Is coal still king in South East Asia?

Dr. Bikal Pokharel, Principal Analyst, Asia Power & Renewables, Wood Mackenzie

14 December 2017
Building a competitive advantage on strong foundations

Over the last 40 years, Wood Mackenzie has evolved naturally along the energy value chain to capture all the key components affecting global markets.

Our integrated approach allows us to spot trends and forecast future dynamics before anyone else.
Wood Mackenzie, Greentech Media and MAKE form the leading market analysis and advisory firm on power & renewables and the transformation of the global electricity industry.

Wood Mackenzie, a Verisk business, is a trusted source of commercial intelligence for the world’s natural resources sector. With detailed coverage of power market fundamentals, gas, coal, solar, wind, energy storage, and grid edge technologies, we make it easier to understand the rapidly evolving power landscape.

GTM Research is the premier market intelligence provider on the decarbonization and decentralization of energy. It is the market research arm of Greentech Media, covering solar, energy storage and grid edge technologies. It became part of Wood Mackenzie after being acquired by Verisk in July 2016.

MAKE is a leading source of intelligence for the renewable energy industry – specialising in onshore and offshore wind. MAKE became part of Wood Mackenzie after being acquired by Verisk in May 2017.
Is coal still king in South East Asia?

At a glance

Coal is the most economical source of fuel. Renewables competition with gas depends on gas prices.

Solar and battery start to compete with gas-fired plants at lower gas prices. Coal continue to be the most economical option.

Solar starts to compete with coal at base load and battery can take over peak load.

Coal’s dominance in South East Asia will continue for 10 years or more
Agenda

Capacity and generation mix
Can South East Asia get away from coal – how fast?

Current tariff comparisons and policy
Does the current tariff provide incentive for renewables as yet?

LCOE of various technologies
How does the cost compare as the cost of renewables decline rapidly?
South East Asia power demand is expected grow at 5% in the next decade

Source: Wood Mackenzie
Total capacity in South East Asia will double in the next 15 years with equal share from coal and renewables in 2030

- Share of thermal plants marginally decrease but with declining domestic piped gas supply led by decline in Thailand and Indonesia, attractiveness of gas-fired plants have declined
- Coal is displacing gas at base load and the trend is expected to continue

Is coal still king in South East Asia?

Source: Wood Mackenzie
Is coal still king in South East Asia?

...however share of generation from coal will be higher by two-folds than that of renewables in 2030

- Share or renewables with hydro increases from 19% to 24% whereas share of non-hydro renewables increase from 5% to 11% by 2030

Incremental generation growth by fuel

Generation mix by fuel

Source: Wood Mackenzie
Indonesia and Vietnam contributes to 67% of the incremental generation growth in the next 20 years.

Incremental generation growth by country:

- Indonesia: 942 TWh
- Vietnam: 942 TWh
- Malaysia: 33%
- Philippines: 67%
- Thailand: 35%
- Cambodia: 33%
- Singapore: 67%
- Myanmar: 58%
- Brunei: 37%

Generation mix by country:

- Indonesia
- Vietnam
- Malaysia
- Philippines
- Thailand
- Cambodia
- Singapore
- Myanmar
- Brunei

Source: Wood Mackenzie
Power tariffs vary significantly across the various markets and hence the attractiveness of renewables vary as well

Power tariffs in the Philippines have been consistently higher than Vietnam and Indonesia by more than two-folds

Average power tariffs in major South East Asian countries

Source: Wood Mackenzie
Renewables and battery in South East Asia are still a costlier option compared to the conventional plants for both baseload and peaking operations.

2017 LCOE by technology

Source: Wood Mackenzie, GTM, MAKE
By 2025, Renewables starts to compete with gas at baseload but coal continue to be the most economical option for baseload

Batteries but with charging from coal plants can replace peaking gas plants;

2025 LCOE by technology

Source: Wood Mackenzie, GTM, MAKE
Solar starts to compete with coal at baseload; Battery can replace gas at peak load

2035 LCOE by technology

Source: Wood Mackenzie, GTM, MAKE
Conclusions

- Coal will continue to dominate the developing economies in South East Asia for the next decade or so (provided coal financing do not cease)

- Based on the LCOE forecasts, coal will continue to be the cheapest source of generation for the next 15 years or more and hence the investment decisions made in regulated and developing markets to meet the increasing demand will lean towards coal (in absence of carbon price).

- Incentives will continue to drive solar growth in the SE Asian markets as the extent of renewables growth need to factor in affordability.

- However, by 2025, solar starts to compete with combined cycle gas plants at baseload and battery starts to compete with open cycle gas plants for peak load. Hence the pace of renewables growth will likely accelerate.

- By 2035, solar starts to become the cheapest source of generation for baseload operation.
Outlook for Singapore’s Electricity Market
Towards a Fully Liberalised Market in 2018

Dr. Bikal Pokharel, Principal Analyst, Asia Power & Renewables, Wood Mackenzie

14 December 2017
Full retail contestability needs a continuous assessment of the possible outcomes.

- Market outlook
- Enablers /Barriers
- Challenges
- Sustainable Prices
- Full Retail Contestability
Current reserve margin stands close to 85%

COP21: Singapore has committed to emission reduction by 36% from 2005 levels by 2030. Replacement of fuel oil generation by gas from 2005 to 2014, further replacement of fuel oil by gas plants in future and solar contribution to grid should be enough to meet this target.

