GrIPP-Net News

A Quarterly Newsletter of the ASEM Green Independent Power Producers Network

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Editorial

The GrIPP Network has completed another milestone when we successfully conducted our first region workshop last October in Bangkok, Thailand. The major partners made several presentations. In addition, invited speakers also discussed important and interesting topics on the use of renewable energy for power generation. The participants gained more insights on the development of renewable energy like hydropower, wind and biomass in Europe and Southeast Asia. A lively exchange of ideas and experiences also resulted from the three roundtable discussions (please see Summary of Proceedings). The program as well as the papers presented during the workshop can be downloaded from our website.

After the workshop, the project partners met to discuss the Network's accomplishments as well as the future activities. Among others is the launching of the website of the Network. It is now open to the public, as well as individuals who would like to register as members of the Network. New members of the Network can avail of the following: (1) Free subscription to our quarterly newsletter, the GrIPP-Net News; (2) Invitation to our workshops; (3) Access to our links libraries and members directory; and (4) Participation in discussion forums.

The Network will also come up with important data sources on renewable energies for power generation. These will be posted as knowledge maps and factsheets, which will be made available as soon as possible.

In addition, the partners firmed up preparations for the second regional workshop, which will be held in March 2003 in Copenhagen, Denmark (*page 6*). Risoe Laboratory will be spearheaded the affair. More details about this workshop will be provided in our website as well as our newsletter.

Meanwhile, as part of the Network's continuing activities, this issue features the important development and market prospects of small hydropower (SHP) in Europe and Southeast Asia. Europe is a market leader in SHP technology, and in most European countries, the economically feasible hydro potential has been harnessed to a great extent. On the other hand, Southeast Asian countries have yet to fully tap their hydropower potential. Thus, there is a possibility of a much closer cooperation between Europe and Southeast Asia in the field of small hydropower development. ◆

The *GrIPP-Net Newsletter*, the official publication of the Green IPP Network, is published quarterly to communicate network activites 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.ASEM-GreenIPPnetwork.net. This *Newsletter* has been produced with the financial assistance of the European Community. The views expressed herein are those of the authors and can therefore in no way be taken to reflect the official opinion of the European Commission.

Network Events

ASEM Green IPP Network First Regional Workshop
"Renewable energy sources in SEA—current stage, market conditions, and outlook"
24-25 October 2002; Sofitel Hotel, Bangkok, Thailand

Summary of proceedings

The first regional workshop of the ASEM Green IPP Network was successfully held on 24-25 October 2002 in Bangkok. The main objectives of this workshop were to give an overview of the current stage of renewable energy sources—focusing on biomass, wind, and small and mini hydropower—in Southeast Asia and discuss the different market conditions in these countries and their impact on project development.

The workshop was divided into an opening session; keynote presentations; consecutive panel sessions on biomass, wind, and hydropower; and parallel roundtable sessions on project structures and financing approaches, policy instruments and regulation, and renewable energy technologies and resources—corresponding to the three competence centres of the ASEM Green IPP Network. A closing session summarised the outcome of the parallel sessions and formally closed the workshop.

Forthcoming Event
ASEM Green IPP Network Second Regional Workshop
"Renewable energy sources in SEA—European Experiences and Perspectives under new Market Conditions"
26-28 March 2003; Denmark
See page 6 for details.

The workshop started with an opening session, graced by a senior representative from the Delegation of the European Commission in Bangkok and the Secretary-General of the Foundation for International Human Resource Development (FIHRD), who each gave an international development perspective of their expectations of the Network. Key officials of the UNESCAP and UNEP offices in Bangkok also gave their recommendations on key issues to be addressed by the workshop after highlighting the present thrusts of both organizations in addressing energy and environment concerns.

