Developing the market for decentralized energy in Thailand

A new, decentralized energy ‘roadmap’ for Thailand charts the way to increased small-scale and local energy production. Sridhar Samudrala and Alan Dale Gonzales survey the scene and make recommendations to facilitate growth in the sector.

A significant crossroads concerning the future of energy with climate change taking the forefront and rising energy costs making societies and economies vulnerable. With all these changes, countries must review and enhance their energy sustainability. These challenges call for Thailand and the ASEAN countries to initiate a comprehensive and ambitious response in order to secure an environmentally sound policy while sustaining economic growth. Recently, the European Commission (EC) awarded the Energy Conservation Center of Thailand (ECCT), World Alliance for Decentralized Energy (WADE) and Full Advantage Co., Ltd. (FA) to further promote decentralized energy and the use of renewables in Thailand.

The team of Full Advantage, WADE and ECCT has developed a decentralized energy roadmap for Thailand to guide and serve as a reference for those interested in decentralized/distributed energy (DE). This roadmap could assist developers and suppliers in locating valuable information on business opportunities.

Thailand’s electricity production is based predominantly on thermal and combined cycle generation, with natural gas accounting for 73% of generation capacity, and lignite/coal for about 15%.

Thailand’s electricity production is broken down as follows: 5% fuel oil, 4% large-scale domestic hydropower, 3% imports and others (mostly hydropower from Laos PDR). Renewable energy accounts for less than 1%, and it is put in the others category. Combined heat and power (CHP) accounts for 10% of total electricity supplied to the grid.

POWER DEVELOPMENT PLAN

In 2007, Thailand produced a total of more than 142,000 GWh of electricity. Currently, its installed capacity is over 29,000 MW. The peak demand was 22,600 MW.

The current Power Development Plan (PDP) calls for a doubling of installed capacity – over 30,000 MW of new capacity through to 2021. It is expected that private power production will account for about 8500 MW and EGAT’s new power plant 11,800 MW. Power purchased from neighboring countries will account for about 6000 MW of the new capacity requirements – see Table 1.

STAKEHOLDERS IN THAILAND

Thailand’s electricity transmission system and most of the country’s generation are under the control of the state-owned Electricity Generating Authority of Thailand (EGAT). Rural electrification is the responsibility of the Provincial Electricity Authority (PEA). The Metropolitan Electricity Authority (MEA) distributes electric power to the Bangkok Metropolitan area and two adjoining provinces. According to PEA, 99.7% of Thai villages are now electrified, but demand grows in step with Thailand’s residential, commercial and industrial growth.

INDEPENDENT POWER PRODUCERS

Private power plants generate electricity under long-term Power Purchase Agreements (PPAs). The Independent Power Producers (IPPs) have PPAs
with 'take or pay' provisions so in the event of low demand for electricity EGAT and the Thai electricity consumers must pay anyway for the energy that was to be generated. Of the total electricity generation capacity about 33% is currently owned and operated by IPPs.

SMALL POWER PRODUCERS:
CHP AND RENEWABLE ENERGY
In 1992, the same year as its IPP program, Thailand also began the Small Power Producer (SPP) Program – probably the most important program for clean, decentralized energy. The SPP program applies to renewable energy and to fossil fuelled combined heat and power (CHP). SPP generators connect to PEA or MSA lines and sell electricity to EGAT.

Of all SPP generators, 110 MW (including self-consumption) or 535 MW (excluding self-consumption) are renewable energy. While prices paid for electricity vary somewhat from contract to contract, generators – whether coal, gas, or renewable – receive the same levelized tariff.

SPPs are generally 5 MW or larger and limited to export a maximum of 90 MW. SPP generators above 8 MW must connect to high voltage (69 kV or 115 kV) lines. SPP generators are broken into two categories: firm and non-firm, depending on their ability to guarantee availability. Firm fossil-fuelled SPPs must generate for at least 7000 hours per year and must generate during the months March, April, May, June, September and October.

VERY SMALL POWER PRODUCER PROGRAMME
The Very Small Power Producer (VSPP) Program provides reduced and streamlined interconnection requirements for generators with net export under 10 MW per site. The new VSPP regulations will also allow fossil fuelled CHP as VSPP generators. (Generators in the VSPP program can be larger than 1 MW, but the maximum amount of power they can export to the grid is 1 MW.)

