EXPÉRIENCE DE LA POLITIQUE RÉGULATRICE NOUVELLE DE LA INDUSTRIE DU ÉLECTRICITÉ THAÏLANDE

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ABSTRACT

Over the past decades the evolution of power markets worldwide has been changing regulatory frameworks and trading arrangements for Electricity Supply Industry (ESI). The awareness of energy and environmental concerns is the key issue causing many countries has set targets for clean, secure and adequate supply of energy for the future. Thailand is one of many countries under Kyoto Protocol has set targets for clean energy and environment by promoting renewable energy and distributed generation (DG) in Thailand ESI. A number of new regulatory policies have been introduced to support the power industry to achieve targets.

INTRODUCTION

Provincial Electricity Authority (PEA) is a state owned enterprise taking responsibility to provide electricity and services to customers for the whole country except metropolitan area. With the government’s policy on clean energy and the vast service area, almost all of renewable energy and DG power plants are in the PEA’s service area, lead to very large numbers of small generating units connected to power distribution system, causing difficulties or barriers in operation and planning of distribution networks with increasing in DG penetration level in the future. As a result, PEA has to play a key role to deal with the regulatory changes. This paper presents the experiences on evolution of renewable energy and DG regarded with the government’s policy on the sustainable and environmentally friendly development in power industry and current situation of DG in Thailand. Then a number of promotions for generating power from clean energy are illustrated, followed by the arrangement for operation and planning of power network to deal with high penetration DG in the system.

ELECTRICITY SUPPLY INDUSTRY STRUCTURE OF THAILAND

The ESI of Thailand comprises three electric utilities under the government [1]. The generation of power and transmission power network are controlled and operated by Electricity Generating Authority of Thailand (EGAT), the main generation and transmission network operator of the country, taking responsibility for the whole country supplying electricity to two power distribution utilities, namely Metropolitan Electricity Authority (MEA) and Provincial Electricity Authority (PEA). EGAT also supply electricity to their large scale industrial customers but did not sell to small customers and households. MEA is responsible for operation and control distribution system and providing electricity to customers in the metropolitan area - i.e. capital city and two surrounding provinces, while PEA is responsible for operation and control distribution system and providing electricity to customers for the remaining part of the country - i.e. 73 provinces or 99 percent of the whole area, covering over thirteen million customers [2]. PEA and MEA mainly purchase electricity from EGAT at sub-transmission level 69 kV and 115 kV, and distribution level at 22 and 33 kV. Furthermore, with the policy of the government that allows SPPs and VSPPs generating power not more than 10 MW can sell electricity directly to distribution utilities. Also with the collaboration of Asian member countries, Asian power grid has been established for crossing border trading, thus large amount of power is imported from large power stations from neighboring countries.

Figure 1: Electricity Supply Industry of Thailand
With the government’s policy on generating power from clean energy, there have been many small power plants in the ESI. Although there are many small power plants such as Very Small Power Producers (VSPPs), Small Power Producers (SPPs) and Independent Power Producers (IPPs) in power network, total installed capacity is still much smaller when compared to large power plants operated by EGAT.

ENERGY POLICY AND PROMOTIONS FOR ENERGY EFFICIENCY

Generating power from large scale power plants using fossil fuel such as coal, fuel oil, lignite and other fossil-fired power plants has been causing environmental problems. Moreover, construction of these large fossil-fired power plants is a difficult task facing high investment, environmental problems and serious protests from NGO and people in that area. Regarding the potentials of renewable energy including agro-industry, municipal waste and oil price crisis, the government has issued a number of sweeping changes to promote renewable energy and distributed generation.

Figure 2 Share of Power Generation (GWh)

The share of power generated from fuel types is shown in figure 2 [1]. As can be seen, in the majority of fuel types, natural gas and coal & lignite are the main types of energy for generating power because these sources of energy can be harnessed in the country and the cost of generation power is reasonably low. Renewable energy is becoming increasingly popular programme which provides the potentials to support government’s policy in terms of both energy and environmental concerns. The trend of generating power from diesel and fuel oil has decreased and will be replaced by greener and saver energy technologies because of the regulatory changes.