**Existing and planned capacity with peak load**

**Available capacity by plant type with peak demand**

Source: Wood Mackenzie
### Significant interest in retail following the introduction of Electricity Futures in 2015

Electricity retailers have more than doubled in the last couple of years

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of retailers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre 2014</td>
<td>5</td>
</tr>
<tr>
<td>2015</td>
<td>9</td>
</tr>
<tr>
<td>Today</td>
<td>25</td>
</tr>
</tbody>
</table>

**Percentage retail share (2005-2015)**

- SP Services
- PacificLight Energy
- Red Dot Power Pte Ltd
- Pre-2014 Retails (Five)
- Hyflux Energy Pte Ltd

Source: EMA, Wood Mackenzie
Current licensed capacity is enough to keep the reserve margin above 30% for the next 20 years

Reserve margin above 30% based on licensed capacity (includes steam plants)

Reserve margin with combined cycle plants drops to below 30%

Source: Wood Mackenzie
Low electricity prices are not sustainable for Gencos

Losing retail consumers will make it even more challenging for the incumbent players

Source: EMC, Wood Mackenzie
The price outlook continues to remain depressed in future

A flat short run marginal cost indicates that flatter wholesale prices will continue

Merit Order (2020)

Annual average power price forecast

Fuel Oil plants setting the price during peak periods

With LNG regas start-up, gas plants starts setting the price

Additional gas plants brings down prices further

Source: Wood Mackenzie
Expectation of a competitive retail market

**Increased competition** - retail providers would have to attract consumers to choose them – incentives, promotions etc

**Lower rates** - something everyone will appreciate!

**Flexible plans**

**Reliable service** - system security still with the system operator
Enablers and barriers to consumer engagement

Source: https://www.ofgem.gov.uk
Price is the key motivator when switching

A survey in the UK suggested that on average ~ £300 of savings per year (£25 or S$45 per month) are needed to make it worth changing supplier or tariff

Source: https://www.ofgem.gov.uk
Switching rates are an important indicator but not necessarily the only measure of success.

Access to price comparisons & online accounts are necessary to engage consumers.

Japan switching rates (April 2016 to March 2017)

Australia switching rates (2016)

Source: Wood Mackenzie

Source: AEMO
Default retail providers have been used to encourage switching in Texas

- Default service price might have to be much higher than Wholesale Electricity Prices (WEP) to induce consumer switching (comparable prices may not work – Massachusetts experience)

- Texas success came from the price differentials – default service prices were much higher)
Increased competition comes with challenges

Declining firm demand
- With demand uncertainty, longer term contracts will be difficult
- Short-term hedging activities

Product differentiation
- 100% renewables
- Discount on regulated tariffs
- Bundling with gas retails, cable network providers, telecom
- Pricing incentives – fixed, variables, S-curve

A strong political commitment to reform is necessary
- Unexpected problem will require major or minor refinements
- Solution should not undermine the expected competitiveness of the market
Key takeaways

Amidst depressed prices, sustainability is becoming an issue for Gencos and full retail contestability can bring further challenges.

Switching rates are an important indicator but not necessarily the measure of success of retail competition.

Ease of access to information and price deals will be key to engaging consumers and success of the full retail contestability.

Product differentiation would be necessary for the retail providers to remain competitive.
Dr. Bikal Pokharel
Principal Analyst, Power & Renewables, Asia Pacific

- Bikal leads the power market research for Asia Pacific. He is a seasoned power and renewables analyst with an established track record of research and consulting in market modeling, inter-fuel analysis, generation planning, cost analysis and bidding strategies. He has been with Wood Mackenzie since 2007.

- Prior to Wood Mackenzie, he was a power market specialist at PowerSeraya, a local power generation company in Singapore.

- Bikal holds a PhD in Power Engineering from Nanyang Technological University, Singapore with specialisation on the aspects of generation planning in competitive electricity markets.
Disclaimer

Strictly Private & Confidential

- This report has been prepared by Wood Mackenzie Limited. The report is intended solely for the benefit of Wood Mackenzie clients and its contents and conclusions are confidential and may not be disclosed to any other persons or companies without Wood Mackenzie’s prior written permission.

- The information upon which this report is based has either been supplied to us or comes from our own experience, knowledge and databases. The opinions expressed in this report are those of Wood Mackenzie. They have been arrived at following careful consideration and enquiry but we do not guarantee their fairness, completeness or accuracy. The opinions, as of this date, are subject to change. We do not accept any liability for your reliance upon them.
Our products span global regions and technologies

**POWER AND FUEL MARKETS**
- Global Energy Markets
- North America Power
- Europe Energy
- China Gas & Power
- Southeast Asia Gas & Power

**WIND POWER**
- Global Offshore Wind
- Wind Premium Plus Package
  - Onshore & Offshore
  - Market Reports
  - Databases

**SOLAR PV**
- Global Downstream Solar
- U.S. Utility-Scale Solar
- U.S. Distributed Solar
- PV Module Supply Chain
- PV Systems & Technologies

**ENERGY STORAGE**

**GRID EDGE**
- Grid Edge
- Global Executive Council