

Overshadowed by Thailand's multi-billion dollar plans for large-scale coal plants and Salween hydro dams is the little-known yet multi-national sector of small power producers. SPPs account for about 15 percent of the country's total installed generating capacity.¹ They have the potential to compete with conventional large-scale hydro dams and thermal plants but the Electricity Generating Authority of Thailand has blocked the development of rules allowing greater competition and customer choice. This report provides background information on Thailand's small power producers, interviews with several SPP managers, and observations about the role and potential of SPPs in Thailand's electricity future.

Contents

Part 1: Overview of Thailand's Small Power Producers

Part 2: SPP Interviews by PI and WWF Thailand²

Part 3: Additional SPP Company Profiles

Part 4: Observations Based on SPP Interviews

Part 5: SPP Outlook in Thailand

Part 1: Overview of Thailand's Small Power Producers

Thailand's Electricity Generating Authority defines a Small Power Producer (SPP) as either a private or state enterprise that generates electricity either (a) from non-conventional sources such as wind, solar and mini-hydro energy or fuels such as waste, residues or biomass, or (b) from conventional sources (natural gas, coal, oil) and using cogeneration (combined cycle units capable of producing power and steam).³

As of March 2005, EGAT has signed contracts with 84 small power producers with a total installed generating capacity of about 4,500 MW.⁴ The country's total installed capacity is almost 31,000 MW.⁵

Of the 71 SPPs operating as of March 2005, 17 are using natural gas in combined cycle plants with installed generating capacities ranging from 66 to 150 MW.⁶

As of December 2004, the Electricity Generating Authority of Thailand reported 71 small power producers in operation, 20 of which use natural gas in combined cycle cogeneration plants.⁷

The Small Power Producer program was established in 1992, followed by the Independent Power Producer program in 1994. Under the rules established by EGAT, SPPs can sell their electricity either to EGAT or to industrial customers located next to the SPP plant, or both. IPPs are obliged to sell their entire output to EGAT.

In the last decade of partial privatization of the power generation business, EGAT's share in power generation has gone from 100 to 59 percent. Independent Power Producers and EGAT subsidiaries now generate about 30 percent of the electricity sold by EGAT. SPPs are providing 7.6 percent and about 2.5 percent is imported from Lao PDR and Malaysia.⁸

More recently, the Thai government introduced rules to promote investment in even smaller-scale producers (under one megawatt) by offering retail prices for their output and connection to the central grid. In July 2002, the Provincial Electricity Authority announced its intention to buy electricity from homes with solar roofs, pig farms, small hydro dams and wind farms. To date almost 40 so-called junior power producers have expressed an interest.⁹

1.1 SPP Rules

The terms of SPP operations, access to customers, and power purchase agreements, are set by EGAT and the Thai energy ministry.

Both IPPs and SPPs have long-term power purchase agreements with EGAT as the single buyer. The PPAs allocate market risk to EGAT (and its captive ratepayers) leaving SPPs and IPPs to manage the operating and fuel price risks. SPP contracts are between 5 and 25 years with terms and specifications set by EGAT, the national power monopoly.

EGAT has defined two types of purchasing rates for buying SPP power, non-firm and firm power. The value of non-firm power is determined by EGAT's short-run avoided energy cost. Firm power means the SPP can guarantee availability of electricity supply during the system peak months. Payment to firm SPPs is determined by EGAT's long-run avoided capacity and energy costs.

EGAT's March 2005 list of SPPs shows 3678.7 MW of firm power SPPs and 935.5 MW of non-firm power for a total of 4614.2 MW. About 58 percent of the Firm power SPP capacity is designated for EGAT with the rest going to industrial customers. All combined cycle plants provide firm power to EGAT.

For non-firm power SPPs, about one-third of the installed capacity goes to EGAT, with the rest going to industrial customers. Most of the non-firm SPPs use

bagasse, which is a fuel by-product derived from sugar processing. To date, 32 sugar factories have invested in power plants ranging in generating capacity from 2 to 52 MW. The newest bagasse-fired SPP is scheduled to start commercial operation in March 2005. The Rerm Udon Sugar Factory in Udonrathani province with a 24 MW bagasse-fuelled plant will supply 2 MW to EGAT.

SPPs direct customers are mainly industrial customers located near the SPP power plants using private distribution lines. At one time, the National Energy Policy Office was drafting rules that would have allowed SPPs access to the state-owned distribution grid, which would allow SPPs access to customers located outside industrial estates. But the SPPs and utilities were unable to reach an agreement. So for now, SPPs are limited to serving industrial customers only.

1.2 SPP Revenue

Small Power Producers receive both a capacity and an energy payment from EGAT. The capacity payment is based on actual kilowatts produced multiplied by a capacity charge covering investment costs plus foreign exchange fluctuations. The energy payment covers variable production and maintenance costs, and is calculated based on actual kilowatt-hours the plant delivers to customers. EGAT is obliged to pay for at least 80 percent of the energy it contracted to buy even if it needs less. SPPs also receive the Ft (fuel transfer payment) which is applied to industrial customers only, and is designed to offset the company's exposure to fuel price fluctuations. The Ft is also subject to government policy changes which means its effectiveness in passing on the real cost of fuel to customers is questionable.¹⁰

The average price EGAT paid for firm SPP power in 2001 and 2002 was 5.4 US cents (2.2 baht) per kWh. This is calculated based on EGAT's long-run avoided capacity and energy cost. The average price for non-firm SPP power was 4.38 US cents (1.77 baht) per kWh.¹¹

1.3 SPP Costs

Renewable SPPs: the cost of a biogas- or biomass-fuelled cogeneration plant in Thailand is estimated at about US\$1200 per installed kilowatt¹² compared to a gas-fired combined cycle plant, which costs between US\$800 and US\$1,000 per installed kilowatt.¹³

In gas-fired combined cycle plants, fuel cost accounts for about 80 percent of the total project cost (including capital, operating, and maintenance). Capital costs for plants with 100 MW capacity are typically between US\$800 to US\$1000 per installed kilowatt.

