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THAILAND

# ON THE HORIZON — RENEWABLE ENERGY IN ASIA

A PRACTICAL GUIDE





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A PRACTICAL GUIDE

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PREPARED BY MERITAS LAWYERS IN ASIA

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HKD	Hong Kong Dollar	SGD	Singapore Dollar
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IDR	Indonesian Rupiah	THB	Thai Baht
JPY	Japanese Yen	USD	United States Dollar
KRW	Korean Won	VND	Vietnamese Dong
MYR	Malaysian Ringgit		

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## ON THE HORIZON — RENEWABLE ENERGY IN ASIA

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As this book goes to press, the global economy is still struggling to climb out of its worst downturn since the Great Depression. At the same time, Japan faces its most significant crisis since 1945 as it deals with the impact of the tsunami and damaged nuclear reactors at Fukushima. While some countries such as China, Singapore, and India have successfully rebounded, most nations are facing dual threats of exceptionally slow economic growth combined with chronic levels of high unemployment. Unlike past recessions, this one has hit developed economies just as hard as less developed countries, which have traditionally borne the brunt of economic downturns.

No matter how the world economy performs over the next few years, two factors stand out that will strongly influence global economic prospects over the next decade. One factor is population growth. Most experts predict that the world's population will grow from 6.9 billion today<sup>1</sup> to 8 billion by 2025 and will add another billion by 2050. This projected increase is as many people who currently live in China and India. Continual population growth places high demands on the world's resources, as more people are demanding more goods and services. Equally significant, the large and rapidly growing economic powerhouses like China and India are accelerating their demand for energy and the goods and services it provides. Between just these two countries, over 3.5 billion people will be pushing their governments to promote rapid industrialization in order to meet the demands of their burgeoning middle classes. These are pressures that neither China nor India, nor any government for that matter, can resist for political reasons.

Economics aside, the combination of these two factors is also putting a heavy strain on our world's delicate environmental balance. The problem is that the energy resources supplied today to meet a growing population's increasing needs for goods and services are mainly derived from carbon-based sources that have significant long-term impacts on the environment. Coal is the dominant fuel in Asia and accounts for 54 percent of energy used today. While this share will go down over time (to an estimated 44 percent share in 2030), the use of coal in developing Asia is expected to increase by nearly 40 percent by 2030.<sup>2</sup>

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<sup>1</sup> U.S. Census Bureau estimate at [www.census.gov/main/www/popclock.html](http://www.census.gov/main/www/popclock.html)

<sup>2</sup> Estimates from USAID ECO-Asia Clean Development and Climate Program, based on data from International Energy Agency, Asian Development Bank, and Asia-Pacific Energy Research Center

For example, the Peoples Republic of China in 2011 is over 70 percent dependent on coal for its total energy needs, and it is the fastest growing economy in the world. As energy needs increase, so does the degradation of the environment. Adding another 2.5 billion people over the next 40 years will magnify the imbalance even more.

Another consideration involves the political climate where carbon-based energy is extracted and consumed. For example, much of the global oil supply is located in geographic areas that regularly experience bouts of political instability. Think about Venezuela, Nigeria, Libya, and points throughout the Middle East. As we have seen time and time again since the oil crisis of the 1970s, any even minor disruption in the assured supply of oil, gas, or other energy sources can and will have a significant impact on global prices.

And the trends of oil import dependency are going in the wrong direction. Over the past decade, oil imports to Asia have increased by 140 percent, and in 2010 the Asia region imported 60 percent of its oil.<sup>3</sup> China's dependence on foreign oil is expected to keep rising, reaching 65 percent by 2015 and 80 percent by 2030.<sup>4</sup>

For all of these reasons, the current global energy mix, which is primarily carbon-based, is untenable over the long run. China, India, and other nations need to find alternate ways to fulfill their energy demands. The only real answer — and our best chance to bring balance back to the environment — is to turn toward alternative sources of energy, which can at least in part replace existing coal and oil sources.

The most cost-effective way of weaning ourselves from fossil fuels is through energy efficiency, and this can be done by taking actions to make homes, buildings, factories, and our transport systems more efficient.<sup>5</sup> But at the same

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<sup>3</sup> National Association of State Energy Officials, "What's Hot in Trade and Imports," available at: [http://www.naseo.org/committees/energyproduction/oil/Trade\\_Hot.htm#What's%20Hot:%20The%20Asian%20Magnet](http://www.naseo.org/committees/energyproduction/oil/Trade_Hot.htm#What's%20Hot:%20The%20Asian%20Magnet)

