

# **Biofuel Laws in Asia: Instruments for Energy Access, Security, Environmental Protection and Rural Empowerment**

M P Ram Mohan\*, G T Thomas Phillippe & M V Shiju

**Abstract:** Asian countries, due to their rapid economic expansion and population growth, would primarily drive the future global energy demand. Energy security and access concerns would accelerate the shift to renewables, especially biofuels, which also hold the key to environment protection and poverty reduction. Presently, insufficient policy guidelines and legal mechanisms hamper the adoption of biofuels as a viable alternative. This paper evaluates the laws relating to biofuels promotion and use in Asia.

## **Introduction**

Biofuels have started receiving increased worldwide attention of late. Their significance has been duly acknowledged by countries like Brazil, the United States and Europe and now the trend continues in to the Asian economies. The increased economic activity and the large population in this region have resulted in an unprecedented increase of primary energy demand specifically for industrial and transportation uses. Biofuels can ease the supply security of high energy consuming Asian economies and this alternative also be looked upon as an environmentally safe, which could contribute to green house gas reduction. The success of Brazil<sup>1</sup> and its further continued initiatives<sup>2</sup> in the biofuels programme have in fact contributed to this increased awareness that biofuels could save millions in foreign exchange, empower and energize the rural community, and ultimately contribute to overall energy security.

---

\* Regulatory Studies and Governance Division, The Energy and Resources Institute (TERI), New Delhi. Email: mprmoan@teri.res.in. Authors would like to thank Ajish P Joy, Research Scholar, Jawaharlal Nehru University (JNU) for comments on an earlier draft.

All the leading Asian economies are net energy importers, making the issue of energy security extremely crucial in the coming years. These countries can take heart from the Brazilian experiments on biofuels using sugar cane. However, replicating Brazil's success may be difficult as many Asian countries face erratic climatic conditions including frequent droughts. Thailand is tapping the potential of tapioca, cassava and palm oil, whereas in Indonesia both palm oil and *Jatropha* are being tapped. In India, the thrust is on *Jatropha Curcas*, which can be grown in both arid and semi arid regions, while other varieties like *Pongaimia Pinnata*, and *karanja* are also actively promoted.

Biofuels which have been in the news since the oil crisis of the 1970s gained real credibility as petroleum motor fuels when supported by Brazil's Proalcohol Programme.<sup>3</sup> This initiative which also received support from the United States<sup>4</sup> and the European Union,<sup>5</sup> is not about replacing the conventional fuels but supplementing gasoline or diesel fuel through the incorporation of blends. Use of these blends, unlike other alternative motor fuels (LPG, CNG) does not require any vehicle modification. It is interesting to note that Brazil's use of natural fuel comprises 23 per cent of all energy spent in the country, compared to a world natural fuel use of about 1.7 per cent.<sup>6</sup> The success of these programmes was mostly driven by the fact that there were strong legal mandates to accomplish the goals.

High oil prices and volatility in oil supply have resulted in an increased awareness in major energy consuming Asian countries to look for an alternative that is indigenous as well as sustainable. Many nations both in Asia<sup>7</sup> and Europe have renewed their interest in the nuclear energy option and have taken steps to increase hydel power production which has social and environmental costs. The biofuel programme though started late in Asia, has the capacity to catapult this region into a major player, both in terms of ensuring energy security and even prospective exports. Already there are major players from the EU<sup>8</sup> and the US looking at the vast lands of Asia and Africa as a gold mine of potential opportunity. In turn most of the Asian countries are in the process of putting policies and legal mandates in place to have a viable and mandatory fuel mix with bioenergy. This paper explores the existing legal and administrative measures that are facilitating the biofuel programme in select Asian countries based on the availability of documents and information. The study would review the existing and prospective legal measures that are being explored by the governments

of India, Philippines, Malaysia, Thailand, Japan and China. The paper concludes with observations by the authors.

## **Legal Approaches for an Effective Biofuel Programme in Asia: Country Studies**

### ***India***

India's GDP is projected to be the third largest in the world by 2030.<sup>9</sup> The current rate of population growth would make India the most populous country by 2030, overtaking China.<sup>10</sup> There will be economic demands that will have to be met by an energy mix which is sustainable. Any shortcomings in the supply of energy resources could create major imbalances in the urban-rural economies and will lead to a disruption of growth and income levels. India is not endowed with large primary energy reserves proportionate with her large geographical area. It is projected that the total primary commercial energy supply in India will grow at an average rate of 3.2 per cent over the period 2002-2025/2030,<sup>11</sup> while at the same time there will be a tripling of the energy requirement to reach 709 mtoe from the current level of 325 mtoe.<sup>12</sup> The country is already heavily dependent on the imported conventional energy accounting for 70 per cent of the present levels, and this will increase dramatically in the next 5 decades when India will become the third largest energy consuming country.<sup>13</sup> The world supply has already become critical with volatility and supply concerns; India needs to find alternatives that are indigenous and sustainable. The solution may lie with biofuels that could be sourced from the vast wastelands<sup>14</sup> of the country.<sup>15</sup>

The biofuels programme if pursued in a coherent and earnest way will have multiple benefits, namely, farmers will be directly connected with their livelihood through plantation, society will benefit through a larger goal of employment generation and the consequent rise in income, the governments meet with the expectation of reduced import of conventional fuels thus saving foreign exchange, the rural economy benefits through decentralized rural energization, empowerment apart from employment, apart from large scale environmental benefits such as reduced vehicular pollution and environmental degradation.<sup>16</sup> To make such a large and massive biofuels programme implementable, it is necessary for the governments both at the national and at the local levels to adopt strong policy measures and legally supported

mechanisms.<sup>17</sup> The legal measures undertaken and recommended by the government to make biofuels programme viable, productive and sustainable are examined below.

### ***Legal and Policy Position on the Existing Biofuel Programmes***

#### *(a) Ethanol Programme*

In India, Indian Power Alcohol Act, 1948<sup>18</sup> as early as in 1948, mandated the blending of power alcohol with petrol.<sup>19</sup> The legislation was passed taking into account future energy security concerns and with the object of harnessing India's surplus of molasses.<sup>20</sup> The Act also had provisions for the determination of the procurement price of power alcohol for the purpose of blending it with petrol.<sup>21</sup> However, this mandate was never followed or implemented, perhaps due to the subsequent relative stability in world oil supply and decrease in the supply of ethanol. This Act was repealed in 2000, following an administrative reforms drive to repeal legislations that had not been used. This move could not have been more ill-timed as within two years, the Government of India started the initiative to blend ethanol with petrol, the very object of the repealed Act.