Because renewable fuels are more costly than natural gas or coal, the National Energy Policy Office (now the Energy Policy and Planning Office) setup what's known as the ENCON fund to provide subsidies to eligible SPPs using renewable fuels and energy sources.¹⁴ Eligible renewable SPPs receive a subsidy of up to 0.89 US cents (0.36 baht) per kilowatt-hour for the first five years of operation. As of June 2002, 31 projects had been selected as candidates for the subsidy. First, the SPPs had to fulfill EGAT's requirements on plant location, fuel source, production details and cost. Then NEPO required the SPP candidates to submit public hearing plan and demonstrate that it had approval from at least 70 percent of the local residents. Successful candidates were then approved by NEPO for the subsidy approved 15 (214 MW). As of August 2003, out of 31 biomass projects proposed for the subsidy, about half were rejected because they could not win public approval for their projects.¹⁵

Part 2: SPP Interviews by PI and WWF Thailand¹⁶

- 1. TLP Cogeneration Company Limited**
- 2. Nong Khae Cogeneration Company Limited**
- 3. Thai National Power Company Limited**
- 4. Bangkok Cogeneration Company Limited**
- 5. Amata Power Limited**

2.1 TLP Cogeneration Company Limited

Mr. Ongkarn Srivichit, General Manager

2.1.1 Location

Head Office: EGCO Tower, 222 Moo 5, Vibhavadi Rangsit Rd., Tungsonghong, Laksi, Bangkok 10210

Plant Location: 16 I-4 Road, Map Ta Phut Industrial Estate, Map Ta Phut, Rayong 21150

2.1.2 Ownership

The three major shareholders of TLP Cogeneration are the Electricity Generating Public Company (EGCO) of Bangkok, Thailand, Thai LNG Power Corporation (TLPC) which is 100 % owned by EGCO, and Electric Power Development Co. (EPDC) of Tokyo. The plant is owned and operated by TLP Cogeneration Company, and was constructed by Toyo Engineering of Chiba, Japan. Toyo awarded GE Power Systems the US\$17.8 million contract to supply two gas turbines for the plant.¹⁷

2.1.3 Generating Capacity

Total capacity generated is 117 MW, of which 60 MW is sold to EGAT and the rest, together with steam, is sold to industries within Map Ta Phut Industrial Estate, e.g. textile industries, electrical appliances companies, American Standard, stainless steel production, and packaging industries. Commercial operation began January 2003.

2.1.4 Technology & Fuel

The plant uses combined cycle system, producing electricity and steam, using natural gas as fuel. The plant has two gas turbines (General Electric), 2 heat recovery steam generators, and 1 steam turbine. Gas turbines manufactured at GE Power System's Belfort plant in France.

2.1.5 Comments

Current operation, trends in the future in terms of economic (price, contract, etc.), social and environmental conditions

The plant has generated and sold electricity to EGAT since January 2003. The company took over the previous business of TLPC (one of the PTT companies). Due to the take-over process, operation was delayed until January 2003. At first, the company had some problems negotiating with EGAT and the Provincial Electricity Authority (PEA) in terms of competing with customers, price, and other benefits. The plant is not operating at full capacity yet due to limited local electricity demand and the contract with EGAT.

Electricity generated for industrial customers is done through a bilateral contract with information provided to the PEA. Electricity is transmitted through a 115 KV line and sold to surrounding industries for less than what PEA charges. Some feedback from industrial customers: regular and reliable electricity with less interruption than that of the PEA. However, from the company's point of view, one of the constraints is maintenance. Due to the small size of the plant, it is not worth investing in repairs. Instead, the company has contracted the PEA for repair services, which sometimes causes delays. Another option occasionally used is to subcontract out to other companies for maintenance but this is costly.

The company has a spare piece of land for future expansion provided the government provides subsidies and policies favouring SPPs. Social and environmental problems are not significant as the plant is located in the designated industrial estate. Additionally, the plant has installed its own water treatment plant, not using the central system of the industrial estate. As for the

interaction with communities, the company has done a number of social contributions when requested and public relations activities.

Possibilities to respond to increasing demands of industrialization and urbanization

Thailand's gas supply is sufficient for another 30-40 years but expansion would lead the country to become too dependent on a single source of fuel. Coal is still the economically attractive source of energy to produce electricity and its price tends to get cheaper. Need incentives to encourage industries to use more steam. As for households, electricity provided through PEA grid works now but it might be worth exploring other options to involve SPPs to generate electricity directly to nearby communities, e.g. mini-grid.

Possibilities to compete with other large dams and other renewable sources

The fuel used for generating electricity has to take into consideration the purpose of the power that is being provided. Take for example, the electricity that would be generated by Nam Theun 2. It will provide low-cost electricity to northeastern Thailand and improve power supply reliability.

SPPs to date are not very cost effective but investors still do it because it is the policy from the government to promote SPPs. Some of the benefits derived could be the sale of steam to industries.

As for other sources of renewable energy, especially the biomass, this is the time for biomass in Thailand. A lot of incentives, especially in terms of price, have been provided to biomass developers or investors. Biomass power plants are believed to have less environmental impacts, which is not really true. Take into consideration, the transportation of biomass materials farther than 200 km to the plant location. Also the more promotion of biomass to generate electricity could also lead to further forest destruction and encroachment.

Wind power is difficult for Thailand in terms of wind potential and commercially viable technologies. Solar would be possible only in the very remote areas where the location and geographical conditions are not appropriate or cost effective for grid system. It would also be more difficult to use solar in industries unless it is cost effective and promoted.

