

GrIPP-Net News

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Editorial

This issue features renewable energy policies and biomass energy in ASEAN and the EU. The European experience shows that appropriate policies and regulatory frameworks are the driving force behind massive private investments on renewable energies. At present, only few ASEAN countries are adopting mechanisms and frameworks to stimulate the private sector to engage in renewable energy power generation. Governments in the region are however becoming aware of the need to promote renewable energies, are recognizing the limitations of their policies and are eager to learn about the approaches adopted by developed countries. In just a matter of time, a huge influx of private investments on renewable energy-based electricity generation is likely to be seen.

The policy and biomass articles featured in this issue are taken from two reports produced by the project *Information for the Commercialization of Renewables in ASEAN* (ICRA): Renewable Energy Policies in ASEAN authored by Romeo Pacudan of the Risoe National Laboratory and Biomass for Electricity Generation in ASEAN written by Lara Bartarelli of Innovation Energie Developpement, supplemented by ECN.

This month also marks the conclusion of the current funding from the EC-ASEAN Energy Facility. National workshops on Green IPP networks were successfully organized in Malaysia, the Philippines and Thailand in August 2005. As a culminating activity, the European workshop on Green IPP will be held in Karlsruhe, Germany on September 15-16, 2005. The network members will take this opportunity to meet and discuss activities for the future.

**Congratulations to all partners for the job well done !
And thanks to EC-ASEAN Energy Facility**

- the editorial board

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RE Policies in ASEAN

The ASEAN countries have recognized the importance of renewable energy in meeting their various energy and developmental goals, and each country has developed specific renewable energy policy framework or have integrated renewable energy concerns in the overall energy and development policy framework. Each country framework reflects current government priorities, developmental concerns, status of renewable energy development, level of liberalization in energy markets, etc.

Cambodia, Indonesia, Malaysia, the Philippines and Thailand have elaborated specific renewable energy policy frameworks. Energy security goals are very prominent in the policy goals of Indonesia, Malaysia, the Philippines and Thailand though environmental protection, energy access and investment promotion goals are also considered important. These policy goals reflect the concerns of growing dependence on imported energy as well as environmental issues related to power generation in the Philippines and Thailand. Malaysia, despite being a net energy exporting country, also recognizes the increased depletion of its mineral energy resources and has pursued a balanced development of renewable and depletable resources. Singapore, being a small country with very limited renewable energy resource but with high per capita energy consumption, encouraged the use of renewable energy in the context of energy conservation.

In Cambodia, Lao PDR and Vietnam, renewable energy development is pursued within the context of improving energy access (rural electrification) in rural communities to promote economic development. This relates to the low electrification levels in Cambodia, Indonesia and Lao PDR. Vietnam has also recognized the relevance of renewable energy resources development as a least-cost option to increase electricity access in remote and isolated regions of the country.

ASEAN countries which have effectively promoted private investments in renewable energy have developed national policy strategies and targets that set out the country's approach and commitment to promote renewable energy development. These

strategies and targets provide long-term direction and send correct signals to market actors.

The differences in priorities, resources, goals and market structures result in diversity of strategies in promoting renewable energy development in each ASEAN member country. Thailand, which has a record of successfully stimulating private investments in grid-connected renewables in the recent years through Small Power Producers (SPP) Programme and subsidies to renewable energy power producers, has moved forward by developing a new national strategy, the *Strategic Plan for Renewable Energy Development* in 2003. The strategic plan aims to increase the share of renewable energy in the primary energy consumption from 0.5% at present to 8% in 2011. To achieve this, the government of Thailand passed the Renewable Portfolio Standards setting 4% share of renewable energy generation for new power plants in 2011. It is also currently developing incentive measures and other support mechanisms.

Malaysia's *Five Fuel Diversification Policy* provides the renewable energy policy guidance while the current grid-based renewable energy programmes embodies national renewable energy strategy. The Small Renewable Energy Power (SREP) Programme allows small power generators connection to the grid at selling rates defined by the Renewable Energy Power Purchase Agreement (REPPA). The SREP programme sets a target capacity of 500 MW to be integrated into the grid by the end of 2005. To accelerate investments in the palm-oil industry, the government launched the Biomass-Based Power Generation and Cogeneration (BioGen) Programme. Furthermore, the government established a National Steering Committee to identify priorities for research and development of new energy sources from solar, hydrogen and fuel cells.

The Philippines' *Renewable Energy Policy Framework* issued in 2002 aims to double the renewable power capacity by 2013 and non-power contribution to energy mix by 100 million barrels of fuel oil equivalent. The government programs aim to achieve this through existing laws and orders regulating the development of geothermal (Act to Promote the Exploration and Development of Geothermal Resources), hydro (the Mini-Hydro Law) and wind energy resources (Executive Order 232 encouraging private participation in the development of ocean, solar and wind resource for power generation). To further accelerate deployment of renewable energies, the government hopes that the Philippine Congress will pass into law the long pending Renewable Energy Bill. The Bill aims for comprehensive renewable energy development and specifies measures such as renewable portfolio standard, renewable energy trust fund, fiscal and financial incentives, etc.

Indonesia's *National Energy Policy* issued in 2004 sets a 5% target of renewable energy in power generation by 2020. The National Energy Policy, Electricity Law, Geothermal Law and Green Energy Policy provides overall policy guidance particularly on the use of renewable energies as a means to promote economic development in remote communities. The only concrete measure being implemented is the power purchase programme for small scale power generation using renewable energy (*PSK Tersebar*). Moreover, the newly elected government of Indonesia has recently introduced a new law (*Government Rule No. 3, 2005*) granting the state utility PLN to select renewable energy developers directly without undertaking a competitive tender process.