The panel sessions on biomass, wind, and hydropower gathered together renewable energy experts from Cambodia, Indonesia, Malaysia, the Philippines, Thailand, and Vietnam to present the status of renewable energy policy, projects, and technologies in these countries, focusing on a specific technology or renewable energy resource. Each panel session started with a presentation of European experience focusing on policies, projects, technologies and resources. Selected experts from key organizations in Asia then discussed the

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Inside

Mini and Small Hydropower in Europe
Development and Market Potential

by ***Joachim Leckscheidt*** *and* ***Tjarinto S. Tjaroko***

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For centuries, Small Hydro Power (SHP) has been an important source of energy in all European countries possessing water potentials. With the invention of more sophisticated turbines in the twentieth century, mini and small hydro plants were used for electricity generation and became the main source of electric energy. Townships in the mountains harnessed water resources to generate electricity. Water powered mills or factories were fitted with turbines and generators and the electric power was used for productive end use.

The Decline of SHP Development

This development continued till about 1950/1960, when the national grid was extended and reached the so far isolated SHP plants. In many cases grid supply turned only to be cheaper than operation, repair and maintenance of the SHP. In addition, stringent water management regulations and safety provisions for civil and electrical installations contributed to the early closure of many minihydro plants which, from a technical point, were still perfectly operational. In many areas the utility companies managed to enforce closure even when the supply from the grid was more costly for the user than from his minihydro plant. If production and feed-in was tolerated at all, prices paid by the utilities were so low that only the existing plants remained economical and this only, as long as no major repairs became necessary.

This situation was prevailing in most countries even after the 1974 oil shock. One would have expected that the oil crisis as well as protests against nuclear power would have opened the market for small and mini hydro. But it took more than twenty years of development and lobbying to bring about legislation and tariffs in favor or MHP.

New Momentum by the European Union

In 1997 the European Union issued the White Paper on Renewable Sources of Energy (26/11/97) outlining the future of Renewable Energy in the European Union. It covers competitiveness, environmental protection, security of supply and the promotion of energy efficiency and renewables. The paper defines a strategy and an action plan to promote renewable energy sources (RES). The target is a 12% share in total energy supply by 2010, compared to an estimated 6% in 1996.

One important feature of the Action Plan was a thorough situation analysis for Small Hydro in Europe. This “Strategic Study for the Development of Small Hydro Power in the European Union” was prepared on behalf of the European Small Hydropower Association (ESHA) under the ALTENER II project of the European Union and published in 2001* . It contains a comprehensive survey of present small hydro production, analyses the constraints to further development and recommends action by European legislators and the industry.

Present situation of SHP in Europe

Hydropower (large and small) contributes 17%** to production of electrical energy in Europe, ranging from 99% in Norway, 76% in Switzerland, 65% in Austria, 51% in Sweden, down to 23% in France, 12% Czech Republic, 6% Poland, 4% Germany, 3% and less in the UK and some other countries.

Small hydropower accounts for approximately 7% of total hydro generation in Europe. The present capacity and production for 30 European countries are shown in Table 1. The total installed SHP capacity stands at 12.600 MW and production is estimated at 50.000 GWh. Leading countries are Italy, France, Germany, Spain, Sweden, Norway, Austria and Switzerland which combine 86% of SHP capacity and production.

The SHP production consists of around 17.500 individual power plants with an average capacity of 0,7 MW and a production of 2.9 GWh per year. Average capacity varies widely between countries, from over 4 MW per plant in Romania and Portugal, 2,69 in Poland, 2,82 in Greece, 2,06 in Turkey, 1,72 in Norway, 1-1,5 MW for Italy, Spain, France, Finland and UK, down to the 200-300 kW range in countries like Germany, Czech Republic, Slovakia and Slovenia. The pattern reflects the water potentials of the respective countries as well as the age of the industry: countries which started early using SHP feature a larger degree of smaller or mini hydropower plants, whereas “newcomers” like Portugal, Greece or Turkey started with plants of bigger capacity. Plants in the “traditional” SHP countries like Germany are the oldest with nearly 50% being over 60 years old. Portugal, Spain, UK, Greece and the Eastern European countries have the “youngest” installations with most plants counting less than 20 years.