Problems and constraints affecting future investment

The capacity of people in the governmental sector, especially those in the Customs Department, has to be increased. They need to understand some of the technical aspects and specifications of the engines or machines used in the power

plant business. Some machines and engines need to be imported and are subject to high tax, which is a financial and economic burden for the private operators.

The price of gas is high and tends to be out of the government's control. The recent trend is 10% higher than the price five years ago. The government should be stronger in negotiating with Unocal, the main gas producer in Thailand.

Recommendations

Certain contract on the sale of electricity has shown some of the commitment of the government to promote SPP but private operators need to make profit. Industries should be encouraged to use electricity generated nearby and at the same time, where appropriate, should be encouraged to use steam generated by the power plant which is much cheaper.

Regarding the price of gas, the government should have a strong bargaining power to negotiate and control the price of natural gas.

The government should be more cautious with biomass power plants as some of them operate with low environmental standards, which might lead to more environmental impacts. This is not against biomass power plants. Some of the plants that are well operating with high environmental performance should be fully supported. It has to be considered on a technical basis. Some of the environmental impacts generated by renewable plants, such as the environmental cost of transportation and the cost of used or wasted batteries from using solar, have to be seriously taken into consideration.

Private operators should have more active roles in negotiation with the government or pursue more proactive roles in pushing for favourable policies on power generation.

2.2. Nong Khae Cogeneration Company Limited

Mr. Boonchai Thirati, Director, Power Business Operations Department;
Mr. Unupong Kongkeo, General Manager, Nong Khae Cogeneration Power Plant; and
Mr. Naphat Nurn-U-Rai, Plant Manager, Nong Khae Cogeneration Plant.

2.2.1 Location

Head office: Gulf Electric Public Company Limited, 11th Floor, M. Thai Tower 1, All Seasons Place, 87 Wireless Road, Lumpini, Phatumwan, Bangkok 10330.
Plant Location: 111/11 Moo 7, Nong Plamor, Nong Khae, Saraburi, 18140.

2.2.2 Ownership

Non Khae Cogeneration Company is owned by Gulf Electric. Gulf Electric is 50 percent owned by EGAT's private subsidiary EGCO, 49 percent owned by Japan's Electric Power Development Company, and 1 percent owned by Mitsiami.¹⁸

2.2.3 Generating Capacity

Total capacity is 121 MW, of which 90 MW is sold to EGAT while the rest is to industries in the industrial estate, e.g. Siam Gypsum, Siam Tyre, Nova Plastic. Steam of 24 tonnes is also sold to Siam Gypsum and Siam Tyre. Operating since 2000.

2.2.4 Technology & Fuel

The plant uses combined cycle system with 2 gas turbines (General Electric) and 1 steam turbine (Alstom). 2 gas boosters are installed to increase gas pressure. Diesel is also stored in a closed container to provide electricity generation for 7 days, in the case that a problem of gas arises from the Petroleum Authority of Thailand (PTT) side.

2.2.5 Comments and Recommendations

Current operation, trends in terms of economic (price, contract, etc.), social and environmental conditions

There has been no problem with the plant's operation. Electricity is sold to EGAT and industries through an underground cable. The steam sold is also transmitted through an underground pipeline. The selling price of electricity is cheaper than that provided by the PEA. However, the price of natural gas is getting high with no price guarantee from the government.

The company has done a number of public relations activities and provided a number of social contributions to nearby communities and schools. Since the plant is located in the industrial estate, there have been no social and environmental problems from the operation.

Possibilities to respond to increasing demands of industrialization and urbanization

The power system will still rely mainly on the grid and EGAT's policy in providing electricity to meet the increasing demand. Using only gas will lead to

supply insecurity in the long run. Gulf Electricity is also looking for opportunities to invest in power services, no matter what fuels are promoted. Gulf has investment experience with the Bo Nok IPP and biomass power plants in operation and going through the local consultation process.

Possibilities to compete with other large dams and other renewable sources

Other renewable sources to be used to produce electricity would need more support from the government in terms of price subsidies. However, social problems and local conflicts are becoming significant in future power plant development. New policies from the government would have to be enhanced giving serious consideration to the social problems and local involvement in the planning process.

Problems and constraints affecting future investment

For gas-fired operations, this would need to be supported by national policy and EGAT's announcement of a new phase of SPP or other programmes. Challenges include social and environmental impacts, and local involvement in the planning process.

Recommendations

The government should provide price guarantee for gas, which could be done through the strong negotiation with the main gas producer in Thailand. As for other renewable sources of energy, more subsidies should be provided in order to increase share of renewable energy in power generation. Rules and regulations should also take into account the local condition and participation at the earlier stage in order to minimize investment cost.

2.3. Thai National Power Company Limited

Mr. Suwat Diraksuntorn, General Manager
Mr. David Leich, CEO¹⁹

2.3.1 Plant Location

Siam Eastern Industrial Park, 60/19 Moo 3, Mabyangporn, Pluak Daeng, Rayong, 21140

2.3.2 Ownership

Thai National Power Company Limited is wholly owned by International Power Group, one of the world's largest independent electricity generating companies

with 6,400 MW (net) in operation, 4,500 MW (net) under construction and approximately 8,000 MW (net) in advanced development. Countries where International Power has operating facilities include Australia, the Czech Republic, Malaysia, Pakistan, Portugal, Spain, Turkey, the United States and United Kingdom. The International Power was created out of the demerger of UK firm National Power PLC, with shares trading on the London Stock Exchange and the New York Stock Exchange.

2.3.3 Generating Capacity

Total capacity is 110 MW, of which 90 MW is sold to EGAT, and the rest to 19 industrial customers within Siam Eastern Industrial Park in Rayong province. Operating since 2000.

