

Overview of biomass for power generation in Southeast Asia

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1. INTRODUCTION

Biomass energy, including fuelwood, accounted for 11% of the world's total primary energy supply (TPES) in 2000 (IEA, 2002). It is the fourth after oil (34.8%), coal (23.5%), and gas (21.1%). It surpasses the combined contribution of nuclear (6.8%), hydro (2.3%) and other new and renewable sources of energy (0.5%). However, in electricity production, biomass energy is the least used, sharing only 1% of the world's total fuel consumption for power. In contrast, the share of other fuels are: coal 39%, hydro 17%, gas 17%, nuclear 17%, oil 8%, and the other new and renewable sources of energy 1%.

In Southeast Asia, biomass is an important source of energy since fuelwood is still the dominant source of energy in almost 50 percent of the region. The share of biomass in the TPES of the ten ASEAN Member Countries in 1998 was about 40 percent. By country, the share of biomass in the primary energy supply in 1999 was: Myanmar - 86%; Lao PDR - 86%; Cambodia - 83%; Vietnam - 48%; Indonesia - 29%; Philippines - 21%; Thailand - 17%; and Malaysia - 8% (FAO-RWEDP, 2000). Biomass energy is largely used in the household sector and in small-scale industries. Recently, its use in combined heat and power generation is increasing. The role of biomass is presently limited in power development, but opportunities exist for increasing its share.

2. BIOMASS RESOURCES FOR POWER IN SOUTHEAST ASIA

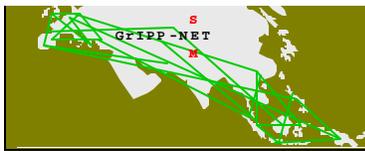
Biomass resources such as wood and agricultural residues are abundant in ASEAN countries and have strong potential as fuels for green power generation. The amount of residues produced from bagasse, ricehulls, palm oil waste and wood waste in five ASEAN countries, namely: Indonesia, Malaysia, Philippines, Thailand, and Vietnam is about 107.55 million tons. Of this total, bagasse accounted for 32%, palm oil waste 27%, rice hulls 23%, and wood waste 18% (EC-ASEAN Cogen 2003/UN-ESCAP, 2000).

In practice, about half of agricultural residues is utilised for energy generation. It contributes 20% of the primary energy demand of industries. Similarly, the ASEAN wood industry converts about half of the raw wood into residue during the production process.

3. STATUS OF BIOMASS POWER IN SOUTHEAST ASIA

In 2000, the total installed ASEAN capacity of renewable energy for electricity generation, both captive and on-grid, was 20,942.46 MW (Table 1). Biomass power accounted for about 8.94%, geothermal 11.15%, large hydro 77.31%, mini/micro hydro 2.41%, and solar PV and wind 0.19% (ACE, 2003).

In ASEAN, the potential of biomass for power generation is promising: about 50,000 MW for all biomass resources in Indonesia (NRSE-SSN Report, 2001); approximately 3,000 MW in Thailand (EC-ASEAN Cogen, 2002); about 1,117 MW in palm oil industry of Malaysia (PTM, 2003); about 60-90 MW from bagasse and 352 MW from ricehulls in the Philippines (NRSE-SSN Report, 2001); and 250 MW from



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bagasse in Vietnam (UN-ESCAP, 2000). About 920 MW in installed capacity could be expected from over 19 million tons of residues in ASEAN wood industry (UN-ESCAP, 2000). Many of this potential could be developed through cogeneration. However, in order to tap the estimated potential, the following key challenges have to be addressed: 1) establishment of a level playing field for biomass power in competition with the often subsidised centralised power generation; 2) establishment of mechanisms to compensate for the avoided external costs of biomass power generation, for example through a so-called environmental “adder” on top of the normal buy-back rate; 3) access to power grid under clear and fair terms and conditions; and 4) development of a market for biomass waste resources. Thailand is facing these challenges by initially launching a competitive bidding for 300 MW of renewable energy generation, mainly biomass. The Thai government has also established a fund to provide developers assistance to cover the differential between production and market price of biomass power. In Malaysia, grid access regulations and buy-back power rates are being developed, and the first grid-based biomass power plant is being constructed (Ramboll, 2003).