Vietnam's draft *Energy Policy* has also specified targets for renewable energies but the current overall renewable energy strategy is embodied in the *Rural Electrification Policy*, which explicitly encourages renewable energy development by foreign or local investors for off-grid supply in remote areas where grid extension is not feasible. To complement this policy, the Ministry of Industry prepared the *Renewable Action Plan* as a framework to scale up renewable electricity development for rural electrification and grid supply. The Action Plan also sets renewable energy development targets during its 10-year implementation phase. The first phase (5 years) aims to achieve 25-51 MW additional capacity while the second phase targets 175-251 MW.

Cambodia's strategy to promote renewable energy development is also embodied in the *National Policy for Rural Electrification*, which specifies the use of renewable electricity systems for rural applications, as part of the national portfolio of grid and off-grid technologies, provided they are least-cost option to the communities. More recently the Ministry of Industry, Mines and Energy launched the *Renewable Energy Action Plan* (REAP) as a framework to increase awareness, mobilize international funding and create favourable environment for market development and private participation. REAP defines renewable energy target (5% of new generation capacity) and sets up funding mechanisms for rural electrification projects using renewable energy.

Lao PDR's *Power Sector Policy* recognizes the role of renewable energy in meeting its goal of maintaining and expanding sustainable electricity supply particularly in rural areas. Renewable energies are promoted to expand and improve off-grid supplies, increase energy self-sufficiency and security, and maximize long-term environmental sustainability.

Lithuania, Portugal, Slovak Republic, Slovenia, Spain, and Sweden. Feed-in tariffs in Europe stimulated investments in wind power, biomass, small-hydropower and solar thermal power generation.

Obligations include schemes that mandate energy suppliers to provide a set quantity or a percentage of their supply from renewable energies. These schemes do not make distinctions between different renewable energy sources and the market determines which renewable energy resources will be selected. Obligations are common in Australia, Europe, Japan and North America. In Europe, various forms of obligations or quota systems are implemented in Belgium, Italy, Poland, Sweden and the UK.

The use of tradable green certificates is very recent. Under this type of scheme, a certificate is created to represent the green attribute of renewable energy and is traded separately from the electricity product. The certificates could be used to record compliance with renewable energy quota schemes or can be sold in the voluntary green power markets. The Netherlands was the first country to introduce tradable certificates in conjunction with its renewable energy target, but shifted back to a feed-in system in 2004.

Some developed countries have also introduced environmental and carbon taxes to reduce energy market distortions and to partly reflect external costs associated with conventional fuel production and utilization. Germany, Denmark, Italy, the Netherlands, New Zealand, Norway, Sweden, Switzerland and the UK have applied environmental or carbon taxes and charges. Except Germany, energy generation from renewable energy sources are exempted from these charges. These levies are revenue neutral and revenues are partly (in some countries fully) used to provide investment incentives to renewable energies and partly returned back to the industry in various pathways.

ASEAN Grid Access Programmes

Renewable energy policies in Europe were introduced almost in parallel with the liberalization of the electricity markets. Hence, the right conditions for market deployment policies were already established. Market regulations that create the right conditions for renewable energy deployment include the following: i) the independent power production laws which require utilities to interconnect and sign power purchase contracts with qualifying renewable energy facilities; ii) market liberalization schemes that allow generators and independent marketers to wheel power to retail customers though the cost of this access are

sometimes very high; and iii) access of small-scale renewable energy systems suppliers to consumer retail outlets as well as end-users access to the distribution grid.

In ASEAN, parallel to the introduction of renewable energy investment incentives, and fiscal and non-fiscal measures, some member countries have introduced various levels of reforms and partially liberalized their electricity markets. Reform measures undertaken include the opening up of the electricity generation market to private investors and introduction of regulatory frameworks for independent power production. To further support grid-based renewable energy investments, Indonesia, Malaysia and Thailand have even developed renewable energy specific access frameworks and programmes (Table 1). On the other hand, the electric power industry reforms in the Philippines, which introduced competitive electricity markets, have promoted access of renewable energies to national grids.

In Thailand, the Small Power Producers (SPPs) program was introduced in the early 1990s and is designed to promote grid-connected electricity generation from renewable energy and cogeneration. A flexible power purchase agreement has been introduced (firm and non-firm) to respond to the technical limitations of renewable energy technologies. Power purchase price is based on the utility's avoided costs.

In 2002, Thailand introduced a new framework that promotes small-scale renewable electricity generation known as Very Small Renewable Energy Power Producers (VSREPP). A VSREPP is defined as a generator with his own generating unit, whose power generating process utilizes renewable energy sources, agricultural and industrial wastes and residues, or by-product steam, and who sells no more than 1 MW of electrical power directly to a distribution utility. The VSREPP regulations allow for net metering arrangements and streamlined interconnection process and requirements so as to minimize the costs of connecting a VSREPP to the distribution systems. Generators with net generation can generate 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 VSREPP Program are pig farms and food processing industries.

Malaysia recently introduced the Small Renewable Energy Power Programme (SREP) which aims to facilitate implementation of grid-connected renewable energy resource-based small power plants. Grid-connection of SREP is governed by the Renewable Energy Power Purchase Agreement (REPPA). REPPA's power purchase price is capped by the government at 4.5 cent US\$/kWh.