The Government of India Notification on the Ethanol Blending Programme (EBP) dated September 2002<sup>22</sup> gave a big boost to the agriculture sector and to a reduction of environmental pollution. The Notification made 5 per cent ethanol blending mandatory in petrol, in 9 states and 3 Union Territories.<sup>23</sup> Based on the success of pilot projects undertaken in 2001, the ethanol blended petrol (EBP) Programme came into effect from 1 January 2003. In 2004 the Government of India, through an order, initiated measures to withdraw the mandatory order regarding mixing of 5 per cent of ethanol in petrol and a subsidy of 30 paise per litre. Though this has created some sort of confusion, the Government clarified in parliament that the EBP programme continues to be mandatory; in terms of Gazette notification No. 705 (E) dated 27.10.2004 and explains,

“... the new notification dated 27<sup>th</sup> October, 2004 is that as long as the prices of ethanol are competitive and reasonable, and the supply of ethanol is adequate, the oil marketing companies will continue to be statutorily required to lift the ethanol and supply ethanol blended petrol in the notified area.”<sup>24</sup>

The explanation<sup>25</sup> with regard to the withdrawal of the subsidy of 30 paise is that, when this programme was introduced, the delivery cost

of ethanol-blended petrol was higher than the delivery cost of petrol. The oil marketing companies were required to lift ethanol through public tenders, blend the ethanol with petrol at blending depots located across the States and then supply this to retail outlets. Therefore, the government decided to grant fiscal incentives by way of reduction in additional excise duty on petrol meant for blending with ethanol. Accordingly, the additional excise duty of Rs. 6 per litre leviable on petrol was reduced by the Government of India by 30 paise per litre in the case of petrol intended for use in ethanol blended petrol. This exemption was valid only up to 30 June 2004. The five per cent ethanol blended petrol was also exempted from the payment of additional excise duty. This arrangement continued with the exemption of additional excise duty, which was not extended beyond 30 June 2004. In parliament the government informed<sup>26</sup> that there is inadequate supply of ethanol to meet the demands of blending.

“The ethanol requirement in 2003-2004 was about 363 million litres per annum. But only 196 million litres was made available for purchase by oil refining companies. During 2003 and 2004, difficulties about the sourcing of ethanol have been reported from Maharashtra, Goa, Gujarat, Andhra Pradesh and Karnataka. The regular supply of ethanol has been affected due to the non-availability of molasses resulting from lower production of sugar owing to low sugarcane crop and drought conditions.”<sup>27</sup>

Therefore, on the expiry of the contract for ethanol procurement, fresh public tenders were invited by oil marketing companies during the year 2004-05. Despite these tenders, owing to the acute difficulties faced in sourcing ethanol in the Western and Southern regions, the oil marketing companies requested the government to suspend the programme for eight months with effect from 1 August, 2004 and to take a fresh decision during the coming sugar season October 2004-September 2005. This was not accepted by the Government and the Ministry of Petroleum and Natural Gas (MoPNG) decided to continue the programme as one of the main objectives of the programme is to support the rural economy.<sup>28</sup>

But faced with the fact that there was not enough ethanol available to be able to implement a five per cent EBP, the government modified<sup>29</sup> the provisions in the original Gazette Notification.<sup>30</sup> In consideration of the issues related to availability of ethanol at reasonable prices, the

government vide notification No. GSR 705(E) dated 27 October 2004 notified that 5 per cent EBP as per Bureau of Indian Standards specifications shall be sold. This sale shall be applicable if the price of sourcing indigenous ethanol for supply of EBP is comparable to the price of indigenous ethanol for alternative uses and if the delivery price of ethanol at the location is comparable to the import parity price of petrol at that location. Along with this if the indigenous ethanol industry is able to maintain the availability of the same for EBP programme at such prices in the notified States and Union Territories.<sup>31</sup>

### *(b) Biodiesel Programme*

The biodiesel programme in India is in the formative years of development. The government is keen to push the biodiesel programme considering the benefits of large scale rural employment and sustainable energy sources that could meet the heavy demands of otherwise expensive conventional fuels. At the national level the biodiesel programme started in 2003 when the Committee on Development of Bio-fuel (Planning Commission) recommended the launching of a National Mission on Biodiesel.<sup>32</sup> The Special focus of the National Mission is on the plantation of *Jatropha* on waste lands. In August 2003, the Ministry of Rural Development (MoRD) was identified as the nodal ministry and in January 2005 a Detailed Project Report was prepared with extensive consultations for the pilot phase (*Jatropha* plantations on 400,000 ha) to MoRD. An unexpected policy statement came on 9 October 2005, when the MoPNG announced the Biodiesel Purchase Policy.<sup>33</sup> Meanwhile, the Government of India's decision to implement the National Mission on Biodiesel is still awaited. At the state government level, several states have initiated biodiesel programmes and policies.

States like Chattisgarh, Uttaranchal, Rajasthan, Andhra Pradesh and Tamil Nadu have already formed nodal agencies for biodiesel development and announced draft biodiesel policies. These states have initiated plantation programmes. For instance, the Uttaranchal Bio-fuel Board (UBB) has planted *Jatropha* in 10,000 hectares in 2005;<sup>34</sup> in Chattisgarh 80 million saplings of *Jatropha* have been planted;<sup>35</sup> while Andhra Pradesh plans to plant *Jatropha* on 16,000 ha and 33 million *Pongamia* saplings in the State<sup>36</sup> and Karnataka has planted 20 million *Pongamia* saplings.<sup>37</sup> Chattisgarh has been the pioneer in this regard. In January 2005, the Chattisgarh Biofuel Development Authority (CBDA) was created to coordinate the state's ambitious plans to reclaim

wasteland and create rural employment through *Jatropha* cultivation. The Government, apart from giving tax benefits to industries, is considering the amendment and repeal of laws relating to land use, the setting up agriculture produce marketing committees and has promised the promoters cheap land, subsidized water and electricity to set up plants. On September 2005, the state government notified the "Lease (Government Land for *Jatropha/Karanj* Plantation and biodiesel based processing unit) Rules, 2005". These rules allow a company to lease government 'wasteland' for the payment of Rs 100/ha, which will increase to Rs 1000/ha in the eighth year. Here the state government is using a contract farming and joint forest management approach on waste fallow and agriculture land. In the State of Uttaranchal, Uttaranchal Bio-fuel Board (UBB) has been constituted as a nodal agency for biodiesel promotion in the state. During August 2004, Uttaranchal Biofuel Mission was launched.<sup>38</sup> The UBB, so far has undertaken *Jatropha* plantation in an area of 100 thousand hectares and has established a *Jatropha* Gene Bank to preserve high yielding seed varieties. UBB has plans to produce 100 million litres of biodiesel. Here the government is using the joint forest management model on un-irrigated degraded forest lands. In Andhra Pradesh (AP), the government created the Department of Rain Shadow Areas Development (RSAD) and has put RSAD in charge of large scale *Jatropha* plantations which the government has introduced. AP government has also announced a major subsidy package to all farmers for installing drip irrigation systems.<sup>39</sup> The government has taken a major initiative in introducing agreements between farmers, the private sector and the state biodiesel board. To protect the interest of the farmers, the government has reduced Value Added Tax on biodiesel to 4 per cent.<sup>40</sup>

At the central government level, the NMB and the Biodiesel Purchase Policy<sup>41</sup> have been undertaken to promote biodiesel. The MoPNG notification on Biodiesel Purchase Policy provides for the purchase of biodiesel by oil marketing companies at the rate of Rs 25 per litre (inclusive of taxes/duties/transportation cost) with effect from 1 January 2006. This is expected to start in about 20 purchase centres in 12 states. The suppliers should have the capacity to supply a minimum 10KL per tanker of biodiesel thereby meeting the prescribed specifications of the Bureau of Indian Standards (BIS)<sup>42</sup> and should be registered with the state level coordinator of oil companies. The blending of biodiesel at a maximum of 5 per cent will be undertaken initially at

these 20 centres depending on the availability.