<sup>4</sup> Estimates for China's oil import dependency in 2030 range from 75%-82% based on these references: The World Bank, "Winds of Change: East Asia's Sustainable Energy Future," available at: [http://www.recoalition.com/re2010/userfiles/files/Winds%20of%20Change%20\(Full%20Text\).pdf](http://www.recoalition.com/re2010/userfiles/files/Winds%20of%20Change%20(Full%20Text).pdf) and Japan Times, "What is Beijing willing to do to secure oil and gas supplies?" (stating US Dept. of Defense predicts oil imports will amount to four-fifths of oil consumption by 2030), available at: <http://search.japantimes.co.jp/cgi-bin/ea20101227mr.html>

<sup>5</sup> Based on estimates in International Energy Agency (IEA), World Energy Outlook 2010



time, it is also important to aggressively develop the most feasible alternatives for supplying sustainable fuel and power directly – through renewable energy. Some examples of renewable energy with real potential are solar, wind, hydro, biomass, biogas, and tidal. While some of these technologies have been commercialized and entered the market, none of them has yet reached anywhere near their full economic and market potential.

Such renewable energy sources cannot become commercially viable without long-term financial incentives and comprehensive pricing policies backed by national governments around the world. Just the sheer size of the capital investments required in order to develop and exploit renewable energy demands that governments underwrite part of those costs, at least initially. This includes government-backed targeted incentives and grants for research and development of these emerging technologies, funding renewable energy demonstration projects, and adopting tax regimes for renewable energy that will attract private investors over the long run. Without the right policies and regulatory incentives, renewable energy sources are unlikely to succeed in Asia or elsewhere.

Globally, investments in clean energy have quadrupled over the past five to six years, from USD46 billion in 2004 to USD173 billion in 2008, and then falling slightly to USD162 billion in 2009.<sup>6</sup> And the upward trend is expected to continue, as technological developments, in combination with the policies and incentives mentioned above, boost the market for clean energy. The total expected investment in clean energy, for just the G-20 countries alone, is expected to be USD2.3 trillion over the next 10 years.

The real growth in global energy demand will occur in developing Asia — most notably China and India — which will demand access to greater and greater levels of energy over the next several decades. The overall demand for energy in the developing Asia region is expected to increase by 65 percent in the next 20 years, and electricity consumption is expected to increase by 114 percent.

Given these strong trends, we wanted to find out where key countries in Asia stand now on renewable energy as a workable alternative and what we can expect in the future.

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<sup>6</sup> UNEP, 2010, Global Trends in Sustainable Energy Investment 2010. Sustainable Energy Initiative (SEFI), in cooperation with Bloomberg New Energy Finance

In order to find the answers, we approached 12 of the leading Asian law firms and asked each to comment on 10 basic questions about renewable energy policies and the regulatory framework in their individual countries:

- 1. What are the driving factors for increasing renewable energy production?*
- 2. Which renewable energy sources are viewed as the best opportunity for your country and why?*
- 3. What role does your government play in regulating the energy industry? Describe the regulating environment and trends in deregulation in your country.*
- 4. What agencies or bodies of government oversee the energy sector? What goals or mandates has your government set for electricity generation or fuels production from renewable sources?*
- 5. What are the opportunities for private ownership (vs. public ownership) in clean energy development and technologies?*
- 6. What is the level of government investment or what incentives are in place to support these goals and targets?*
- 7. What kind of emphasis is placed on researching and developing renewable energy technologies versus looking to outside energy resources?*
- 8. Is your country on track to be a clean energy importer or exporter from the standpoint of power production supply and manufacturing?*
- 9. How developed is your country's workforce to support innovation, development and the production of renewable energy?*
- 10. What are the key barriers to increasing renewable energy as a part of your country's energy mix?*

Each chapter of this book is devoted to insights on a specific country in Asia. Our hope is that this book will spark the beginning of an ongoing dialogue among government officials and planners, venture capitalists, individual entrepreneurs, researchers, multinational corporations in the energy sector, and NGOs as they focus their attention on how best to accelerate the deployment of renewable energy resources in Asia and elsewhere. The stakes are high for all of us. We cannot afford to step back from the challenges and ignore the great opportunities renewable energy technologies offer.

