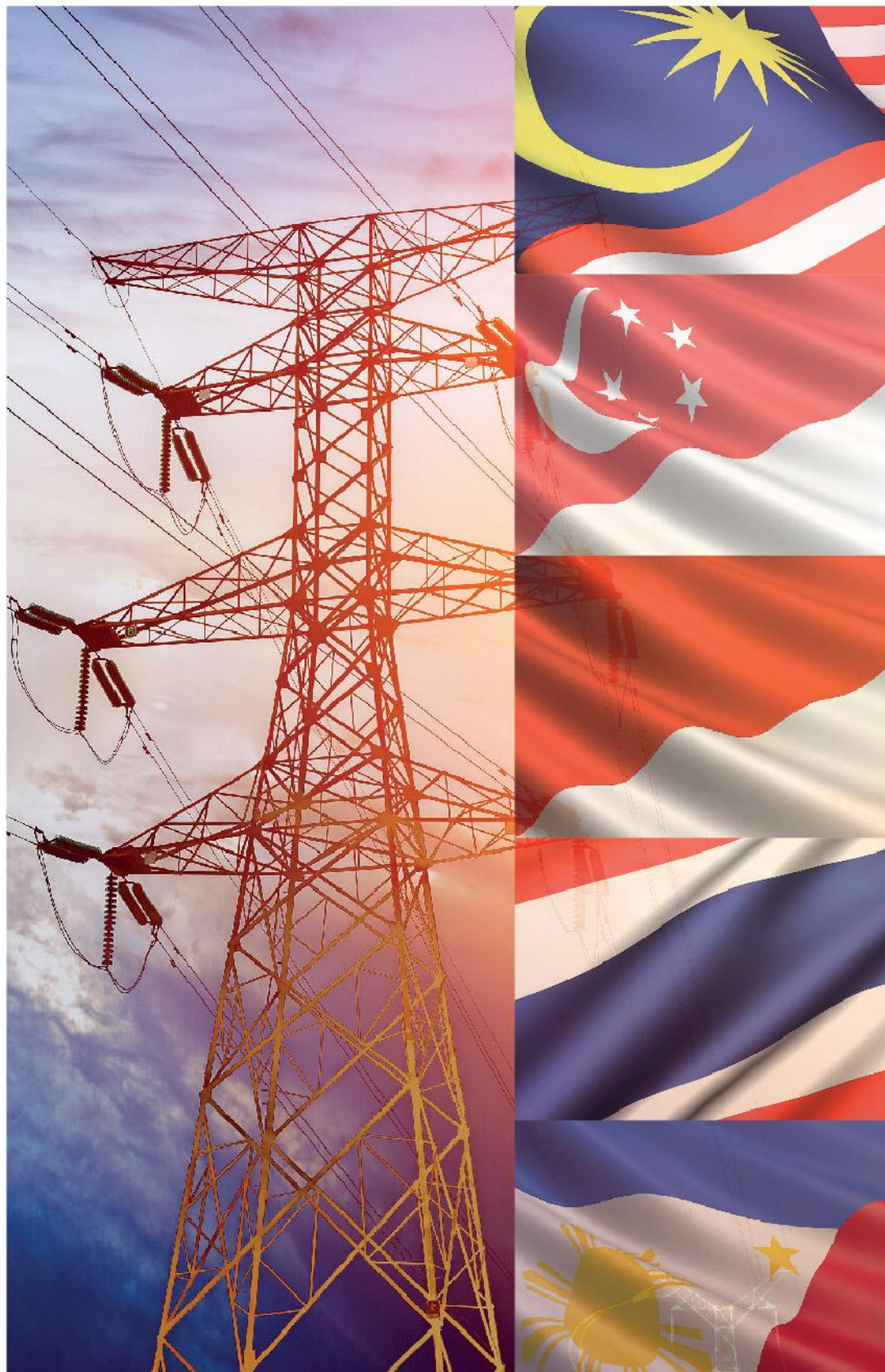


REGIONAL COMMENTARY

ASEAN-5 Power Sectors

RAM
RATINGS

October 2016



REGIONAL COMMENTARY

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ASEAN-5 Power Sectors

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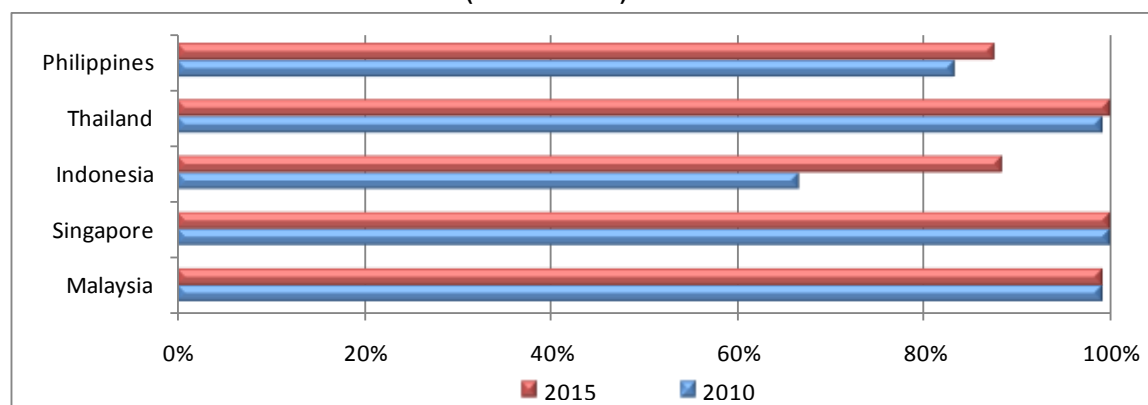
Overview