The Planning Commission study supported by the National Mission of Biodiesel (NMB) Report envisions far-reaching changes in the legal scenario to accommodate the biodiesel programme in the country. But at this point of time, when the whole initiative is at the experimentation stage, both the Planning Commission Report<sup>43</sup> and the NMB Report opines that presently the scope of biofuels could very well be integrated under the ambit of the existing laws. When the country is well positioned in the context of biofuels, it should have a separate legal mechanism in the form of Biofuels Act or Alternative Fuels Act. The following sections explain the legal amendments and the regulatory mechanisms suggested by the Planning Commission to promote the use of *Jatropha* based biodiesel.

The scope of the Weights and Measures Act, 1976 defines any goods for its characteristics in India that relate to inter-state trade or commerce in weights, measures and other goods which are sold or distributed by weight, measure or number. The Planning Commission recommends that the biofuels constituents like biodiesel and bioethanol being new products need to be defined for their characteristics under the Weights and Measures Act.<sup>44</sup> With regard to the procurement of raw materials, the report identifies that legal changes should take into account two factors for the promotion of the *Jatropha* and *Pongamia* plantation. First, there should be a provision for listing these raw materials under the category of cash crops which would nationally and internationally build an identity as a plant of some commercial value and second the government must set a procurement price for *Jatropha* and *Pongamia* seeds, as this would give the required incentives to farmers.

As far as licensing is concerned, it is clear that the oil marketing companies will be responsible for the procurement, whereas under the NMB it is recommended that the government issues licences in order to regulate the production and distribution of biodiesel in accordance with the Motor Spirit and High Speed Diesel (Regulation of Supply and Distribution and Prevention of Malpractice's) Order 1998<sup>45</sup> where the rules and guidelines are laid down for the issuance, renewal and cancellation of the licence given with respect to maintaining blend quality and avoiding adulteration. The Prevention of Food Adulteration Act, 1954 and Bureau of Indian Standards Act, 1986 are also required to incorporate these requisites so as to maintain the quality of edible oils. With regard to maintaining environmental and in particular adherence



to Bharat/Euro emission norms, suitable amendments to the Environmental Protection Act, 1986 and the Motor Vehicles Act, 1988 and the rules framed needs to be incorporated to meet the required levels of standards or discharge from biodiesel engines.

Since *Jatropha* oil is being mixed with diesel, it will have to be recognized as an essential commodity to be protected under any circumstances. Considering this the government is planning to notify *Jatropha*/ biodiesel as a new category under the Essential Commodities Act, 1955. This gives the power to control production, supply, distribution, etc. of essential commodities for maintaining or increasing supplies and for securing their equitable distribution and availability at fair prices. In order to prevent unethical trade practices like hoarding and black-marketing in either *Jatropha* oil or biodiesel, it is being considered to include the biodiesel category under the Prevention of Black-marketing of Supplies of Essential Commodities, Act, 1980 to detain persons whose activities are found to be prejudicial to the maintenance of supplies.

With the understanding that tax incentives will benefit the interests of various stakeholders, the Planning Commission report has laid down clear mandates to provide an adequate subsidy programme and tax incentives. Since the programme is new in India, it is important that the biofuels programme gets sufficient support from the government. Keeping this in view, the government plans to tread carefully after the controversy with regard to the Ethanol Blending Programme. Among various tax incentives that are planned are included the deduction or waiver of excise duty, state and local taxes, and also the provision of adequate subsidies.

As far as an integrated biofuels programme is concerned, there has not been a legal push till date to promote biofuels on a large scale and in a sustained way. Different States in India have initiated their own ways to promote biofuels.

### ***Philippines***

The Philippines has launched the use of biodiesel, particularly a form of biodiesel known as Coco Methyl Ester or CME. This is a derivative of coconut oil and is commonly called Coco-biodiesel. The drive to switch over to an alternative source of fuel would harness a number of Philippines country strengths, while easing some of the burdens at the same time. The Philippines is the world's second largest producer of

coconuts and a move to increase the usage of Coco-biodiesel would provide and establish a long-term, sustainable alternative domestic market and as a result, will stabilize the domestic coconut production, resulting in raising the price of copra. It would also enhance farm-based reintegration of opportunities.<sup>46</sup>

Increased dependence on Coco-biodiesel would also mean the enhancement of energy supply security through the use of indigenous resources, at the same time resulting in foreign exchange savings. Furthermore, the move would also benefit 3.5 million coconut farmers and 20 million Filipinos dependent on the coconut industry.<sup>47</sup>

The Department of Energy Act of 1992, declares the energy policy of the State as.

“... to ensure a continuous, adequate and economic supply of energy in view of ultimately achieving self-reliance in the country’s energy requirements through the integrated and intensive exploration, production, management and development of the country’s indigenous energy resources, without sacrificing ecological concerns.”<sup>48</sup>

Though the use and promotion of biofuels can be implicitly read into Section 2 (a) of the Department of Energy Act, the first concrete instrument in the Philippines to promote biofuels as a source of alternative fuel supply is the Memorandum Circular No. 55 issued by the Office of the President on 9 February 2004. Section 1 of this Memorandum Circular directs all departments, bureaus, offices, agencies and instrumentalities of the government, including government owned and controlled corporations to incorporate the use of one per cent by volume CME in their diesel requirements. The Memorandum Circular designates the Department of Energy (DOE) as the lead implementing agency for the CME Diesel Programme.<sup>49</sup> Section 4 of the Memorandum also mandates the Department of Energy to formulate the rules and regulations to give effect to the Memorandum Circular. To further supplement the CME Diesel drive, the Philippine Coconut Authority (PCA) is directed to include in its national programme for the coconut industry, the development of the supply chain for CME. The PCA, in consultation/coordination with other government agencies and the private sector, is also mandated to formulate a programme to encourage investment and technology for the production of CME to meet the needs of the domestic market.<sup>50</sup> The Memorandum Circular is vested with overriding powers and all orders, issuances, rules and regulations or parts thereof, which

are inconsistent with the Circular, are stated to be repealed or modified accordingly.<sup>51</sup>

Pursuant to Section 4 of the Memorandum Circular, the Department of Energy formulated the Rules and Regulations implementing the Memorandum Circular. The Rules and Regulations serve as a comprehensive guideline for the implementation of the objectives of the Memorandum Circular. It empowers various agencies and prescribes their functions for the successful implementation of the CME Diesel Programme.

The Department of Transport and Communication (DOTC) is mandated to monitor and test emissions of the State owned CME Diesel run vehicles and submit reports of the same to the DOE.<sup>52</sup>

The Department of Environment and Natural Resources has the function of coordinating with the DOTC and DOE in terms of data generation of the results of emission testing using CME.<sup>53</sup> This data is to serve as an input in the emission standard-setting necessary to maintain air quality.

The Department of Science and Technology (DOST) coordinates and provides support on research and development works to do with the production and application of CME being undertaken by the academe, research institutions and others.

The Department of Trade and Industry is empowered to provide incentives to investment on CME production and coconut processing for the biodiesel industry. The Department of Finance is directed to develop and recommend appropriate fiscal and non-fiscal incentives for participating petroleum and oleochemical companies to promote the sustainable development of the CME Diesel programme.

The Philippine Coconut Authority (PCA) has assumed, in partnership with the coconut farmers, processors, refiners and traders, the further responsibility of ensuring the security of coconut oil supply by undertaking an aggressive programme for planting, replanting, fertilization, agricultural research and development, and rehabilitation of the coconut industry. To this end, the Rules and Regulations require the PCA to formulate a programme to encourage investments and technology for the production of CME to meet the needs of the domestic market.