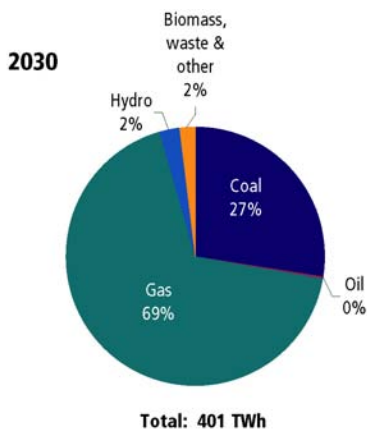
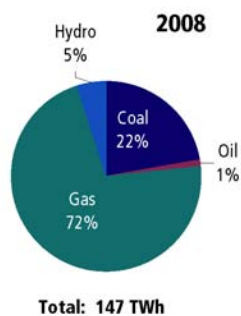
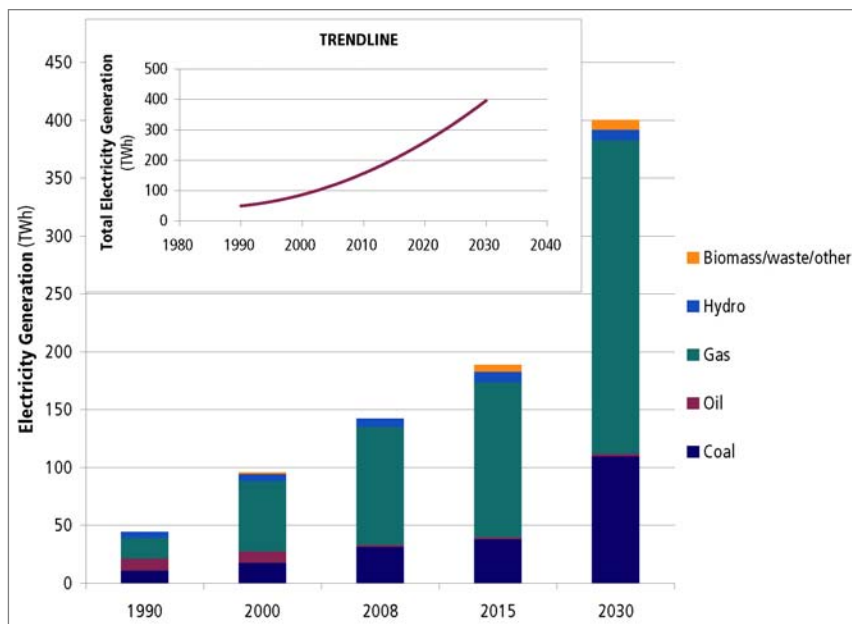
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USAID's ECO-Asia CDCP program uses policy and market interventions to promote the scale up of investment and implementation in clean energy in developing Asian economies. The program is active in China, India, Indonesia, the Philippines, Thailand, and Vietnam. ECO-Asia CDCP partnered with Meritas in the development of this guide as part of its Asia Clean Energy Policy and Regulatory Dialogue, which is aimed at building capacity in the region to design and implement effective policy, regulatory, and legal frameworks for energy efficiency and renewable energy.

## Electricity Generation by Fuel Type: Thailand



Source: Asian Development Bank, International Energy Agency, Asia-Pacific Energy Research Center, and The World Bank

## 1. What are the driving factors for increasing renewable energy production in Thailand?

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Thailand relies heavily on energy imports due to its limited energy resources. In 2009, Thailand imported 84 percent of its crude oil, 49 percent of its coal, and 21 percent of its natural gas.<sup>1</sup> Dwindling oil reserves and significant increases in oil prices in the world market have resulted in substantial loss in foreign exchange. Moreover, oil demand is projected to grow annually. Thailand's demand for crude oil and oil products has steadily increased over the past two decades from a demand of more than 230,000 barrels per day in 1986 to 1.1 million barrels per day in 2009.<sup>2</sup>

Oil demand is projected to grow annually at 3.9 percent, from 35 million tons of oil equivalent (MTOE) in 2002 to 103 MTOE in 2030, mainly driven by the transport and industry sectors. Net oil import dependency (the share of oil consumption in Thailand that is imported) is projected to increase from 89 percent in 2002 to 94 percent in 2030, as a result of increasing demand and declining domestic oil production. Increasing renewable energy production in Thailand would therefore improve self-sufficiency, help save foreign exchange, and create security of supplies.

In order to address Thailand's heavy dependence on imported oil, the government has heavily promoted research and development of ethanol and biodiesel to be an important alternative transport fuel for Thailand.<sup>3</sup> Thailand's Ministry of Energy has established several policies to ensure a sufficient energy supply for the country's development and to reduce reliance on oil imports.

Because agricultural commodities are a large part of Thailand's economy, the government has utilized local agricultural products to develop ethanol and biodiesel. Efforts are underway to improve energy crop production yield per acreage through promotion of better agricultural practices, development and use of higher yield varieties of energy crop plants (sugar,

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<sup>1</sup> Department of Alternative Energy Development and Efficiency, "Thailand Clean Energy Policy and Programs," available at: <http://www.adb.org/documents/events/2009/Climate-Change-Energy-Workshop/THA.pdf>

<sup>2</sup> Ministry of Energy, Thailand, "Energy Statistics Table 2.4-1: Demand and Supply of Crude Oil and Oil Products," available at [http://www.eppo.go.th/info/2petroleum\\_stat.htm](http://www.eppo.go.th/info/2petroleum_stat.htm)

<sup>3</sup> <http://www.eppo.go.th/doc/policy-wannarat-E.html>

cassava, and oil palm), and crop switching, while restricting land expansion. This will aid the agricultural sector by increasing the price of agricultural products. Additionally, three percent of Thailand's farmland is currently not being utilized.<sup>4</sup> Utilizing marginal land to grow energy crops can facilitate production of green energy and generate income for farmers without threatening the nation's food security.