The ASEAN-5 countries are home to 458 million people with a cumulative GDP of USD2.1 trillion in 2015. As emerging markets, these nations have been charting healthy economic growth, with a 5-year CAGR of 3.7% (2010: USD1.8 trillion).¹ Fuelled by their robust economies, rapid industrialisation and expanding populations, electricity demand has also risen accordingly, with a 5-year CAGR of 4.8%. This growing demand for electricity necessitates a steady source of power supply. Nonetheless, efforts to close the supply-demand gap have often posed challenges to certain countries. While Malaysia, Singapore and Thailand have excellent access to electricity supply, Indonesia and the Philippines have experienced huge power deficits, as underlined by their electrification rate of less than 90% (refer to Chart 1).

- **IPPs play important role in power generation.** Apart from playing the role of regulator and policy planner, the governments of some countries have assumed complete or extensive control of their key utility companies. The power sectors of 3 of the ASEAN-5 countries are structured as single-buyer frameworks. In Malaysia, Indonesia and Thailand, national and state utility companies monopolise their respective jurisdictions and act as sole offtakers for independent power producers (IPPs), thereby eliminating competition and demand risk. On the other hand, Singapore and the Philippines operate liberalised retail electricity markets. Private participation has played a key role in the ASEAN-5's power sectors, where IPPs contribute more than half of these countries' aggregate installed capacity (refer to Chart 2).

¹ Source: World Bank

Chart 1: ASEAN-5's electrification rates (2010 vs 2015)



Source: ST (Malaysia), EMA (Singapore), PLN (Indonesia), DOE (Philippines) and World Bank (Thailand)

- Subsidy reforms a key trend.** Given the liberalised power sectors of Singapore and the Philippines, their electricity tariffs are market-driven. However, the electricity rates of the other ASEAN-5 members are regulated and controlled by their respective governments. In 2015, the Philippines' electricity tariffs were the highest in the region, at USD0.18; this was followed by Singapore's USD0.15 (refer to Chart 3). Notably, the tariffs for Malaysia, Indonesia and Thailand are substantially subsidised by the respective governments. Although the weak prices of fossil fuels should help check electricity tariffs, prolonged subsidies are a burden to government finances. As such, RAM believes that these governments are moving towards deregulating electricity tariffs in the long run, in line with the implementation of subsidy reforms.

Chart 2: Degree of IPP participation as of end-2015

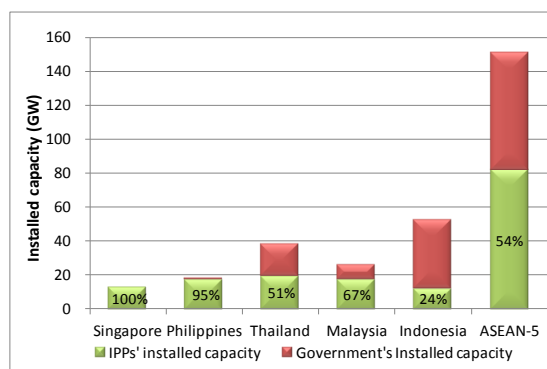
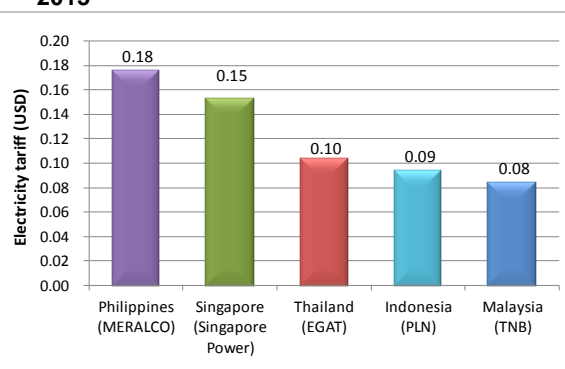


Chart 3: ASEAN-5's average electricity tariffs in 2015



Source: ST, TNB, SESB, SEB (Malaysia), EMA, Singapore Power (Singapore), PLN's Annual Report 2015 (Indonesia), EGAT, EPPO (Thailand) and DOE, MERALCO's Annual Report 2015 (Philippines)

