CHAPTER 3

FORMS OF ALTERNATIVE ENERGY AVAILABLE

As it is projected that energy demand will keep increasing, efforts have been made to explore and develop other potential energy sources to accommodate the increasing demand. Renewable energy, energy which is inexhaustible, and alternative energy are considered potential options, which will help reduce not only the country's dependency on imported energy but also risks of volatility of imported fuel prices. Several public agencies have carried out researches into various renewable energy and alternative energy sources.

Renewable Energy

Renewable energy is mostly derived from natural resources and is considered clean and environmentally friendly. However, there exist obstacles to the development of renewable energy and the costs of harnessing renewable energy resources are still high compared with those of using commercial energy, particularly, the development of solar and wind energy which require the use of high cost technology.[13] Renewable energy that has high potential to be used in place of commercial energy includes, for example, hydropower, biogas and biomass energy, solar energy and geothermal energy. Studies and development on these energy sources have continuously been undertaken by several agencies, both at the local level

[13] www.dundee.ac.uk/prospectus/undergrad/courses/renewable.htm

initiated by local intellect and at the government level. At present, the development of renewable/alternative energy has become a focus of interest and wider utilization has been promoted to replace conventional energy consumption in parallel with the efforts to stimulate people to use energy efficiently and economically.[14]

Although renewable energy consumption makes up tiny percentage of Thailand's fuel share of energy consumption, with hydropower accounting for the majority of that percentage, alternatives to fossil fuel-fired energy production are making up an increasing share of the country's energy production. Since Thailand does not have the luxury of domestic natural resources on the scale of neighbors such as Malaysia and Indonesia, Thailand is forced to import much of its energy for domestic use. Oil imports cost the Thai government an estimated 300 billion baht ($7.3 billion) each year.[15]

However, there are many forms of alternative energy available and what is important is how much priority would a country give in order to promote its usage and development. That being said, alternative energy is a concept beyond commercial energy or even commercial ideas, where one needs to step outside of the way one sees how energy is to be created, used, as well as taking into account, the greater environmental costs, translated into economic values and losses, through a certain type of social conscience which needs to be built or instilled through awareness.

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[14] smartmoves.questacon.edu.au/.../technology.asp?subtech=Renewable%20Energy&Supergroup=Renewable%20Energy

[15] www.energy.go.th/en/aboutUs_09Law_05.asp

Take for example, the European Union, which has been accused of being overly protectionistic to gain its market access.[16] One of the key barriers is built around the environmental costs which most countries, including developing countries like Thailand, sees as being barriers to trade. The costs of social responsibility, the emissions, the toxins, and everything else, once worked back, do make sense on why they would not want to have to be the one bearing the costs of environmental degradation or on the social welfare, particularly, on the health of its people. To a certain extent, developing countries might not understand or do not want to understand such logic, because their national interests lies in the fact that more export and market penetration equates better chance of ensuring economic development. But the main point of this passage is to say that, it is not always about who is gaining and who is losing. Because that is mutually exclusive from how, within the process of thinking, environmental conscience could be put into economic processes.

There are many companies out there working towards a greener earth. And a lot are in the energy business. Even though we should not be overly naïve about their "green campaign," as it is often used as defense against criticisms from the activities they have conducted in order to procure energy for their investors. But it is also noteworthy to see that, their campaigns do seem to make better sense at capturing the concerns many countries are sharing such as global warming.

According to BP company, several factors in countries' energy policies around the world demanded close attention in 2006. This also goes hand in hand with climate policy, where there was a lot of debate over relations between national governments and international oil companies. Transparency over the revenues

[16] www.eea.europa.eu/documents/prague_statement/prague_statement-en.pdf

government receives from energy companies and the way they spend them continued to receive scrutiny. Public awareness and concern over climate change intensified during 2006.[17] new research was published that highlighted the increasing future risks of the impacts of climate change and the growing acceptance that much of the observed global warming and associated impacts result from human activity. There was also significant legislative activity, especially in Europe and the US, in order to address the issues. To understand that Thailand is still also a developing economy is legitimate, as there are identified social and economic limitations,, but it does not hurt to be incorporating these ideas into their national policy at early stages. There really is no time to waste and there are many benefits Thailand could gain from investing in and promoting the usage of alternative energy in the long term.

Biofuels

With record high oil prices sending fuel costs skyward, Thailand is turning to its most abundant resource, its farmland, for potentially highly profitable production of fuel alternatives. It is important to find supplementary sources of alternative energy to replace the dependence on oil imports and be able to use existing technological know- how and further develop it to transform agricultural produce into energy.[18] Biofuels, derived from sources such as sugarcane, cassava, and palm oil, have become a new growth industry in countries endowed with agricultural surpluses.