Table 1. ASEAN RE strategies and targets

<p>Indonesia <i>Small Scale Distributed Power Generation Using Renewable Energy, PSK Tersebar (2002)</i></p> <ul style="list-style-type: none"> • Obliges PLN – the national electric utility – to purchase up to 1 MW capacity generation using renewable energy sources by small enterprises. • Tariff rate is 80% of PLN's production cost if the electricity purchased is interconnected to medium voltage network, or 60% of production cost if it is interconnected to low voltage network. <p>Malaysia <i>Renewable Energy Power Purchase Agreement (REPPA)(2001)</i></p> <ul style="list-style-type: none"> • Selling price is capped at a ceiling of RM 0.17 sen/kWh (USD 0.045 cent/kWh). <p>Philippines <i>Electric Power Industry Reform Act (2001)</i></p> <ul style="list-style-type: none"> • Priority dispatch for renewable energy generation. • Distribution utilities and contestable markets can negotiate directly with electricity generators including renewable energy producers. <p>Thailand <i>Small Power Producers (SPP) Program (1992)</i></p> <ul style="list-style-type: none"> • Encourage participation by SPPs in electricity generation; promote the use of indigenous by-product energy sources and renewable energy for electricity generation; promote more efficient use of primary energy; reduce the financial burden of government investment in electricity generation and distribution. • Buy-back rate were based on the avoided costs of the Electricity Generating Authority of Thailand (EGAT). A firm contract pays both capacity and energy generation while a non-firm contract considers energy payment only. In the 1990s, the avoided fuel was fuel oil. The oil price increase in 2000 shifted EGAT's marginal plant to natural gas-fired power plant. Consequently, the reference technology was changed from fuel-oil fired to natural gas-fired power plant. <p><i>Very Small Renewable Energy Power Producers Programme (2002)</i></p> <ul style="list-style-type: none"> • To promote participation of small generators (less than 1 MW) in electricity generation and efficient use of domestic natural resources that are environmentally friendly.

Sources: Indonesia – DGEEU (2005); Malaysia – Pusat Tenaga Malaysia (2004); Philippines – Department of Energy (2005); Thailand – NEPO (2002).

In the late 1990s, Indonesia issued the legislation on Small Power Generation from renewable energy covering procedures for small private power generation from renewable energy interconnected to the grid of the state-owned utility PLN. The power purchase tariff is, however, to be negotiated between PLN and the developer. The renewable energy policy was recently strengthened with the passage of the legislation in 2002, allowing renewable energy power plants up to 1 MW capacity to be interconnected to the grid. The purchase tariff is calculated at 80% and 60% of the utility's (PLN) announced electricity base price for interconnection at medium and low voltages, respectively.

With the operation of competitive electricity markets in the Philippines, electricity generators will have direct access to national and distribution grids. The wholesale electricity spot market (WESM) rule also specifies priority dispatch for renewable energy generation. Electricity wholesalers, retailers and contestable customers on the other hand can directly

negotiate with generators (including renewable energy) for the bilateral trade of electricity. This however does not guarantee that the wholesale market-clearing price will provide sufficient returns to renewable energy generators. The government at present is studying various options to stimulate private investments on renewable electricity generation under the competitive electricity market setting.

Financial Mechanisms in ASEAN

Many ASEAN countries provide financial assistance and grants to renewable energy developers, and at the same time established funds to support renewable energy development. Many of these funds raised are not mainly intended for renewable energy development but for rural electrification, environmental protection, energy conservation and social obligations (Table 2).

Table 2. Funds to support RE Development

<p>Cambodia <i>Rural Electrification Fund</i></p> <ul style="list-style-type: none"> • Part of the Rural Electrification and Transmission Project funded by the World Bank and Asian Development Bank. • Provides grant to private developers. The grant is expected to contribute 25% of the total project investment costs: REF grant (25%); private equity (25%); bank loan (50%). <p>Malaysia <i>Malaysia Electricity Supply Industry Trust Account (MESITA Fund) (1997)</i></p> <ul style="list-style-type: none"> • Independent power producers and Tenaga Nasional Berhad Generation contribute 1% of their annual audited revenue to the fund. • The Fund has been providing financial assistance to rural electrification, energy efficiency and renewable energy projects. <p><i>Renewable Energy Business Fund</i></p> <ul style="list-style-type: none"> • To support the financial requirement of the full scale model projects (FSM) that would be established under BioGen Programme. • Funding will come from Bank Industry Teknologi Malaysia Berhad (RM 14 million), GEF (RM 9 million) and MESITA fund (RM 5 million). <p>Philippines <i>Energy Regulation 1-94</i></p> <ul style="list-style-type: none"> • ER 1-94 directs the power producers or energy resource developers to provide monetary and/or non-monetary benefits to host and affected communities. • Generating companies are required to set aside PhP 0.01 per kWh of electricity sales as benefit to host communities. In <i>non-highly urbanized region</i>, fifty percent of these benefits (PhP 0.005/kWh) are allocated to electrification fund (EF) while the remaining benefits are allocated to development and livelihood fund (DLF) and reforestation, watershed management, health and/or environment enhancement fund (RWMHEEF), PhP 0.0025/kWh each. In <i>highly urbanized cities</i>, the grant allocations are the following: PhP0.075/kWh for EF; and PhP0.00125/kWh each for DLF and RWMHEEF. <p><i>Universal Charge</i></p> <ul style="list-style-type: none"> • The universal charge is a non by-passable charge sanctioned by Electric Power Industry Reform Act (RA 9136) for the following purposes: i) recovery of stranded debts of NPC; and
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stranded contract cost of NPC and qualified distribution utilities; ii) missionary electrification fund; iii) equalization of taxes and royalties between the indigenous or renewable resources of energy vis-à-vis imported energy fuel; iv) environmental charge for the rehabilitation and maintenance of watershed areas; and v) mitigation fund for the removal of cross-subsidies.

