3-2022

Legal challenges and opportunities for peer-to-peer electricity trading in Thailand

Piti EIAMCHAMROONLARP
Chulalongkorn University

LEGAL CHALLENGES AND OPPORTUNITIES FOR PEER-TO-PEER ELECTRICITY TRADING IN THAILAND

PITI EIAMCHAMROONLARP*

I. INTRODUCTION

Electricity is a critical resource for a country as it powers devices and enables modern living with digital transactions, crypto mining, deployment of electric vehicles (EV) etc. Given these emerging activities, electricity demand is forecasted to keep rising.[1] The peak electricity load in Thailand for 2018, 29,969 MW, will likely increase to 53,997 MW by 2037.[2] However, Thailand, as a party to the United Nations Framework Convention on Climate Change, must consider negative impacts on the environment from electricity generation. To meet these challenges, renewable resources are needed for cleaner electricity generation and ensuring security of electricity supply, while simultaneously minimizing any adverse impact on the environment.[3]

Empowered by renewable technology,[4] electricity users can consume electricity from the distribution grid and, simultaneously, supply electricity generated from renewable resources to other consumers, thus becoming "prosumers".[5] Prosumers may sell excess electricity via the grid to other electricity users through a digital platform with no intermediary – known as peer-to-peer (P2P) electricity trading.[6] By using information and communication technologies (ICTs) to improve quality of life, a smart city is capable of supporting P2P electricity trading transactions. This paper analyzes electricity licensing systems, together with the third-party access regime under the Energy Industry Act B.E. 2550 (2007) that enable locally generated electricity traded on a P2P basis, as well as the regulation of smart metering services.

II. ELECTRICITY INDUSTRIES AND THE REGULATORY FRAMEWORK IN THAILAND

An adequate, uninterrupted electricity supply provided to flexible smart energy systems lies at the heart of activities powered by electricity.[7] Reflecting a centrally planned economy, the Thai electricity industry is dominated by three state-owned electricity enterprises, namely, the Electricity Generating Authority of Thailand (EGAT),[8]

* Faculty of Law, Chulalongkorn University; Director of the LL.M. (Business Law) International Program.

1 Energy Policy and Planning Office (Thailand), "Power Development Plan (2018 to 2037)", available at http://www.eppo.go.th/images/Infromation_service/public_relations/PDP2018/PDP2018Rev1.pdf (last accessed 22 October 2021), 4.

2 Ibid.

3 Office of Natural Resources and Environmental Policy and Planning (Thailand), "Thailand's Intended Nationally Determined Contribution", available at https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Thailand%20First/Thailand_INDC.pdf (last accessed 22 October 2021).

4 Saulé Milčiuviené et al., "The Role of Renewable Energy Prosumers in Implementing Energy Justice Theory" (2019) 11 Sustainability 5286, 5286-87.

5 Sharon B. Jacobs, "The Energy Prosumer" (2016) 43 Ecology Law Quarterly 519, 521.

6 International Renewable Energy Agency, *Peer-to-Peer Electricity Trading: Innovation Landscape Brief* (IRENA 2020), p. 6.

7 International Energy Agency, *Power systems in transition: Challenges and opportunities ahead for electricity security*, available at https://iea.blob.core.windows.net/assets/cd69028a-da78-4b47-b1bf-7520cdb20d70/Power_systems_in_transition.pdf (last accessed 29 October 2021), 4.

8 Electricity Generating Authority of Thailand Act B.E. 2511 (1968), s. 6.

Metropolitan Electricity Authority (MEA)[9] and Provincial Electricity Authority (PEA).[10] EGAT is government-vested with the authority to generate, acquire, transmit or distribute electrical energy to the MEA, PEA or other electricity authorities.[11] MEA is vested with the authority to distribute electricity supplied to it by EGAT within the Bangkok region.[12]

A. Security of Electricity Supply at the Expense of Others

Absent a retail supplier choice, electricity users in Bangkok mainly consume electricity supplied by MEA through distribution grids owned by MEA. Therefore, newer types of consumers such as crypto mining, as well as electric vehicle charging stations, are powered with MEA-supplied electricity. While enjoying uninterrupted MEA supplied electricity, users in Bangkok inevitably source this electricity at the expense of those living in other parts of the country. In 2021, electricity generated from renewable resources, excluding very small power plants, in EGAT's system only accounted for 17.66% (23,185 MW) of total power.[13] Under such centralized sourcing, it is likely that electricity is consumed by Bangkok residents from coal-fired power plants located in other provinces.

