Singapore’s Electricity Industry: Liberalisation and Features

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Business Development
Contents

• Market Reform Milestones
• Features of the National Electricity Market of Singapore (NEMS)
• Tracking EMC’s Performance
• EMC’s Dashboard
• EMC’s Recent Projects and Services
Impetus for Reform

• Electricity market reform is seen as a way of:
  o Increasing economic efficiency through competition
  o Increasing efficiency of government assets
  o Attracting private investment
  o Sending accurate price signals
  o Encouraging innovation
  o Providing consumer choice

• The electricity market has a significant impact on the competitiveness of a country’s economy
Stages of Industry Reform

Single Buyer - Monopsony

- Generation
- System Operator, Transmission and Distribution
- Retail
- Consumers

- Competitive
- Regulated Monopoly
- Regulated Monopoly
- No retail choice
Stages of Industry Reform

Wholesale Competition

- Generation
- System Operator, Transmission and Distribution

Retail

- Large Consumers
  - Retail choice
- Competitive
  - Small Consumers
  - Tariff

Regulated Monopoly

Competitive
Stages of Industry Reform

Full Retail Competition

Generation

System Operator, Transmission and Distribution

Retail

All Consumers

Competitive

Regulated Monopoly

Competitive

Retail choice
Singapore’s Market Reform Milestones

May 1963
Formation of Public Utilities Board
• Supplies water/electricity/gas to Singapore

Oct 1995
Corporatisation of electricity/gas

Apr 1998
Formation of Singapore Electricity Pool (SEP)

Mar 2000
Decision to deregulate further

Apr 2001
Further restructuring
• PUB restructured as water authority under ENV
• EMA to regulate electricity and gas industries
• PSO to take over system operations
• EMC formed to operate and administer wholesale electricity market

Holding Company (Singapore Power) owning:
• 2 gencos (Power Senoko, Power Seraya)
• 1 T&D company (PowerGrid)
• 1 electricity retail company (Power Supply)
• 1 gas supply company (PowerGas)

Temasek Holdings owning 3rd genco (Tuas Power)
### Singapore’s Market Reform Milestones

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Details</th>
</tr>
</thead>
</table>
| Jan 2003   | Commencement of NEMS                                                                           | - Real-time wholesale market for electricity  
- Phased contestability of consumers                                                     |
| Jan 2004   | • Implementation of Vesting Contracts  
• Implementation of Interruptible Load                                                             |                                                                                             |
| 2008       | **Sale of Gencos**                                                                             |                                                                                             |
| May 2013   | **LNG terminal began operation**                                                                |                                                                                             |
| Apr 2016   | Implementation of Demand Response Programme                                                      |                                                                                             |
| Oct 2014   | **Launch of Electricity Futures Market**                                                       | - USEP Quarterly Base Load futures                                                          |
| H2 2018    | Full Retail Competition                                                                        |                                                                                             |

- **Mar** - Tuas sold to Huaneng Group  
- **Oct** - Senoko Power sold to Lion Power  
- **Dec** - Power Seraya sold to YTL Power
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Features of NEMS

Mandatory real-time gross pool-based model

- **Spot market** for 5 products - energy, 3 types of reserves and regulation
- **30-minute trading periods** with 65-minute gate closure
- Market settled daily (20 days in arrears)
Features of NEMS

Dispatch

• Security-constrained least-cost dispatch

• Co-optimisation of energy, reserves and regulation, modeling of network and power flows

Pricing

• Ex-ante (prices determined before each period), locational marginal pricing

• Generators paid their locational nodal prices

• Loads charged at system weighted average price (i.e. Uniform Singapore Energy Price (USEP))
Features of NEMS

Market structure

• High degree of vertical integration in generation and retail, concentration in generation has fallen over the years

• Vesting contracts in place to mitigate market power
After correcting for movements in fuel price (HSFO), Singapore’s electricity price (USEP) decreased over the years as electricity market competition intensifies and efficiency improves.
Consumers