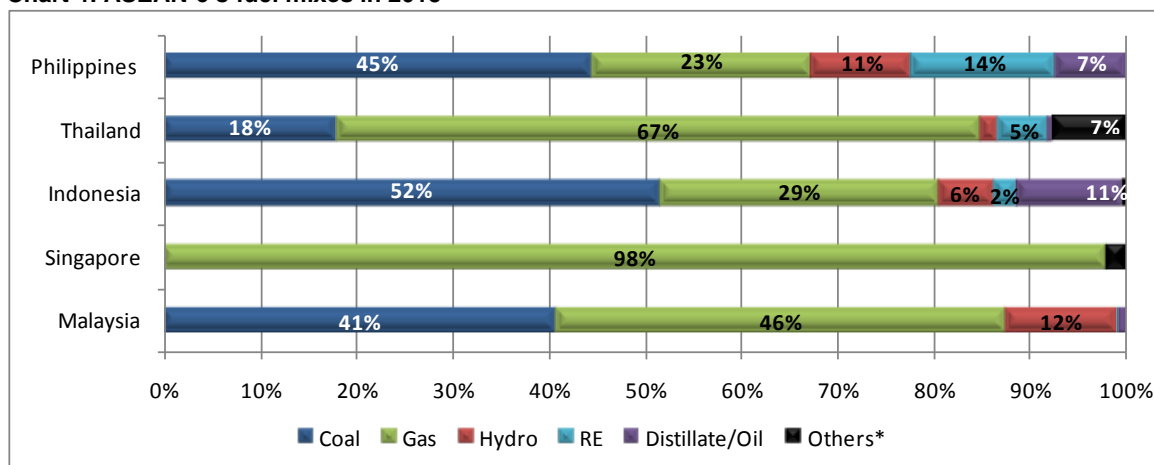
Note: Bloomberg exchange rates as at 31 December 2015: USD/PHP = 46.905; USD/SGD = 1.4185; USD/RM = 4.29; USD/THB = 36.03; USD/RPH = 13,788

- Coal to dominate future fuel mix.** At present, the ASEAN-5 countries rely heavily on natural gas for electricity generation. This is especially so for Singapore (98% of its fuel mix in 2015), followed by Thailand (67%) and Malaysia (46%) (refer to Chart 4). With the exception of Singapore that does not operate or own any coal-fired power plant, we expect coal to feature prominently as a dominant source of fuel for the other ASEAN-5 members. This is due to the abundance of this commodity in the region (particularly in Indonesia),² its cost advantage and increasingly more efficient coal-fired power plants. Notably, the completion of the first ultra-

² Source: BP Statistical Review of World Energy 2016. Indonesia was among the world's top 5 coal producers in 2015.

supercritical coal power plant in 2015 established Malaysia as the forerunner of clean coal energy in this region.

Chart 4: ASEAN-5's fuel mixes in 2015

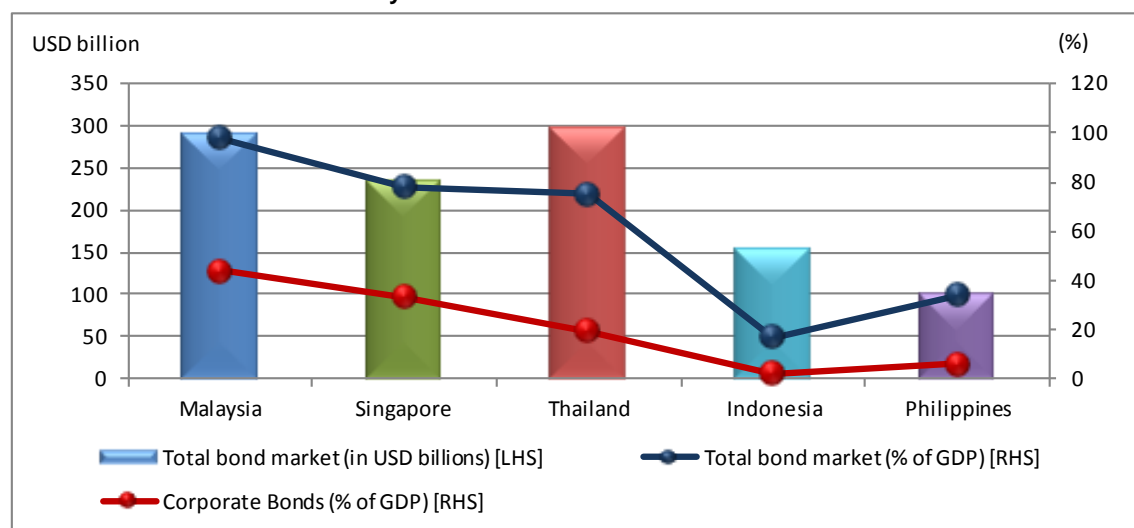


Source: TNB, SESB, SEB (Malaysia), EMA, Singapore Power (Singapore), PLN's Annual Report 2015 (Indonesia), EGAT, EPPO (Thailand) and DOE, MERALCO's Annual Report 2015 (Philippines)

* Consist of power imports for Thailand, other fuels for Indonesia and waste-to-energy for Singapore.