[17] www.bp.com/liveassets/bp_internet/globalbp/
[18] www.ethanol-gec.org/information/Thai-Bio-Feb07

As one of only five major net food exporters in the world, Thailand is in an extremely competitive position to become a regional biofuels production base.

One of the real potential lies in cassava, a woody shrub widely grown for starch and animal feed production. The yield of cassava production in Thailand is twice as high as the world average, and could be further increased, government would provide subsidies in order to provide growers with financial incentive to improve their cultivation practices and increase the quantity of cassava produced per hectare of cultivated land. Ethanol production, one of the key alternative energy derived from plants, could greatly be increased, if proper plants are built in order to yield sufficient amount for commercialization.

Furthermore, Gasohol is an alternative fuel for vehicles. It is a mixture of ethanol and regular gasoline at the ratio 1:9. The properties of derived gasohol are the same as Octane 95 gasoline. More critically, the use of gasohol will not only reduce oil consumption and air pollution from vehicle exhaust but also boost farmers' income through the selling of their agricultural products, i.e. sugarcane and cassava. At present, 1 million litters per day of Gasohol are sold mostly in Bangkok. All government vehicles that can use 95-Octane gasoline must use Gasohol. The target is that before 1st January 2007 all of 95-Octane gasoline, accounting for 40 million litters of Gasohol or 4 million litters of ethyl alcohol per day, will be sold at 4,000 stations around the country.

Market potential in Asia is high, with 90% of Thailand's current ethanol exports going to Japan, the world's largest importer of ethanol and second largest consumer of gasoline. Supplying this growing demand means higher value-added for the agro-industry. The biofuels production is also seen as instrumental for raising

agricultural commodity prices and incomes of farmers, hence helping combat poverty and promoting greater development in rural communities.

The government is offering direct support, including BOI (Board of Investment of Thailand) maximum privileges of duty-free imports and an 8-year corporate income tax exemption. The Thai biofuels industry hopes that it can follow Brazil, the world's leading ethanol producer, and move its agro-industry further up the value chain. The two nations have already signed a memorandum of understanding (MOU) to exchange biofuels information and expertise.

Additionally, all kinds of vegetable oil including leftover oil from food industries can be used as diesel substitute in slow diesel engines such as water pumping or boat engines. However the oil has to go through chemical processes to become ester, called Biodiesel or B100, which is usable in all diesel engines. To make the Biodiesel more prevailing, the government sets target that 8.5 million litters per day of B100 will be available in 2012.[19] In terms of energy plantation, palm oil has been considered the most economical product to produce Biodiesel. Basing on financial evaluation, palm oil plantation yields higher return than any other kinds of cash crops. In this context, turning present suitable farmland into palm oil plantation would be financially viable.

Thus far, several institutes have undertaken studies and development of the quality of biodiesel and "blended oil" (a mixture of diesel and crude plant oil or that of diesel and refined plant oil without any chemical process) compared with the specified diesel standards. It has been reported that blended oil has advantages over diesel in that it contains lower sulfur content and helps with lubrication; however, the

[19] www.eppo.go.th/doc/NIO-EnergyAndNaturalResource2003.html

quality of different bulks of blended oil varies although it is sold at the same distribution station. Research is being carried out on biodiesel production from crude coconut oil ("cocodiesel") and on the impact of cocodiesel utilization on the environment.

According to the Energy for Environment Foundation, biomass represents significant energy generating potential since it uses agricultural waste products, such as byproducts from rice, oil palm, sugar and wood processing mills which are plentiful in Thailand. Such production is particularly appropriate for businesses which have access to a regular supply of agricultural products. Waste water from agricultural processing industries as well as municipal waste is used by agricultural mills and municipalities, respectively, to produce biogas. Palm oil and tapioca mills build biogas systems as part of their wastewater treatment and use the biogas produced to replace fuel oil or LPG consumption or to produce electricity.

In an effort to reduce this dependence on costly foreign oil, Thailand is turning to another source of energy that the country has in abundant supply: the sun. Thailand has constructed a 42.5 MW solar power plant in the northern province at Mae Hong Son. The plant, which consists of six solar-cell generating units is the largest solar-powered station in the ASEAN region when it was completed in April 2004. EGAT said that the plant have the ability to generate 500 kilowatt-hours (kWh) of power in the initial phase but eventually will be able to produce 1,750 kWh and help meet the growing power demand of tourists in the province. Although EGAT says that production costs for solar-powered electricity are five times as high as that of fossil fuel-fired power, EGAT officials note that construction costs of the Mae

Hong Son station were considerably lower than the cost that the government would otherwise have had to spent to transmit electricity to the province from elsewhere.

