

The Restructuring of the US Electricity Market: An Overview and Lessons for Singapore

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SYNOPSIS

A reliable and secure electricity supply is critical to economic development. Since 2018, Singapore has begun to restructure its electricity market by opening up the generation and retail markets to commercial players and by allowing end users to switch retailers. A successful restructuring requires good institutional design and sufficient legislation and rulemaking. This policy brief provides an overview of the restructuring of the US electricity market and seeks to inform Singapore's ongoing restructuring.

KEY POINTS

- The restructuring of Singapore's electricity market involves unbundling the generation and procurement. This is similar to the restructuring of the US electricity market.
- Since the 1880s, the US electricity sector has experienced five major stages of development, including two waves of restructuring.
- New incentives are needed to encourage more commercial players to participate in efficient and sustainable electricity generation in Singapore.
- The restructuring of the electricity sector in Singapore requires legislation and rulemaking to incentivise and ensure adequate participation of new market actors.
- Consumer education, information disclosure and the involvement of independent organisations are important.

INTRODUCTION

A reliable and secure electricity supply is critical to Singapore's social and economic development. In Singapore, there have been two major industrial organisations in the electricity market: the Energy Market Authority (EMA) is the regulator that monitors and ensures the security of the electricity generation and transmission system, while SP Group operates both the transmission network and distribution network. To promote effective competition, Singapore's electricity market is being progressively reformed.

The most profound reform in recent years is the Open Electricity Market initiative, which has been progressively rolled out to all consumers in Singapore since 1 April 2018. Under this initiative, both households and business end users can have more choice and

flexibility by switching to a different retailer instead of the SP Group. This reform is still ongoing and its impact on Singapore's electricity market are of great interest to policymakers, as it can affect the reliability of electricity supply.

There are some lessons regarding the reform of the electricity market that Singapore can draw from other countries. For example, the history of the US electricity industry since the 1880s provides several lessons. This sector experienced five major stages of development, including two waves of restructuring. Through a series of legal changes and rulemaking, the US electricity industry transformed from a series of vertically integrated utilities with monopoly rights over large service territories to several organised markets with diverse participants.

Deregulation Versus Restructuring

For a long time, the US electricity sector has been considered as a natural monopoly. The subsequent development of the electricity market resulted in many interactions between governments and utilities. The aim was to ensure sufficient competition among electricity producers and to achieve reasonable prices for the end users. A number of newspaper articles and reports described this process of replacement of natural monopolies as deregulation or liberalisation. However, this description is not precise, as the US electricity market is, to this day, still regulated by the Federal Energy Regulatory Commission (FERC) at the federal level, while the public utilities commissions (PUCs) in each state still regulate the distribution companies.

A more appropriate term describing such interactions is “restructuring”, with legal changes that allow: (1) non-utility generators to sell electricity to utilities; and (2) retail service providers to buy electricity from generators and sell to end users. In the US, the government owns a small share of the electricity generation industry, for example, federal power agencies or municipal companies. However, the restructuring did not involve the privatisation of government owned assets.

Five Stages in the US Electricity Market

The history of the US electricity industry comprises five key stages.

First Stage (1882–1910): Ruinous Competition

In 1882, the Pearl Street Power Station opened in New York. Since then, many central power stations and companies—such as GE and Westinghouse—were established. The most notable feature of this period is the fierce competition between companies. There were also overlapping distribution lines and as a result, the efficiency of the electricity industry was low.

Second Stage (1910–1970): Golden Era of the Natural Monopoly Consensus

During this period, the most important feature is that utilities were granted monopoly rights over a geographical area. Most end users were served by monopolists, vertically-integrated utilities that operated electricity generation, transmission, distribution and billing. Prices

were fixed by regulators to cover generation costs and enable a reasonable profit.

A major legislation is the Public Utility Holding Company Act of 1935 (PUHCA), also known as the Wheeler-Rayburn Act. This was enacted in response to the Wall Street Crash of 1929 and the Great Depression. As the corporate structures of investor-owned utilities (IOUs) became highly leveraged and complex, PUHCA limited IOUs’ operating to a single state under state regulation, or forced IOUs to divest so that each IOU became a single integrated system serving a limited geographical area. Another remarkable technological change during this period is the introduction of nuclear power. The first commercial nuclear power plant came on-line in 1957 in Shippingport, Pennsylvania promising to significantly lower the cost of electricity generation.

Third Stage (1970–1996): First Wave of Restructuring

The major legislation during this period is the Public Utility Regulatory Policies Act of 1978 (PURPA), which was passed by the US Congress as part of the National Energy Act in response to the oil crisis. The purpose of PURPA is to promote greater use of domestic renewable energy. The key feature of the restructuring is that it allows non-utilities to generate electricity for consumption by utility users, effectively removing vertically integrated utilities from their role as only sources of electricity for their costumers. Under PURPA, regulated and natural monopoly utilities were forced to buy power from other more efficient producers, if that cost was smaller than the utility’s own “avoided cost”. Such a cost is the additional cost that the utility would incur if it generated (or purchased) the required power. PURPA actually created a market for merchant generators (called as “IPPs”). It also promoted renewable energy by exempting projects from State and Federal regulations. In addition, the Energy Policy Act of 1992 enabled wholesale trading (electricity trading as a commodity). This allowed IPPs without long-term contracts to sell power to utilities at market price.