- Promising potential for renewable energy.** Among the ASEAN-5, Philippines is the largest producer of RE (including hydro), followed closely by Malaysia, Indonesia and Thailand. Although it accounts for less than 15% of the ASEAN-5's electricity generation mix, renewable energy (RE) (including hydro) is poised to make a greater contribution in the future. As signatories to the Paris Agreement 2015, the ASEAN-5 members have expressed their commitment to the framework of the United Nations Framework Convention on Climate Change, which deals with the mitigation, adaptation and financing of greenhouse gas emissions, effective 2020. Save for Singapore, the ASEAN-5 have implemented feed-in-tariff mechanisms to encourage the growth of RE. Thailand is currently the largest producer of solar power in South-East Asia while Indonesia and the Philippines have significant geothermal potential. Meanwhile, hydro power is also prominent in Malaysia, the Philippines and Indonesia.
- Bond markets - vital funding source.** The infrastructure of the power sectors in the ASEAN-5 countries are mostly funded via loans from domestic and foreign banks. That said, stable long-term funding through local-currency bonds is most suitable for the financing of power projects. Apart from Malaysia and Singapore, the rest of the ASEAN-5 countries' corporate bond markets are still nascent (refer to Chart 5). While Singapore has established itself as a regional financial hub, Malaysia's domestic bond market has played a vital role in providing almost all of its power sector's long-term financing needs. The depth of Malaysia's bond market and the relative maturity of local institutional investors have enabled large-scale and long-term investments in the country. As the global leader in sukuk, Malaysia's expertise and favourable regulatory framework for Islamic finance will continue playing a key role in promoting sukuk financing for the region's infrastructure funding needs.

Chart 5: ASEAN-5's local-currency bond markets as at end-June 2016



Source: AsianBondsOnline

- Power-deficit countries face plant-up challenges.** Complicated bureaucracies as well as lengthy permit- and land-acquisition processes are the common causes that have been hindering the full electrification of Indonesia and the Philippines. A lack of long-term financing options has also contributed to delays in power plant-ups. Both countries have implemented regulatory reforms and provided government support to instill investor confidence. Nevertheless, RAM believes that more far-sighted and sustainable support endorsed - by the ASEAN Economic Community,³ such as greater financial integration and power-sharing models among the ASEAN-5 - could help address this problem.
- Better energy integration for ASEAN-5.** Moving forward, as the ASEAN-5 members strive to overcome the challenges of economically and sustainably meeting rising energy demand, greater integration among the energy markets could help enhance energy security as well as encourage more efficient utilisation of the region's resources. RAM envisages the ASEAN-5 energy industry to develop into a more integrated and sophisticated market, as more cross-border transactions and shared-infrastructure initiatives can be expected among the nations while their governments are envisaged to introduce more deregulation to stimulate healthy competition in the longer term. In line with the ongoing efforts to achieve the realisation of the ASEAN vision, we believe that continued focus on cultivating a strong credit culture, enhancing transparency and greater effort in framework harmonisation will encourage more cross-border investments in this region.

³ The ASEAN Economic Community aims to implement economic integration initiatives to create a single market across the region.

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ASEAN-5 Power Sector Dashboard

Table 1: Data on ASEAN-5 countries (2015)

	Malaysia	Singapore	Indonesia	Thailand	Philippines
Land area (square km)	329,000	707	1,810,000	511,000	298,000
Population (million)	30.3	5.5	255.5	65.7	100.7
Gross domestic product (USD billion)	296	293	862	396	292
Gross domestic product per capital (USD)	9,766	52,889	3,374	6,013	2,879
Electricity generation (GWh)	135,000 (estimate)	50,272	233,982	192,189	82,413
Electrification rate (%)	99	100	88	100	88
Electric power consumption per capital (kWh)	3,799	8,639	899.5	2,660	818
Total installed capacity (GW)	26.7	13.4	52.9	38.8	18.8
Reserve margin (%)	(1) Peninsular Malaysia: 25 (2) Sabah: 22 (3) Sarawak: 60	87	22	42	(1) Luzon: 36.4 (2) Visayas: 26.1 (3) Mindanao: 33.4
National utility companies	(1) Tenaga Nasional Berhad (2) Sabah Electricity Sdn Bhd (3) Syarikat SESCO Berhad	Singapore Power Group	PT Perusahaan Listrik Negara	Electricity Generating Authority of Thailand	National Power Corporation

Source: ST, TNB, SESB, SEB (Malaysia), EMA, (Singapore), PLN (Indonesia), EGAT, EPPO (Thailand) and DOE, MERALCO's Annual Report 2015 (Philippines) and World Bank