The other landmark achieved by the Philippines is the passing of a Biofuel Bill by the House of Representatives. It has been forwarded to the Senate for final approval after which the Bill would become law. The "Bioethanol Fuel Act of 2005"<sup>54</sup> which has been pushed forward by

the Committee on Energy of the House of Representatives was notified as an urgent measure by President Arroyo post the soaring crude oil prices in the international market. The full title of the original Bill reads “an Act mandating the use of bioethanol or ethyl alcohol as transport fuel, establishing for the purpose the National Bioethanol Fuel Programme, appropriating funds thereof, and for other purposes.”

The Bill mandates the Department of Energy to adopt a National Bioethanol Fuel Programme that will implement a mandated blending of gasoline with bioethanol as a motor fuel. The DOE is also directed to gradually phase out “harmful gasoline additives and oxygenates” within six months after the law comes into effect. Gasoline that still contains these additives or oxygenates and gasohol (the gasoline-bioethanol blend) that do not follow the mandated mixture will be confiscated by the DOE.<sup>55</sup>

The Bill also provides fiscal incentives to encourage fuel production. These include exemption from paying tariff and duties on imports of inputs, machinery and equipment for 10 years, and a tax rating of bioethanol fuel equivalent to unleaded gasoline that shall remain for 10 years.<sup>56</sup>

The Bill<sup>57</sup> was revised by the House of Representatives to provide for policy support for the development of biofuels, other than bioethanol. Now that policy support is also accorded to other biofuels, the national programme has been re-christened the National Biofuels Programme.<sup>58</sup>

The Bill mandates the constitution of an independent board called the National Biofuels Board. The initial proposal of the Bill was to have the percentage blend directly increased from the given per cent to 10 per cent by the end of the fourth year of the approval of the law. The revised Bill would assign the National Biofuels Board, comprising of both private and government offices, including high-level representatives of the Department of Labour and Employment and the Philippine Coconut Authority, the function of recommending an increase in the minimum blend every two years. The Board will also have the power to determine and recommend a higher limit in terms of percentage of the fuel ethanol blended into gasoline. The Board also has the additional function of formulating a national programme for biofuels other than bioethanol.<sup>59</sup>

Another Bill that is pending before the Committee on Energy of the House of Representatives is the “Biodiesel Act of 2005”.<sup>60</sup> The full

title of this Bill reads “an act requiring the pre-blend of locally-produced methyl ester into diesel fuel to promote clean air and boost resource development for renewable fuels to reduce import dependence, open new export revenue, and provide fuel security for the country in times of global fuel shortage.” The Bill seeks to harness coco methyl ester as a diesel enhancer to address air pollution, boost resource development as well as the rural economy, reduce oil import and accelerate the development of locally sourced renewable fuel.

Though the Bill has a long way to go before it reaches the Senate, the same would be a valuable support for the country's nascent Cocabiodiesel efforts.

### **Thailand**

Rising oil prices have dealt Thailand's economy a major blow in 2005. Inflation is at a seven-year high, the current account is running deeply in deficit after years of surpluses, and the growth rate of the economy in 2005 is at its slowest in four years. The country is heavily dependent on oil imports. At 10 per cent of the GDP, they are up from the previous peak in 1980 of 8.0 per cent of GDP, and are four to five times the oil import bills of developed economies.<sup>61</sup>

While most countries have few options, but to put up with the huge import bill when it comes to soaring oil prices, Thailand is fast developing gasohol, a blend of gasoline and plant-based ethanol. Thailand is the world's top producer and exporter of tapioca, and its second-biggest sugar exporter, two crops in demand for the production of ethanol.

The major legislation in Thailand dealing with the subject of energy is The Energy Development and Promotion Act, 1992. An indirect reference to the subject of biofuels and their promotion can be found in this Act. Under the Act, one of the duties of the Department of Energy Development and Promotion is, *inter alia*, to maintain production and transformation of energy sources and the utilization of biomass to produce fuels.<sup>62</sup>

The Ministry of Energy (MoEN) through the Department of Alternative Energy Development and Efficiency (DEDE) has developed a Gasohol Strategy. The MoEN along with the Ministry of Agriculture and Cooperatives and the Ministry of Industry jointly proposed the Gasohol Strategy to the Cabinet in December 2003. The primary objective of the Gasohol Strategy was to create sustainable energy security for

the country and its communities, to enhance the potential of communities to be energy production sources and to support the development of a domestic bio-chemical industry.<sup>63</sup> The Gasohol Strategy was adopted by a Cabinet Resolution dated 9 December 2003. The MoEN set the target on using ethanol for MTBE substitution in gasoline 95 by 1 ml/d by 2006 and for oil substitution in gasoline 91 for 3 ml/d by 2011.<sup>64</sup>

Through a Cabinet Resolution adopted on 18 May 2004, the Gasohol Strategy was further structured into two phases. Phase I, called the MTBE Replacement Phase, involves imposing the policy to terminate the use of MTBE in ULG 95 and replacing it with Gasohol 95 in some areas. Phase II of the Strategy, called the Gasohol Mandate Phase consists of notifying the list of cars capable of gasohol use, identifying the specification of Gasohol 91 and 95, and issuing regulations to the government agencies for the procurement of gasohol fuelled cars. The final stage of the Gasohol Mandate Phase involves the enforcement of the policy to use Gasohol 95 and 91 across the country.<sup>65</sup>

More specific steps in the direction of biofuels are the various implementations by the Ministry of Energy (MoEN) in support of the development of gasohol as a source alternative fuel. The MoEN has issued documents to every ministry for their support in the gasohol programme by directing all the government and state enterprise vehicles to use gasohol. This direction was dated 9 June 2004 with a requirement that every organization should file a monthly report of its target results in gasohol use.<sup>66</sup>

MoEN has issued a document to the National Supply Board at the Office of Prime Minister and Bureau of the Budget dated 9 June 2004 to determine the specification of cars to be procured in the fiscal year 2005 with a capability of being fuelled by gasohol. The Department of Energy Business (DEB) has announced the requirements in Gasohol Specification (No.3), 2004 with an effective date on 15 November 2004 for the specification of both gasohol 95 and gasohol 91.<sup>67</sup>

MoEN has reduced the remittance to the Oil Fund and the Energy Conservation and Promotion Fund, including the excise tax exemption, thus reducing the price of gasohol from that of gasoline 95 by 0.75 baht effective from 1 November 2004. The Cabinet has accepted a proposal of the MoEN to replace gasoline 95 with gasohol 95 in all gas stations within Bangkok.<sup>68</sup>

The DEB invited the gasohol producers and distributors for a meeting to update them about the gasohol promotion schemes of the

MoEN and for hearing any problems that might occur in that implementation. The Energy Policy and Planning Office brought together the ethanol producers and the Refinery Group to have a discussion on an ethanol-purchasing price for a long run of 3-6 months and for institution of an arrangement in the form of a long-term ethanol-purchasing contract.<sup>69</sup>

MoEN and the Ministry of Industry jointly agreed on 24 December 2004 to replace the National Ethanol Board with the National Biofuel Promotion Board for the better organization, regulation, supervision and the determination of policy for the biofuel industry. This aims to make the fuel operations a national agenda with an effective implementation for both ethanol and biodiesel and an integrated operation, starting from raw material, factory establishment, production, blending and distribution of gasohol, including the selling price determination.<sup>70</sup>