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## 2. Which renewable energy sources are viewed as the best opportunity for Thailand and why?

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Thailand, being an agricultural country, has a diverse range of sources of biomass raw materials that can be converted into energy. These materials include bagasse from sugar plants, rice husks, palm oil, maize, and tapioca. Some of these raw materials are converted to fuels such as ethanol and bio-diesel used for transportation, and some of them are used to produce electricity for sale to the electricity grid, and for waste heat within agricultural processing factories.

Biogas projects utilizing manure of livestock (pigs in particular) are considered a great success.<sup>5</sup> The biogas produced is used for on-site electricity generation and/or cooking in households. Another important resource being used for biogas production is waste water from agricultural waste water (i.e., plants that make tapioca starch from cassava). The potential for electricity generation from biogas is in the range of 30–40 MW.

Thailand's geographical location is also suitable for the harnessing of wind and solar energy; however, these forms of energy have been developed more slowly than biomass and biofuels because of the high cost relative to other energy sources. Some prime locations for wind energy projects are in forests deemed conservation areas by the Natural Resources and Environment Ministry, which poses as an additional obstacle since projects must undergo several complicated processes to develop on conservation

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<sup>4</sup> The Nation, "Farmers growing electricity: A matter of changing the way we think," 24 June 2010, available at: <http://www.nationmultimedia.com/home/Farmers-growing-electricity-A-matter-of-changing-t-30132255.html>

<sup>5</sup> United Nations Economic and Social Commission for Asia and the Pacific, "Part 3: The Energy Conservation and Renewable Energy Programme in Thailand," available at: [http://www.unescap.org/esd/energy/publications/finance/part3\\_pongsit.html](http://www.unescap.org/esd/energy/publications/finance/part3_pongsit.html)

land. Renewable and alternative energy sources in 2010 accounted for 10 percent of Thailand's total energy use. As of December 2010, use of biomass energy was 1,650 MW; energy from mini- and small-scale hydropower was 58.9 MW; energy from municipal waste was 13.13 MW; and energy from wind power was 5.6 MW.

Under the government's Renewable Energy Development Plan, the government's goal is to have 20.3 percent of total energy consumption be derived from "alternative energy" resources — 14 percent from renewables, and 6 percent from natural gas for vehicles. The renewable energy target for the power sector for 2021 is 5,600 MW of power purchased through the SPP and VSPP programs, with the main resources being biomass, waste-to-energy, biogas, wind, and solar energy.<sup>6</sup>

The targets for ethanol and biodiesel are also aggressive: for ethanol, for example, the target is 1.4 million liters per day in 2009, increasing to 3 million liters per day in 2011, and 9 million liters per day in 2022, with a minimum of E10 (10 percent ethanol) in use by 2011. For biodiesel, B2 (two percent biodiesel in diesel fuel) was made mandatory in 2008, with expected targets of B5 in 2010 and B10 in 2011.<sup>7</sup>

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### 3. What role does your government play in regulating the energy industry? Describe the regulating environment and trends in deregulation in your country.

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The government's 15-year energy alternative energy development plan for the period 2008-2022 has the following objectives:

- ◆ Use renewable energy as the main source of energy to substitute for imported oil;
- ◆ Increase security of energy supplies;
- ◆ Promote community-based use of integrated green energy;
- ◆ Promote the technological development of renewable energy production; and

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<sup>6</sup> "Thailand's Experience in Clean Energy and Vision for the Future." 2009. Presentation by Piyasvasti Amranand, former Thailand Minister of Energy, at the Asia Clean Energy Forum, Manila, Philippines, June 19.

<sup>7</sup> *Biofuels in Asia: An Analysis of Sustainability Options*. 2009. USAID ECO-Asia Clean Development and Climate Program. May.

- ♦ Promotion and research and development on high-efficiency renewable energy sources.

Actions and trends that will affect renewable energy include deregulating the prices of liquefied petroleum gas and diesel fuel; amending electricity tariff structures to reflect full production costs; developing a transparent monitoring system for energy prices to reflect genuine economic costs; continuation and development of tariff “adders” to promote the buy-back of renewable energy from small-scale producers; development of policies on energy conservation and renewable energy in the transportation sector; and promoting research and development in energy conservation and renewable energy technologies.

