

REToolKit Case Study

Small Power Producers in Thailand

1. Summary

Overshadowed by Thailand's multi-billion dollar plans for large-scale coal plants and hydropower dams is the little-known yet multi-national sector of small power producers (SPPs) that account for about 15 percent of the country's total installed generating capacity. They have the potential to compete with conventional thermal plants and large-scale hydro dams.

Thailand was one of the first countries in Asia to adopt a small power solicitation program. The Thai SPP program was modeled on elements of the PURPA small power program in the United States. The monopoly state utility, EGAT, is the only entity to which an SPP may sell power in Thailand. No direct retail sales are now allowed.

However, such concepts are now under discussion within the regulatory authority to allow net metering or direct retail sales by SPPs, or both, at a future time.

What is of particular note in the Thai system is that competitive bidding by renewable energy SPPs is used to suppress and award subsidy payments. This approach has been successful in minimizing the cost of these subsidies and employing available subsidy funds to bring forth the maximum number of megawatts of new private power resources. However, the approach requires that there be a controlled competitive solicitation process for SPPs rather than a continually open offer to sign PPAs and purchase power. Both approaches have advantages, but only with a competitive solicitation can competitive bidding for subsidy be applied.

2. Overview of Thailand's Small Power Producers

The Electricity Generating Authority of Thailand (EGAT) 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 (units capable of producing both power and steam).

The SPP program was established in 1992, followed by the Independent Power Producer (IPP) 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.

The initial request for 300 MW of SPP power was made by EGAT in 1992. This amount was expanded to 1,444 MW in late 1995. By 2003, the country was in surplus power situation and no additional IPP power was accepted after that date, but small SPP power is still being accepted.

As of March 2005, EGAT has signed contracts with 84 SPPs with a total installed generating capacity of about 4,500 MW. The country's total installed capacity is almost 31,000 MW. Of the 71 SPPs operating as of March 2005, 17 are using natural gas in combined-cycle cogeneration plants with installed generating capacities ranging from 66 to 150 MW.

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. IPPs 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 Laos and Malaysia.

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.

2.1 SPP Size and Resource Limitations

Eligible SPP projects include biomass, waste, minihydro projects, photovoltaic (PV) systems, or other renewable projects, such as wind. Conventional fossil fuels can be used for up to 25 percent of the fuel of such a resource on an annual basis. The eligible cogeneration technologies must use energy sequentially in a topping or a bottoming cycle. At least 10 percent of the energy output annually must be utilized in a thermal application. System efficiency of 45 percent must be achieved for the use of oil or natural gas in a cogeneration system. Each of these above requirements mirrors the PURPA requirements in the United States in fundamental ways.

The regulations allow SPPs to deliver up to 60 MW for sale to EGAT, although up to 90 MW is within the discretion of EGAT to accept on a case-by-case basis. The project can have a nameplate capacity greater than the limit, as long as power sale is limited to the allowed capacity. Several projects at 90 MW have been accepted. EGAT does not contract with projects below 1 MW; these very small projects sell power output directly to one of the two national distribution companies.

2.2 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% of the firm power SPP capacity is designated for EGAT with the rest going to industrial customers. All combined-cycle cogeneration 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.

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 on-site industrial customers only.

2.3 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% of the energy it contracted to buy even if it needs less.

SPPs also receive a fuel transfer payment, which is applied to industrial customers only, and is designed to offset the company's exposure to fuel price fluctuations. The fuel transfer payment is also subject to government policy changes which means its effectiveness in passing on the real cost of fuel to customers is questionable.

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.

2.4 SPP Cost and Subsidy

The capital cost of renewable SPPs is higher than that from conventional IPPs. For example, the cost of a biogas- or biomass-fuelled cogeneration plant in Thailand is estimated at about US\$1200 per installed kilowatt compared to a gas-fired combined cycle plant, which costs between US\$800 and US\$1,000 per installed kilowatt.

Because renewable energy power plants 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. 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. Two billion baht (\$50 million) was allocated to such renewable project subsidies, in up to 300 MW of such projects contracted after June 2000. Selected projects had to be in commercial operation by September 2004 or earlier.

The National Energy Policy Office (NEPO) used the competitive bidding process as the tool to select the applicants with the lowest required subsidy-adder to receive the subsidy. The application procedure for obtaining such subsidies is extremely sophisticated, documenting a host of financial factors, expenses, and revenues.

To receive the subsidy, the SPP first has to fulfill EGAT's requirements on plant location, fuel source, production details and cost. Then NEPO requires the SPP candidates to submit a public hearing plan and demonstrate that they had approval from at least 70

percent of the local residents. To date, the average subsidy awarded has been 25 baht per KWh (\$0.006 per KWh) to 31 projects for 513 MW.

3. Observations and Concerns of SPP Stakeholders

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. However, SPP managers accepted their dependence upon EGAT as the guarantor and single buyer as necessary if not inevitable.

SPPs are not competitive with larger-scale power projects and require government subsidies. However, SPPs provide needed fuel diversification for a country that relies on natural gas for generating 70 percent of its power supply.

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.

SPP managers favored 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.

SPP stakeholders expressed concern about the standardized PPA, which was solely drafted by EGAT. The PPA was criticized as being too simplistic and not protective of SPP interests. Many SPP and IPP projects borrowed foreign debt capital in U.S. dollars because it carried a lower interest rate and longer term than local loans. However, some sophisticated international lenders refused to lend because the PPA for SPPs was too simple and not adequate. In particular, the commitment to purchase was too indefinite. Concern was also raised about EGAT dispatch protocol for SPPs. Greater coordination between EGAT and the two national distribution companies was recommended. Third-party retail sales are allowed within an industrial area, but energy banking or net metering was suggested in those situations where EGAT, now in surplus, was not accepting all power output.

4. 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.

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

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.