Solar energy

Solar energy is increasing in importance for Thailand, with the Thai government planning to increase its solar power production capacity to 30 MW by 2006.[20] However, environmentalists say this is a mere fraction of Thailand's solar energy potential; Greenpeace has argued that the country has the ability to meet fully one-third of its electricity demand through renewable energy by 2020, with most of the growth coming from solar energy. Thai citizens are taking solar energy's potential into their own hands, as some 20,000 people at Naresuan University have turned the campus into a "solar city" with such items as minibuses, public phones, and ovens all powered by solar energy. The Thai government also is kicking off a project aimed to supply 300,000 homes with solar cells in a bid to generate additional solar energy.[21]

The use of solar energy for power generation through solar cells or photovoltaic (PV) cells, has also been promoted by the government. So far, about 5 megawatts of PV power generation systems have been installed in Thailand; most of them are in remote areas beyond the grid systems. Unfortunately, solar cells still have to be imported. Government supports have also been given to demonstration projects on solar energy utilization and integrated systems of PV/hydropower and PV/wind energy. Several government agencies under the Ministry of Energy have been

[20] www.eia.doe.gov/emeu/cabs/thaienv.html
[21] www.nu.ac.th/english/research/location/i_sert.htm

undertaking studies and development of the PV technology. For example, the Department of Alternative Energy Development and Efficiency (DEDP) has studied and explored the potential of solar energy utilization. Solar cell battery-charging stations have been established in various rural villages that do not have access to the national grid system and for Border Patrol Police Schools that are located outside the grid system. Several demonstration projects have been carried out, for example, demonstration of renewable energy utilization in the areas of six major Royal Initiative Projects such as the installation of PV power generation systems and the installation of PV-pumping systems for rural village water supply. Furthermore, The Electricity Generating Authority of Thailand (EGAT) has developed several projects to demonstrate power generation using the PV technology, PV power generation without use of batteries, and rooftop PV grid-connected systems. Development has also been undertaken on the integrated use of solar/wind energy for power generation at Phromthep Cape in Phuket Province, and the integrated use of solar/hydro energy at Klong Chong Klum in Sakaew Province.

The Energy Policy and Planning Office (EPPO) is the government agency responsible for monitoring the ENCON Fund allocation for renewable energy projects. Grants have been given to encourage R&D on solar energy. Examples of funded projects are: (1) the development of solar radiation measuring station network for Thailand; (2) the demonstration project of electricity generation and distribution system using solar cells in Mae Hong Sorn Province in northern Thailand, most of whose areas are mountainous with scattered population; and (3) the establishment of "Solar Energy Park" to serve as the center for demonstration and information dissemination on solar energy. Besides, the Thailand Research Fund (TRF), an

independent organization under the Office of the Prime Minister, is another institute undertaking R&D and facilitating information on solar cells. In 2001, TRF approved a research project on the production of silicon from paddy husks, which can be eventually used for solar cell production, thereby promoting the development of solar cells using indigenous resources.

The adoption of solar power is hindered by its cost, which is approximately four to five times higher than conventional biomass power generation.[22] Thus, strong incentives are needed for Thailand to harvest its solar energy potential. There are opportunities for investors to manufacture solar cells in Thailand, the production of which qualifies for BOI investment privileges.

Hydropower

Environmental groups advocate the establishment of mini- and micro-hydropower plants to minimize the negative repercussions from large-scale dams. The Energy for Environment Foundation estimates that Thailand's installed mini- and micro-hydropower capacity is approximately 350 MW. Currently, the development of hydropower is limited to government agencies, such as EGAT, the Royal Irrigation Department or community-based projects.

Increased dependence on hydropower is another goal of the Thai government, with plans to import significant quantities of hydroelectricity from

[22] zebu.uoregon.edu/1999/ph161/l28.html

Laos.[23] EGAT holds a 25% stake in the Nam Theun 2 Power Company, an international consortium that is planning to build a 1,070 MW hydropower plant and dam at an estimated cost of $1.1 billion. Thailand, through EGAT, is expected to buy 90% of the power generated by the project over the next 25 years. However, plans for the project were thrown up in the air in July 2003 when Electricite de France (EdF), the French power utility with a 35% stake in Nam Theun 2, announced plans to withdraw from the project. In October 2003, EdF appeared to reverse course by deciding to stay in the project.[24] The hydropower plant, although touted for its supposed renewable energy benefits, also has been criticized for its environmental and social impacts on the local population.