The most significant recent development in the regulation of Thailand’s energy sector is the passage of the Energy Industry Act in December 2007. One of the purposes of the Act is to restructure the energy industry management by separating the functions of policy-making, regulation, and operation. The Act provides for establishment of an Energy Regulatory Commission (ERC), and an Office of ERC. The ERC is responsible for promotion of a safe and secure energy supply; protecting consumer benefits; promoting competition, efficiency, fairness, and transparency in the operation of the energy industry. The Act also plays an important role in developing regulations to stimulate increased update of energy efficiency and renewable energy measures in both the power and gas sectors.<sup>8</sup>

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#### **4. What agencies or bodies of government oversee the energy sector? What goals or mandates has your government set for electricity generation or fuels production from renewable sources?**

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The National Energy Policy Council is the primary agency overseeing Thailand’s energy sector. This Council is chaired by the Prime Minister and includes a number of key ministers and officials, including the Minister of Energy.

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<sup>8</sup> “Energy Industry Act and Renewable Energy in Thailand: A Complementary View.” 2008. Presented by Presented by Supichai Tungchaitrong, Energy Regulatory Commission of Thailand. [www.slideshare.net/electricitygovernance/energy-industry-act-and-re-in-thailand](http://www.slideshare.net/electricitygovernance/energy-industry-act-and-re-in-thailand).



The Ministry of Energy was established in October 2002 and has overall responsibility for managing the energy sector and developing national strategic energy plans and targets. Its key duties are to supervise and promote the stability of the country's energy supply and to provide integrated services to the general public. National strategic plans and policies of the Ministry of Energy must be approved by the National Energy Policy Council and subsequently approved by the Cabinet. The Energy Conservation Promotion Fund Committee approves funding for all energy efficiency programs and activities.

Under the Ministry of Energy, there are six offices and departments: Office of the Minister, Office of the Permanent Secretary, Energy Policy and Planning Office (EPPO), Department of Alternative Energy Development and Efficiency (DEDE), Department of Mineral Fuels, and Department of Energy Business.

EPPO is the primary agency in terms of policy and planning, and DEDE is the agency primarily responsible for implementing energy efficiency programs and regulations. This includes implementing the 15-year alternative energy development plan discussed above. However, there is some overlap between the roles of EPPO and DEDE in terms of program implementation.

The Energy Conservation and Promotion Act (ENCON Act) of 1992 is one of the major laws governing clean energy. Under the ENCON Act, there are three types of programs: compulsory, voluntary, and complementary. DEDE oversees the compulsory program, which requires that large ("designated") factories and buildings conduct energy audits and submit energy conservation targets, plans, and reports every three years.

EPPO oversees both the voluntary and complementary programs. The voluntary program promotes energy efficiency and renewable energy programs such as energy conservation in tobacco curing and ceramic kilns. It also promotes energy conservation technology, enhances marketing of energy-efficient equipment, demonstrates and disseminates PV grid connections for households and government buildings, PV-pumping for village water supply, and biogas from animal slaughter houses.<sup>9</sup>

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<sup>9</sup> United Nations Economic and Social Commission for Asia and the Pacific, "Part 3: The Energy Conservation and Renewable Energy Programme in Thailand," available at: [http://www.unescap.org/esd/energy/publications/finance/part3\\_pongsit.html](http://www.unescap.org/esd/energy/publications/finance/part3_pongsit.html).

Thailand also has five state enterprises and one public organization in the energy sector: the Electricity Generating Authority of Thailand (EGAT), Metropolitan Electricity Authority (MEA), Provincial Electricity Authority (PEA), PTT Public Co. Ltd., Bangchak Petroleum Public Co. Ltd., and the Energy Fund Administration Institute.

The Electricity Generating Authority of Thailand (EGAT) is responsible for generating and supplying electricity nationwide through two other state enterprises: the Metropolitan Electricity Authority and the Provincial Electricity Authority. EGAT also runs a Demand Side Management Office, which promotes energy efficiency in appliances and equipment through a national standards and labeling program.

As noted above, the Energy Regulatory Commission was established under the framework of the Energy Industry Act of 2008. Among other responsibilities, the ERC regulates the energy prices (i.e., for electricity and gas); approves power plant licenses, permits, and grid connections; regulates electricity tariffs; and develops regulations to support energy efficiency and renewable energy.

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## 5. What are the opportunities for private ownership (vs. public ownership) in clean energy development and technologies?

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As a matter of public policy, the government encourages private ownership in clean energy development technologies. Since the 1990s, the government has encouraged more private participation in the electricity generation business in order to reduce the public investment burden on clean energy technologies.