Table 1. Renewable Energy Status for Power Generation in ASEAN (2000), in MW

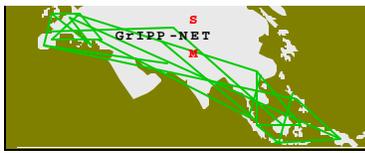
Country	Biomass	Geothermal	Hydro	Mini/micro-hydro	Solar	Wind	Total (MW)
Brunei D.	-	-	-	-	0.0024	-	0.0024
Cambodia	n.d.	-	18	0.96	0.13	-	19.09
Indonesia	302	363	4,246	21	8	0.4	4,940.40
Lao PDR	n.d	-	621	6	0.16	-	627.16
Malaysia	213	-	2,225	6	2.19	0.15	2,446.34
Myanmar	-	-	340	83	0.24	-	423.24
Philippines	21	1,960	2,480	230	0.44	0.06	4,691.50
Singapore	220	-	-	-	-	-	220
Thailand	1,230	0.3	2,886	94	8	0.17	4,218.47
Vietnam	n.d	-	3,294	62	0.11	0.15	3,356.26
ASEAN-10	1,986	2,323.30	16,110	502.95	19.27	0.93	20,942.46

Biomass energy could achieve the global targets for CO₂ emissions. However, a lot still needs to be done in order to develop the appropriate processes and technologies to boost the market. Ironically, the lack of immediate demand for biomass energy due to competition with other fuels is a major impediment for the development of these processes and technologies (Ramboll, 2003).

The way ahead is for governments of the ASEAN countries to mobilise the market forces by setting up policies, regulatory framework, and appropriate incentives to address the above mentioned challenges. Thailand is a recent example of a government facing the challenge.

4. POLICY AND REGULATORY ENVIRONMENT

In ASEAN countries, the development of renewable energy for power generation is basically a policy issue. In many countries, appropriate policy framework is, therefore, developed to ensure that national energy policy goals are met. For biomass power, planning and programme implementation for grid power capacity installation vary in Member Countries. Government regulations set, among others, the guidelines for the purchase and sale of power between generators and electric utilities, clearly defining their obligations and rights.



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In Indonesia, the national energy policy aims to reduce dependence on oil and gas and to diversify the energy mix to include other energy resources such as renewable energy. The Ministry of Mines and Energy published the tariff for purchase of electricity under the Small-Scale Renewable Energy Power programme which aims to ensure the availability of electricity and to provide business opportunities for small-scale power investors (DJLPE, 2003).

In Malaysia, the energy policy promotes renewable energy as the fifth fuel source. Under the Third Outline Malaysia Plan (OPP3 2001-2010) and the Eighth Malaysia Plan (8MP – 2001-2005), the Government will intensify and accelerate the development and use of renewable energy. The strategies of the 8MP for RE are: 1) promotion of RE resources such as biomass, biogas, municipal waste, solar, and mini-hydro; 2) in-house biomass-based cogeneration; 3) demonstration projects; 4) commercialisation of research; 5) extension of financial and fiscal incentives; 6) promotion of cooperation between public and private sectors; and 7) R&D on palm diesel and use of alternative sources such as fuel cell, hybrid cell, and hydrogen fuel (PTM, 2003).

In the Philippines, appropriate policies, regulatory conditions, and incentives have been put in place to increase power generation from indigenous resources, which will have positive impacts on the market for biomass technologies. The Omnibus Investment Code, the amended Executive Order 226 which allows the private sector to participate in power generation, Build-operate-transfer Law, and the Electricity Power Industry Reform Act are the relevant laws that will support the development of the renewable energy industry (DOE, 2003).