Prices paid to SHP producers vary considerably among European countries with the lowest tariffs in Finland, Norway and Sweden (1,2 to 3 Eurocent/kWh) followed by a medium range of 4 to 6 Eurocent/kWh in UK, Ireland, Spain, Portugal up to tariffs which include a promotional element such as 9 Eurocent/kWh in Belgium and Switzerland, 90% of end user tariff in Greece or 65%-80% in Germany

In the future, SHP production will also benefit from carbon money under the so-called Joint Implementation mechanism. Projects located in countries where green house gas emission targets are met—first countries will probably be UK and Germany—can earn additional revenue for the emission reduction being achieved. Emission reductions can be credited for a period of five years if they are certified to fulfill the criteria of “environmental additionality”. First transactions are reported by Eco Securities of UK, e.g., a forward contract for 6,1 million CO_2 in 2008-2012 worth 3 million Euro resulting from a 55-MW hydro plant in Romania, or a purchase of the environmental benefits of a 8,2-MW run-of-the-river plant in Guatemala for a ten-year period.

In most European countries the economically feasible hydro potential has been harnessed to a great extent (see Table 2). From the still untapped potential the SHP plants have a better chance for realization than large hydro with reservoirs, which face severe opposition due to their considerable environmental impact. Yet even the small and mini hydro run-of-the-river plants

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* Source : esha@arcadis.be. The Survey covers over 90% of the SHP production in the EU and 13 other European countries including Norway, Switzerland, Czech Republic, Hungary, Poland, Turkey and others.
** for OECD Europe, Source: IEA

Table 1: Installed capacity and production of SHP plants (up to 10 MW) in 30 European countries

Country	MW	GWh	Number	MW/Plant
EU Countries	***1.863***	***35.833***	***13.359***	***0,76***
Austria	848	4.246	1.110	0,76
Belgium	95	385	39	2,44
Denmark	11	30	38	0,29
Finland	320	1.280	225	1,42
France	1.977	7.100	1.700	1,16
Germany	1.502	6.253	5.625	0,27
Greece	48	160	17	2,82
Ireland	32	120	44	0,72
Italy	2.209	8.320	1.668	1,32
Luxemburg	39	195	29	1,34
Netherlands	30	60	7	4,28
Portugal	280	1.100	60	4,67
Spain	1.548	5.390	1.056	1,47
Sweden	1.050	4.600	1.615	0,65
UK	160	840	126	1,26
Non-EU Countries	***2.468***	***10.556***	***4.104***	***0,62***
Croatia	30	120	13	0,23
Czech Republic	250	677	1.136	0,22
Norway	941	4.305	547	1,72
Poland	127	705	472	2,69
Romania	44	176	9	4,89
Slovakia	31	175	180	0,17
Slovenia	77	270	413	0,19
Switzerland	757	3.300	1.109	0,68
Turkey	138	500	67	2,06
6 other non EU	73	328	158	0,46
Grand total - 30	***12.617***	***50.635***	***17.463***	***0,72***

Source: ESHA Study and ACE computations; GWh for Croatia and Romania estimated taking four (4) GWh per MW. Figures for Netherlands from Hydro Power and Dams World Atlas 2001.

Table 2. Estimated Hydropower Potential and Exploitation in Europe

Countries	Econ. Feasible Potential (GWh/a)	Prodn. from Hydro Plants (GWh/a)	Exploitation Ratio (%)
15 EU Countries of which	390.000	320.000	82
Austria	50.000	38.000	76
France	72.000	70.000	97
Germany	25.000	25.000	100
Italy	55.000	52.000	95
Spain	40.000	35.000	88
Sweden	85.000	68.000	80
Selected non-EU Countries of which	480.000	250.000	52
Norway	180.000	120.000	67
Romania	30.000	16.000	53
Switzerland	36.000	34.000	94
Turkey	120.000	40.000	33

Source: IEA, Eurostat, Hydropower & Dams and own interpolation/computations

meet various obstacles. Although feed-in regulations are now in place in almost all European countries, the licensing and contract procedures are cumbersome and time consuming. Opposition from environmental groups, often based more on emotion than rational arguments, has to be countered. Requirements for minimum water of the original river or stream limit the exploitable flow. Demands for the installation of fish ladders or changes in civil structures in line with the natural environment can drive up civil engineering costs to levels where the investment is not any more economical.

