

Corporatization of singapore electricity industry economics essay



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The corporatization of Singapore Electricity Industry initiated from 1995 and it is gradually transferred into one of the world's most liberalized electricity markets. This paper analyzes the key government policies implemented during the corporatization reform process as well as the rationale behind those policies. At the same time, positive and negative impacts of these policies are evaluated and discussed. Final part discusses the challenges facing the electricity industry in the future and Singapore government plans to ensure sustainable economic development and enhance its national energy security.

History & Background

The global energy market has been drastically altered in past decades. The demand of the energy has increased rapidly particularly in Asia due to fast growth of large developing countries, like China. More importantly, oil price fluctuated radically due to financial crisis and unsettled world pattern.

Singapore as a small and resource-scarce country will remain as the price taker of the world's oil market which leaves the country's electricity price at a risk of volatility. What can Singapore do to maintain the electricity price at a relatively stable level? Will the corporatization of the industry successfully lower the price or leave the electricity supply of the country vulnerable?

Source: Singapore National Energy Report

Before 1990s, Public Utility Board (PUB) was the only provider of electricity of the country. In order to increase the efficiency in all electricity segments (generation, transmission and distribution), Singapore government decided to corporatize the industry. Initial reform started in 1995 when Singapore

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Power was established as a vertically integrated power company running all the business regarding electricity and PUB played the role of industry regulator. However, efficient allocation was not clearly revealed after this primary reform due to the monopoly position of Singapore Power Company. As a result, government further deregulated the market by introducing market competition into the competitive (power generation and retail) segments of the industry. Market competition drives all companies to seek optimal resource allocation and advanced technology to lower the cost and therefore stay competitive in the market. And Consumers can enjoy the advantage of affordable electricity price. Until Oct 2010, there are eleven power generator companies (gencos) and six retail companies in the market. [1]The following chart shows a basic time table of the reform.

Graph 1. 2 Time table of the Singapore electricity corporatization reform

Before 1990

Public Utility Board is the only provider of the electricity in Singapore.

1995

Initial corporatization of the PUB started and Singapore Power was established.

2000

Government further deregulated the market by separating Singapore Power into competitive and natural monopoly segments.

2003

Commencement of the National Electricity Market of Singapore and Retail Market with 5 power generation and 5 retail companies.

Oct 2010

There are 11 gencos and 6 retail companies in the market.

Policies implemented and the rationale behind the policies

2. 1 Structure separation and targeted policies

The key of the corporatization reform is to introduce free market competition. However, due to the natural monopoly character of the grid, the government separated Singapore Power into competitive parts and natural monopoly parts. From Singapore Power perspective, this separation put an end to the company's vertical integration from generation, distribution to retail sections and thus effectively takes away the company's monopoly power. On the other hand, government can set more targeted regulations upon different sections to ensure the smoothness of the reform.

Graph 2. 1 The structure of Singapore Power before and after structure separation

Resource: Deregulation of electricity and gas industries (LKY courses)

The wholesale and retail electricity markets are partially open to the market competition. In the wholesale market, government issued power generation licenses to five power gencos. Three largest gencos, Power Seraya, Senoko

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Power and Tuas Power takes 90% of the country's total consumption. (in 2003) To ensure the gencos competitiveness and avoid cartel, all gencos are required to produce 65% of power in the government contract at stipulated price which equals to the long-run marginal cost (LRMC) of the generation. The long-run marginal cost (LRMC) is determined from EMA by outside consultant and the cost includes cost of asset, running cost and financial cost.[2] This contract serves as an insurance of basic electricity supply to Singapore and can avoid volatility of the electricity price. Other than the quantity regulated in the contract, companies are competing with each other by selling electricity to Singapore Power and strive for reasonable profit returns.. Companies bid the price every half an hour and the lowest price wins the bid.

On the other hand, in the retail market, government gradually opened up the market in three phases. From Jun 2003, consumers with monthly consumption over 20, 000 kWh are put into contestable section and the six months later, the consumption level decreased to 10, 000 kWh. Till now, consumers account for 75% of the total demand, mainly are industrial and commercial users, are open for the retail companies' to compete with different service package and market price. While the rest 25% of the consumers, compromised by 1. 2 million domestic small and non-domestic households are in the non-contestable market managed by SP Service Ltd. The electricity price in non-contestable market is regulated by the EMA and usually around 20-25 cents/kWh.[3] Why not open up the small household market to the retail companies? One main reason is economies of scale. The cost of the implementing retail competition is higher than the benefit gained.

In the natural monopoly grid part, the critical point is to set fair play rules and avoid market failure. Hence electricity grid is directly managed by state-owned SP Power Grid. Here government intervention can avoid market failure like repeated construction and waste of resources. At the same time, to create a level market, EMA regulates SP Power Grid to provide equal service of using the infrastructure to all the gencos in the market.