2.3.4 Technology & Fuel

The plant operates with the 110 MW combined cycle gas turbine power station comprises 2 GE Frame, 6 gas turbines, 2 Kawasaki Heavy Industries Heat recovery steam generators and 1 Kawasaki Heavy Industries steam turbine.

2.3.5 Comments and Recommendations

Current operation, trends in terms of economic (price, contract, etc.), social and environmental conditions

The plant commenced daily commercial operations in October 2000. It supplies 90 MW to EGAT and the rest to industries within the industrial park.

Plant has been operating successfully; no problems with the contract and power purchase agreement with EGAT. The plant has its own connection of gas pipeline from the Petroleum Authority of Thailand. Apart from electricity, the plant also has the capacity to generate high quality steam, super heat steam of about 200 degrees Celsius, but currently it has no customers for the steam so the steam is used for power generation within the combined cycle plant.

Possibilities to respond to increasing demands of industrialization and urbanization

This would depend on government policy.

Possibilities to compete with other large dams and other renewable sources

Relying on natural gas would not secure the country's demand for electricity. Large dams would provide a new supply but the social and environmental

impacts, especially the relocation of local communities, have to be seriously considered.

In order to cope with increasing demand, coal would be attractive to ensure power supply security.

Other renewable sources are not cost effective, given the high investment cost. However, in the long run, solar and wind have more potential in Thailand. This would depend significantly on the future technology to make solar and wind more attractive for investment. Biomass is another option but the main concern would be the available and reliable supply of biomass materials as fuel.

Problems and constraints affecting future investment

The price of electricity sold to industries within the industrial park, offered by the company is lower than EGAT's price but nevertheless acceptable. The price of selling electricity is set by the government under the "pass through" category whereby the increased price of fuel would be the burden of customers through what is known as the FT (fuel tax) charge. This depends on the price of natural gas, which is not guaranteed by the government. If the price of natural gas significantly increases, it would affect future investment.

Future investment depends on the national policy. The company would like to expand or invest more in power generation provided the government announces the next phase of the SPP programme.

Recommendations

SPPs are good because they generate more investment in the country. The government should continue the programme. If gas is to remain in use, there should be a price guarantee, both for current and forecast price, for private investors. However, other sources of fuels, especially renewables should be supported through research and development and to contribute to the national power supply.

2.4. Bangkok Cogeneration Company Limited

Mr. Suvit Limvattanakul, General Manager and
Miss Sopavan Lekaviroj, Business Coordinator

2.4.1 Location

Head office: 16th Floor, Rajanakarn Building, 183 South Sathorn Road, Yannawa, Sathorn, Bangkok.

Plant Location: 16 I-4 Road, Map Ta Phut Industrial Estate, Map Ta Phut, Rayong 21150.

2.4.2 Ownership

The company's shareholders comprise Air Products and Chemicals Inc. (U.S.A.) (48%), NatSteel Ltd (Singapore) (18%), Hua Kee Co., Ltd. (16%), Chatri Sapon Co., Ltd. (16%) and Bangkok Industrial Gas Co., Ltd. (2%).

2.4.3 Generating Capacity

Total capacity is 113 MW, of which 90 MW is sold to EGAT and the rest is sold to Bangkok Industrial Gas (BIG) and used in the plant. Also, the steam of 25 tonnes/hr. is sold to Bangkok Industrial Gas.

2.4.4 Technology & Fuel

The plant is using cogeneration facility with a single-train natural gas-fired combined cycle unit. The facility employs a GE 6FA turbine (MS6001FA) and dry low NO_x technology. The plant has 1 steam turbine (GE), 1 generator, heat recovery steam generator, cooling water system, filtered water and demineralised water plant and fuel system.

2.4.5 Comments and Recommendations

Current operation, trends in the future in terms of economic (price, contract, etc.), social and environmental conditions

The operation so far has no problems. This might be due to the fact that it is located in the industrial estate. Gas is purchased from Bangkok Industrial Gas, a sister company. The facility has installed the dry low NO_x, resulting in lower NO_x emissions than the Thai standard. The price offered by the government is also a satisfactory one, not a lot of profit, but at an acceptable level. The price of gas is high but uncontrollable. The use of combined cycle is a good option due to its low investment cost. There is more potential for steam sales, which have yet to be actively promoted.

Possibilities to respond to increasing demands of industrialization and urbanization

The company and the plant could expand its capacity but would need approval from EGAT and related government authorities. The same with household users: the system mostly relies on the central grid provided by EGAT and PEA.

Possibilities to compete with other large dams and other renewable sources

Investment cost of gas power plant cannot compete with large dams, as it is much higher. As for other renewable sources, the company supports the idea of using more renewable sources to generate electricity. However, there are still limitations, especially in terms of reliable sources, efficiency, and cost of investment. Coal is still an attractive source, especially in terms of price and supply security. Another source that the country should maximize and provide more research and development for is the use of waste to produce electricity.

Problems and constraints affecting future investment

Limitations in terms of price subsidies from the government and the control of gas price.

Recommendations

Government policy should promote more renewable energy to replace the use of gas, which will be depleted in future, and to diversify energy supply.

Existing thermal power plants should be encouraged to turn to use combined cycle technology, which costs less.

Industries should be encouraged to use more steam to increase benefit to power plant operators.