The ESHA study estimates, that from a purely technical viewpoint, additional 2100 MW of SHP could be made available by upgrading the existing plants and restarting abandoned ones. Environmental concerns, however, would reduce this volume to around 1.100 MW. The potential for new SHP is estimated to be theoretically, i.e. without any constraints, more than 14.000 MW, mainly for the large unexploited capacities in Norway and Switzerland. Taking in account environmental and economic constraints the study assumes a potential of 6.700 MW still to be exploited. Both potentials combined add up to 7.800 MW which is 62% of present installed SHP capacity. Consequently, despite the high exploitation ratio in Europe there is still ample room for further development.

SHP Industry and Technologies

Different from other RES_technologies, the SHP industry has been slow in exploiting the opportunities offered by the deregulation of the energy markets and the trend toward clean energy. A considerable number of small-scale SHP manufacturers closed down and some leading turbine manufacturers discontinued their SHP production lines. The SHP industry is estimated to about 60-70 turbine manufacturers employing around 8000 people. In addition the installation of SHP plants provides work for consultants and contractors in the water engineering and electric power fields. The job creation in these fields exceeds the employment in the turbine manufacturing industry.

Investment costs differ from country to country, which reflects not only the wage level and construction cost, but also the sophistication of SHP plants. Switzerland and Germany report the highest costs namely 4.000-10.000 and 4.000-6.000 Euro/kW, respectively. At the lower end of the scale are Poland with 500–1.200, Spain and Norway with 1.000-1.500 and Greece, Slovakia and Slovenia with 1.000–2.000 Euro/kW. The average of 2.000-2.500 Euro/kW applies to 14 other countries which reported their SHP investment costs in the ESHA survey.

SHP is a proven technology which has reached a high degree of efficiency and reliability. However, the industry has developed a number of new technologies to further improve efficiency and operation. Some recent technical innovations include new designs and the use of new composite materials for low-head turbines, high speed generators and variable speed operation, submersible technologies, new types of computer-based digital controllers for remote diagnostic and automatic monitoring, and web cameras to allow regular checks on remote-control basis.

Market Prospects

Europe is a market leader in SHP technology. Optimal turbine designs are available and new technical developments offer automated operation of SHP. Production costs for SHP equipment have been lowered considerably and standardization will allow European manufacturers to reduce the present price level even further. Therefore, from the technical side, there should be no obstacles for increasing SHP production and meeting the 2010 target of the EU White Paper.

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Small Hydropower in Southeast Asia

by ***Nathaniel C. Domingo, Fidelpio V. Ferraris, Prof. Rowaldo R. del Mundo***
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Introduction

SHP has been applied in Southeast Asia (SEA) for three decades now. There is a number of existing SHP installations, both of mini and micro scale. However, comparing the current installed capacity to the potential capacity, SEA has yet to fully reap the benefits of SHP.

Hydro Resources in SEA

Countries of mainland SEA have high hydropower potential for they are drained by five major river systems: the Irrawady, Salween, Chao Phraya, Mekong, and Red River. Except for Vietnam, countries of mainland SEA only have aggregate estimates of hydropower potential—potential undivided among the different scales of hydro technology. Thailand has an estimated theoretical potential of 1,770 TWh/year of hydropower. Cambodia's hydropower potential, although under evaluation, is estimated at 83,000 GWh/year. Laos has a theoretical hydroelectric potential of about 26,500 MW excluding mainstream Mekong. Of this, about 18,000 MW is technically exploitable, with 12,500 MW found in the major Mekong sub-basins and the remainder in minor Mekong or non-Mekong basins. Myanmar has a technically feasible hydropower potential of 37,000 MW, the largest in SEA. Meanwhile, Vietnam, which has more than 2,200 rivers with lengths of more than 10 km, has an estimated SHP potential between 1,500 and 2,000 MW—7% to 10% of the total economic hydropower potential.