Malaysian Power Sector

Energising a steady growth path

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- **Electricity demand supported by industrial growth.** Backed by its strong economic fundamentals, Malaysia's growth has been resilient. In the last decade, GDP has charted a CAGR of 5.3%. The nation has changed from an agricultural- and commodity-based economy to one fuelled by manufacturing and services. In 2015, demand for electricity increased 2.5% y-o-y to 124,695 GWh, driven by the expansion of electricity sales to domestic customers (+3.7%) and the commercial sector (+3.0%).⁴ We expect demand to keep increasing at about 2% to 3% per annum, supported by the continued implementation of the Economic Transformation Programme, various development corridors and the 11th Malaysia Plan (11MP).
- **National and state utilities dominate.** Malaysia has a well-developed power infrastructure, with an electrification rate of 99% against its population of 30 million as of 2015.⁵ The sector is divided into 3 separate grids, in accordance with geographical delineation. Tenaga Nasional Berhad (TNB) is the national utility company that dominates the national grid in Peninsular Malaysia. In East Malaysia, Sabah Electricity Sdn Bhd (SESB) and Sarawak Energy Berhad - via Syarikat SESCO Berhad (SESCO) - control the respective grids of Sabah and Sarawak. These national and state-controlled utility companies monopolise all the transmission and distribution (T&D) assets within their respective grids.⁶ Except for Sabah, the utility companies also command the lion's share of generating capacity. In power generation, private participation comes in the form of IPPs. The national and state utility companies play a crucial role as the sole off-takers for the generating capacity and electrical energy produced by all the IPPs.
- **Solid government support.** Apart from majority ownership of TNB via various agencies, subsidised gas and periodic tariff reviews also form part of the implicit government support received by the national utility giant. In Sabah, SESB's financial profile is underscored by significant support from the Government of Malaysia (GoM) in the form of direct fuel subsidies, development grants and soft loans. The Sarawakian power industry, meanwhile, is tightly controlled by the state government, which is involved in the entire supply chain – as the policy planner, regulator and owner as well as operator of almost all the power-related infrastructure there. While the financial profiles of the 3 utility companies are fundamentally different, RAM has a favourable view of their credit profiles given their strategic functions and solid relationships with the relevant governments.
- **More transparent tariff-setting mechanism.** TNB's tariff adjustments take into consideration changes in fuel prices, albeit in a less structured manner. The incentive-based regulation (IBR) was introduced in 2014; it allows a review of electricity tariffs every 6 months to take into account changes in fuel costs via the Imbalance Cost Pass-Through (ICPT) mechanism, to reflect the market prices of all fuel-related and other generation-specific costs. Any excess (or reduction in) fuel cost is passed on to consumers via tariff adjustments. We have a positive view of the IBR as it provides TNB with stable returns throughout the 3-year regulatory periods, which should help

⁴ Source: TNB, SESB and SEB.

⁵ World Bank

⁶ Apart from the national and state utility companies, NUR Power Sdn Bhd is the only independent power company (220 MW) licensed to generate, distribute and sell electricity to tenants at the Kulim Hi-Tech Park in Kulim, Kedah, for 30 years until September 2028.

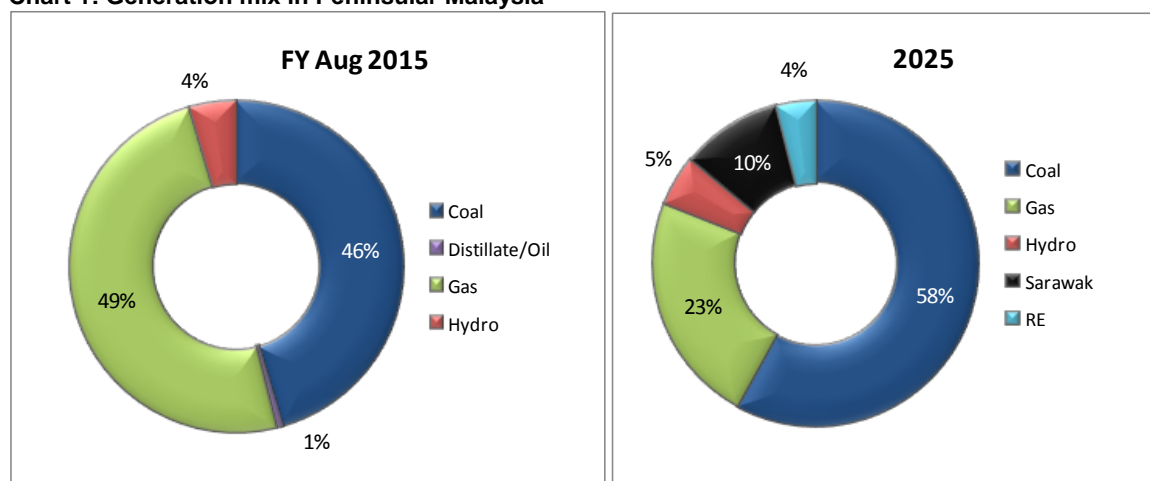
preserve its long-term financial profile.