Wind power

Although Thailand's installed wind power capacity is less than 500 kW, GE Energy sees high potential for this energy source due to technological advances in turbine size and efficiency. Technology is now available for low wind areas, such as Thailand, with wind speeds of four-to-five meters per second. EGAT has used 150 kW wind turbines to generate power in Phuket since 1990.

[23] www.egat.co.th/english/dams/hydroelectric_dam.htm
[24] www.industcards.com/hydro-laos.htm

Counter arguments on the forms of alternative energy and the environment

From the global perspective, the US Department of Energy has calculated that oil demand will grow by 35% between 2004 and 2025 - from 82 million barrels per day to 111 million - largely because of the voracious appetite of newly industrializing countries such as China and India. Output would need to rise by a similar amount. However, this assumes that the major producers, including Saudi Arabia and Nigeria, will double or even triple their production; few independent analysts now believe this will be possible. A greater likelihood is that crude-oil supplies to Asia will begin to dry up within two decades.

But while the world oil markets may be fickle and manipulative, the alternatives are not so obvious, even when coupled with efficiency drives. Coal is perceived in Asia as being too dirty, while local deposits are usually of poor quality; there is grassroots opposition to costly and invasive hydro-electric schemes, and solar generation lacks the economies of scale that could create a viable market.

Yet biofuels also have their skeptics, not least within the environmental and scientific communities that were once so vocal in support. Still to be verified is whether the industry is as eco-friendly as claimed and offers a viable economic alternative to fossil fuels.

Studies in Australia and the US have concluded that ethanol, the biofuel blend used for motor vehicles, pollutes groundwater by releasing high levels of benzene. The US journal Science even reported that fuels containing ethanol produced just as many greenhouse emissions as gasoline. Greenhouse gases in the atmosphere

trap the sun's heat, theoretically causing global warming that could change the world's climate catastrophically.

Ethanol has also been found to damage cars manufactured before 1986, while there can be wider ignition problems for fuels that contain 20% or more the substance, also known as ethyl alcohol or grain alcohol.

From an economic viewpoint, the impact of biofuels varies sharply depending on location and the available feedstock. While oil palm produces about 2,700 barrels of oil a year per square kilometer, the highest level of efficiency recorded for any feedstock, corn produces only 76 barrels and coffee 147.5.

So much feedstock is consumed in the production process that 540% of all arable farmland worldwide would have to be used to meet projected energy demand, or 54% of the Earth's entire land surface. Growing biofuel on all of the world's farmland would still only provide about 20% of the energy produced each year from crude oil.

Nobody is sure what the investment returns will be for technologies that are largely untried in this region. But investors are coming because of a realization by policymakers that there will be no set formula for energy sufficiency: the answer will be a mix of applications that offers plenty of growth potential without breaking the bank.

According to US environmentalist Kelpie Wilson, he said that over the past several years, as the dimensions of the energy and climate crisis have unfolded, the press, the public and politicians have embraced 'silver bullet' solutions one after another according to the fad of the day. One moment it's hydrogen, then ethanol, then nuclear power, then wind. Yet, today there is a growing recognition that no single

energy technology can replace fossil fuels, but there is still no recipe that tells how to combine energy technologies into a healthful brew that can save our planet and our civilization.

As for Thailand, the financial burdens imposed upon the country's environment, it also has experienced ongoing problems in the coordination among public institutions responsible for environmental and natural resource management. The legislation passed in the early 1990s was meant to establish a comprehensive framework for the protection of Thailand's environment, but weak regulatory implementation and noncompliance by polluters continue to prevent the country from making meaningful strides in achieving an environmentally sustainable rate of growth.

Concern for Thailand's environment and the country's obligations under international environmental conventions continues to grow. The role of environmental non-governmental organizations (NGOs) is steadily increasing, while the process of decentralizing the government's role in formulating local environmental policy decisions also is beginning to take hold. Nevertheless, Thailand continues to have a considerable amount of work to do pertaining to its environment. Working with organizations such as the World Bank and UNEP, the Thai government is taking measures to restructure the management of its natural resources. The existing regulatory command-and-control regime has also been a major source of debate as it has shown to be ineffective, and is slowly being replaced by the introduction of market-based instruments. In addition, direct pressure from many Thai communities affected by pollution is playing a role in influencing the government and the private sector to improve their compliance with environmental regulations.