Though separated by seas and not having common major river systems, the countries of insular SEA—Indonesia, Malaysia and Philippines—also have high potential for hydropower. Indonesia has a total hydropower potential of approximately 75 GW from 1,315 possible locations of different sizes and utilization schemes. Of this potential, around 50% could be exploited by large-scale hydro, and 493 MW by micro-hydro. To date, the country has installed a total of 21 MW of micro-hydro capacity, which represent only 4% of the total micro-hydro power potential. On the other hand, the Philippines, which has 421 principal rivers with watershed areas ranging from 40 to 25,000 sq km, has a minihydro potential of 1,286.776 MW, according to the Philippine Department of Energy estimates. So far, only 89.07 MW has been exploited. Malaysia's technically feasible potential of hydropower is around 123,000 GWh/year; however, small hydro potential is very low.

Status of SHP in SEA

Indonesia has a number of SHP installations and more are being planned. The micro-hydro project of the Government of Indonesia (GOI) and the GTZ developed standardized hydro and electricity schemes with nominal capacities of 10-100 kW and installed 28 micro-hydro power plants between 1992-1999. Plans to continue the project will focus on implementing standardized technologies for off-grid decentralized village hydro schemes with nominal capacities less than 100 kW and replacing diesel by installing on-grid schemes with nominal capacities greater than 25 kW. The PLN (electric utility of Indonesia), under the East Indonesia Renewable Energy Development (EIRED) Program, identified SHP plants at 15 sites in Sulawesi, Papua Barat (former Irian Jaya), and Flores with a total capacity of around 25 MW.

Currently, the Philippines has 68 micro-hydro systems, generating an aggregate capacity of 233 kW and benefiting some 6,000 households. The Philippines has 51 existing mini-hydropower facilities with a total installed capacity of 82.07 MW. These mini-hydro plants contribute around 200 GWh or 0.34 million barrels of fuel oil equivalent (BFOE) every year. The total installed capacity of mini-hydro will increase to 89.07 MW as a 7-MW plant in Bukidnon nears completion. By 2009, aggregate mini-hydropower capacity will reach 151.29 MW with the development of additional 12 mini-hydropower sites.

In Thailand, the Department of Alternative Energy Development and Efficiency (DEDE), formerly known as the Department of Energy Development and Promotion (DEDP), and the Provincial Electricity Authority (PEA) are some of the institutions involved with mini and micro-hydro. The DEDP installed 23 mini hydropower plants with capacities ranging from 200 kW to 6 MW for a total of 128 MW. Aside from mini hydro, the DEDP has also built many village-level micro-hydro power plants. Meanwhile, the PEA operates three small hydro generation stations with a total capacity of 3.8 MW. It plans to implement five more small hydro generation stations to increase the total capacity of its small hydro to 18 MW.

Among the countries of SEA, Vietnam is the most active in hydro technology. In 1998, around 500 small hydropower plants were constructed with a total capacity of 75 MW. Aside from having many installations, Vietnam also manufactures mini and micro-hydro components. Locally manufactured components include various types of turbines—Francis, Kaplan, Pelton, Crossflow, and Propeller type—and associated equipment for installations of up to 2.1 MW. Two mini-hydro installations programs are currently on going. The first program concentrates on the China-Vietnam border region, while the second focuses on the Central Highland provinces that border Laos and Cambodia.

Barriers to SHP

Some major issues hampering the commercialization of SHP in SEA include high investment cost, lack of knowledge in SHP development, lack of government policies, socio-economic concerns, environmental concerns.