The Ministry of Energy, through the Energy Policy and Planning Office (EPPO),<sup>10</sup> established three programs to promote private sector investment: the independent power producer (IPP) program, the small power producer (SPP) program, and the very small renewable energy power producer (VSPP) program.

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<sup>10</sup> EPPO was formerly called the National Energy Policy Office, until the establishment of the Ministry of Energy in 2002, at which time it was brought under the Ministry and renamed the Energy Policy and Planning Office.

EGAT established the IPP program in 1992, and this began a gradual process of partly privatizing state-controlled power utilities. This program established and listed on the stock exchange the Electricity Generating Public Company Limited (EGCO), the country's first independent power producer. EGCO operates under long-term power purchase agreements with EGAT. The power purchase agreements provide for capacity payments and energy payments, with fuel cost passed through for reimbursement by EGAT.

Some key IPP terms under the power purchase agreements are:

- ◆ Power prices submitted by IPPs should not exceed EGAT's cost
- ◆ The contract for the power purchase agreement must be between 20 and 25 years
- ◆ Investors must have proven technological capability
- ◆ Fuel choices must be clear, acceptable to the public, and have stable pricing structure

The Small Power Producer (SPP) program was established in 1992 to purchase power from small power producers of up to 50 MW, with an initial ceiling of 300 MW. This ceiling was increased to 1,440 MW in 1995 and then to 3,200 MW in 1996. Under the SPP program, SPPs can sell electricity to EGAT for distribution or to consumers provided that this energy is generated using renewable or alternative energies. EGAT purchases electricity at a buy-back rate based upon the utility's avoided costs.

The VSPP program was established in 2002 to allow the purchase of renewable energy from producers of up to 1 MW. The buy-back rate was set at the utility's avoided cost. This per-project ceiling was increased to 10 MW in 2006. The VSPP program allows for net metering arrangements and streamlined interconnection requirements so as to minimize the costs of connecting a VSPP to the distribution systems. Generators with net generation can earn income by selling electricity to the distribution utilities at the latter's avoided costs (the wholesale price that the distribution utilities pay to EGAT for bulk electricity). The main targets of the VSPP program are pig farms and food processing industries.

The government also included an incentive for VSPP and SPP projects called an "adder," which is to be added to the buy-back price for renewable energy projects, above the normal tariff rate. The adders range from as low

as USD0.01/kWh for biomass projects to as high as USD.217/kWh for solar projects.<sup>11</sup>

The following table summarizes the status of renewable energy projects proposed under the SPP and VSPP programs. A total of more than 8,000 MW has been proposed by renewable energy project developers. Currently, just over 800 MW of this capacity is operational and selling to the grid.

	SSP Program		VSPP Program	
	Operational & Selling to Grid (MW)	Total Amount Proposed (MW)	Operational & Selling to Grid (MW)	Total Amount Proposed (MW)
<b>Renewable Energy</b>				
Solar	0	466	26	2,780
Biogas	0	0	61	235
Biomass	353	615	313	2,275
Waste-to-energy	0	33	30	157
Hydro	0	0	0.9	7
Wind	0	1,295	0.4	97
Other	39	39		
RE Subtotal	392	2,745	432	5,550
<b>Commercial Energy</b>	1,996	3,600	9	60
<b>Total for all Energy</b>	<b>2,388</b>	<b>6,345</b>	<b>441</b>	<b>5,610</b>

Source: Energy Policy and Planning Office, Thailand. 14 March 2011. Summary tables for SPP and VSPP programs posted at [www.eppo.go.th/power/data/index.html](http://www.eppo.go.th/power/data/index.html)

## 6. What is the level of government investment or what incentives are in place to support these goals and targets?

The Energy Conservation Promotion Fund (ENCON Fund) is the main driver (besides tariff mechanisms) for providing financial support for energy efficiency and renewable energy programs in Thailand. The ENCON Fund

<sup>11</sup> Greacen, Chris and Anastas Mbwala. 2010. Country Case Studies: Thailand and Tanzania. Feed-in Tariffs and Small Power Producer Regulations. Presented at Renewable Energy Policy Workshop, World Resources Institute, Washington, DC. November 22.

was established in 1992 under the Energy Conservation Promotion Act, and has typically had annual inflows of around THB2,000 million (USD50 million), from a levy on petroleum products.

One of the main initial objectives of the ENCON Fund was to provide financial support to large (“designated”) factories and buildings for investment in, and operation of, energy conservation programs in their facilities. The ENCON fund has also been used to support other agencies that wish to undertake energy conservation, including activities on renewable energy projects, energy-related research and development, public awareness campaigns, and expenses for management and monitoring of the energy conservation program.