2.5. Amata Power Limited

1. Surachai Saibua, President
2. Sumate Chanwitayanuchit, Vice President, Business Development
3. Pairach Leerunnavarat, Vice President, Operations

2.5.1 Office Location

Dr. Gerhard Link Building, 15th Floor, 88 Krungthepkreetha Road, Huamark, Bangkok, Bangkok 10240

2.5.2 Ownership

Amata shareholders include B. Grimm Group (30 percent), Energie Baden-Wuerttemberg AG (30 percent - Germany's fourth largest utility company), E.ON Kraftwerke (23 percent - Germany's largest thermal generator supplying 11 percent of electricity to German grid), and Thai stock exchange-listed Amata Corporation (14 percent).²⁰

From B.Grimm Group web site:

"As one of the pioneers in private power our joint venture Amata Power in which B. Grimm takes the biggest share and leads the strategic development, management and operation, provides clean, reliable and inexpensive electricity and steam to the national grid and over fifty large manufacturers of international repute in Thailand and Vietnam. Through our joint ventures Siemens Limited in Power Engineering and Hamon B. Grimm Limited the clear world and Thai market leader for cooling towers in power plants, as well as our B. Grimm Energy Technology Ltd. for Boilers, By Pass Stacks and related equipment, we contribute to the steady increase in efficiency and pollution reduction of the Thai Energy sector."²¹

2.5.3 Generating Capacity

Amata-EGCO Power Limited has 165 MW capacity at Amata Nakorn Industrial Estate, of which 90 MW is sold to EGAT, and the rest to industries within Amata Nakorn Industrial Estate.

Amata Power (Bangpakong) Limited has 112 MW capacity of which 90 MW is sold to EGAT, and the rest to industrial users in the industrial estate.

Amata Power (Rayong) Limited has 2 - 4 MW gas turbines (Solar Centaur 50), 2 heat recovery steam generators and 2 gas-fired boilers.

Engineering & Procurement Contractors: ABB (Germany) and Alstom Power (Thailand).

2.5.4 Project Description

Amata-EGCO Power Combined Cycle Plant (165 MW) - cogeneration combined cycle unit with 1 gas turbine and 1 steam turbine, Amata Nakorn Industrial Estate, Chonburi, licensed as an SPP. Commercial operation began September 1999. Project Cost: US\$125 million. The estate will have approximately 250 companies upon completion, mostly in the automobile, electronics, computers and consumer products sector. 95 percent of these companies are joint venture companies with foreign partners.

Amata Power (Bangpakong) Combined Cycle Plant (112 MW) - cogeneration combined cycle unit with 1 gas turbine and 1 steam turbine, Amata Nakorn Industrial Estate, Chonburi, licensed as an SPP. Commercial operation began September 2001. Project Cost: US\$78 million.

Amata Power (Rayong) – 8 MW cogeneration plant in Amata City Rayong Industrial Park. Provides power and steam to industrial users, including Allegiance Healthcare, Sinochem Chemicals, and BMW. Commercial operation began January 2000. Project cost: US\$7.73 million. Turnkey contractors: Electrowatt Engineering (Switzerland) and Electrowatt-Ekono (Thailand) Limited.

Amata Power (Bien Hoa) Diesel Plant (Vietnam) 12.8 MW. Licensed by the Ministry of Planning and Investment to build a 120 MW power plant. Project is divided into two stages: Phase 1 consists of 3 diesel generators with 6.4 MW capacity each (US\$5.5 million); and Phase 2 is construction of a 100 MW combined cycle plant. Amata City (Bien Hoa) Industrial Park is located in Dong Nai province, 25 km northeast of Ho Chi Minh City. Estimated total project cost: US\$110 million.

2.5.5 Comments and Recommendations

Current operation, trends in terms of economic (price, contract, etc.), social and environmental conditions

Plants are operating with no problems. With the government support in terms of pricing, the operation works. Without government subsidies, it would be difficult and not cost effective for the gas SPP to operate as it cannot compare and compete with the large IPPs. The company got a concession for both sites to sell electricity to nearby industrial users at a lower price offered by the Provincial Electricity Authority (PEA). Both sites are located in the industrial estate, resulting in a few to no complaints from surrounding communities. However,

the company has done a number of public relations and activities with the surrounding communities.

Government (EGAT) contract and the central grid is necessary for the success of gas-fired SPPs due to the possible risks and uncertainties to the company whether the demands of industrial users would be stable and guaranteed. This also would affect the security of investment and loans from financial institutions. EGAT's long-term contract helps make the operation financially viable.

However, with the current situation of selling electricity to nearby industrial users, the company has to compete with the PEA by offering a lower price, better services (more stability and reliability) and, sometimes, discounts. In terms of services, the company believes that they have provided better services to industrial users, particularly due to the close distance to the users where prompt services could be provided.

Potential and possibilities to respond to increasing demands of industrialization and urbanization

This would be difficult without the government to guarantee demand and links to the central grid. The company finds it difficult to sell the steam produced. Industries need to be encouraged to use more steam in their production process. Currently, the company has quite limited customers for steam, namely petrochemical companies, and food and beverage companies. The steam will be transmitted through pipeline through to industrial users. Industrial users located in industrial estate would be the main customers for steam. Therefore, the government should promote and encourage more use of steam.

Potentials and possibilities to compete with other large dams and other renewable sources

The price of gas is quite expensive as is the installation or construction of pipelines for gas delivery. The Bangpakong site had to construct a three-kilometre pipeline to connect to the existing PTT pipeline, which cost about 70 to 80 million baht. Government policy from the government should promote the use of gas and steam among industrial users. However, even with support from government on more use of gas, it might not be possible to risk relying on a single source of fuel. There must be support for more diversified fuel in electricity generation. In some cases, coal is a more stable and more reliable source. Hydro also has great potential, as it is renewable. Fuel cell technology is another source but more research should be conducted.

Biomass might not be commercially viable yet due to unreliable sources of fuel, e.g. rice husks and other associated impacts, e.g. local opposition, long distance

for transporting fuel to the plant, leading to environmental and social impacts, e.g. traffic risks, more use of energy in transporting, etc.

