobile industry today has probably the greatest surplus capacity worldwide. In the US, the automobile majors have taken to advertising sale of cars on credit at zero down payment, zero interest and zero repayment in the first year! We in India too have followed such a model, with motor vehicle production slated to reach 10 million per annum by 2007. A million new cars and utility vehicles and about five million two wheelers are sold every year. Thanks to poor public transport, the current car ownership of 8 per 1000 is slated to go up considerably over the next two decades, further accelerating the oil demand.

Indian oil demand is now rising at 10 percent every year. In the year 2004, out of the total 114m tones of oil requirement, 75% was imported at a cost of $26 billion. The recent sky-rocketing prices, fear of supply disruptions and excessive dependence on imports are sources of grave concern. And yet, in the foreseeable future, we need a fungible source like oil to meet a variety of energy needs. What can we do to reduce dependence on imported oil?

We have to identify and mass produce renewable fuels. The fuel cell technology based on hydrogen is still in the realm of the future. Many renewable sources like solar, tidal or wind power suffer great disadvantages of high cost, inadequate technology, or inability to store and use in a flexible manner. For years, the Nobel-laureate and physicist George Porter and others have ably argued that the Sun is the most reliable energy source, and green plants are the most cost-effective energy factories harnessing sunlight through photosynthesis. We must remember that all our coal and oil are plant products converted into easily usable energy forms over billions of years. Through genetic engineering, the efficiency of photosynthesis can be enhanced to about 4% from the current 2%. If that happens, we can have cheap, plentiful, renewable fungible bio-fuels to meet **all** our energy needs – for transformation, electricity, heating, lighting, industry and everything else.

That may be a futurologist's dream. But happily, even today, we have the technology and means to mass produce oil substitutes for our transportation needs. While India's land mass is only 2.5% of the world's, we are blessed with about 12% of the total agricultural land. Production of ethanol through fermentation of sugars, bio-diesels from plants like Jatropha curcas, and eventually full conversion of all biomass including cellulose into ethanol and other fuels through the use of genetically engineered enzymes are the three best options available to us. Full biomass conversion on a commercial scale will be possible within 3 – 5 years, but ethanol from plant sugars and bio-diesel from oils are already commercially viable.

Brazil, India, Malaysia and Indonesia are best placed to harness these renewable fuels, thanks to rich soils, plentiful sun-light, and year-long cropping. Brazil is already the pioneer in the field, producing 14 billion litres of ethanol from sugar cane, or the equivalent of 200,000 barrels of gasoline a day. Brazilian law requires all motor vehicles to use fuel blended with 22% ethanol, while 20% of all vehicles use only ethanol. What is more, the cost of ethanol is very low, at $25 a barrel equivalent of gasoline! The Brazilian programme created nearly a million new jobs, and cut the oil import bills by a cumulative $60 billion (at 2000 prices) over the past three decades. This amount is more than ten times the total investment in the programme, and over 50 times the initial subsidies given. Guaranteed purchase by state-owned oil company Petrobras, low-interest loans for agro-industrial ethanol firms, and price stabilization of ethanol at 59% of government-set gasoline price at the pump were the key policy initiatives which helped the boom. Nearly 25% of gasoline has thus been substituted by ethanol produced only on 5% of the agricultural land.

The committee on development of bio-fuel in its 2003 report pointed out that our present distiller capacity of 2900KL of ethanol is sufficient for 5% blend until 12th plan. The committee also recommended raising Jatropha plantations over 11.2 million ha of degraded and hedge lands, under-stocked forests, and cultivable

fallows. India can easily move towards 20% ethanol blend with gasoline, and 20% bio-diesel blend with diesel, over the next decade.

In order to encourage such a shift, the right policies and investments should be in place – tax incentives, subsidies to agriculture for bio-fuels, processing capacity, infrastructure, investment in technology and distilleries, buy-back arrangements, guaranteed offtake of ethanol and bio-diesel, removal of restrictions on molasses movement and bio-fuel manufacturing, and R&D. The benefits are many – energy security, lower costs of fuel, foreign exchange savings, reduction of overall CO_2 and particulate emissions (plants capture atmospheric CO_2), revitalization of farming with increased demand for agricultural output, protection of top soil, and sustainable growth.

Few choices in today's world offer such win-win solutions. The world is shifting gears to reduce dependence on imported oil. India has a priceless opportunity, given our natural advantages. It is time to act.

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