Through the ENCON Fund, the government promotes energy efficiency and renewable energy through a range of fiscal incentives. These include:

- ◆ Buying energy at avoided cost
- ◆ Subsidizing raw materials used for biodiesel
- ◆ An 8-year corporate tax exemption
- ◆ Exemption of import duties for equipment related to renewable energy or energy efficiency
- ◆ Reduction of corporate income tax for businesses that improve their energy efficiency
- ◆ Direct subsidies between 10 and 30 percent on biogas, municipal solid waste, and solar-hot water projects
- ◆ A government co-investing scheme through the Energy Conservation Promotion Fund
- ◆ Soft loans for renewable energy and energy efficiency investments under the Revolving Fund Program<sup>12</sup>

The ESCO Fund is a co-investment fund between the Thai government and private investors. Investors from the private sector are in fields such as equity investment, venture capital, equipment leasing, and carbon credit trading. In 2008, the Fund had an initial budget of USD15 million, which was managed by the Energy Conservation of Thailand Foundation and the

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<sup>12</sup> Department of Alternative Energy Development and Efficiency - International Energy Efficiency Forum, “Financing Energy Efficiency and Renewable Energy: Thailand’s ENCON Fund,” 27-30 September 2010 available at:

[http://www.unece.org/se/pp/eneff/Astana\\_EEForum\\_Sep2010/d1s4\\_3\\_Praserat\\_e.pdf](http://www.unece.org/se/pp/eneff/Astana_EEForum_Sep2010/d1s4_3_Praserat_e.pdf)

Energy for Environment Foundation. This program has long-term plans to be corporatized into an investment company.<sup>13</sup>

The Revolving Fund Program provides for soft loans via private financial institutions for energy-efficiency projects. Soft loans are characterized as having less than four percent interest, a loan period of seven years with a one-year grace period, and with a loan amount of up to THB50 million (USD1.3 million). The Revolving Fund Program supported over 250 efficient energy and renewable energy projects between 2002 and 2008, with total investment around USD500 million. In 2009, the Revolving Fund Program secured an additional USD60 million for its budget.<sup>14</sup>

Another important financial incentive for renewable energy is the electricity “addler.” The addler is an incentive applied to project developers under the SPP and VSPP programs. The addler is the amount paid to the project developer in addition to the base price for either the SPP or VSPP project. The base price is typically in the range of THB2.5-3/kWh (USD0.085 to 0.10/kWh).

		<b>Adder<sup>15</sup></b> <b>(THB/kWh)<sup>16</sup></b>	<b>Number of Years</b>
Biomass	<= 1 MW	0.5	7
	> 1 MW	0.3	7
Biogas	<= 1 MW	0.5	7
	> 1 MW	0.3	7
Waste-to-Energy <sup>17</sup>	<= 1 MW	2.5	7
	> 1 MW	3.5	7
Wind	<= 1 MW	4.5	10
	> 1 MW	3.5	10
Small Hydro	<= 1 MW	0.8	7
	> 1 MW	1.5	7
Solar		8.0	10

<sup>13</sup> Ministry of Energy, “Thailand Clean Energy Policy and Programs,” 27 March 2009, available at <http://www.adb.org/documents/events/2009/Climate-Change-Energy-Workshop/THA.pdf>

<sup>14</sup> Id.

<sup>15</sup> Decision of National Energy Policy Committee, March 9, 2009. As of March 2011, the addler rates are currently under review, and it is possible that the addler for biomass will be increased and the addler for solar will be reduced.

<sup>16</sup> THB30 equals approximately USD 1

<sup>17</sup> Community and industrial waste, non-hazardous.

## 7. What kind of emphasis is placed on researching and developing renewable energy technologies versus looking to outside energy resources?

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Thailand's current energy policy emphasizes promotion of research and development of all forms of alternative energy; however, there is no emphasis on whether this technology is to be developed locally.

The ENCON Fund sponsors hundreds of renewable and alternative energy projects on a continuous basis, including local projects for research and development of technologies. For example, beginning in mid-2005, the Energy Policy and Planning Office and the Ministry of Energy, along with the Thai Research Fund, assigned the Joint Graduate School for Energy and Environment to implement the Energy Policy Research Project. The multi-year project is designed to provide information, analysis, and policy recommendations on policies and programs that support and promote increased implementation of energy efficiency and renewable energy technologies and options.