B. Liberalization Transition Under a Single-Buyer Model

The dominant role of EGAT, MEA and PEA does not mean that private operators are prohibited from competing in the electricity industry. If not exempted, private power producers, whether a large-scale operator or Bangkok residents who desire to become prosumers, can obtain electricity generation and supply licenses from the Energy Regulatory Commission (ERC), an independent energy regulator, under the Energy Industry Act B.E. 2550 (2007).[14] Prosumers can apply to sell their self-generated electricity to MEA and PEA in accordance with ERC power purchasing according to ERC rules.[15] Selling self-generated electricity from renewable resources to MEA and PEA is not a P2P transaction since prosumers are required to sell the electricity back to the grids owned by MEA and PEA.

III. Peer-to-Peer Electricity Trading as a Way Forward

P2P electricity trading is the exchange of surplus renewable energy among prosumers and consumers.[16] This contributes to balancing electricity generation and consumption in an area since it allows consumers to purchase electricity generated by prosumers in the same city. Being supplied by electricity that was locally generated, electricity consumers become less dependent on electricity centrally supplied by MEA and PEA.

---

[9] Metropolitan Electricity Authority Act B.E. 2501 (1958), s. 6.
[10] Provincial Electricity Authority Act B.E. 2503 (1960), s. 6.
[11] Electricity Generating Authority of Thailand Act B.E. 2511 (1968), s. 6(1).
[12] Ibid, ss. 6(2) and 8.
[13] Electricity Generating Authority of Thailand, "Electricity Generation Mix", available at https://www.egat.co.th/index.php?option=com_content&view=article&id=2455&Itemid=116 (last accessed 25 October 2021).
[14] Energy Industry Act B.E. 2550 (2007), s. 47.
[15] Energy Policy and Planning Office (Thailand), "Resolution of the Energy Policy and Planning Committee in the Meeting No.3/2006", available at http://www.eppo.go.th/index.php/th/eppo-intranet/item/1741-nepc-thaksin106#s5 (last accessed 29 October 2021).
[16] Jacob G. Monroe et al., "Agent-Based Model of a Blockchain Enabled Peer-to-Peer Energy Market: Application for a Neighborhood Trial in Perth, Australia" (2020) 3 Smart Cities 1072, 1073.

A. P2P Electricity Trading Among Prosumers: Licensable Activities

Despite the existence of the single-buyer model, there is no legal restriction prohibiting prosumers from selling their self-generated electricity to consumers. Legally, they can obtain a right to generate and supply electricity to passive consumers. Prosumers may choose not to sell electricity to MEA or PEA under a long-term power purchase agreement, but directly sell electricity to passive consumers under ERC regulations, such as tariff regulations and safety standards. Private charging station operators in Bangkok may choose to purchase electricity from Bangkok-resident prosumers.

B. Smart Metering Services: Regulating Through Administrative Order

Participating prosumers and consumers are required to communicate with each other for negotiation of energy prices and payments.[17] Smart meters are a step towards smart electrical grids. They are communication devices between consumers and the utility company[18] capable of:

> measuring electricity fed into the grid or electricity consumed from the grid, providing more information than a conventional meter, and that is capable of transmitting and receiving data for information, monitoring and control purposes, using a form of electronic communication.[19]

A smart meter measures energy consumption like a traditional meter, but has communication capability that allows data to be read remotely and displayed on a smart in-home display (IHD), or transmitted securely externally.[20]

Being transactive, a smart meter enables participants to decide whether to participate in the P2P market based on demand and generation data as well as the information available about market conditions.[21] Smart meters can be programmed to only charge an EV from P2P prosumer-generated electricity.[22] Such meters can provide the consumer with information on availability of electricity generated from renewable resources.[23] A smart meter enables a consumer to choose to purchase electricity during low-cost periods.[24] During high tariff peak load hours, locally generated electricity from renewable resources can be purchased to save cost.