On 11 April 2005, The National Energy Policy Board issued an Order No. 3/2005 to appoint the Biofuel Promotion and development Committee to establish the Plan and Policy on the administration and development of the country biofuels. This would be a focal point in policy determination, supervision, regulation and promotion of biofuels. On 19 April 2005, based on a proposal by the MoEN, the Cabinet agreed to reduce the Oil Fund burden by pushing forward the gasohol use promotion schemes, i.e. using 4 ml/d of gasohol and speeding up the increasing of gasohol stations from 800 to 4000 stations by the end of 2005. A strict order was issued to comply with the Cabinet Resolution dated 9 December 2003, which resolved to use gasohol in all government and state enterprises vehicles. A requirement was also imposed on the 413 gas stations located within the government and state enterprise campuses to sell only gasohol.<sup>71</sup>

MoEN has determined the measures to support and promote the use of biofuel, especially gasohol by increasing the pricing difference between gasoline and gasohol by 1.50 baht per litre and increasing the remittance to the Oil Fund by 0.05 baht per litre.

Biodiesel initiatives in Thailand are still in various experimental project stages, though there is a Cabinet Resolution dated 18 January, 2005 targeting the commencement of commercial biodiesel distribution by 2006 and to increase the biodiesel percentage in blends by up to 10 per cent by 2012.<sup>72</sup>

## **Malaysia**

Malaysia, the world's largest producer of palm oil, is moving in the direction of initiatives for the use of palm biodiesel. The government unveiled a National Biofuel Policy in August 2005. Which is primarily aimed at reducing the country's fuel import bill. This aims to promote further the demand for palm oil, which will be the primary commodity for biofuel production (alongside regular diesel), as well as to shore up the price of palm oil especially during periods of low export demand.<sup>73</sup>

The policy envisions a multi pronged strategy for the development of palm biodiesel as a commercial reality. This involves the production of a biodiesel fuel blend of 5 per cent processed palm oil with 95 per cent petroleum diesel. Simultaneously, the policy aims at encouraging the use of biofuel among the public. This means providing incentives for oil retail companies to supply biodiesel pumps at fuel stations. As a support measure, the policy also directs the establishment of industry standards for biodiesel quality. To ensure the smooth supply of biodiesel, the policy also calls for the setting up of new biodiesel plants.

A more significant development in Malaysia is a proposed legislation on biofuel use. The Commodities Ministry had formulated a Biofuel Plan in June 2005. This was approved by the Malaysian cabinet, the first step before the proposal can be taken to the Malaysian Parliament to make it law. Presently, the Bill is in the Malaysian Parliament and legislators are expected to make it law some time in 2006.

The Bill seeks to mandate the use of 5 per cent palm oil blend across the country by 2007. After the enactment of this law, unblended diesel would no longer be available in Malaysia. Prior to enforcement of this mandate in 2007, the Bill seeks to make biodiesel commercially available from 2006 in order to enable consumers to try out this blend.

As a preparatory measure to the mandatory use of biofuels in 2007, the Malaysian government plans to introduce biodiesel as the fuel source for the Defence, Plantations and Transport ministries starting early 2006. Selected public buses, taxis and army trucks and four-wheel drive vehicles will use biofuel, while palm oil millers will feed their generators and mills with the fuel. The interim trial period is to be used to identify any problems arising out of the large-scale use of biodiesel.<sup>74</sup>

## **Indonesia**

Indonesia, the world's second-largest palm oil producer, is preparing a biofuel scheme for the next five years.<sup>75</sup> The Indonesian Agriculture Ministry



has been studying a biofuel programme and plans to open plantations of *Jatropha* and palm in the future. Indonesia aims to boost crop area under palm plantations to 8 million hectares in the next three years from the current 5 million hectares. Indonesia is exploring the world biodiesel market as world palm oil demand stagnates.<sup>76</sup>

### **Japan**

In 2003, Japan had introduced a law that allowed for the blending of ethanol with gasoline by up to 3 per cent. The Environment Ministry of Japan aimed to introduce gasoline containing 3 per cent bioethanol on the retail market by April 2005. For a country that consumes about 1.04 million barrels of gasoline a day, the government also has the ambitious plan to replace all retail gasoline by bioethanol blended fuel by 2012. Japan, a Kyoto Protocol leader expects this effort to cut carbon dioxide emissions by as much as 2 million tons a year.

This vision suffered a setback due to the failure of bioethanol blended gasoline to hit the market in 2005. Analysts are of the opinion that scarce availability of domestically produced bioethanol and possibly the heavy dependence on imports are the contributing factors for bioethanol not hitting the market.<sup>77</sup>

Japan, being the world's second largest gasoline consumer, would require a very large amount of bioethanol to replace 3 per cent of gasoline. Bioethanol blended gasoline facilities would require huge investments and the ambitious government policy would also create risks for the oil industry involving import costs and possible volatility in freight rates. Furthermore, the scarcity of domestically produced ethanol would mean that the huge requirement of ethanol to replace 3 per cent of gasoline would have to be imported. This would significantly add to the cost of blended gasoline as most of the ethanol import has to be from Brazil, which is geographically distant. Taking these factors into account, it is unlikely that bioethanol blended gasoline would hit the markets very soon.

### **China**

Though China ranks third in the world in ethanol production, not much of it is used as fuel. The Chinese bioethanol fuel programmes are a product of the state sponsored five-year plans.<sup>78</sup> In February 2004, the government directed five provinces to blend 10 per cent bioethanol with the gasoline used in those provinces. These five provinces account

for 16 per cent of all passenger vehicles in China. Another four provinces have been directed to promote the use of ethanol blended gasoline for trials. Presently, the government subsidizes ethanol production at four plants.<sup>79</sup> Though new ethanol plants are under construction, projections show that the demand for ethanol required for a 10 per cent blend for all cars in China would far exceed the projected supply even after taking into account all the present proposed initiatives.<sup>80</sup> At the same time biodiesel production in China is still at a very nascent stage.

To supplement the biofuels initiative and in general to give the production of renewable energy a boost, the National People's Congress of China recently enacted The Renewable Energy Law, 2005 which has come into force from 1 January 2006. The aim of this Law is to promote the development and utilization of renewable energy, improve the energy structure, diversify energy supplies, safeguard energy security, protect the environment, and realize the sustainable development of the economy and society.<sup>81</sup> The term renewable energy has been defined expansively to include, *inter alia*, biomass energy<sup>82</sup> and Article 32 of the Law specifically defines 'biological liquid fuels' to include methanol, ethanol, biodiesel and other liquid fuels that may be derived from biomass resources.