- **Coal – cheaper fuel source.** As at end-May 2016, gas constituted the largest fuel cost for TNB (about 51% of its total fuel expenses), closely followed by coal (40%). TNB's gas cost stems from indigenous piped gas, which is subsidised by the GoM, and liquefied natural gas (LNG), which is imported at market prices. Despite the subsidy, TNB's cost per unit of electricity generated by gas-powered plants is still higher than that of coal (19.67 sen/kWh vs 9.13 sen/kWh for the 3 months ended 31 May 2016). Given its cost advantage, coal is expected to become the main fuel component in power generation. Moreover, coal prices have declined more than 30% since January 2014, to USD56.20/MT as at end-May 2016. While prices have been trending upwards in recent months amid supply cuts and strong demand from China, they are still below the peak in 2008.
- **Electricity tariff largely influenced by regulated piped gas price.** In line with the GoM's subsidy rationalisation, the price of regulated piped gas in the power sector rose to RM19.70/mmBtu in June 2016 (from RM18.20/mmBtu previously). That said, the persistent depression in oil and coal prices had kept the electricity tariff rebate at 1.52 sen/kWh for June and December 2016, thus maintaining TNB's average net tariff at 37.01 sen/kWh. We believe the GoM will maintain its subsidy-rationalisation programme by gradually elevating the regulated price of piped gas. Although TNB's tariffs remain largely influenced by the price of piped gas, we expect any upward revision to be moderated by the weaker coal and LNG prices.
- **Government-dictated tariff reviews for Sabah and Sarawak.** While under the same regulatory purview as Peninsular Malaysia, Sabah's tariff reviews do not follow the IBR framework. The last revision took place in January 2014. Notably, Sabah's average net tariff of 33.32 sen/kWh is still lower than Peninsular Malaysia's 37.01 sen/kWh, but higher than Sarawak's 19.94 sen/kWh.⁷ SESB relies heavily on more expensive diesel-powered generation and is required to incur higher network costs given Sabah's low population density. As such, SESB's tariffs cannot cover its hefty operating costs; hence financial support from the GoM is necessary to sustain its daily operations. Thanks to this financial backing, SESB remains a timely paymaster to all the IPPs in Sabah. Similarly, Sarawak's electricity tariffs are solely dictated by the state government. In line with the gradual reduction of SESCO's operating costs amid the increasing proportion of hydro-power capacity in its generation mix, the state government has effected tariff reductions for the domestic, commercial and industrial segments.
- **Peninsular Malaysia's generation mix to skew towards coal.** As at end-2015, Peninsular Malaysia's installed electricity-generating capacity summed up to 20,710 MW, primarily fuelled by gas, with a reserve margin of around 25%.⁸ Given its cost advantage, plant-ups are expected to lean towards coal, with a total 4,000 MW of capacity anticipated to come on-stream from 2016 onwards. Meanwhile, various RE plants are also in the works given the incentives under the feed-in tariff (FiT) system. Based on the approved generation development plan, coal is expected to power 58% of the total installed capacity, followed by gas (23%), RE (9%) and the possibility of electricity imported from Sarawak (10%) by 2025. Assuming a 3% annual growth in electricity demand, the reserve margin in Peninsular Malaysia is expected to stay healthy at 32% in 2019.

⁷ Source: TNB, SESB and SEB.

⁸ Source: 2016 Peninsular Electricity Supply Industry Outlook by the Suruhanjaya Tenaga.

Chart 1: Generation mix in Peninsular Malaysia



Source: TNB, ST

- SEDA promotes RE growth under FiT.** The GoM has been encouraging the growth of the RE sector via the Sustainable Energy Development Authority of Malaysia (SEDA); this has been facilitated by the FiT mechanism, established under the Renewable Energy Act 2011. The FiT system obliges the utility companies to purchase electricity generated by RE projects at FiT rates that are fixed throughout the tenure of the RE power purchase agreements (PPAs). Given the priority of dispatch and favourable pre-specified FiT rates guaranteed to RE projects, the FiT mechanism ensures the viability of RE investments. Based on the 11MP, RE capacity (excluding large hydro plants) is expected to reach 2,080 MW by 2020, contributing 7.8% of the total installed capacity in Peninsular Malaysia and Sabah, compared to a negligible contribution in 2015.⁹ Consequently, we expect RE producers to experience encouraging growth and have good access to the bond market, as has been observed globally.
- Electricity shortage in Sabah.** In March 2015, Sabah's generation mix comprised gas (83%), diesel (7%), hydro (6%) and biomass (4%).¹⁰ Despite Sabah's estimated system reserve margin of 22%,¹¹ its east coast has been experiencing a power shortage while the west coast is well supplied in terms of generation capacity. More than 25% of the electricity demand on the east coast is supported by the west coast grid – through the integrated east-west grid constructed in 2007. As such, the east coast relies heavily on ageing diesel-fired plants that have high outage rates. To address this issue, the GoM is considering several plant-ups, including a 180-MW hydro plant in Upper Padas and a 300-MW combined-cycle, gas-fired power plant in Lahad Datu.

⁹ Source: SEDA and RAM's calculations.

¹⁰ Approximated from SESB's daily generation mix as at 15 March 2015. Source: Suruhanjaya Tenaga.

¹¹ As of November 2015. Source: TNB and SESB

- **Abundant hydro power in Sarawak.** The Sarawak Corridor of Renewable Energy (SCORE) has prompted Sarawak Energy to embark on an aggressive expansion programme, to harness the state's abundant hydro-power potential of more than 20,000 MW. The full operation of the 2,400-MW Bakun dam in July 2014 and the 944-MW Murum dam in 2Q 2015 is expected to raise Sarawak's generating capacity to around 3,600 MW (on a firm basis). Meanwhile, the SCORE continues to chart gradual growth, with 14 PPAs (accounting for about 2,764 MW of electricity supply) already signed. Sarawak targets a long-term generation mix of 60% from hydro plants, with another 20% each from gas and coal-fired plants, respectively.¹²
- **Funding needs well met by bond issues.** As power infrastructure projects typically have lengthy gestation periods, they generally require longer-term financing, which has been well met by Malaysia's matured bond market. Furthermore, the domestic power sector is characterised by a supportive regulatory landscape, robust PPA terms, and strong sponsors as well as counterparties. These are the key catalysts that have been driving the growth of power bonds in the country. Since the first IPP bond issue by YTL Power Generation Sdn Bhd in 1993, the power industry has been one of most active sectors vis-à-vis continuously tapping the Malaysian bond market for its funding needs, with tenures ranging from 3 to 29 years. Power bonds account for some 37% of Malaysia's RM220.4 billion (USD55 billion)¹³ of infrastructure bonds issued in the last decade.
- **Deep and matured domestic bond market.** Home to one of Asia's deepest local-currency debt capital markets, Malaysia's outstanding bonds amounted to RM1.2 trillion (USD288.8 billion) as at end-June 2016 (equivalent to 98% of its GDP).¹⁴ It is the third-largest bond market in Asia¹⁵ relative to the size of its GDP, after Japan and South Korea. Malaysia also leads the global sukuk market, with 54% of total outstanding sukuk as at end-May 2016. Sukuk has become more prominent over the years, with more than 94% of IPP bond issues comprising sukuk after 2000, compared to only 25% before that. We further highlight that all of Malaysia's outstanding IPP bonds - amounting to RM40.9 billion - are sukuk issues.¹⁶ The depth of the domestic bond market and the relative maturity of local institutional investors allow large-scale and long-term investments in Malaysia.