The high initial capital cost of SHP schemes acts as a major impediment to SHP development in SEA where funding problems are most acute. The issue of distance between the hydro energy resource and the load centers, as in the case of Thailand and the Philippines, poses difficulties for SHP development. Project costing varies with the site, the size and the type of application. The specific investment cost per kW of SHP project also varies greatly from country to country, ragning from US$600/kW to US$4,000-6,000/kW. Further, the pre-investment work—site survey and feasibility study—is higher for SHP in percentage of the ultimate investment than large hydro. Usually, the cost of pre-investment work for SHP could be higher than the acceptable 10-15% of total investment, even if they are supported by government or foreign aid.

Attention has been paid to the training and technology transfer in some SEA countries during the last two decades, which enables them to master a great portion of work in SHP development. Although several countries have set up their own capabilities in SHP development, including pre-investment studies, engineering design, construction and operation, some other countries need to rely to a great extent on technical support from abroad. This fact, added to the costs of importing foreign

expertise, materials and equipment, even if subsidized, has greatly impeded the faster development and more widespread introduction of SHP projects.

As these SHP are commonly produced for consumptive (i.e., residential) use, financial resources for the necessary O&M are frequently insufficient to warrant sustained operation. It is common that the existing SHP plants would be dismissed and replaced by the grid once the grid is extended to the area (e.g., Vietnam). Also, the economic feasibility of many SHP projects is not clear especially if and when compared with large-scale hydro and thermal power generation.

The socio-economic merits of electricity and of local resources exploitations are well established, but their quantification is still in infancy. In consequence, they do not usually enter into the evaluation of economic merits and projects, which could bring considerable advantages to the local population, and are in danger of being discarded by conventional economic analysis.

In some SEA countries, hydro developments are located in mountainous areas, commonly on land belonging to cultural minorities. In such cases the right of way to a project site, or the actual acquisition of ancestral lands may be problematic. Furthermore, there could be objections to water diversion if there are larger water users downstream for irrigation or drinking water supply.

In addition, there could be some environmental concerns although the environmental impact of run-of-river type developments is usually quite limited.

Policy Instruments Supporting SHP

In SEA, there exist policies supporting the use of SHP. Though more policies still need to be developed, existing policies signify the interest of SEA in SHP. In Indonesia, the decree on Small Power Purchase Tariffs (SPPT) opens the energy generation market to private entrepreneurs and cooperatives. The decree aims to regulate the selling of privately produced electricity to PLN, with one of its priorities being the electricity production from non-conventional energy sources (NRES) such as wind, solar and mini-hydro. PLN, according to the small power project agreement (SPPA) and the SPPT, will purchase NRES-based electricity generated and fed into the PLN grid by private companies. All SPPAs are long-term agreements with PLN to safeguard the interest of the private investor.

Meanwhile, the Philippine Department of Energy's Renewable Energy Power Program (REPP) allocates US$30 million as a financial facility for private sector participation in NRE projects with capacities ranging from 200 kW to 25 MW. Project proponents are free to negotiate the financial terms with the conduit bank but the proposed interest rate, 12% for the funding source plus a 4-6% spread for the conduit, seems unattractive. To stimulate mini-hydro development, the Philippine government enacted Republic Act 7156, or the Mini-hydro Law. The law stipulates special incentives and privileges, such as tax and duty-free imports, lower sales tax, 10% VAT exemption, and seven-year income tax holiday.

To initiate private participation in power sector development and to promote the use of indigenous by-product energy sources and renewable energies for electricity generation, Thailand introduced the Small Power Producer (SPP) scheme in March 1992. At the end of 1996, there were 17 SPP contracts, three firm and 14 non-firm, with a total installed capacity of 910 MW; about 370 MW were sold to the national grid. The Thai government has embarked on a comprehensive Energy Conservation (ENCON) Program, adopting the Energy Conservation and Promotion Act of 1992. As one of its main objectives, the ENCON Program aims to promote the development and use of renewable energy sources, through Voluntary Programs. The program offers two types of financial support: support for the project implementing organization for the operational cost for management, administration incentives to individuals.