Development Bank of the Philippines Financing Programmes

- Low interest loans extended to new and renewable energy and rural power projects. Funds come from various ODA funds and the World Bank.

Capacity Building to Remove Barriers to Renewable Energy (CBRED) Project Financing Mechanisms

- Established funds to address financing barriers: Project Preparation Fund; Loan Guarantee Fund; and Micro Finance Fund. Funds are sourced from GEF.

Singapore

Innovation for Environmental Sustainability Fund, \$20 million (2001-2006)

- To encourage and assist companies to undertake innovative environmental projects that could help to meet the government's goal of environmental sustainability. Projects with strong elements of "innovation" and "early adoption" are sought. Of particular interest are developments that address the specific limitations that Singapore faces such as limited land resource and the densely populated and highly urbanized environment.

Thailand

Energy Conservation Promotion Fund (ENCON Fund)

- The ENCON Fund was established in 1995. The fund revenues are derived from a levy on petroleum products sold domestically. Since October 1998, the premium rate has been adjusted from 0.01 to 0.04 Baht/litre and imposed on gasoline, diesel, kerosene and fuel oil.
- The ENCON Fund provides renewable energy "Project Owners" with financial assistance or grants. "Project Owners" must be government agencies, state-enterprises, educational institutions, or non-profit organizations. Private entities can join as "Project Participants" of individual Project Owners. Proposed projects of "Project Participants" must have a higher Economic Internal Rate of Return (EIRR) than the minimum rate set by the ENCON Fund Committee. At the initial stage, the minimum rate is set at 9%.
- SPP Subsidy (2001). Request for Proposals (RFP) was issued in July 2001 inviting private investors and SPPs to submit a proposal for subsidy on energy payment on top of EGAT's energy payment under the SPP contract. A budget of 2060 million Baht was allocated from the ENCON Fund for the energy payment subsidy. The RFP calls for viable projects that require additional incentive of no more than 0.36 Baht/kWh for a period of up to 5 years.
- Energy Conservation Revolving Fund. The fund is managed by 6 commercial banks. Provide low interest loans (fixed at 4%) to energy conservation and renewable energy projects. Proponents can borrow up to US\$1 million per project, and payable within 7 years.

Vietnam

Remote Area Renewable Energy Fund

- The Fund was set up by the Ministry of Industry and will be used to provide grants to the provinces for establishing remote area commune grids.
- Funds were raised from GEF and IDA funds.

Sources: Cambodia – *Ministry of Industry, Mines and Energy (2004)*; Malaysia – *Pusat Tenaga Malaysia (2004)*; Philippines – *Department of Energy (2005 and 2004)*, Singapore – *National Environment Agency (2004)*; Thailand – *NEPO (2002)*, *DEDE (2004)*; Vietnam – *ESMAP (2001)*.

Cambodia is establishing the *Rural Electrification Fund* with financing from the World Bank (IDA) and Global Environment Facility. The Fund is a component of the Rural Electrification and

Transmission project jointly funded by the World Bank and Asian Development Bank. The Fund provides a financial grant of up to 25% of the total project costs to renewable energy projects for rural electrification.

Malaysia's MESITA Fund is a social obligation fund contributed by power generators. Each utility puts in 1% of their annual audited revenue to the fund and this is being used to assist government projects and studies on rural electrification, energy efficiency and renewable energy. Recently, the government launched the *Renewable Energy Business Fund* to be used mainly for financing full-scale biomass energy demonstration projects. The Fund could provide financing of up to 80% of the total project cost. Funding will be sourced from the Bank Teknologi Malaysia, GEF and MESITA Funds with total amount of RM28 million.

The **Philippines** has two sources of financial support intended for rural electrification projects including renewable energies. The *Energy Regulation 1-94 (ER 1-94)* mandates power generators to set aside PhP 0.01 per kWh of electricity sales to be used for financing projects that benefit the host communities such as rural electrification, watershed management and livelihood programs. The second source is the *Universal Charge*, a non by-passable charge sanctioned by Electric Power Industry Reform Act (RA 9136). At present the missionary electrification subsidy and environmental charge are levied to the ratepayers through the universal charge. To provide assistance to project developers, the Development Bank of the Philippines (DBP), has established financing programmes providing low interest loans for new and renewable energy and rural power projects. The programme is funded by various overseas development assistance (ODA) funds and the World Bank. Moreover, the current GEF project 'Capacity Building to Remove Barriers to Renewable Energy Development' also established 3 funding portfolios to support projects that promote and apply innovative strategies and delivery mechanisms. These are project preparation fund, loan guarantee fund and micro-finance fund.