Through this Law, the Government of China lists the utilization development of renewable energy as the preferential area for energy development and promotes the construction and development of the renewable energy market by establishing total volume for the development of renewable energy and taking corresponding measures.<sup>83</sup> Furthermore, the government encourages economic entities of all ownerships to participate in the development and utilization of renewable energy and protects the legal rights and interests of the developers and users of renewable energy on the basis of law.<sup>84</sup>

The energy authorities of the State Council are responsible for carrying out renewable energy resource surveys and to formulate technical regulations for the same.<sup>85</sup> They are also responsible for the setting up of long- and medium-term targets for the development and utilization of renewable energy at the national level.<sup>86</sup> On the basis of these targets and taking into account, the economic development and the actual situation of renewable energy resources at the regional level, the State Council is to coordinate with the government at a regional level for the setting up of long- and medium-term targets for the provinces and other regions.<sup>87</sup>

The Law mandates the energy authorities of the State Council to prepare a national renewable energy development and utilization plan on the basis of the renewable energy targets.<sup>88</sup> At the provincial level, this responsibility falls on the energy authorities of the provincial government.<sup>89</sup>

The energy authorities of the State Council are also mandated to frame development guidance catalogues for renewable energy industries.<sup>90</sup> The standardization authorities of the State Council have the mandate to set technical standards for renewable energy technology and products.<sup>91</sup>

The Government of China encourages clean and efficient development and utilization of biological fuel and encourages the development of energy crops.<sup>92</sup>

The Law specifically encourages the production and utilization of biological liquid fuel.<sup>93</sup> Gas-selling enterprises are mandated, on the basis of the regulations of the energy authorities of the State Council or the government at the provincial level, to include biological liquid fuel conforming to the national standard into its fuel-selling system.<sup>94</sup> Failure by a gas selling enterprise to include biological liquid fuel that conforms to the national standard into its fuel selling system and thus causing economic loss to the biological liquid producing fuel enterprise would make the former liable to pay compensation.<sup>95</sup> Any further non-compliance of corrective directions issued by the State Council or the provincial government to include biological liquid fuel would attract an additional fine up to the amount of economic loss caused by such non-inclusion.<sup>96</sup>

The Law provides a significant boost to the development, utilization and promotion of renewable energy by listing scientific and technical research in the development and utilization, and the industrialized development of renewable energy as the preferential area for hi-tech development and hi-tech industrial development in the national programme. It allocates funding for the scientific and technical research, application demonstration and industrialized development of the development and utilization of renewable energy so as to promote technical advancement in the development and utilization of renewable energy, reduce the production cost of renewable energy products and improve the quality of the products.<sup>97</sup>

The Law also constitutes the renewable energy development fund for supporting scientific and technological research, standard establishment and pilot projects for the development and utilization

of renewable energy,<sup>98</sup> construction of renewable energy projects for domestic use in rural and pasturing areas,<sup>99</sup> construction of independent renewable power systems in remote areas and islands,<sup>100</sup> surveys, assessments of renewable energy resources, and the construction of relevant information systems,<sup>101</sup> and localized production of the equipment for the development and utilization of renewable energy.<sup>102</sup>

The Law permits financial institutions to offer preferential loans with financial interest subsidy to renewable energy development and utilization projects that are listed in the national renewable energy industrial development guidance catalogue and that conform to the conditions for granting loans.<sup>103</sup> Even before the enactment of this Law, some renewable projects had already received such loans under a circular called the "Circular Regarding Issues on Further Supporting the Development of Renewable Energy, 1999" that was published in January 1999 by the National Reform and Development Commission and the Ministry of Science.<sup>104</sup> The Law also provides tax benefits to projects listed in the renewable energy industrial development guidance catalogue, and specific methods for the granting of these benefits are to be prepared by the State Council.<sup>105</sup>

## **Conclusion**

The important issue that has to be discussed is the need to have a biofuels legal regime. It is pertinent to note that the recent set of biofuels initiatives have been motivated by record highs in the international oil prices. Only at this sustained high price level would biofuels become an economically viable alternative. The corollary would also mean that the easing of oil prices would significantly affect the infant biofuel ventures.

There is a pressing need to support biofuel ventures as, apart from the environmental benefits, specifically in the Asian context biofuels also present the possible solution for energy security through diversification, and rural energization and employment. Even if oil prices come down, thus making biofuel alternatives relatively costly in the short run, the shortage of crude oil supply is an inevitability that has to be faced at some point. The raw materials needed for the biofuel industry being a product of the rural economy, biofuel ventures in Asia revolve around the active participations of the rural populations.

For these reasons, a strong legal regime supporting biofuel initiatives is necessary. There should be a legal mandate for the compulsory blending of biofuels with regular fuels. This would create a market for

biofuels. To facilitate the entry of more players in the biofuel industry and to ensure the uninterrupted supply of biofuels, the production of the same should be made economically viable. Thus the law should also provide for various tax breaks and subsidies. Once the biofuel industry attains the economies of scale to be self-sustaining, these incentives can be gradually withdrawn.

Thus a legal regime for biofuels is not only a necessity, but it is also a prudent measure that cannot fail to provide benefits.

## End Notes

- <sup>1</sup> The Brazilian National Programme of Fuel Alcohol (PROALCOOL) of 1975, promoted the production of sugarcane ethanol to overcome the oil shock. The programme mandated blending of sugar ethanol to gasoline (20-26% vol.). By 2005, the programme became fully competitive to gasoline after phasing out support mechanisms. In 2004, 14.8 Mm<sup>3</sup> produced, 2.5 bln litres exported accounting saving of 35.1 Mt CO<sub>2</sub> eq (~ 14% of national CO<sub>2</sub> emissions from fossil fuels). (Unica - São Paulo Sugarcane Agroindustry Union and also Lucon, Oswaldo, 2005) The success of PROALCOOL was due to: (1) close coordination among all sectors involved, the various ministries, the automobile industry, PETROBRÁS (state owned oil company), the fuel distributors, and the gas stations, and the consumers and (2) the creation of subsidies to stimulate the production and purchase of hydrated alcohol run cars. The reduction of the tax on industrialized products (IPI) also played a major role in this context. <http://brazilembassyinindia.com/proalcool.htm> (accessed on Jan 04, 2005).
- <sup>2</sup> (a) Ministry of Agriculture, Livestock, and Supply, Government of Brazil launched the National Agro-energy Plan on 14 October 2005. The initiative is part of the government's effort to increase biofuel production. Beginning in 2008, a 2 % mixture of biodiesel with regular diesel fuel will become mandatory in Brazil. This represents an annual consumption of nearly 1 billion litres of biodiesel. (Alexander's Oil and Gas Connections, 2005).  
(b) From 2008, Brazilian oil companies will have to add at least 2 per cent biodiesel to regular diesel and from 2012, this percentage will rise to 5 per cent. This will act as an incentive to industries to develop profitable ways of using biodiesel and for farmers to produce more to meet the internal demand. (Osse, Sergio 2005)
- <sup>3</sup> Supra note 1.
- <sup>4</sup> In United States, state governments have taken the initiative in a large way by introducing biofuels (biodiesel and ethanol mixing) legislations.
- <sup>5</sup> European Union Biofuels Directive (2003/30/EC) lays down guidelines to expand the production and use of biofuels derived from agricultural, forestry and organic waste products. The directive sets only indicative targets and not mandatory targets. The target for 2005 is 2% of transportation fuel and 5.75% by 2010. Thus, as per the Biofuels directive member states should ensure that a minimum proportion of biofuels and other renewable fuels is placed on their market. If the objectives set in the directive are achieved, the consumption of biofuels in the EU will increase from 1.4 mill. tons oil equivalents in 2001 to 19 mill. tons in 2010. The Energy tax directive (2003/96/EC, 27.10.2003), gives the possibility to member states to grant tax reductions/exemptions in favour of biofuels, under certain strict conditions. The exemption or reduction in taxation applied by member states must be adjusted to take account of changes in raw material prices to avoid over-compensation.