An electricity distribution system operator (DSO) and an electricity supplier can provide smart metering services. Electricity suppliers can be responsible for installing

---

[17] Manish Kumar Thukral, "Emergence of blockchain-technology application in peer-to-peer electrical-energy trading: a review" (2021) 5 Clean Energy 104, 116.

[18] Joseph Lee and Vere Marie Khan, "Blockchain and Smart Contract for Peer-to-Peer Energy Trading Platform: Legal Obstacles and Regulatory Solutions" (2020) 19 UIC Review of Intellectual Property 285, 286-87; P. Vijayapriya et al., "Smart Tariff for Smart Meters in Smart Grid" (2010) 2 International Journal of Engineering and Technology 310, 311.

[19] Commission Directive (EU) 2019/944 (OJ 2019 L 158 p.25), art. 2(23).

[20] Office of Gas and Electricity Markets, "Smart metering - what it means for Britain's homes", available at https://www.ofgem.gov.uk/sites/default/files/docs/2011/03/consumersmartmeteringfs_0.pdf (last accessed 6 November 2021).

[21] Wayes Tushar et al., "Peer-to-Peer Trading in Electricity Networks: An Overview", available at: https://arxiv.org/pdf/2001.06882.pdf (last accessed 6 November 2021), 3.

[22] Ruud Kempener et al., "Smart Grids and Renewables: A Guide for Effective Deployment", available at https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2013/smart_grids.pdf?la=en&hash=08F3E571B5580F017E70BCD1EC39864536681ADB (last accessed 6 November 2021), 16.

[23] Ibid.

[24] Electricity Authority (Te Mana Hiko), "What are smart meters?", available at https://www.ea.govt.nz/consumers/what-are-electricity-meters/ (last accessed 6 November 2021).

smart meters for consumers.[25] Moreover, a DSO can own and operate smart metering systems.[26] In the Bangkok region, MEA and private operators can apply for an electricity distribution license or an electricity supply license to provide consumers with smart metering services under section 47 of the Energy Industry Act B.E. 2550 (2007).

C. Connecting to the Grid: Third Party Access

Electricity generated by prosumers must be transported to electricity users. Reflecting a physical layer of P2P electricity trading, prosumers have a right of access to existing distribution grids owned by other grid owners such as MEA in Bangkok, without needing to construct their own electricity grid. For example, prosumers may sell their self-generated electricity to charging station operators by relying on MEA's distribution grid. In exchange, MEA can collect connection charges, wheeling charges and related service fees.

Under the Energy Industry Act B.E. 2550 (2007), licensed electricity operators who own an electricity grid such as EGAT, MEA, and PEA must allow other licensees to use its electrical grid. Therefore, a small power producer's right to use electricity grids owned by state-owned enterprises is clearly guaranteed by the Energy Industry Act B.E. 2550 (2007). Electricity suppliers, such as charging station operators, can choose to purchase electricity generated from renewable resources by prosumers in Bangkok and, simultaneously, avoid purchasing centrally supplied electricity from EGAT.

IV. Overcoming Potential Regulatory Challenges

In only permitting smart meter services, the current electricity regulatory regime still lacks the ability to promote installation of smart meters as well as to regulate service quality. In addition, recognition of the third-party access without a contractual arrangement for wheeling service and suitable tariff regulation is unlikely to practically attract users to participate in P2P electricity trading.

A. Broadening the Scope of Regulation for Smart Metering Services

To facilitate deployment of smart metering in practice,[27] the ERC, by adopting the UK Office of Gas and Electricity Markets' (Ofgem) approach, could exercise its regulatory power through the licensing system by additionally requiring a supplier or DSO to take all reasonable steps to install a smart meter for all their domestic and small business customers. This requirement can be incorporated into a distribution system license or a supply license, as an additional condition of an administrative order.[28]

The ERC can ensure the quality of smart metering services by including an additional service quality requirement in an issued electricity license.[29] For example, these requirements can set minimum standards that the supplier or the DSO agrees to

[25] Office of Gas and Electricity Markets, "Supply licence guide: Smart metering", 3.
[26] Alessandro Pitì et al., "The Role of Smart Meters in Enabling Real-Time Energy Services for Households: The Italian Case" (2017) 10 Energies 199, 199.
[27] Office of Gas and Electricity Markets, "Supply licence guide: Smart metering".
[28] Administrative Procedure Act B.E. 2539 (1996), s. 39, para. 2(4).
[29] Regulation of Energy Regulatory Commission Regarding Energy License Issuance B.E. 2551 (2008), cl. 13.