Additionally, beginning in 1985, H.M.K. Bhumibol Adulyadej initiated several royal projects to develop biofuels from local agricultural crops. Projects include the Royal Chitralada Project that experimented with bio-ethanol production and the Palm Oil for Biodiesel Project. These projects utilized local research facilities to develop these alternative energy technologies.<sup>18</sup>

While Thailand has funded and developed its own alternative and renewable energy technologies, Thailand also relies on outside resources. For instance, DuPont's subsidiary operating in Thailand has developed seeds for energy crops. DuPont has also been developing crystalline silicon and thin films used for photovoltaic solar cells that the company anticipates will be utilized for Thai solar projects. The Petroleum Authority of Thailand, in collaboration with Toyota, has conducted extensive research and development in alternative fuels like biodiesel.

Several international organizations are also actively assisting Thailand in a wide range of energy efficiency and renewable energy programs. These organizations include the European Union, DANIDA of Denmark, GTZ of Germany, and JICA, METI, and NEDO of Japan. The aim of these programs

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<sup>18</sup> <http://www.green-power.co.th/en/environment/royal-initiative-projects.php>

is to improve efficient use of energy and water, and reduce GHG. The Thai government also engages in technology transfer with ASEAN and APEC countries.<sup>19</sup>

In most cases, government and industry look for outside sources for industrial scale technology and equipment, be they wind turbines, boilers and turbines for bioenergy production, biofuel production plants, etc. Localization of equipment and parts manufacturing is encouraged by the provision of investment privileges by the Board of Investment (BOI). Tax credits (of up to 200 percent) for R&D expenditure have recently attracted the interest of companies investing in energy R&D, mainly larger industrial conglomerates. Their research efforts are expected to produce tangible results for industrial applications. Government-funded research has thus far been fragmented and success stories are limited. Two notable examples of local R&D that has resulted in practical applications are biogas technology and the development of small scale biodiesel production plants.

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## 8. Is Thailand on track to be a clean energy importer or exporter from the standpoint of power production supply and manufacturing?

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Thailand is a leader in the Southeast Asia region in terms of developing policies and incentives to promote renewable energy businesses and projects. Thailand has more experience than any other country in the region in terms of policy frameworks, financial incentive schemes, and development of private-sector capability to provide renewable energy equipment and services.

A number of companies that have developed and implemented biomass and biogas projects in Thailand are seeking project development and investment opportunities in renewable energy in other neighboring countries in the region.

Despite the strong progress, Thailand has fallen short of some of its targets for renewable and alternative energy. Alternative energy resources accounted for 10 percent of total energy use in 2010, which was lower than the Ministry of Energy's target in its 15-year plan. The use of wind

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<sup>19</sup> [http://www.unece.org/se/pp/eneff/Astana\\_EEForum\\_Sep2010/d1s4\\_3\\_Prasert\\_e.pdf](http://www.unece.org/se/pp/eneff/Astana_EEForum_Sep2010/d1s4_3_Prasert_e.pdf)



power was short of the target of 45 MW, with production only at 5.6 MW. Hydropower production was at 58.85 MW versus the goal of 142 MW. Biomass energy was at 1,650 MW versus the target of 2,454 MW, and energy from ethanol was 1.2 million liters per day versus the target of 2.1 million liters.

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## 9. How developed is Thailand's workforce to support innovation, development and the production of renewable energy?

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According to the Ministry of Energy, financial institutions that provide loans for renewable energy projects are still hesitant to provide funding, especially for small projects. Much of this hesitation could be alleviated if bankers had more knowledge about renewable energy technologies.

Government staff could also benefit from training in design of efficient energy programs, particularly in the areas of market research and economic analysis.

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## 10. What are the key barriers to increasing renewable energy as a part of Thailand's energy mix?

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The main obstacle to increasing the implementation of renewable energy use is the higher cost of renewable energy systems, as well as familiarity and confidence in the newer technologies and systems. For example, production of solar energy and wind energy is more expensive than traditional fossil fuel forms of energy.

Thailand has addressed these barriers with a number of policies and regulations, including the ENCON Act and the VSPP and SPP regulations for small power producers. The country also has made available several different kinds of financial incentives, including the ENCON Fund, the Energy Efficiency Revolving Fund, and the adders for renewable energy project developers under the VSPP and SPP programs.

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However, wind, hydropower, and other renewable energy usage have fallen short of projected targets for 2010 by 5 percent.<sup>20</sup> The Ministry of Energy has blamed the shortfall on a lack of effective investment incentives, and is currently reviewing how relevant state agencies can clear away obstacles.

The use of ethanol and biodiesel have increased significantly due to financial incentives at the gas pump and strong promotion by the government. The use of ethanol and biodiesel is hampered for older vehicles by the cost of converting old engines to make them compatible with the new fuels.

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<sup>20</sup> The Nation, "Gov't to review alternative energy plan," 5 January 2011, available at: <http://www.nationmultimedia.com/home/Govt-to-review-15-year-alternative-energy-plan-30145691.html>

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