¹² Source: Sarawak Energy, <http://www.theborneopost.com/2015/03/25/seb-to-build-more-thermal-power-plants-in-next-nine-years/>

¹³ Source: Bank Negara Malaysia; BNM Middle Rate as at 12 August 2016: RM4.0105 per USD.

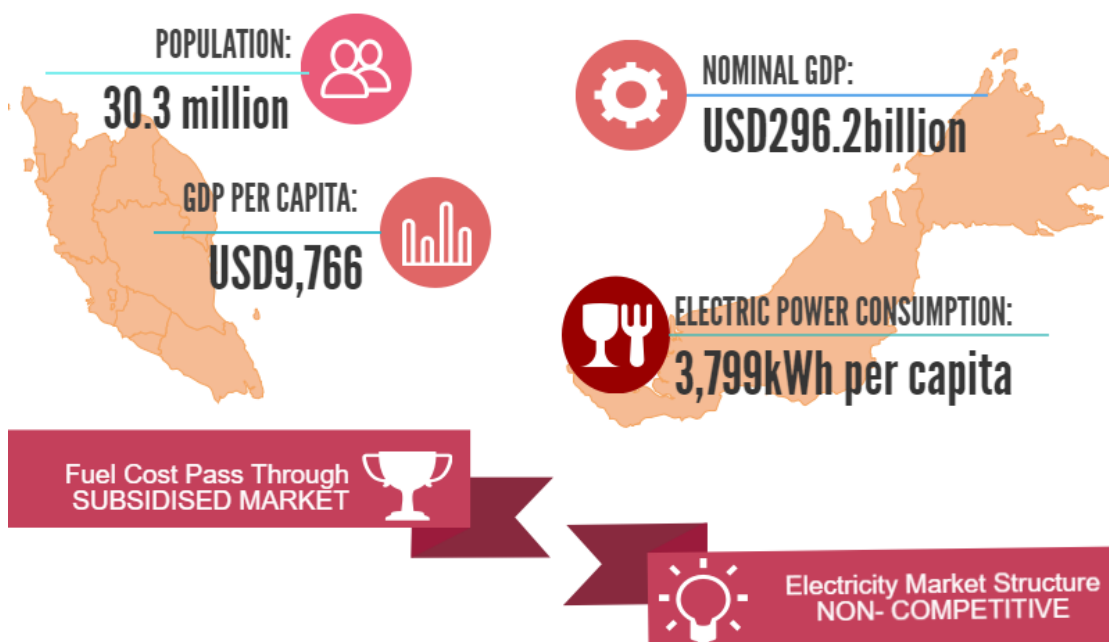
¹⁴ Source: AsianBondsOnline.

¹⁵ Asian countries here refer to the People's Republic of China, Hong Kong, Indonesia, Japan, South Korea, Malaysia, the Philippines, Singapore, Thailand and Vietnam.

¹⁶ Source: FAST Bank Negara Malaysia as at 11 August 2016.

Malaysia

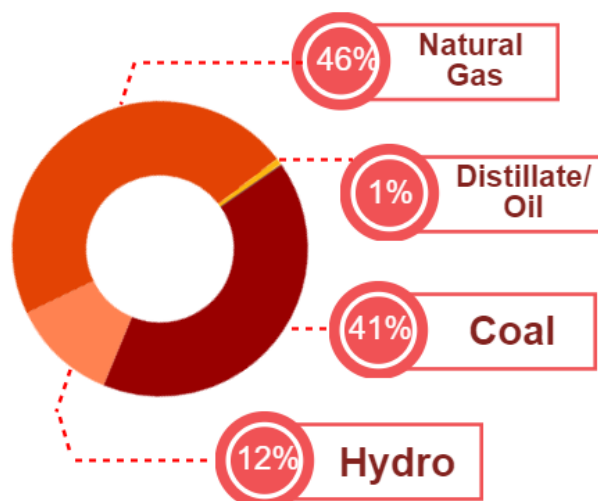
• Key Statistics as at 2015 •



ELECTRICITY PRODUCTION

Electrification Rate: 99%
Electricity Production (estimate): 135,000 GWh
Installed Capacity: 26,662 MW
Peak Load: 16,822 MW (Peninsular Malaysia) 914 MW (Sabah) 2,288 MW (Sarawak)
Reserve Margin: 25% (Peninsular Malaysia) 22% (Sabah) 60% (Sarawak)
Average Tariff: USD0.08/kWh (Peninsular Malaysia)
Transmission Losses: 1.5% (Peninsular Malaysia) 1.8% (Sarawak)
Distribution Losses: 6.2% (Peninsular Malaysia) 8.2% (Sabah) 12.5% (Sarawak)