follow when they are installing customer smart meters.[30] These requirements are referred to by Ofgem as the Smart Meter Installation Code of Practice.[31]

A smart meter must be able to link smart meters in homes and small businesses with energy suppliers and network operators.[32] Clearly there must be an operator that is responsible for establishing and managing the smart metering data and communications infrastructure.[33] Taking Ofgem's approach into account, the ERC may exercise its regulatory power under Section 47 of the Energy Industry Act B.E. 2550 (2007) to establish a smart meter communication license.[34]

B. Developing Details on Wheeling Service and Tariffs

The electricity grid owner must allow others to use its grid on a non-discriminatory basis; however, simultaneously, there must be an arrangement detailing rights and duties between the grid owner and the grid user. Prosumers need to know what they undertake to perform while using the grid for P2P electricity trading. On the other hand, the grid owner, such as MEA, will need to know what charges it can collect from the grid prosumers. These rights and duties can be reflected in a wheeling service agreement. To ensure its fairness, the ERC may exercise its power to notify a standard form of wheeling service agreement as a kind of energy service agreement.[35]

The grid owner is allowed to collect related service fees, for example, connection charges, wheeling charges, imbalance charges and ancillary service charges. These charges cannot be freely established by the grid owner but are subject to the ERC's determination.[36] The grid owner must submit the proposed service tariffs for the ERC's approval.[37] In approving the proposed wheeling tariff, the ERC must take into account several factors including the actual cost and the appropriate return on investment for the grid owner.[38]

V. CONCLUSION

Electricity supplied on a P2P basis will allow electricity consumers to consume electricity that is locally generated, thus minimizing the negative environmental impact caused by electricity generation in other parts of the country. Prosumers selling self-generated electricity on a P2P basis can obtain relevant electricity licenses from the ERC. The transportation of electricity can be supported by the third-party access regime. Smart meters serve as a crucial element enabling effective communication between the buyer and the seller. These devices provide consumers with a signal to facilitate a decision to consume less electricity or be informed about the availability of locally generated electricity.

---

[30] Bulb, "Smart Meter Installation Code of Practice", available at https://help.bulb.co.uk/hc/en-us/articles/360031031831-Smart-Meter-Installation-Code-of-Practice (last accessed 7 November 2021).

[31] Office of Gas and Electricity Markets, "Smart meter transition and the Data Communications Company (DCC)", available at https://www.ofgem.gov.uk/cy/energy-policy-and-regulation/policy-and-regulatory-programmes/smart-meter-transition-and-data-communications-company-dcc (last accessed 7 November 2021).

[32] Ibid.

[33] Data Communications Company, "The Smart DCC license", available at https://www.smartdcc.co.uk/about-dcc/governance-regulations/smart-dcc-licence-regulation/ (last accessed 26 October 2021).

[34] Smart Meter Communication License (granted pursuant to the Gas Act 1986 (UK), ss. 7AB(2) and (4) and the Electricity Act 1989 (UK), ss. 6(1A) and (1C)).

[35] Energy Industry Act B.E. 2550 (2007), s. 91.

[36] Ibid, s. 66, para. 1.

[37] Ibid, s. 67.

[38] Ibid, s. 65(1).

This paper has analyzed the prosumers' right to generate and supply self-generated electricity to neighbors or small business operators by obtaining a relevant electricity license from the ERC. Their right to use electricity grids to transport electricity is guaranteed by a third-party access regime. A DSO and supplier can provide smart metering services through additional requirements in electricity licenses.

However, the ERC is recommended to exercise its regulatory power under the Energy Industry Act B.E. 2550 (2007) together with the Administrative Procedure Act B.E. 2539 (1996) to include additional requirements imposing minimum standards for smart meter installation. A new type of electricity license such as a smart meter communication license should be incorporated into the licensing regime. As regards the third-party access regime, the ERC can announce a standard form of wheeling service agreement to facilitate P2P electricity trading. The ERC is responsible for ensuring the reasonableness of the wheeling service tariff to be charged by the grid owner.