Generators with capacity above 66 kVA (PEA) or 300 kVA (MEA) must connect at medium voltage levels (41 kV or 33 kV). Generators lower than these capacities can connect at low voltage (230 V/380 V). As of September 2007, 124 generators totaling 66.8 MW have applied for interconnection. The Energy Policy and Planning Office (EPPO) data indicates that as of September 2007, only 36 generators totaling about 36 MW are actually in operation.

The SPP and VSPP laws do provide an important policy framework and a set of standard experiences upon which feed-in tariff arrangements can be built.

REGULATORY COMMISSION
One of the most significant developments in the Thai energy sector is the establishment of the Energy Regulatory Commission (ERC). The ERC was appointed in February 2008.

The provision of an ERC authorized under the Act to approve tariffs and issue licenses means that the regulation of Thailand's energy sector will become more robust, transparent and predictable. Through the mechanism of the licenses, they will focus on accounting separation of the state-owned utilities. This is the first step in the implementation of the enhanced single buyer model.

RENEWABLE TARIFFS
The Thai government has set a target of 8% of all commercial energy in Thailand to come from renewable energy sources by the year 2021-2022. This means that there will be a need for an additional 1340 MW to be added to the grid. To meet the target the Thai Ministry of Energy has proposed various supporting measures and incentives including feed-in tariff.

The following analysis shows that in order to reach the proposed target, a feed-in tariff of at least 1.8 bath/kWh (5 cents/kWh) or greater (above avoided cost levels) is required. Such an 'across-the-board' subsidy would result in nearly all new renewable energy being biomass-based, with a small portion comprising mini-hydro.

FEED-IN TARIFF
At this time, Thailand's feed-in tariff program still has not set a number of policies/rules.

Comparing to international experiences, it is clear that to establish an effective feed-in tariff program in Thailand, the following are required:

- a legal basis that provides sufficient assurances to investors that feed-in tariff levels will be sufficiently high to justify investment
- generators to have guaranteed access to the grid (open access is already partially in place, but improvements and standards are required)
- an empowered ERC with analytical capacity and the authority to levy fines.

ACCESS TO THE GRID
Thailand's utilities are to be commended for being leaders in grid-connection of renewable energy in the region. However, not all private power producers are treated with interconnection arrangements. Some issues mentioned by generators include: interconnection charges and back-up power charges are believed to be either discriminatory or are not reflective of actual costs, unnecessary interconnection to higher voltage lines when connection to lower voltage lines would suffice, prohibition on solar electric installations to sell electricity to MSEA due to equipment compliance requirements and permits required for the VSPP program remain excessive.

BARRIERS AND OPPORTUNITIES
BARRIERS
Some of barriers include (but not limited to):

- a cabinet resolution that allocates construction of 50% of all new generating capacity in years 2011 to 2015 to EGAT, the state monopoly generator
- a conflict of interest arising out of the transmission grid – limited access to grid for new CHP/DE projects
- low renewables target
- no policy to encourage energy efficiency
- restrictions in the implementation of energy plants in commercial complexes and buildings based on zoning
- lack of information, training or services, awareness and knowledge on climate change issues.

Thailand has a choice between a business as usual approach which commits to conventional fossil fuel and hydro power, or a move towards a clean, secure, sustainable decentralized energy system that can ensure higher efficiencies and proper energy use.

OPPORTUNITIES
There is a tremendous scope for DE/CHP and cooling in Thailand. The Roadmap has pointed out the various mechanisms to further promote DG/CHP in Thailand. Listed are
some of the opportunities:
- renewable energy target to be increased to 15%
- VGFNetmatering increased from 1 MW to 30 MW
- ERC to regulate utilities to purchase from renewable energy sources
- CDM financing now available through many carbon finance firms.