The energy master plan of Vietnam recommends the establishment of a Small Hydropower Development Authority (SHPDA). Since investments in the sector have been stagnant for years, the objective of the SHPDA would be to stimulate small hydro development by building local capacity to prepare a "bankable" pipeline of isolated and grid-connected small hydro projects that could lead to investments in this least cost remote power source on the order of US$20 million over a five-year period. ◆

Sources: Promotion of Renewable Energy Sources in Southeast Asia, www.aseanenergy.org/pressea/Water Resources, Large Dams and Hydropower in Asia, Master's Thesis, Kajander, T. 2001; Philippine Energy Plan 2003-2012, Philippine Department of Energy; Presentation on Market Conditions, Barriers and Outlook for Small and Mini-hydro in SEA, Dr. Chen Shengshui; Ministry of Industry and Handicraft, Lao PDR via Internet (http://www.lao-energy.com)

Mini and small hydropower in Europe ..... *Cont. from page 3*

The EU White Paper estimates the investment for implementing its strategy to 950.000 million Euro, a great part of which would have to be for SHP development. Taking the figure of 7.800 MW for the SHP market potential—which might be on the low side—and an average investment of 2.000 Euro per installed kW, a market volume of minimum 15.000 million Euro can be estimated.

Additional markets can be tapped in Asia, South America and Africa. Table 3 shows a relatively high hydro exploitation ratio for Europe. However, it is obvious that the Asian market offers a fantastic market potential. In contrast to Africa and South America, Asia is a vibrant market where investment capital can be raised and capable joint-venture partners are found. In India, the Ministry of Non-Conventional Energy Sources would be a good address to identify interested partners. For the 10 ASEAN countries, the ASEAN Centre for Energy (ACE) in Jakarta will establish contracts with suitable companies or institutions in any of the 10 ASEAN member countries. For China, the Hangzhou Regional Centre for Small Hydro Power could be approached as an entry point. ◆

Table 3. Economic Hydropower Potential by Continent and % Exploitation

Region	Economic Hydro Potential	% Exploitation
Africa	12%	8
Asia	45%	25
Europe	10%	75
North & Central America	13%	75
South America	20%	30

Acknowledgments: *This paper draws on the findings of the aforementioned ESHA study, which was established in collaboration with Istituto di Economia delle Fonti di Energia, Milano/Italy and Sveriges Energiföreningars Riskorganisation, Köpping/Sweden. Other sources include: Prof. A. Zervos of EREC (presentation: Renewable Energy Development in Europe), K. Jorgensen of RISOE Roskildle/Denmark (Small Hydropower in Europe), J. Troni of Ecoscurities/UK (Hydropower within the Context of a New Carbon Economy), the 2001 Hydropower & Dams World Atlas, and various other papers.*

Summary of proceedings ..... *Continued from page 1*

market conditions and barriers for the development of biomass, wind, and hydropower.

The parallel roundtable sessions discussed issues thought to be critical for each of the competence centre—project structures and financing approaches, policy instruments and regulation, and renewable energy technology and resources. These parallel sessions were well attended by invited speakers and panelists and other participants who attended the workshop. ◆

Upcoming Network Event

ASEM Green IPP Network Second Regional Workshop
"Renewable energy sources in SEA—European Experiences and Perspectives under new Market Conditions"
27-28 March 2003; Copenhagen, Denmark

Preliminary Program

Day 1

- Registration and Opening program
- Session 1: Green IPP Opportunities in Europe: IET, JI and CDM
- Session 2: Experiences of European players in SEA
- Session 3: Business opportunities and market conditions in SEA
- Session 4: European perspectives (on wind, etc.)

Day 2

- Site visit (wind farms in Denmark)

For further information, please contact: Mr. Kaj Joergensen, Risoe National Laboratory, Denmark (e-mail: kaj.joergensen@risoe.dk) or Mr. Dominik Moest, IIP, Germany (e-mail: Dominik.Moest@wiwi.uni-karlsruhe.de).