Problems and constraints affecting future investment

The price of fuel is not controllable; experience of the current operation using gas has shown almost .10 baht increase in gas price. Another problem is the source of fuel, which should not be a single source. Diversification of fuel, be it biomass, gas, etc. should be significantly promoted. At the same time, with the promotion of biomass SPP, only up to 20 MW of electricity generation, we have seen local opposition in several cases, which increases the investment cost. Local opposition is the main problem when deciding whether or not to continue with the biomass business. It might be worth having a large power plant and managing local opposition for a certain period of time, instead of smaller ones with local opposition at most sites; this might be more cost effective.

Recommendations

Government policy to encourage industrial users to use more steam in their production processes should be in place. Practical policies and actions to promote better understanding on fuels for electricity generation, be it coal, gas, biomass, etc., should be encouraged so that local opposition as well as delays to project development could be avoided. Also, the government should consider the continuation of SPP programme but prior to that consultation with private development should be conducted so that lessons learnt from existing SPP operations could be shared and new practical solutions could be developed.

Part 3: Other SPP Company Profiles

3.1 AT Biopower

Owned by Japan's third largest utility, Chubu Electric Power Company, Flagship Asia Corporation of Malaysia, Al Tayyar Energy of United Arab Emirates, and Britain's Roll-Royce Ventures. AT Biopower plants are constructed by Electrowatt-Ekono (Thailand), part of the Finnish Jaako Poyry Group, with McBurney Corporation as combustion technology provider.²²

Private Energy Market Fund provided US\$3.3 million for financing the company's 22 MW plant in Pichit province in 2003. The plant has long-term fuel supply agreements with rice mills and a 25-year contract to sell power to EGAT under the SPP program. The plant is scheduled to start operating in December 2005.²³ The plant was originally scheduled to start December 2003 but was delayed due to local opposition followed by government-mandated hearings.

The Environment Policy and Planning Office approved an environmental impact assessment for a second plan in Nakhon Pathom on October 24, 2003. Construction is expected to begin mid-2004.²⁴

3.2 Glow Energy Group²⁵

As of June 2004, Glow's SPPs were supplying 350 MW to 30 industrial plants in Map Ta Phut industrial estate. Customers include: Aromatica (Thailand), Vinythai, Thasco Chemical, Thai Olefins, Bayer, and Asia Silicon.²⁶

Glow is an established IPP and SPP in Thailand, describing itself on its web site as Thailand's "largest truly private power provider." Its lead shareholder is Suez Energy International. Glow SPP Public Company is 99 percent owned by the Belgium-based Tractabel Electricity and Gas International, which is a division of the French multinational SUEZ.

Glow has a total 1670 MW of IPP and SPP projects, and provides electricity, steam, chilled and treated water, and other services to industrial power consumers in industrial estates owned by the Hemaraj Land and Development Company.²⁷

In March 2005, Glow announced a new deal to build a 40 MW cogeneration plant to supply Vinythai, a petrochemical plant in the Map Ta Phut industrial estate, with electricity and steam.²⁸

Glow reported a profit of more than 4 billion baht (about US\$100 million) from its Thai operations in 2004.²⁹

In 2003, 80 percent of its revenue came from electricity (45 percent of which was sold to EGAT); 18 percent from steam, and 2 percent from water and other services to industrial customers. Sales increased slightly in 2003 due to an upturn in the petrochemical industry and a corresponding increase in demand from customers. Performance has also improved: its SPPs had only 1.5 days of unscheduled outages in 2004 compared to 15 in 2001.³⁰

Glow is positioned for future Independent Power Producer (EGAT has defined IPPs as large scale projects in the 700 MW range and higher), citing Thailand's Power Development Plan to add 12,755 MW of new generating capacity between 2011 and 2015.

3.3 Roi Et Green Company

Owns and operates a rice husk-fired power plant in Roi Et province. The company is owned by EGAT's private subsidiary, EGCO. Commercial operation began May 2003.

In December 2003, *The Nation* reported that the Roi Et Green company's main supplier of rice husk, Sommai Rice Mill, had setup a rival plant. Roi Et Green Company general manager, Pornsak Pornchanadham, is quoted as saying the company was taken by surprise by the competition and in future would have to be more cautious about suppliers of raw materials in order to stabilize its running costs. He also said there are many rice mills in Roi Et and nearby provinces that could provide raw materials.³¹

3.4 Siam Power Generating Company

Owned by Hong Kong Electric International (36 percent) and several Thai firms. Originally supposed to come online in 2001 but delayed to 2006. A dispute over the power purchase agreement with EGAT has been brought to the International Court in France.³²

3.5 Thai Biogas Energy Company

Owned by Al Tayyar Energy Company of the United Arab Emirates³³ and the Private Energy Market Fund of Finland.³⁴ Private Energy Market Fund, a private equity firm sponsored by the Finnish government and the Finnish engineering giant, Jaakko Poyry Group, announced in 2003 that it would provide almost US\$4 million for the finance and development of several waste-to-energy facilities in central Thailand, for the cassava and ethanol industries.³⁵ No scheduled completion or operation date is provided.

The Thai Biogas Energy Company facility will convert waste into methane thereby reducing heavy fuel oil and electricity consumption on the part of the host company (an unnamed cassava processing plant). The plant currently produces 500 tons per day of cassava starch, and without the biogas facility, it normally consumes US\$2,230,000 in electricity and US\$2,200,000 in heavy fuel oil costs per year. Estimated cost savings to the host company are not disclosed.³⁶

Biogas is used to generate electricity for the host company (an unnamed cassava processing plant) and for the grid. The technology used is methane collection powered by gas boilers. The methane is generated through an anaerobic digestion process using cassava-rich wastewater.