Thailand's Energy Conservation Fund (ENCON Fund) is a fund generated from the levy imposed on domestically sold petroleum products. The Fund mainly provides assistance on energy efficiency projects though part of it is used to support renewable energy development: i) as financial assistance to renewable energy project developers; and ii) as subsidy to small renewable energy power producers. More recently the *Energy Conservation Revolving Fund*, which is initially designed to provide financial assistance to energy conservation projects, has opened up to renewable energy projects. The Fund, managed by 6 commercial banks (Siam City bank, Bangkok Bank PCL, Industrial Finance Corporation of

Thailand, Thai Military bank, Bank Thai and Sri Ayutthaya Bank), provides low interest loans at a fixed rate of 4%. The maximum amount set for lending per project is US\$1 million. The government also plans to use the ENCON fund for the financial incentives being developed under the *Strategic Plan for Renewable Energy Development*.

The *Innovation for Environmental Sustainability (IES) Fund of Singapore* provides assistance through grants to project developers who undertake innovative environmental projects (including renewable energy projects) that satisfy the government's objective of environmental sustainability. The assistance is based on the various levels of support for different components of allowable cost, up to a maximum of S\$2 million for each project.

The *Remote Area Renewable Energy Fund of Vietnam* is established to support the Renewable Energy Action Plan. Some funds from GEF and IDAs are placed into this account to support rural electrification projects in remote communities using renewable energies.

RE Market Deployment in ASEAN

The increase of renewable energy supply in developed countries since the 1970s is, to a large extent, the combined result of various policy instruments implemented over the years. New renewable energy technologies such as solar, wind and some biomass technologies have also been growing rapidly since the 1980s. The deployment of these new renewable energy technologies was largely due to the combined effect of various policy measures adopted in these countries such as investment incentives, fiscal incentives, incentive tariffs and obligations.

Private sector investments on renewable energies in ASEAN are, in a similar manner, driven by grid access programmes and various policy measures (Table 3). Among the countries in the region, Thailand has so far attracted significant private investments on renewables. Its *Small Power Producers (SPP)* programme and *Power Purchase Agreements (PPA)* coupled with investment incentives and production subsidies generated significant capacity additions. The subsidy programme initially budgeted a subsidy payment for around 300 MW capacity but it generated project proposals with more than 700 MW capacity. Even the country's *Very Small Power Producers (VSPP)* programme has attracted interests from various agro-industries with the potential of generating small power capacities. The newly adopted *Renewable Portfolio*

Standard (RPS) supported by various incentives (currently being developed by the government) is expected to create capacity additions in the medium term.

Malaysia's *Small Renewable Energy Producers (SREP)* programme has also created strong interest from the private sector, as indicated by the number of proposals approved by the government. However, only 12 MW capacity has been added at the beginning of 2005 which is far below the Programme's target of 500 MW capacity addition at the end of 2005. The Malaysian government needs to modify the current *Renewable Energy Power Purchase Agreement (REPPA)* in order to attract private investments on renewables. Improvements proposed include the following: increase of the power purchase rate from the cap of RM 0.17/kWh to RM0.22/kWh to provide reasonable returns to investors, and standardization of REPPA to include performance flexibility and improved bank ability provisions in order to attract investment financing.

Table 3. RE Market Deployment in ASEAN

<p>Indonesia <i>Small Scale Distributed Power Generation (PSK Tersebar)</i></p> <ul style="list-style-type: none"> • 4 projects in operation with total capacity of 156 kW. • 7 projects under construction/commissioning process with total capacity of 4.89 MW. <p>Malaysia <i>Small Renewable Energy Producers (SREP) Program</i></p> <ul style="list-style-type: none"> • As of January 2005, 62 projects were approved with aggregate capacity of 355 MW; 2 projects were commissioned in 2004 with total capacity of 12 MW. <p>Philippines <i>Minihydro Incentives</i></p> <ul style="list-style-type: none"> • As of 2003, 52 mini-hydro projects with total installed capacity of 77 MW; 4 on-going private investor-owned projects. <p><i>Geothermal Incentives</i></p> <ul style="list-style-type: none"> • As of 2003, 1175 MW capacity is developed by state-owned PNOC-EDC while 757 MW capacity is developed by private investors. <p><i>Wind Power Incentives</i></p> <ul style="list-style-type: none"> • 3 projects with total capacity of 0.21MW; one on-going private sector project with total capacity of 25 MW. <p>Thailand <i>Small Power Producers (SPP) Programme</i></p> <ul style="list-style-type: none"> • For the period 1992-2002 - 50 projects with total capacity of 3.5 GW, of which 23 projects with capacity of 509 MW were renewable energy-based. • Status in 2004 - total of 38 RE projects with total capacity of 914 MW. <p><i>SPP Subsidy results in 2002</i></p> <ul style="list-style-type: none"> • The programme targeted around 300 MW capacity additions through subsidy. • 31 projects were proposed with total capacity of 511 MW. • 14 projects were selected in 2003 with aggregate capacity of 194 MW. <p><i>Very Small Power Producers (VSPP) Programme</i></p> <ul style="list-style-type: none"> • Status in 2004 - 15 projects were proposed with total capacity of 1.4 MW.
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Sources: Indonesia – *DGEEU (2005)*; Malaysia – *Pusat Tenaga Malaysia (2005)*; Philippines – *Department of Energy (2005)*; Thailand – *DEDE (2005)*.

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Biomass Energy in the European Union

Biomass energy resource potential is large in the EU and various schemes have been implemented at national and regional levels to make bio-energy competitive with conventional fuels for power generation.