Graph 2. 2 Deregulation of wholesale market and retail market in 2003

Resource: Deregulation of electricity and gas industries (LKY courses)

2. 2 Policy consistency and government transparency

As the structure separation plays the key role of the corporatization reform, policy consistency and government transparency gives confidence to all investors in the market. To avoid uncertainty of the market condition and unnecessary shift of the policies and regulations, regulator of the industry, Energy Market Authority (EMA), set up an independent Rules Change Panel. The panel is designed to evaluate every new policy as well as policy amendment. It reviews and evaluates all the cost and benefits of proposed policy changes and ensures that policy amendment is made with thorough discussion and consideration. Government transparency is another advantage of Singapore. The government is famous for its transparency and amazingly low corruption rate which makes Singapore one of the most desirable places for investment.

2. 3 Long waited gencos sales

Among all the gencos, three national-owned principle gencos, Power Seraya, Senoko Power and Tuas Power takes up 80% of the market (in 2007). The government plan of divesting them by sales or IPO was suspended in 2002 due to unfavorable economic environment. With these three oligopolies in the market place, optimal efficient resource allocation could not be attained. In 2007, Singapore investment company Temasek restarted its plan to sell three gencos. The first gencos sold is Tuas Power at a price of S\$4. 2 billion to China's Huaneng Group in Mar 2008.[4]Second gencos Senoko Power was sold to Lion Power Holdings, a consortium led by Japan's Marubeni Corporation for S\$3. 65 billion in Sep 2008.[5]And the last company, Power-seraya was sold to Malaysia's YTL Power International for S\$3. 8 billion at the end of that year.[6]After divesting the main gencos to different country's investors, domestic electricity market can be more competitive.

Apart from selling the state-owned gencos, Singapore government issued more operation licenses to gencos and retail companies into the market. Sufficient number of competitors promotes proper function of invisible hand. Till now, there are total 11 gencos (Power Seraya Ltd, SembCorp Cogen Pte Ltd, Island Power Company Pte Ltd, Keppel Merlimau Cogen Pte Ltd, National Environment Agency, Tuas Power Generation Pte Ltd, Shell Eastern Petroleum Pte Ltd, Senoko Waste-To-Energy Pte Ltd, Senoko Energy Pte Ltd, ExxonMobil Asia Pacific Pte Ltd, Keppel Seghers and Tuas Waste-to-Energy Plant Pte Ltd) and 6 retail companies (Keppel Electric Pte Ltd, SembCorp Power Pte Ltd, Tuas Power Supply Pte Ltd, Senoko Energy Supply Pte Ltd, Seraya Energy Pte Ltd and Island Power Supply Pte Ltd) in the wholesale and retail markets.[7]Driven by competitive market, it is ideal to have those

companies reach zero economic profit condition and thus benefit all the consumers.

Positive & negative effects analysis

To ensure sustainable economic development, the primary objective is to provide reliable and affordable electricity supply. Corporatization of the industry is also aiming at this objective. However, every change leads to both desirable outcome and side effect. Here we are going to analyze the positive & negative effects of the reform.

3. 1 Positive: cushion effects

The most significant benefit of the corporatization reform is the market competition cushioned the domestic electricity price from the drastic fluctuation of the world oil price. The following graph shows the international petroleum price and the domestic electricity tariff price in the last 10-year time. As it is shown in the graph, the highest price of the world petroleum is 417% greater than the lowest price while the highest domestic electricity price is only 93% greater.

Graph 3. 2 World oil price and Singapore electricity tariff from 2001~2010

Resource: Singapore Power Service, www.spservice.com.sg

3. 2 Positive: advanced technology increased energy efficiency rate

Secondly, separating one competition power generation market and one retail market from vertically integrated Singapore Power Company not only

increases efficient allocation of the resources, but also stimulates the power generation companies seeking advanced technology to lower the cost. From year 2000 to 2006, the energy production efficiency rate raised from 38% to 44%.[8]Increased efficiency rate decreased power generation cost and carbon footprint.

3. 3 Positive: High oil price driven the allocation of power resources

In order to provide competitive electricity price, market competition driven the power generation plants switch from oil-fired steam type to gas-fired combine cycle gas turbines due to the uncertainty of oil price. Gas-fired plants are more environmental friendly than oil-fired steam ones since they can reduce the air-pollution and lower carbon emission of the country. The following histogram shows the allocation of the energy resources of power plant in 2005 and 2009. The gas increased from 26% to 81% in 8 years.

Graph 3. 3 Composition of Singapore electricity resources from 2006 and 2009

Resource: Deregulation of electricity and gas industries (LKY courses)

3. 4 Negative: the absolute electricity price is still high in Asia

Despite all the benefits Singapore gained from the corporatization, the industry can further improve in certain areas.

Currently, the electricity price is determined by the market supply and demand. Market competition cushioned the price from world's petroleum rate. However, absolute electricity tariff of Singapore is still on the top of the

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Asia region. High electricity price imposes negative effects on economic competitiveness of the domestic market and attraction to foreign investment. The following graph shows the basic electricity tariff for the small household of countries and regions of the neighboring countries and regions. Singapore's electricity rate is almost twice as much as its neighbors.