3.6 Thai Power Supply Company

Private company owns and operates three plants in Chachaengsao province fuelled with either rice husk or wood chip. The first and second plants have 47.4 MW and 10.4 MW capacity, respectively. The newest plant with a 3 MW capacity started operating in March 2004.³⁷

Part 4: Observations Based on SPP Interviews

- 4.1 Gas-fired SPPs are a product of government policy, not necessarily customer needs or market demand. This makes them quite insecure given their dependence on EGAT and vulnerability to government policy changes that affect their commercial viability.
- 4.2 SPPs built capacity to EGAT's specifications, not its customers. This has meant some SPPs have unused capacity or not enough customers for electricity or steam.
- 4.3 SPPs claim they are supplying cheaper and better quality service to industrial power consumers than the Provincial Electricity Authority provides. However, there does not appear to be any official records or studies to substantiate this or compare performance with IPPs and EGAT plants. Contracts between SPPs and industrial customers are not available for independent review.
- 4.4 The SPP program has given a limited number of the country's industrial power customers the right to buy power in bulk direct from private suppliers, without having to go through EGAT. These customers benefit economically from greater reliability than the central grid can provide, which is important to manufacturers where power interruptions of even a few seconds can be extremely damaging and costly.
- 4.5 SPPs interviewed refused to disclose details of their contracts with industrial customers, or estimates of cost savings to their customers. In order to promote efficiency and competition in performance – which would be one of the functions of an electricity regulatory body – the new regulator should be looking at SPP performance vs. central grid power, establishing performance indicators, and ensuring that this type of information is in the public domain. To our knowledge, even though the SPP program was established over a decade ago, there has been no formal

- study or evaluation of SPP performance compared to EGAT plants, EGAT affiliated plants, IPPs, or central grid reliability in general. This kind of information is urgently required to advance definitions of and debate about reliability, efficiency, clean power etc.
- 4.6 SPP managers interviewed repeated official policy: that SPPs are not competitive with larger-scale power projects and require government subsidies; that reliance on natural gas for generating 70 percent of the country's power supply is risky and therefore fuel diversification is needed; that without government-guaranteed revenue SPPs would not be able to attract private capital. Yet SPPs also report that they are providing cheaper and higher quality service to local customers than the Provincial Electricity Authority or EGAT can provide.
 - 4.7 Not a single SPP executive interviewed advocated market rules and fair competition as a way to expand their business. All noted their dependence upon EGAT as the guarantor and single buyer as necessary if not inevitable.
 - 4.8 SPP managers favoured more government-controlled prices and subsidies, and had no vision of expanding outside the industrial estates to facilities designed to serve different classes of consumers (i.e., municipal buildings, hospitals, universities, commercial complexes, and household consumers). When asked about this most pointed to further reliance on natural gas as a problem.
 - 4.9 SPP managers downplayed the viability of renewable energy playing a greater role in the power system, citing cost as a major obstacle. In fact, renewable energy SPP generators that have come online to date without subsidy include all types of biomass fuels (i.e. bagasse, wood chips, paddy husk, waste) indicates that these fuels are commercially viable without subsidy.

Part 5: SPP Outlook in Thailand

EGAT's Power Development Plan (2004 - 2015) calls for an additional capacity of 13,770 MW by 2013, equivalent to as many as 20 new large-scale power plants. The plan does not include any gas-fired cogeneration SPPs and includes only 770 MW of renewable energy projects, which amounts to a mere 3 percent of the total additional capacity planned.³⁸

The Alternative Power Development Plan, developed by the National Economic and Social Advisory Council in 2004, calls for a shift away from large-scale

power plants and large hydro dams to less risky, less environmentally damaging, and lower cost options, including demand-side management (1500 MW), industrial cogeneration (2500 MW), and renewable energy (2,200 MW). This plan, which uses the Thai energy ministry's own data on achievable potential for DSM, renewables, and cogeneration, would cost about 60 percent less than EGAT's plan, which calls for a total investment of US\$24.4 billion over the next decade.³⁹

A key policy recommendation included with the National Economic and Social Advisory Council's PDP is that large industrial customers, who together consume more than 60 percent of the country's total energy demand, be given the right to buy their power supply directly from private power suppliers. Such a move would relieve the state of its obligation (and investment burden) to expand the system to meet the needs of large industrial consumers, and would encourage private investment in fuel-efficient cogeneration plants.

If implemented, this policy would eliminate much of the rationale for greater reliance on large hydro dams and the dam building industry knows it. According to the World Commission on Dams, "Gas-fired combined cycle systems, which combine high efficiency and flexibility with a comparatively low initial investment cost, have become the preferred choice where gas is available."⁴⁰ In 1998, the hydropower industry's journal *International Water Power & Dam Construction*, reported that large hydro in the Mekong region faced a competitive threat from gas-fired combined cycle plants, which are far more fuel-efficient than conventional thermal plants and can be built where power is needed without the need for a costly long-distance transmission system. "Gas is easy to transport and domestic power generation produces the greatest value for the consuming country [Thailand]," the journal noted.⁴¹

As for the advantages to consumers and the environment, Thailand's gas-fired SPPs are recognized as having improved the quality of service for industrial power consumers, reduced demand on the central grid, and operated with higher environmental and public accountability standards for power producers.⁴² However, those advantages, which could be extended to other types of consumers (i.e., commercial buildings, municipal facilities, university and college campuses), tend to be obscured by the much more visible environmental transgressions of SPP customers. The factories and chemical plants inside government-designated industrial estates benefit from clean SPP power and steam, but they have also generated some of the country's worst environmental and public health hazards. Consider, for example, the Map Tha Put Industrial Estate. There are 103 factories concentrated in this estate, many of them chemical and plastics manufacturers producing hazardous waste products, and operating with no buffer zone between the plants and more than 30,000 people living in the

immediate vicinity. Since Map Tha Phut was established, there have been accidental releases of poisonous and toxic substances into the air and water, causing health problems for residents. As well, the coastal waters near the industrial estate have been found to contain unsafe levels of heavy metals and hazardous chemicals.⁴³

¹ www.egat.co.th

² SPP interviews conducted by Wanun Permpibul, WWF-Thailand, and Grainne Ryder, Probe International (Canada), October - November 2003.