- <sup>6</sup> Osse, Sergio, 2005.
- <sup>7</sup> 22 of the last 31 Nuclear Power Plants (NPPs) connected to an energy grid were in Asia, and 18 of the 27 NPPs presently under construction are in Asia (IAEA Study 2004).
- <sup>8</sup> A good example is the case of the number of important biofuels technology as well as marketing players investing in Asian and African countries.
- <sup>9</sup> Goldman Sachs, 2003.
- <sup>10</sup> UNDP, 2003. *World Urbanization Prospects: The 2003 Revision Population Database*, United Nations Population Division (<http://esa.un.org/unup/index.asp?panel=3>) Assessed December 21, 2005.
- <sup>11</sup> EIA 2003. *International Energy Outlook*.
- <sup>12</sup> IEA 2002. *World Energy Outlook*.
- <sup>13</sup> *World Energy Outlook*, 2002, Also see Ram Mohan and Kumar, 2005 and *Report of the Committee on Development of Biofuels*, Planning Commission, Government of India, 2003. More, see <http://envfor.nic.in/naeb/sch/wsl/wsl.html>
- <sup>14</sup> Ministry of Environment and Forests (MoEF), Government of India initiated the National Wastelands Identification Project (NWIP) in collaboration with the National Remote Sensing Agency and the Survey of India to prepare district-wise wastelands maps on 1:50,000 scale by using satellite data. Wastelands maps for 146 districts have been prepared and distributed to the concerned State and district level agencies. Maps for 91 districts are under preparation. Selection of these districts is based on the criterion that 5% or more of the geographical area of these districts is estimated to be wastelands.
- <sup>15</sup> (a) Kalam, A P J Abdul 2005 <http://presidentofindia.nic.in/scripts/events/latest1.jsp?id=991> Assessed 24th December 2005.
- (b) The Auto Fuel Policy announced by Government of India also recommends the use of biofuel to cut harmful vehicular emissions by almost 50 per cent. Mashelkar 2002. Report of the Expert Committee on Auto Fuel Policy, 2002.
- <sup>16</sup> Ram Mohan and Kumar, 2005 also Kher, Rajeev, 2005.
- <sup>17</sup> *Ibid*.
- <sup>18</sup> The *Power Alcohol Act* was repealed as per the recommendation of the P C Jain Committee which was appointed to recommend the scraping of laws that serve no purpose.
- <sup>19</sup> Section 6, The *Indian Power Alcohol Act, 1948*.
- <sup>20</sup> Discussion on Indian Power Alcohol (Repeal) Bill, 2000. (Bill Passed) (XIII LOK SABHA debates).
- <sup>21</sup> Section 2 (c), The *Indian Power Alcohol, 1948*.
- <sup>22</sup> The Gazette Of India: Extraordinary [Part I- Sec. I], Ministry Of Petroleum And Natural Gas Resolution, New Delhi, 3 September 2002 No. P-45018/28/2000-C.
- <sup>23</sup> The areas that have been notified are the States of Goa, Gujarat, Haryana, Karnataka, Maharashtra, Punjab, Uttar Pradesh, Uttaranchal, Andhra Pradesh (all districts except Chittoor and Nellore), Tamil Nadu (only districts — Coimbatore, Dindigul, Erode, Kanyakumari, Nilgiri, Ramanathpuram, Tirunelveli, Tuticorin, and Virudhunagar), and the Union Territories of Chandigarh, Dadra & Nagar Haveli and Daman & Diu.
- <sup>24</sup> XIV Lok Sabha Debates, Question to the Minister of Petroleum and Natural Gas to the situation arising out of the withdrawal of mandatory order regarding mixing of 5% of ethanol in petrol and subsidy of 30 paise per litre given to the ethanol.
- <sup>25</sup> *Ibid*.
- <sup>26</sup> *Ibid*.
- <sup>27</sup> *Ibid*.
- <sup>28</sup> *Fifth Report, Standing Committee On Petroleum & Natural Gas (2004-05)*, (Fourteenth Lok Sabha) Ministry Of Petroleum & Natural Gas, Lok Sabha Secretariat, New Delhi, April, 2005.

- <sup>29</sup> Supra note 24.
- <sup>30</sup> Supra note 22.
- <sup>31</sup> Supra note 28.
- <sup>32</sup> *Report of the Committee on Development of Biofuels*, Planning Commission 2003.
- <sup>33</sup> Biodiesel Purchase Policy, Ministry of Petroleum and Natural Gas, Government of India, 9 October 2005.
- <sup>34</sup> Lohia, A. K. 2005.
- <sup>35</sup> Duhera, Rolly, 2005.
- <sup>36</sup> Prasad, Manohara, 2005.
- <sup>37</sup> Supra note 35.
- <sup>38</sup> Supra note 34.
- <sup>39</sup> Supra note 36.
- <sup>40</sup> Supra note 36.
- <sup>41</sup> See supra notes 22, 32.
- <sup>42</sup> The Bureau of Indian Standards, empowered through a legislative Act of the Indian Parliament, known as the *Bureau of Indian Standards Act, 1986*, operates a product certification scheme. The BIS product certification scheme is essentially voluntary in nature, which allows the licensees to use the popular ISI Mark, and is largely based on ISO Guide 28.
- <sup>43</sup> Supra note 32
- <sup>44</sup> Detailed Project Report, National Mission on Biodiesel, Ministry of Rural Development, Government of India (2004).
- <sup>45</sup> Ministry of Petroleum And Natural Gas Order, New Delhi, 28th December, 1998 GSR 772 (E).- Order made by the Central Government in exercise of the powers conferred by Section 3 of the *Essential Commodities Act, 1955*(Central Act 10 of 1955).
- <sup>46</sup> <http://www.doe.gov.ph/alternative/cme.htm>
- <sup>47</sup> *Ibid.*
- <sup>48</sup> Section 2 (a), *Department of Energy Act, 1992*.
- <sup>49</sup> Section 2, Memorandum Circular No. 55. Office of the President of the Philippines, dated 9 February 2004.
- <sup>50</sup> Section 3, Memorandum Circular No. 55. Office of the President of the Philippines, dated 9 February 2004.
- <sup>51</sup> Section 6, Memorandum Circular No. 55. Office of the President of the Philippines, dated 9 February 2004.
- <sup>52</sup> Section 5, Rules and Regulations Implementing Memorandum Circular no. 55.
- <sup>53</sup> *Ibid.*
- <sup>54</sup> House of Representatives Bill No: HB 04629.
- <sup>55</sup> Yap, Arthur 2005 [http://www.iea.org/Textbase/work/2005/Biofuels/Biofuels\\_Yap\\_Presentation.pdf](http://www.iea.org/Textbase/work/2005/Biofuels/Biofuels_Yap_Presentation.pdf)
- <sup>56</sup> Ho, Abigail L 2005, [http://money.inq7.net/topstories/view\\_topstories.php?yyyy=2005&mon=11&dd=09&file=3](http://money.inq7.net/topstories/view_topstories.php?yyyy=2005&mon=11&dd=09&file=3).
- <sup>57</sup> This is a Bill sponsored by Representative Juan Miguel Zubiri.
- <sup>58</sup> Reyes, Mary Ann L., 2005.
- <sup>59</sup> *Ibid.*
- <sup>60</sup> House of Representatives Bill No: HB 04341
- <sup>61</sup> "Thailand looks to biofuels to ease economic pain". *The Financial Express*, Bangladesh, 21 November 2005, [http://financialexpress-bd.com/index3.asp?cnd=11/21/2005&section\\_id=4&newsid=7391&spcl=no](http://financialexpress-bd.com/index3.asp?cnd=11/21/2005&section_id=4&newsid=7391&spcl=no)
- <sup>62</sup> Section 6 (6), *The Energy Development and Promotion Act, 1992*.
- <sup>63</sup> Policy on Alternative Energy by Ethanol, Department of Alternative Energy Development and Efficiency, Ministry of Energy, Thailand (2005).
- <sup>64</sup> *Ibid.*
- <sup>65</sup> *Ibid.*