The EU targets to double the share of the Renewable Energy Sources (RES) in gross inland consumption, from 5.4 % in 1997 up to 12.0% by 2010. Various legislative actions have been undertaken in order to facilitate this target, most important of which are: i) to promote the electricity generation from renewable energy sources by increasing the production from 14.0 % in 1997 up to 21.0 % by 2010 for EU 25 corresponding to 22.1% for EU 15 (Directive 2001/77/EC); ii) to promote the use of biofuels for transport applications by replacing diesel and petrol up to 2% by 2005 and 5.75% by 2010 (Directive 2003/30 EC) with the accompanying de-taxation of biofuels (modification of the taxation of energy products and electricity directive 2003/96/EC) and; iii) to double the share of cogeneration from 10% to 18% of total electricity generation by 2010. The EU CHP/cogeneration directive was approved in February 2004 by the European Parliament.

Biomass accounts for a substantial share in primary energy consumption. In European power production, share of biomass is slightly lower with approximately 1.9% or 66 TWh in 2003 (IEA, 2004) but these figures are steadily increasing. Regional differences however are large, with Finland (12%) topping the EU countries and several others less than 1% - see figure below.

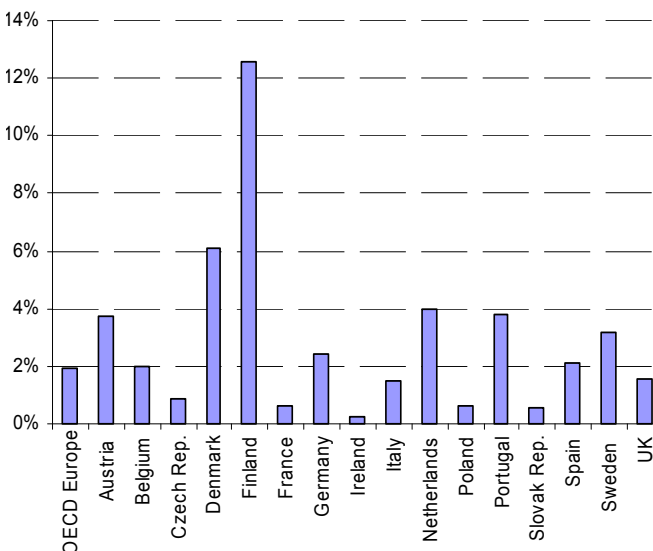


Figure 1. Percentage biomass-based power production in OECD Europe 2003 (IEA 2004 figures)

The recent EU communication on 'The share of renewable energy in the EU' (COM(2004) 366 final) concluded that further efforts – in particular in the biomass sector – are needed in order to achieve the EU RES policy objectives. To meet this goal, intensified use will be made of biomass, both for heating purposes and for power generation. Timber and forestry residues are available in ample quantities, but the required investment costs are a barrier to the broad-based use of this energy source.

In 2001, total biomass production for energy purposes was 56 Mtoe. To achieve the RES 12% target 74 Mtoe more from biomass is needed by 2010. This additional production can only be achieved in the short term with strong and targeted measures and actions in all three sectors (electricity, heat, and biofuels for transport) and a better coordination of EU policies.

Each of these sectors has to contribute the following indicative additional amounts of biomass energy: electricity 32 Mtoe, heat 24 Mtoe, and biofuels 18 Mtoe. This would lead to a total biomass accumulated energy production of 130 Mtoe in 2010. To ensure the achievement of this objective a Community Biomass Action Plan is in the process of development.

The biogas sector has been developing constantly in most of the countries of the European Union. In 2002, European biogas production increased by 10% compared with 2001 production – yet for lack of economically profitable outlets, approximately half of the biogas produced in Europe is simply burned off in stacks. The UK is the European leader in terms of biogas production, then Germany and France.

Currently there are over 4000 biogas installations in the EU, most of which are municipal solid waste plants. These are principally valorized in the form of cogeneration. In Sweden these plants provide the main source of biogas that is used as a fuel or fed into the public natural gas network. The second largest producer and users of biogas are farms. The biogas produced and trapped at waste storage dumps (approximately 450 installations across Europe) provide useful sources of electricity that are injected into the power grids. More recently in Denmark the developments of municipal waste methanisation units are being put in place, a total of 120 installations to date, which represent collective co-digestion units (joint treatment of liquid manure, agro-industrial waste etc). This new wave of investments in biogas systems throughout Europe is a response to better purchasing tariffs.

Wood fuels have been traditionally used in the geographic regions where they have been produced. Nonetheless, over the last few years it's been

possible to observe that real international exchange networks are being set up, notably from the Baltic states to the Scandinavian countries. Italy has also become an importer. Dutch, Belgian and Swedish power stations are currently buying enormous quantities of pellets and other conditioned biomass products to add to the fuels of their conventional power stations (co-firing) and in this way meet their national CO₂ targets. This has produced a gigantic market for several million tonnes of biomass per year. In fact 70% of industrial generation plants could be converted to biomass co-firing without new investments and loss of performance.

An estimate for the Netherlands showed that around 60% of the renewable energies will have to be obtained from biomass if the country is to meet its 2010 carbon emission target. A major role is planned for the co-firing of biomass in power stations. The motivation for the emergence of these projects is basically economic, although legislation has also played its part. High costs for waste disposal, high taxes on fossil fuels, and legal provisions have accelerated the development of biomass co-combustion.