Graph 3. 4 Basic electricity tariffs of Asia countries and regions

Country & Region

Electricity price for small household (S\$/kWh)

China

0. 12 SGD

Malaysia

0. 09 SGD

Indonesia

0. 12 SGD

Hong Kong

0. 14 SGD

Taiwan

0. 1 SGD

Singapore

0. 23 SGD

Resource: China Gird, Tai Power Co., Ltd., HK Electric Holdings Ltd., ASEAN Centre for Energy

3. 5 Negative: un-diversified energy resource

Another concern is on nation's energy security since Singapore power is heavily dependent on gas. As we can see from graph 3. 3, more than 80% of the power generation relies on natural gas which leaves the country vulnerable to the international gas price and supplies. Currently, Singapore imports most of the liquefied natural gas from Indonesia and Malaysia through pipelines. Recently, Indonesia faced increasing domestic demand of natural gas and is now considering cut down the export to Singapore.[9]To lower the risk the un-diversified energy resource, Singapore government has worked on building liquefied natural gas (LNG) terminal as well as renewable energy resources. This will be further discussed in the next part.

4. Future challenges and targeted policies

Several major challenges lie in front of the electricity industry. First and foremost, ever increasing world energy demand and unstable energy prices will still be the main concern of the problem. Secondly, how to diversify the energy resources and protect the national energy security strategy is another problem. Thirdly, Singapore government needs to find a balanced electricity price between ' pursuit the aspiration to be the global city in Asia'

and reminding residents to consume electricity with cautious. With all the challenges ahead, the following policies are currently studied and discussed.

4. 1 Intelligent Energy System

Considering the cost & benefit model, non-constable small household consumers has not yet opened to the market competition. But this doesn't mean that the part can't be further liberalized. The third stage of corporatize the electricity retail market is focusing on the rest 25% of the small households. A system called Intelligent Energy System (IES) is now under testing procedure. This system integrated smart meter technology with e-payment. By using the system, small household can easily purchase electricity from retailers at various points-of-sale and encourage consumers to shift the electricity consumption from higher price period to lower price period to reduce to total cost.

4. 2 Liquefied natural gas (LNG) terminal

To enhance the energy security, Singapore government supported the infrastructure construction of liquefied natural gas (LNG) terminal. LNG terminal enables all gencos to buy natural gas from different sources and thus diversify the supply of the energy resource. And due limited land reserve, Singapore could not afford to build several small LNG terminals but only a large LNG terminal. In this case, government intervention plays the key role given that it was difficult for private sector to raise such large sum of fund and too risky to invest heavily on infrastructure building.

Consequently, Singapore government takes over the LNG terminal project and it will be finished in 2013.

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4. 3 Renewable energy resources and nuclear resource

Renewable energy technology is another solution to diversify energy resource. Renewable energy resources like solar and biomass need the support from the government on research & development as well as the infrastructure investment. Although it can't replace the gas-fired generation in a short period of time, it serves as an alternative to the problem and benefits environment sustainability.

Another solution which Singapore government presently takes into consideration is to adopt nuclear power plant. The main concern to nuclear energy is the safety issue, particularly given the consideration of high urban density and small country size. Nuclear fuel and waste disposal is another tricky problem to solve. Nevertheless, with the rapid development of the nuclear technology and the increasing safety level, nuclear plant alternative cannot be ignored from the future development list.

4. 4 Determine an appropriate electricity price

One reason for the high electricity price is that Singapore government does not subsidize the electricity and the purpose is to let Singaporeans consume electricity with cautious. Moreover, unevenly distributed subsidy or incentives on certain advanced technology may lead to unfair competition and thus resulting in sub-optimal resource allocation.

When pricing the electricity, negative externalities such as environment sustainability and energy security should be taken into consideration. The study of pricing scheme will enable the country adjust to the rising energy

price and carbon constraining regulation. Such pricing scheme should be carefully calculated and gradually implemented.

5. Conclusion

Singapore's long-term energy objective is economic competitiveness, energy security and environmental sustainability. To achieve the goal, the government adopted serious of policies to corporatize the electricity industries. Structure separation is most critical part to the success of the whole reform. By separating the industry into competitive market and natural monopoly grid, government can set targeted policies to both segments. Consistent policy and transparent government approach gives the investor confidence to the market. And the sales of three principle state-owned gencos freed the market from oligopoly and encouraged free market competition.

Positive effects of the reform includes: it cushioned domestic electricity price from world oil price; it increased power generation efficiency rate by adopting advanced technology and it shifted energy resource from oil to natural gas. However, negative effects are also revealed: the absolute electricity price is still among the top of Asia and the un-diversified energy resource leaves the country vulnerable to changes in gas price and supplies.

Finally, in response to the future challenges, Singapore government is studying the following policies. First, Intelligent Energy System will to be introduced to open up the remaining 25% of the non-contestable small households to the competitive market. Second, LNG terminal is built to enhance national energy security. Thirdly, renewable resources and nuclear

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power are considered to diversify the energy resources composition. Lastly, negative externalities and country's competitiveness will be taken into consideration to determine appropriate electricity price in the future.