- <sup>66</sup> Promotion on Ethanol Use, Department of Alternative Energy Development and Efficiency, Ministry of Energy, Thailand (2005).
- <sup>67</sup> *Ibid.*
- <sup>68</sup> Cabinet Resolution RE: The Promotion of Gasohol through the Gas Stations within Bangkok, dated 2 November, 2004.
- <sup>69</sup> *Ibid.*
- <sup>70</sup> *Ibid.*
- <sup>71</sup> *Ibid.*
- <sup>72</sup> Biodiesel, Department of Alternative Energy Development and Efficiency, Ministry of Energy, Thailand.
- <sup>73</sup> [http://www.bcb.com.my/corporate\\_info/pdf/Aug05/Vol%203%202005%20Ind%20Issue%20biofuel%20policy%20081205.pdf](http://www.bcb.com.my/corporate_info/pdf/Aug05/Vol%203%202005%20Ind%20Issue%20biofuel%20policy%20081205.pdf)
- <sup>74</sup> [http://english.people.com.cn/200512/25/eng20051225\\_230698.html](http://english.people.com.cn/200512/25/eng20051225_230698.html)
- <sup>75</sup> <http://www.planetark.com/dailynewsstory.cfm/newsid/33161/story.htm>
- <sup>76</sup> <http://www.planetark.com/dailynewsstory.cfm/newsid/31182/story.htm>
- <sup>77</sup> <http://www.planetark.com/dailynewsstory.cfm/newsid/31592/story.htm>
- <sup>78</sup> Moore, Janet 2005 <http://www.startribune.com/117/story/73696.html>
- <sup>79</sup> <http://www.planetark.com/dailynewsstory.cfm/newsid/31182/story.htm>
- <sup>80</sup> Slingerland and Geuns 2005.
- <sup>81</sup> Article 1, The Renewable Energy Law, 2005.
- <sup>82</sup> Article 2, The Renewable Energy Law, 2005.
- <sup>83</sup> Article 4, The Renewable Energy Law, 2005.
- <sup>84</sup> *Ibid.*
- <sup>85</sup> Article 6, The Renewable Energy Law, 2005.
- <sup>86</sup> Article 7, The Renewable Energy Law, 2005.
- <sup>87</sup> *Ibid.*
- <sup>88</sup> Article 8, The Renewable Energy Law, 2005.
- <sup>89</sup> *Ibid.*
- <sup>90</sup> Article 10, The Renewable Energy Law, 2005.
- <sup>91</sup> Article 11, The Renewable Energy Law, 2005.
- <sup>92</sup> Article 16, The Renewable Energy Law, 2005.
- <sup>93</sup> *Ibid.*
- <sup>94</sup> *Ibid.*
- <sup>95</sup> Article 31, The Renewable Energy Law, 2005.
- <sup>96</sup> *Ibid.*
- <sup>97</sup> Article 12, The Renewable Energy Law, 2005.
- <sup>98</sup> Article 24 (1), The Renewable Energy Law, 2005.
- <sup>99</sup> Article 24 (2), The Renewable Energy Law, 2005.
- <sup>100</sup> Article 24 (3), The Renewable Energy Law, 2005.
- <sup>101</sup> Article 24 (4), The Renewable Energy Law, 2005.
- <sup>102</sup> Article 24 (5), The Renewable Energy Law, 2005.
- <sup>103</sup> Article 25, The Renewable Energy Law, 2005.
- <sup>104</sup> "China: Renewable Energy Policy in Motion", *Iran Daily*, 17 December 2005 <http://www.iran-daily.com/1384/2452/pdf/i8.pdf>
- <sup>105</sup> Article 26, The Renewable Energy Law, 2005.

## Reference

- Alexander's Oil and Gas Connections. 2005. *New and Trends: Latin America*. Volume 10, Issue #20.
- Department of Alternative Energy Development and Efficiency, Ministry of Energy. 2005. *Policy on Alternative Energy by Ethanol*. Thailand.
- Department of Alternative Energy Development and Efficiency, Ministry of Energy. 2005. *Promotion on Ethanol Use*. Thailand.



- Duhera, Rolly. 2005. *Bio-Diesel From Field To Wheel*. Bangalore: BioSpectrum.
- EIA. 2003. *International Energy Outlook 2003*, Washington
- Goldman Sachs. 2003. Global Economics, Paper No: 99, *Dreaming with BRICs: The Path to 2050*.
- Government of India. 2003. *Report of the Committee on Development of Biofuels*. Planning Commission, New Delhi.
- Ho. Abigail L. 2005. Biofuel bill passed in House, *Inquirer News Service, INQ7.net, Manila*.
- IEA. 2002. *World Energy Outlook 2002*, Paris.
- Kher, Rajeev. 2005. "Biofuels: The Way Ahead", *Economic and Political Weekly Commentary*.
- Lohia, A K. 2005. *Income generation through Jatropha plantation: Uttaranchal's Experience*, International conference and expo on Biofuels - 2012: Vision to reality, New Delhi.
- Lok Sabha Secretariat. 2005. *Fifth Report, Standing Committee on Petroleum & Natural Gas (2004-05)*, New Delhi.
- Lucon, Oswaldo. 2005. *Bioethanol: Lessons From The Brazilian Experience*. International Conference on Biofuels: Vision to Reality-2012, New Delhi.
- Mashelkar, R. et al. 2002. *Report of the Expert Committee on Auto Fuel Policy*. New Delhi.
- Ministry of Petroleum and Natural Gas, Government of India. 2005. *Bio-diesel Purchase Policy*, New Delhi.
- Moore, Janet. 2005. "Ethanol has appeal in China". *Star Tribune*, Minneapolis.
- Osse, Sergio. 2005. *Brazil moving ahead with biofuel initiatives*. SouthWest Farm Press, United States.
- Prasad, Manohara. 2005. *Biodiesel Programme in Andhra Pradesh*, International Conference and Expo on Biofuels - 2012: Vision to Reality, New Delhi.
- Ram Mohan, M P & Kumar, Linoj 2005. *Biofuels: The Key to India's Sustainable Energy Needs*. RISO International Energy Conference: Technologies for Sustainable Energy Development in the Long Term, Denmark.
- Reyes, Mary Ann L 2005, *Biofuel bill approved in The Philippines*. Manila: SeedQuest.
- Slingerland and Geuns. 2005. *Drivers of an International Biofuel Market*. Discussion Paper, CIEP Future Fuel Seminar, Clingendael Institute, Netherlands.
- UNPD. 2003. *World Urbanization Prospects: The 2003 Revision Population Database*.