About 6% of Denmark's total energy consumption is covered by biomass energy, representing 75% of the country's renewable energy production. Denmark is an agricultural country that generates large amounts of straw and animal wastes which are increasingly being used as sources of energy. Straw is efficiently pressed and used in on-farm heating systems and increasingly purchased by utilities for power generation. Though only 12% of the country is forested, 70% of all wood residues is (being) used for energy purposes. The majority of these residues are chipped in situ using mobile equipment. Municipal solid waste is also increasingly being used for energy. Households separate organic from non-organic

waste. The organic waste is used in biogas digester plants, which generate heat and electricity from biogas.

For the EU-15, ECN's Admire Rebus model (ECN, 2003) calculates a baseline scenario for biomass sources as shown below.

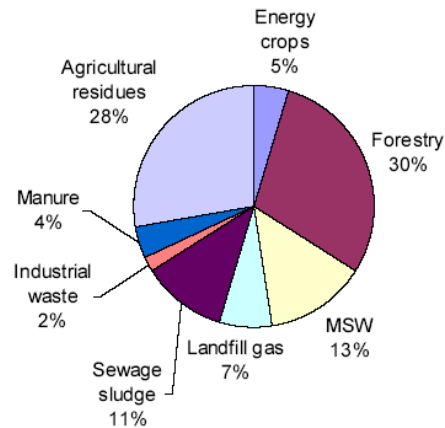


Figure 2. Biomass resource in 2010 in baseline scenario from Admire Rebus

Currently forestry, agricultural residues and municipal solid waste are the main biomass sources. In the mid-term however, particularly energy crops may become more important.

additional references

IEA, 2004. *Database OECD electricity generation by fuel and country*.

ECN, 2003. *Renewable electricity market developments in the European Union. Final report of the ADMIRE REBUS project*. Report ECN-C-03-082, Petten.

Biomass Availability in ASEAN

The ASEAN region is endowed with huge biomass resources. The region is home to the world's largest producers of palm oil, sugar, rice, rubber, timber products, starch and coconuts. The range of these activities give rise to large quantities of calorific by-products that are presently not valorized or otherwise discarded as waste. The effective use of these waste by-products alone are thought to hold much potential for the regions' future electricity production. A full resource assessment has not been done across the region and the assumption from one region to the next may differ with regard to resource availability. As an indication the following table on the potential for biomass

generation has been compiled. It should also be noted that some of these figures are national targets.

The potential for power generation from biomass in the region amounts to about 13,5 GW installed capacity as shown in Table 4 – it should be noted that this figure does not take into account the potential power generation from biogas produced from anaerobic digestion from municipal solid waste, wastewater treatment of palm oil and tapioca industries, sewage treatment or animal farms. In addition the figure does not take into account Lao PDR where no data on potential production are available. Notwithstanding, only about 15% of these readily available and known resources would need to be diverted to the power sector to meet the regional renewable energy target of 2000 MW by 2010.

Data on the biomass resource base in most countries of the region is either outdated or inexistent – the Philippines for example is in need of updating its

biomass resource base due to loss of interest in the technology during the 1990's. It is only recently that there is a renewed interest on biomass due to technology improvements and positive experiences in other countries. In Cambodia a detailed resource assessment has recently been undertaken by a JICA funded project – this is scheduled to be completed at the end of 2005. In Lao PDR, data collection has recently started. Rice husks and wood residues hold most potential in the country – although a full assessment needs to be conducted.

Table 4. Potential for Biomass Power Production (in MW)

	Paddy	Palm Oil	Wood	Sugar Cane	Coconut	Total
Cambodia						700
Indonesia	450	260	275	360	250	1800
Lao PDR	60			8		68
Malaysia	156	2400	55			2600
Philippines	360			540	20	920
Thailand						7000
Vietnam	150		5	200		400
TOTAL	1500	2700	920	1500	270	13500

Market Deployment ... Continued from page 7

Indonesia's *Small-scale Distributed Power Generation Programme* has also generated various interests from community-based projects. The results so far are modest and the programme is fraught with issues such as the following: i) the power purchase agreement stands only for one year which needs to be renewed annually; ii) many projects are not bankable and have difficulty in securing funding from financial institutions; iii) programme participation procedure is not transparent; iv) non-uniform tariff for each renewable energy which is based on the local production cost of the state utility PLN; and v) investment required to build a 1 MW power plant is too high for small businesses and communities. Proposals to increase investments on distributed power distribution include the following: i) development of long-term power purchase agreement; ii) increase of capacity limit to 5 or 10 MW; and iii) devolution of licensing and business permission to local governments.

The Philippines' fiscal and non-fiscal incentives for geothermal, mini-hydro, and OSW (ocean, solar and wind) also engendered interests from the private sector. Private investments on geothermal energy are significant as manifested by past capacity additions and proposed project developments in the medium term. The incentives for mini-hydropower development were introduced more than 10 years ago but it only generated modest investments from the private sector. The wind energy development incentives appear to attract more interest from the private sector as the government is aggressively opening areas with high wind power potential for development concessions. To enhance private

investments, the government must formulate new frameworks and mechanisms that are consistent with the emerging competitive electricity market.

ASEAN Modern Biomass Case Studies

Korat Cassava Waste to Energy - Thailand

Sangan Wongse Industries (SWI) is one of Thailand's largest producers of cassava (tapioca) starch, accounting for about 12% of Thailand's national total of 1,8 to 2,0 million tonnes per annum. SWI is based on Korat about 250 km northeast of Bangkok.