Table 1: Summary Status of SPP and VSPP Projects

Table 1 shows the current summary of SPP and VSPP projects supplying electricity to the grid at distribution level [1]. As can be seen, two major types of fuel consumed for generating power are: fossil fuels and non-conventional energy (renewable energy), with response from the policy the amount of non-conventional energy projects submitted for sale of power is more than fossil fuel power plants, but power generated from fossil fuel projects is greater because of the size of fossil-fired power plants is much bigger than non-conventional energy plants. By the end of 2008, a very large number of applications from renewable energy and cogeneration projects have been received, more than one thousand projects with total generating capacity over 4,000 MW of only VSPPs programme.

Prior to government’s policy on clean energy and environment, regulatory changes and competition in power markets, power companies are seeking the efficient planning, operation and investment. This has caused power companies to identify and develop more economical methods of supplying power in order to cope with increased energy demand in the future. In order to achieve the targets in terms of energy and environmental concerns, a number of sweeping changes to the policy have been launched to promote energy efficiency and clean energy. The key issues are the following:

- The Energy Industry Act, B.E. 2550 (2007) is created on the basis “to promote adequate and secure energy service provision, while maintaining fairness for both energy consumers and licensees”.

- The VSPP programme was revised to cover cogeneration power plant and extend the generation capacity up to 10 MW for VSPP, and up to 90 MW for SPP

- The extra selling tariff “adder”, the one top of normal tariff for 7-10 years for those submitted proposal by the end of the year 2008, is granted
to SPPs and VSPPs generating power from renewable energy and sells to power grid.

- Financial incentives by investment subsidies and soft loans for selected types of renewable energy projects, especially biogas from factories producing palm oil, ethanol, pig farms and other types of agro-industry.
- The government budget is provided for government bodies to operate special projects such as mini and micro hydro power plants which need to ask for permission from local authorities.
- Policy on trading carbon credit through clean development mechanism (CDM) for private sector, resulting in increasing many projects, particularly municipal wastes and biogas projects.

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Adder (Baht/kWh)</th>
<th>Number of Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomass</td>
<td>0.3 (US Cent 0.97)</td>
<td>7</td>
</tr>
<tr>
<td>Biogas</td>
<td>0.3 (US Cent 0.97)</td>
<td>7</td>
</tr>
<tr>
<td>Mini-hydro (50-200KW)</td>
<td>0.4 (US Cent 1.29)</td>
<td>7</td>
</tr>
<tr>
<td>Micro-hydro</td>
<td>0.3 (US Cent 2.58)</td>
<td>7</td>
</tr>
<tr>
<td>Municipal Wastes</td>
<td>2.5 (US Cent 8.06)</td>
<td>7</td>
</tr>
<tr>
<td>Wind</td>
<td>3.50 (US Cent 11.29)</td>
<td>10</td>
</tr>
<tr>
<td>Solar</td>
<td>8.0 (US Cent 25.81)</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 2: “Adder” to the Tariff for SPPs and VSPPs

Table 2 illustrates the adder which is granted to small scale renewable energy power plant, depends on the type of renewable energy consumed.

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Existing 2006 (MW)</th>
<th>Target in 2011 (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar</td>
<td>30</td>
<td>45</td>
</tr>
<tr>
<td>Wind</td>
<td>1</td>
<td>115</td>
</tr>
<tr>
<td>Mini-hydro</td>
<td>44</td>
<td>156</td>
</tr>
<tr>
<td>Biomass</td>
<td>1,977</td>
<td>2,800</td>
</tr>
<tr>
<td>Municipal Wastes</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>Biogas</td>
<td>5</td>
<td>60</td>
</tr>
<tr>
<td>Total</td>
<td>2,061</td>
<td>2,276</td>
</tr>
<tr>
<td>Peak generation of Power</td>
<td>21,064</td>
<td>27,596</td>
</tr>
</tbody>
</table>

Table 3: Target for Power Generated from Renewable Energy During 2006-2011

As shown in table 3, the initial target for various types of renewable energy capacity announced by the government for 2011.