Calendar of Events

Power-Gen India & Central Asia (Conference)
14 - 16 January 2003; Pragati Maidan, New Delhi, India
URL: http://www.power-genindia.com

The Second Regional Conference on Energy Technology Towards a Clean Environment (RCETCE)
12-14 February 2003, Phuket, Thailand
URL: http://www.serd.ait.ac.th/teenet/rcetce.htm

CLEAN 2003 - India International Clean Energy Expo 2003
20 - 23 February 2003; Bangalore, India
URL: http://www.cleanenergyexpo.com/

COGEN Europe Annual Conference 2003 "Cogeneration - the Path towards Growth"
03 - 04 April 2003; Brussels
URL: http://www.cogen.org/events/Annual_Conference_2003.htm

SE Asia Forum on GHG Market Mechanisms and Sustainable Development (Forum)
08 - 10 April 2003, ADB, Manila, Philippines
URL: http://www.ieta.org/

Asia Wind Power Conference and Exhibition
17 - 19 April 2003; Beijing, China
URL: http://www.cnwpa.org/wind-e1.htm

In the News

Germany Approves Second Offshore Wind Project

German maritime planning authority BSH has approved a second North Sea wind farm, Butendieck, in a further move to boost the offshore wind energy sector. Already the world's leading onshore wind energy producer with 10,000 MW of capacity, Germany has plans to add 25,000 MW to offshore capacity by 2030 from a current zero. Buerger Windpark Butendieck GmbH of Husum received permission to build 80 turbines (of three MW each). The park will be in a zone with water depths of 20 metres 34 km off the northwest German coast near Denmark and owned by a pool of private investors.

Source: Reuters via PlanetArk, 19 December 2002

Philippine Plant to Use Renewable Fuel

The Central Negros Power Corp. (CNPC) plan to convert its 50-MW coal-fired power plant in Pulupandan in Negros Occidental into a renewable power project. CNPC and Central Negros Electric Cooperative (CENECO) will sign a memorandum of agreement (MOA) to explore the use of indigenous sources of energy as an alternative fuel for the Pulupandan power plant project.

CENECO and CNPC have an existing power supply purchase agreement for a 50-MW supply of electricity. CNPC would conduct, at its own expense, a thorough study on the various renewable energy resources in Negros Occidental, particularly on wind and biomass replacement of coal as fuel for the power plant. The study, expected to be completed in 12 to 15 months from the date of the signing of the MOA, will be submitted to CENECO.

Source: Manila Times, 17 December 2002

Denmark to Fund Philippine Wind Plant

Denmark is to fund the establishment of a commercial wind power plant in the Philippines, which is striving to become Asia's largest user of wind to generate electricity. Construction of the 25-MW plant in the northern province of Ilocos Norte will begin in 2003 and will be completed in 2004, according to the Department of Energy (DOE). It will be the first commercial wind plant to be established in the Philippines through a $25-million funding from the Danish International Development Agency. The plant will be built and operated by Danish firm Northwind Power Development, which is to sell the electricity to a local distributor at rates below that of traditional power plants.

Source: AFP via Business Day, 11 December 2002

Aklan NGO Develops Coco Shell-powered Electric Generator

Sustainable Rural Enterprise (SRE), a non-government organization based in Kalibo, Aklan, Philippines, will work with US-based Community Power Corp. (CPC) in developing a modular biomass power system called Biomax. Biomax is powered by raw coconut shells and can generate 15 kW up to 4 MW of electricity and 30 kW of heat. The first prototype is now being used in Kalibo while a second one is being developed at CPC in Colorado, USA and will be deployed in Ibajay, Aklan, before the end of 2002 or early 2003. The Biomax system powers production equipment including a grinder, sieving drum, decorticator, small power tools, lights and a computer by using local shell residues. Previously, majority of coconut husks were either burned or left to rot, generating pollution and greenhouse gases. The waste heat from the Biomax can also be used for drying crops such as rice, copra, mangoes, fish, etc.

Source: The Philippine Star, 15 November 2002