The benefits include:
- saving valuable financial resources – inefficiencies in fossil fuel centralized generation mean that more than half of the energy goes up the chimney as waste heat in fossil-fuelled power plants.
- reducing the risk of fuel price variations – most of Thailand’s electricity comes from fossil fuels with prices that rapidly fall and rise (specifically natural gas). Gas imported from Myanmar is more expensive than that from Thailand, and current negotiations over transport charges may well raise the price further.
- improving national energy security – since Thailand’s domestic supplies of fossil fuels are limited, new electricity plants will increase Thailand’s reliance on imported fossil fuels, at risk of supply disruption by events beyond Thailand’s control.
- reducing greenhouse gas emissions – making investments in clean energy now is imperative if we are to stand a chance of reducing global carbon dioxide emissions to levels that avoid the worst effects of dangerous climate change.

**SUMMARY AND RECOMMENDATIONS**

Full Advantage: WADE and BECIT, through the EC funding, have developed the Roadmap for DE/CHP and recommend the following to strengthen the Thai energy sector: In order to enable Thailand to efficiently meet the challenge of ensuring a low carbon, sustainable and secure energy future, the following recommendations are proposed:

- separate the electricity transmission and generation interests in order to remove the conflict of interests and allow open access for independent power producers to its transmission network.
- empower the regulator

**Table 1. The scope for new power capacity development in Thailand**

<table>
<thead>
<tr>
<th>Operator</th>
<th>Capacity (MW)</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>EGAT</td>
<td>11,800</td>
<td>39%</td>
</tr>
<tr>
<td>IPP</td>
<td>6000 including four existing IPP (4400) + new (1600)</td>
<td>20%</td>
</tr>
<tr>
<td>New power plant</td>
<td>4800 either EGAT or IPP</td>
<td>16%</td>
</tr>
<tr>
<td>Small power producers</td>
<td>1900</td>
<td>7%</td>
</tr>
<tr>
<td>Very small power producers</td>
<td>560</td>
<td>2%</td>
</tr>
<tr>
<td>Neighbouring country</td>
<td>5040</td>
<td>17%</td>
</tr>
<tr>
<td>Total</td>
<td>30,200</td>
<td>100%</td>
</tr>
</tbody>
</table>

Figure 1: Effect of feed-in tariff on renewable energy production. Source: (Thail Ministry of Energy 2009a)
with the capacity to police regulations adequately, and with the necessary powers to enforce them. 

- Reform the power planning process towards an integrated resource planning (IRP) process, overseen by the energy regulator, from which utilities are required to choose the options with the lowest overall economic and environmental cost to society.

- remove the barriers that currently prevent new legitimate DE/CHP from developing and introduce policy changes that put energy saving and renewable energy generation at the forefront of the energy agenda.

**FOR RENEWABLES**

- re-introduce the RPS program but not make renewable energy development contingent on construction of new fossil fuel power plants.
- Focus on feed-in tariffs as a mechanism to promote electricity generation from renewables. Increase the renewable energy target to 10%-15% for the near future (2015 and beyond).
- implement a renewable energy law passed by legislature that will enable the introduction of feed-in tariffs for renewable energy sources.

**FOR DEMAND SIDE MANAGEMENT**

- expand energy efficiency labelling and standards for appliances.
- provide low-cost (or free) energy audits to businesses and homes to help end users identify how to save energy.

- FOR CHP
  - restart the Small Power Producer (SPP) program to allow new CHP generators to sell electricity on the Thai national grid.
  - rationalize and enforce environmental regulations relating to the electricity generation (for example, air emissions regulations are more lenient for coal plants than biomass plants for the same pollutants).
  - introduce mutually agreed-upon principles for determining feed-in tariff levels for different technologies. The levels for municipal solid waste and solar electricity should probably be reviewed and changed.

Unless positive policy signals are provided clearly and immediately there is a possibility that Thailand being a DE market will not increase at the desired levels. Future energy will be procured from fossil plant that will contribute to increased climate change. The use of DE/CHP will only accelerate the stature while providing environmentally sound energy to the consumers of Thailand. The EC hopes the Roadmap will assist those in Thailand to find solutions to an environmentally sound solution through the use of DE.

Sridhar Samudrala is the Director, Asia with WADE. Email: ssumudrala@wade-us.com

Alan Dale Gonzales is the Executive Director of Full Advantage, Bangkok, Thailand. Email: alandale@gfull-advantage.com

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