³ www.egat.co.th

⁴ www.egat.co.th (2005) Small Power Producers, March.

⁵ Board of Investment (2005) "Thailand's Electricity Industry Report," Elenex Thailand 2005, Bangkok, Thailand, March 2 - 5.

⁶ www.egat.co.th (2005) "Small Power Producers [Firm Contract As March 31st 2005]," Power Purchase Agreement Division, Electricity Generating Authority of Thailand.

⁷ www.egat.co.th

⁸ www.glow.co.th (2004) CreditNews Announcement No. 299, Glow SPP Public Company Limited, December 23.

⁹ Kongrut, Anchalee (2002) "Alternative power market takes first steps," *Bangkok Post*, October 14.

¹⁰ www.glow.co.th (2004) CreditNews Announcement No. 299, Glow SPP Public Company Limited, December 23.

¹¹ du Pont (2005) "Nam Theun 2 Hydropower Project: Impact of Energy Conservation, DSM, and Renewable Energy Generation on EGAT's Power Development Plan (PDP), Report prepared for the World Bank, March.

¹² Permpongsacharoen, Witoon (2004), "An Alternative to Thailand's Power Development Plan (PDP), National Economic and Social Advisory Council, Bangkok, Thailand, May.

¹³ www.apppp.co.th Capital cost figures for some SPP and IPPs are posted on the Association of Private Power Producers of Thailand web site.

¹⁴ Amatayakul, Wathanyu and Greacen, Chuenchom Sangarasri (2002) "Thailand's Experiences with Clean Energy Technologies: Power Purchase Programs," May.

¹⁵ Kongrut, Anchalee (2003) "Biomass policy needs rethink, says industry," *Bangkok Post*, August 18.

-
- ¹⁶ SPP interviews conducted by Wanun Permpibul, WWF-Thailand, and Grainne Ryder, Probe International (Canada), October - November 2003.
- ¹⁷ GE Power Systems (2001) "Toyo Engineering awards contract to GE Power Systems," June 11, in Alexandra's Oil & Gas Connections, www.oilandgas.com, Vol. 8, No. 13, July 17, 2001.
- ¹⁸ *Krungtep Turakij* (2003), May 15.
- ¹⁹ Listed as a member of the Association of Private Power Producers of Thailand www.appp.or.th
- ²⁰ Amata Power (2003) "Company Profile."
- ²¹ www.bgrimmgroup.com
- ²³ Electricity Generating Authority of Thailand (2005) "Small Power Producers as of March 31st 2005," Power Purchase Agreement Division, www.egat.co.th.
- ²⁴ www.atbiopower.co.th ADB News, November 2003.
- ²⁵ www.glow.co.th
- ²⁶ Electricity Generating Authority of Thailand (2005) "Small Power Producers as of March 31st 2005," Power Purchase Agreement Division, www.egat.co.th.
- ²⁷ www.hemaraj.co.th
- ²⁸ www.glow.co.th
- ²⁹ www.glow.co.th
- ³⁰ www.glow.co.th (2004) CreditNews Announcement No. 299, Glow SPP Public Company Limited, December 23.
- ³¹ Thongrung, Watcharapong (2003) "Energy split," *The Nation*, December 15.
- ³² www.siamlaw.co.th
- ³³ Al Tayyar Energy Company, www.altayyarenergy.com
- ³⁴ Private Energy Market Fund, www.pemfund.com
- ³⁵ www.pemfund.com (2003) "PEMF has invested in biogas generation in Thailand," Private Energy Market Fund press release, October 24.
- ³⁶ <http://www.pi.energy.gov/pdf/library/EWSL/EWSLthailand.pdf> "Clean Thai Biogas Plant," Energy and Water for Sustainable Living, pp. 54-55.
- ³⁷ Electricity Generating Authority of Thailand (2005) "Small Power Producers as of March 31st 2005," Power Purchase Agreement Division, www.egat.co.th.

³⁸ Permpongsacharoen, Witoon (2004), "An Alternative to Thailand's Power Development Plan," *Watershed*, Vol. 10, No. 1, p.31.

³⁹ Permpongsacharoen, Witoon (2004) p. 32.

⁴⁰ World Commission on Dams (2000) *Dams and Development: A New Framework for Decision-Making*, p.153.

⁴¹ *International Water Power & Dam Construction* (1998) "The gas-fired threat to SE Asian hydro power," August, p.14 - 15.

⁴² See for example, *Matichon* (2003), "Small power producers can be big saving to the country," January 7.

⁴³ www.greenpeacesoutheastasia.org (2003) "Water off Map Tha Phut Industrial Estate contains heavy metals and hazardous chemicals," Press release, Greenpeace Southeast Asia, August 4.

Additional SPP References

Amatayakul, Wathanyu and Greacen, Chuenchom Sangarasri (2002) "Thailand's Experiences with Clean Energy Technologies: Power Purchase Programs," Energy Conservation and Renewable Energy Division, NEPO, Paper prepared for UNDP's International Seminar on Energy for Sustainable Development and Regional Cooperation, Beijing, China, July 25 - 26, 2002.

Energy Policy and Planning Office (2003) "Energy Strategy for Competitiveness Workshop," Bangkok, Thailand, August 28. Prime Minister Thaksin Shinawatra chaired the workshop. The full report is available in English at www.eppo.go.th

Srisovanna, Phongjaroon (2004) "Thailand's Biomass Energy," Paper presented at "Electricity Supply Industry in Transition: Issues and Prospects for Asia" Conference, 14 -16 January, p. 16-39.

Srisovanna, Phongjaroon (2002) "Thailand's Energy Situation," Cogen3 Launching Seminars, Power point presentation, www.cogen3.net, August 20, Bangkok, Thailand.