In Thailand, the national energy policy promotes renewable energy to address key issues on energy security, to reduce energy import, and to reduce greenhouse gas emissions. The Energy Conservation Promotion Fund is the government's tool to implement, among others, power purchase and subsidy programmes for Renewable Energy Small Power Producers (SPP) and Very Small Renewable Energy Power Producers (VSREPP) (ASEAN Energy Bulletin, 2002).

In Vietnam, the 10-year Renewable Energy Action Plan, which will soon be adopted by the Government which will set the policy framework for the development of renewable energy systems for on-grid and off-grid options (ASEAN Energy Bulletin, 2002)

5. POLICY INSTRUMENTS FOR BIOMASS ENERGY IN ASEAN

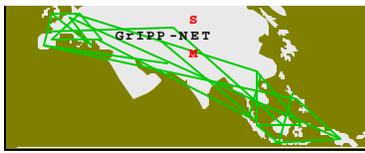
5.1. Target Setting

Most ASEAN countries have specific targets for the installation of renewable energy capacity, usually within the planning framework of between 5 to 10 years. Targets are included in the energy plans of the countries and they are achieved by launching specific programmes like small-scale RE power producers programme in Indonesia, Malaysia, and Thailand. In Malaysia, the target for the installation of new RE capacities was set at about 600 to 700 MW by 2005, mostly comprising of grid-based biomass power plants. These targets are usually met through call of proposals or public bidding.

5.2. Investment incentives/Subsidies

In Southeast Asian countries, project developers of biomass-based power projects can avail of investment incentives in various forms (e.g. subsidies, tax credits).

In the Philippines, the following fiscal incentives are available to encourage investment, with special concessions for biomass power generation projects: 1) tax duty exemption on imported capital equipment,



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2) tax credit on domestic capital equipment, 3) income holiday of 6 years; 4) additional deduction for labor costs, and 5) deduction of infrastructure expenses from taxable income.

In Malaysia, project developers can avail of the following incentives: 1) income tax exemption of 70% on statutory income of 5 years or investment tax allowance of 60 percent of capital expenditures incurred within a period of 5 years and to be utilised against 70% of the statutory income; and 2) import duty and sales tax exemption on imported machinery and equipment and sales tax exemption for domestically produced machinery and equipment.

5.3. Pricing

In Indonesia, the Small-Scale Renewable Energy Power Programme, launched in August 2002, encourages the participation of small-scale RE power producers to sell power of 1 MW and below to the grids of PLN. PLN calculated the guaranteed price of RE electricity to small-scale RE producers at 80% of PLN's current selling price of electricity at medium voltage interconnection; and 60 percent for low voltage interconnection.

In the Philippines, the possibilities for guaranteed minimum prices for electricity from renewable energy are being investigated. The aim is to enhance the competitiveness of renewable energy projects with conventional technologies.

In Thailand, the price for purchasing electricity under the SPP is based on avoided cost (the wholesale price that distribution utilities pay to EGAT for bulk electricity purchases) of electricity. For those signing contracts to supply a firm capacity, the purchase price is based on the long-run avoided cost of the utility. On the other hand, there is no contracted demand for non-firm contracts, and accordingly, there is no capacity payment.

5.4. Production incentives

Production incentives are paid for every unit of energy generated, for example, cents/kWh. Thailand provides incentives in the form of subsidy/grant for every unit of kWh generated on top of the agreed power purchase rate between the SPPs and EGAT.

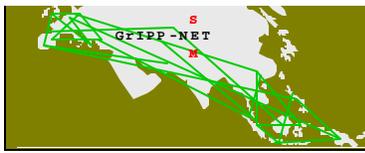
5.5. Power Purchase Agreements

Power purchase agreements for selling RE electricity to the grids are practiced in the following ASEAN countries, namely; Indonesia, Malaysia, Philippines, and Thailand. In Malaysia, power purchase agreement under the Small Renewable Energy Programme (SREP) is negotiated between the project developer and power utility. The duration of the PPA varies in the Member Countries.