IMPACTS OF REGULATORY CHANGES ON ELECTRICITY SUPPLY INDUSTRY

Regarding regulatory changes, Thailand ESI is investigating support for the development and deployment of new operation and planning methods and technologies. Also the trend of DG technologies has been moving towards connection closer to end-users through the development of generation technologies and control and power electronic equipment. The installation of renewable energy and DG power plants to the network is one flexible alternative when power companies want to strengthen power distribution system in terms of maximizing network capability without expensive network upgrading. Moreover, new connection standards for power industry and new planning techniques are required when the power industry has to take account of widespread use of small scale generation without upgrading existing network. However, generating power from renewable energy and DG power plants connected to distribution power networks has a number of major technical implications, which are being widely investigated and can be divided into four main groups: load flow, voltage control, fault level and security of supply [3-5]. Therefore, there is a requirement to study the impacts of high penetration level in all aspects as might be in place towards in the future to facilitate the development or provide valuable guidance to support the development and deployment of carbon-free technologies in the future.

BENEFITS TO THE IMPLEMENTATION OF DISTRIBUTED GENERATION

- Security of supply: distributed generation can contribute towards the security of supply into two ways: the first way is that through spread over the area and increasing the number of power generation sources, the reliant on the large conventional power plant and facing the black out in the wide area can be avoided by increasing a high number of small generation mix. The second way is through increase the ability of power system in order to maintain the supply in the case of future uncertainty.

- Defer investment in power transmission system: conventional power system is highly centralised, which have to upgrade and expand the existing infrastructure to serve growing load demand but need more investment and time consuming process. DG has the advantages to overcome this issue because it can be located near the load or
support the expansion of transmission assets in the remote area where expansion of transmission assets is a barrier.

- Climate change benefits: reduction in carbon emission is one of benefits from distributed generation. DG technologies fuelled by renewable energy sources can contribute to future reduction in carbon emission than conventional central power plants using fossil fuel.
- Improving financial return: since distributed generation can be located close to load, there is no need constructing transmission and distribution asset for distributed generation to serve load

ARRANGEMENTS TO SUPPORT THE DEVELOPMENT OF DISTRIBUTED GENERATION

The government agency, particularly Energy Policy and Planning Office (EPPO), Ministry of Energy has set a numbers of promotions to support the development of DG in power industry. Thus, PEA has been deploying and employing several tasks in accordance with the policy to facilitate the development and deployment of DG in the system. The tasks being prepared and implemented are as follows:

- Establishing the codes that comprise the code of utilisation of the energy network system facilities, the code of energy network system connection and the code of energy network system operation, in accordance with the Energy Industry Act, B.E. 2550 (2007), allowing other licensees or power system operators utilise or connect to PEA’s power system. In addition, each power utility under the government has created their own the codes to support their customers.
- Deploying and Employing information technology, communication and control technologies, e.g. supervisory control and data acquisition (SCADA) system, Geographic Information System (GIS) and Automatic Meter reading (AMR) to improve operation and planning and services.
- Planning power systems by considering jointly network design and network operation to support the increasing generation penetration level. This will increase the potential of networks to connect DG and harness the benefits without suffering the problems. For example, active network management schemes require a joint planning and operations consideration.
- Operating networks with active network management schemes will enhance the capability of networks to connect higher generation penetration levels, resulting in increasing network utilisation and optimal benefits.
- Utilising new technologies to improve network performance in terms of fault rating such as applying new electronic fault limiter in network will mitigate some negative points of DG connection but at a cost.

CONCLUSION

The alteration of energy source issue and the challenge of global warming require an appropriate regulatory frameworks and technologies. The Thai government has set target for clean power generation by 12% of total generation capacity by 2011. In order to achieve this goal, power industry of Thailand is working towards the development of new and renewable energy resource harnessing, energy efficiency management and intelligent power networks to meet the government’s targets by deploying and employing several tasks to strengthen power systems to support the increasing greener technologies in electricity supply industry.

Acknowledgments

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REFERENCES