- Contestable consumers – buy from retailers / Market Support Services Licensee (MSSL) / Singapore Wholesale Electricity Market
- Non-contestable consumers – buy from MSSL at a regulated electricity tariff
### Generation Installed Capacity (Year 2016)

<table>
<thead>
<tr>
<th>Generation Company</th>
<th>Registered capacity (MW)</th>
<th>Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senoko Energy</td>
<td>3,300</td>
<td>25%</td>
</tr>
<tr>
<td>YTL PowerSeraya</td>
<td>3,100</td>
<td>23%</td>
</tr>
<tr>
<td>Tuas Power Generation</td>
<td>2,446</td>
<td>18%</td>
</tr>
<tr>
<td>Keppel Merlimau Cogen</td>
<td>1,310</td>
<td>10%</td>
</tr>
<tr>
<td>Sembcorp Cogen</td>
<td>1,189</td>
<td>9%</td>
</tr>
<tr>
<td>Pacificlight Power</td>
<td>800</td>
<td>6%</td>
</tr>
<tr>
<td>Tuaspring</td>
<td>396</td>
<td>3%</td>
</tr>
<tr>
<td>Exxonmobil Asia Pacific</td>
<td>220</td>
<td>2%</td>
</tr>
<tr>
<td>National Environment Agency</td>
<td>180</td>
<td>1%</td>
</tr>
<tr>
<td>TP Utilities</td>
<td>134</td>
<td>1%</td>
</tr>
<tr>
<td>Shell Eastern Petroleum</td>
<td>128</td>
<td>1%</td>
</tr>
<tr>
<td>Others</td>
<td>158</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13,361</strong></td>
<td><strong>100%</strong></td>
</tr>
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Tracking Performance – Customer Responsiveness Survey

Customer Satisfaction 100% for Past 2 Years

- Satisfaction %
- Target

2012: 90%
2013: 95%
2014: 100%
2015: 100%
• “EMC staff has been apt and transparent in promptly resolving any settlement related matters in the wholesale market.” - SP Services Ltd

• “EMC has been fair and professional in dealing with the MPs. In addition, EMC also actively sends out information to the MPs via email, hence transparency is good.” - Senoko Waste-to-Energy Pte Ltd

• “The EMC has been proactive and responsive to the market needs. I appreciate the collaborative approach and thank you to all the EMC staff involved.” - Senoko Energy Supply Pte Ltd
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EMC’s Dashboard

- Singapore Electricity Roundtable 2017
- Bulletin 95 - latest issue
- MSCP Market Watch Q3 2016 - latest issue
- Latest MSCP Determinations made in October 2016
- NEMS Market Report 2015 now available
- EMC recognized for dedicated voluntary service

- 72 period Supply Demand and USEP
- 72 Period Bus Price Distribution
- 72 Period MNN Price Distribution
EMC’s Dashboard

Real-Time Prices and Demand - 08 Mar 17

Real-time Ancillary Services Prices - 08 Mar 17
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EMC’s Recent Projects

- **Domestic**
  - Trainings in collaboration with the Sustainable Energy Centre of Excellence
  - Implemented market system and rule changes for Demand Response

- **Overseas Consultancy**
  - Oman
  - Sharjah

- **Overseas Training/Secondment**
  - Sharpah

- **Gas**
  - Launched a Gas Trading Board for secondary gas trading in S’pore
  - Jointly developed and launched the SGX LNG Index Group (Sling), a spot index for Asian LNG
EMC offers customised training programmes and consultancy services for the following topics:

- Developmental Roadmap for Electricity Industry
- Optimising Generation Dispatch
- Peer Review of Existing Processes
- Implementing Demand Response
- Developing an Electricity Futures Market
- Risk Management and Business Continuity/Disaster Recovery Processes
EMC’s Services

Other available services include:

• Organisational Development
• Market Design
• Market Systems
• Market Operations
• Market Evolution
Thank you

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