In the Philippines, standard power rates are applied for the purchase of power from biomass cogenerators having less than 10 MW capacity, reflecting the structure of capacity and energy costs of the National Power Corporation for varying levels of power availability and dispatchability.

5.6. Soft Loans and other Innovative Financing Schemes

Soft loan programmes for renewable energy are established in some countries order to help ease the problem of financing for small-scale RE projects. In the Philippines, an investment window for renewable energy was established in the mainstream lending operations of the Development Bank of the Philippines (DBP). The loan usually involves a low interest rate, reasonable monthly amortisations, simplified procedures, and grace periods.



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For biomass cogeneration systems, there are innovative schemes that have been modeled by the ASEAN-EC Cogen Programme. The schemes usually involve sustainable financing mechanisms and strategic alliances for cost sharing, reduction of transaction cost, and risk minimisation.

5.7. Public-Private Partnership

Public-private partnership (PPP) is encouraged in the ASEAN countries in the development and demonstration of new technologies, including renewable energy technologies. Involvement of the public sector instills confidence of the private sector to invest in renewable energy projects. PPP is proven successful in large-scale and complex renewable energy projects involving advanced technologies such as cogeneration. In the Philippines, examples of PPA schemes are the build-operate-transfer (BOT), build-operate-own (BOO), etc. Under the BOT scheme, projects can be commissioned through two procedures: an open tender calling for bids and unsolicited proposal.

5.8. Education, training and awareness programmes

Education, training and awareness programmes are indirect measures that help promote positive attitude towards renewable energy among the general public. The current trend is to share information, to identify technology transfer opportunities, and to increase public awareness of the positive attributes of renewable energy.

5.9. Permits, Grid Access Regulations, and Environmental Compliance

Indonesia, Malaysia, Philippines, and Thailand have developed guidelines on securing permits for installation of RE grid-based projects and grid access. In most cases, environmental compliance certificate must be secured before a project is constructed.

In Thailand, the regulations for the Very Small Renewable Energy Power Producers (VSREPP) programme (1 MW and below) allow for net metering arrangements and streamlined interconnection process and requirements, so as to minimise the costs of connecting a VSREPP to the distribution systems.

6. SUCCESS FACTORS FOR BIOMASS PROJECTS

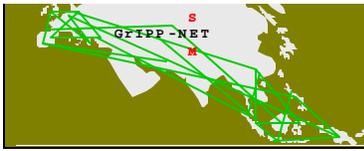
Policy instruments are gradually opening up the power market for renewable energy in Southeast Asia to a wide range of potential electricity producers, generating incentives for investment for the installation and upgrading of biomass technologies for power generation.

Energy supply security policy is a common policy of the Member Countries that is expected to stimulate the greater utilisation of biomass energy.

Cost competitiveness of biomass power plants is quite attractive, economically and financially, under certain specific conditions and locations.

Environmental benefits from biomass utilisation include, among others, solving the issue of waste disposal and reduction of exhaust gas emissions which are being encouraged under the Global Environment Facility (GEF) and Kyoto Protocol.

Technologies for utilising biomass for power generation are available at higher efficiencies, thus useful for a wide range of energy purposes.



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7. PROSPECTS

Bioenergy will focus mainly on the application of cogeneration technologies (combined heat and power production) which are proven to bring the cost of energy generation to competitive levels in agricultural enterprises in the ASEAN. The COGEN 3 programme, pursued jointly by EU and ASEAN during the next 3 years, will ensure the rise in commercial application of this scheme.

The various programmes of the ASEAN countries such as the Small-scale RE Power (SSREP) programme of Indonesia, the Small Renewable Energy Programme (SREP) in Malaysia, and the Small Power Programme (SPP) and Very Small Renewable Energy Power Producers (VSREPP) in Thailand are expected to increase the utilisation and investment for biomass energy for power generation.

Overall, the greater utilisation of biomass for power generation will contribute positively to the supply, utilisation, and environmental objectives of the energy sector of all the Member Countries.

For further information, please visit the website of ACE at <http://www.aseanenergy.org>.