Design, construction and operation of the waste to energy plant is taken care of Korat Waste to Energy (KWTE) who then sells the biogas and electricity at a discounted rate to the SWI.

This project represents one of the largest waste to energy projects in the world – delivering biogas with a nominal capacity of 120,000m³ per day (33 MW of thermal energy) to fuel the factory's starch dryers with the surplus gas being used for electricity generation – 3.15 MW power plant.

The design of the waste to energy plant is based on Waste Solutions Ltd Covered In Ground Anaerobic Reactor (CIGAR) which consists of a constructed in-ground lagoon that has been covered by a plastic membrane. A compressor pumps the accumulated gas under the membrane gas through a pipeline to the gas burners and electricity generators. A significant aspect of the CIGAR process is its low capital and operating costs, which makes the technology very applicable to a wide range of opportunities, particularly in developing countries.

The construction of the KWTE biogas plant was completed in April 2003 at a total cost of USD 1.4 million. The construction of the power plant was completed in March 2004 and in operation since April 2004. The total biogas production from the CIGAR digester amounts to 80,000 m³ per day.

The plant in its current configuration replaces already all of the factory's heavy fuel oil consumption and 62% of its electrical energy needs. Overall now the factory is over 86% energy-independent. The system is sized so as to allow for SWI's growth in starch production to 750 tonnes of cassava per day compared to today's 550 tonnes per day.

Besides the obvious economic and environmental benefits, the plant produces the following benefits: i) land recovery – the old treatment system that comprised of over 200 hectares of lagoons and channels can now be brought back into agriculture production; ii) process water recovery – the treated

water can be reused for irrigation or be further treated as an industrial water source; and iii) biomass recovery – the biomass recovered from the CIGAR is high in nutrient content and does not contain harmful organisms – it can be used as a fertilizer, stock food supplement or as soil conditioner.

The success of this project has led to intense interest from the agricultural processing industry in Thailand and abroad. Two new plants based on CIGAR concept has set a new standard for affordable and environmentally sustainable treatment of solid and liquid wastes from agriculturally based processing industries. Two new plants based on CIGAR technology are currently under construction in Thailand. One of these will treat the wastewater from an ethanol distillery in central Thailand. Further projects based on CIGAR technology are in preparation in Thailand, Indonesia, China and Malaysia.

First Grid Connected Biomass based Power Generation Project from Landfill Gas - Malaysia

Landfill Gas (LFG) Power Generation at Air Hitam Sanitary Landfill, Puchong is the first grid connected Renewable Energy project in the country. This LFG project has a capacity of 2 MW and it has the status of Small Renewable Energy Programme (SREP) project, where it will gain the SREP benefits such as tax exemptions etc. This project is owned by Jana Landfill Sdn Bhd (JLSB), a wholly-owned subsidiary of TNB Energy Services Sdn Bhd and Worldwide Landfill Sdn Bhd as the landfill site operator. The project construction has been completed in November 2003. This project has secured the RE Tariff from TNB of RM 0.165 per kilowatthour.

The total investment cost for this project is about RM 9.8 millions, of which the equipment cost amounts to about RM 9 millions. The funding agency for this project is Bumiputra Commerce Berhad Bank. By proportion, the investment cost for this project to produce 1 MW of power is RM 4.9 millions. The feasibility study of this project was sponsored by

Malaysian Electricity Supply Industry Trust Account (MESITA), Tenaga Nasional Berhad (TNB) and UK Government Foreign and Commonwealths Office.

The power plant has 2 Austrian-made 1048kW reciprocating gas engines. Besides the gas engines, the gas generator also comprises a gas extraction system. This system is directly connected to the pipe from the gas field or well. The system functions as the fuel pre-treatment system of the biogas such as filtration, heating and cooling of the gas. This is to ensure the quality of biogas before entering the gas engine. The interconnection point of TNB substation with the gas power generator is located only 30 meters from the site. The overhead cable is used for connecting 415V generating voltage from the plant to the 11kV transmission voltage at the substation with the transformer rating at 1250 kVA. 90% availability is anticipated for the first phase. The operation mode of this power plant is as a base load power plant. Among the benefits gained from this project are the reduction in odour level to the surrounding area and mitigation of green house gasses emission. These benefits are also shared by the surrounding community, whereby previously they have to face the higher level of odour problem everyday. The concession period for this power plant is 15 years. JLSB extracted biogas from the wells, which were built at the landfill site. Each well can produce biogas for 20 years.

Calendar of Events

September 2005

Current Development of Green IPPs: Experiences, Challenges and Strategies
15-16 September 2005, Karlsruhe, Germany

October 2005

Solar Power 2005 Conference and Expo
5-9 October 2005, Washington DC, USA

14th European Biomass Conference and Exhibition: Biomass for Energy, Industry and Climate Protection
17-21 October 2005, Paris, France

The 1st Asia ESCO Conference
20-21 October 2005, Bangkok, Thailand

November 2005

Green Power Mediterranean
15-16 September 2005
Rome, Italy

Renewable Energy in Europe: Removing Barriers, Developing Trading, Meeting Targets
24-25 November 2005
London, UK

The *GrIPP Net Newsletter*, the official publication of the Green IPP Network, is published quarterly to communicate network activities and to support the dissemination of relevant information and network results. It is provided free to network members and interested stakeholders, and can be downloaded from this site: www.EC-ASEAN-GreenIPPnetwork.net.

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