Fourth Stage (1997–2001): Restructuring

The goal of restructuring during this period was to lower electricity prices to end users.

This involved both displacing the vertically integrated utility as the only supplier of wholesale and retail electricity. During this period, the industry was subject to a profound restructuring process that change the operation and rules of generation, transmission and retailing. Since the beginning of this period, in the states with organised whole-sale markets, generators compete among each other to have the lowest costs to attract retailers, and all generators are free to enter and participate in the electricity market.

Regarding transmission, at the beginning of the restructuring process, investor owned utilities (IOU) or public utility entities had to provide non-discriminatory access to their transmission system and post data on transmission availability. This was regulated by the FERC Orders 888 and 889, which were released in 1996. Later, the transmission networks were controlled by independent entities, i.e., the Regional Transmission Organizations (RTOs). This was regulated by the FERC Order 2000, released on December 20, 1999. As a result, retailers competed for consumers with lower prices and innovative services, which included different pricing schemes and clean energy. This process of restructuring led to great changes to the electricity market, although the magnitude of the changes differed across states. One of the most notable changes is the divestment of assets from IOUs that previously owned generation, transmission and distribution assets. During the restructuring, IOUs were forced to sell their power generation plants—and give up control of their transmission networks. They still owned and operated distribution networks under regulation of PUCs but in states with retail competition, had to allow consumers to switch to different retailers. The switching is not compulsory and IOUs were the default providers.

Fifth Stage (2002–Present): No More Radical Restructuring

In this current period, there is no more radical restructuring. The US electricity market now consists of diversified participants. Table 1 shows the type of ownership, the major participants in generation, transmission and distribution.

Table 1. Participants in Generation, Transmission and Distribution

Participant	Description
Investor-owned utilities (IOUs)	Most are vertically-integrated utilities; Many do not own generation anymore; Do not own transmission; Still own distribution.
Public Power Systems	Publicly owned and regulated at municipal and state levels; Many are distribution only.
Federal Power Systems	Can own and control transmission to wholesale and directly serve customers.
Electric cooperatives	Privately owned and controlled; Non-profit; Most are net power buyers
Wholesale non-utility affiliates of regulated utilities	Can sell energy or delivery but not both.
Merchant generators (IPPs)	Can sell power to utilities at market price
Power marketers	Buy and sell power but do not own generation, transmission or distribution facilities
PURPA qualifying facilities	Under the Public Utility Regulatory Policies Act of 1978 (PURPA); Can be small power production facilities or cogeneration facilities.
<i>Source: Authors' own elaboration.</i>	

Lessons for Singapore

The US experience in electricity market restructuring provide useful insights for Singapore, in which a similar restructuring process is ongoing. Prior to the Open Electricity Market initiative, commercial firms in Singapore were already allowed to participate in the generation, displacing utilities' generation function. This happened in the first wave of the US electricity market restructuring (the third stage). Unlike the US restructuring, however, the current policy

does not enforce the electricity purchase from those producers that are more efficient. Also, the first wave of the US restructuring specifically encouraged generation from renewable sources. In Singapore, natural gas is the dominating source in generation at about 95 per cent. The share of electricity from renewables, especially that generated by commercial players, is still limited. The policy should provide commercial players new incentives to participate in generation. More, importantly, such a policy should be directed towards renewables (e.g., solar energy) and efficient generation technologies.

Singapore's ongoing reform is more concentrated in displacing the utilities' procurement function, which is, to some extent, similar to the US electricity market restructuring during 1997 – 2001 (the fourth stage). Singapore's electricity market currently has two major industrial organisations, the EMA and the SP group. Through the restructuring, there may be new market participants (e.g. power marketers). Legislation and rule-making are necessary to regulate all new market participants. Policymakers should be also aware of potential conflicts of interests between market participants. In addition, consumer education regarding the restructuring is important. Through information outreach, the public could be well informed regarding the restructuring purposes, agenda and legislation. Such a transition should avoid being too complicated for the public to understand; a lesson from the US case.

In both types of restructuring, policymakers should encourage and promote information disclosure and the involvement of independent third-party organisations. The standards for data reporting, accounting and data sharing regarding market operation and performance should be enhanced and harmonised. In Singapore, independent and professional organisations can play a crucial role in standard harmonisation and market surveillance. Performance and evaluation of the restructuring should be rigorously institutionalised to inform policymakers.

CONCLUSION

This policy brief reviews the historical development of the US electricity industry by

describing five major stages. Since the 1880s, there have been two stages of restructuring, in which the electricity industry was transformed from a natural monopoly to a market with diversified participants. Through profound restructuring, the US electricity sector achieved competition, efficiency, reliability and to become a more sustainable model.

WHAT TO LOOK OUT FOR

- New incentives to encourage more commercial firms to participate in the generation; this is more efficient and sustainable.
- New rulemaking to regulate new market participants.
- New institutions to support market surveillance and evaluation.

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