• Generation Mix (estimate) •



Source: Suruhanjaya Tenaga, TNB, SESB, SEB, Department of Statistics Malaysia and World Bank

Table 1: Active sukuk issues by Malaysian IPPs (as at 11 August 2016)

IPPs	Capacity (MW)	Plant Type	Location	Facility	Tenure (Years)	Maturity Date	Amount (million)	Outstanding (million)
Sarawak Power Generation Sdn Bhd *	320	Gas	Bintulu, Sarawak	Serial <i>Sukuk Musyarakah</i>	15	24-Dec-21	215.00	30.00
Mukah Power Generation Sdn Bhd *	270	Coal	Mukah, Sarawak	Senior <i>Sukuk Mudharabah</i> Programme	15	27-Dec-21	665.00	375.00
Musteq Hydro Sdn Bhd *	20	Hydro	Sungai Kenerong, Kelantan	Bank Guaranteed <i>Sukuk Musharakah</i>	10	26-Jan-22	80.00	60.00
Teknologi Tenaga Perlis Consortium Sdn Bhd *	650	Gas	Kuala Sungai Baru, Perlis	<i>Sukuk Murabahah</i>	10	31-Jul-23	835.00	680.00
Jati Cakerawala Sdn Bhd - SPV for TTPC*	-	-	-	<i>Sukuk Murabahah</i>	10	31-Jul-23	540.00	455.00
Jimah Energy Ventures Sdn Bhd *	1,400	Coal	Jimah, Negeri Sembilan	Senior Islamic Medium-Term Notes Facility	20	05-May-25	4,850.00	2,990.00
Special Power Vehicle Bhd - SPV for Jimah *	-	-	-	Class A Islamic Medium-Term Notes Facility	17	19-May-22	797.00	552.00
				Class B Islamic Medium-Term Notes Facility	29	05-May-34	204.70	204.70
Ranhill Powertron II	190	Gas	Kota Kinabalu, Sabah	(i) Islamic Medium Term Notes	11	17-Jun-22	360.00	270.00
				(ii) Guaranteed Islamic Medium-Term Notes	18	15-Jun-29	350.00	350.00
Sepangar Bay Power Corporation Sdn Bhd *	100	Gas	Kota Kinabalu, Sabah	<i>Sukuk Murabahah</i>	12	03-Jul-29	575.00	403.00
Kapar Energy Ventures Sdn Bhd	2,420	Multi Fuel	Kapar	<i>Sukuk Ijarah</i>	13	03-Jul-26	2,000.00	1,490.00
Kimanis Power Sdn Bhd	285	Gas	Kimanis Bay, Sabah	Islamic Medium-Term Notes Programme	16	08-Aug-28	1,160.00	1,100.00
Tanjung Bin Power Sdn Bhd *	2,100	Coal	Tanjung Bin, Johor	<i>Sukuk Ijarah</i> Programme	17	16-Aug-29	4,500.00	4,045.00
Manjung Island Energy Berhad - SPV for TNB Janamanjung Sdn Bhd *	1,000	Coal	Manjung, Perak	(i) Series 1 of Islamic Securities Programme	19	25-Nov-30	3,860.00	3,860.00
				(ii) Series 2 of Islamic Securities Programme	20	25-Nov-31	990.00	990.00
Tanjung Bin Energy Issuer Berhad - SPV for Tanjung Bin Energy Sdn Bhd *	1,000	Coal	Tanjung Bin, Johor	<i>Sukuk Murabahah</i>	20	16-Mar-32	3,290.00	3,290.00
TNB Western Energy Berhad	1,000	Coal	Manjung, Perak	<i>Sukuk Wakalah and Ijarah</i>	20	30-Jan-34	4,000.00	3,655.00
TNB Northern Energy Berhad	1,071	Gas	Prai, Penang	<i>Sukuk Wakalah and Ijarah</i>	23	29-May-36	1,625.00	1,625.00
Jimah East Power Sdn Bhd	2,000	Coal	Jimah, Negeri Sembilan	<i>Sukuk Murabahah</i>	23	3-Dec-38	8,980.00	8,980.00
Sarawak Hidro Sdn Bhd	2,400	Hydro	Bakun, Sarawak	<i>Sukuk Murabahah</i>	15	11-Aug-31	5,540.00	5,540.00
							45,416.70	40,944.70

Source: FAST, BNM and publicly available information.

* Rated by RAM

Table 2: Matured sukuk issues by Malaysian IPPs

IPPs	Capacity (MW)	Plant Type	Location	Facility	Tenure (Years)	Maturity Date	Amount (million)
Stratavest Sdn Bhd *	60	Diesel	Tawau, Sabah	Guaranteed Commercial Papers/Medium-Term Notes	7	27-Sept-00	184.00
				<i>Al-Bai' Bithaman Ajil</i> Serial Bonds	10	25-Aug-08	276.68
Segari Energy Ventures Sdn Bhd *	1,303	Gas	Lumut, Perak	<i>Sukuk Al-Ijara</i> Revolving Underwritten Facility	4	31-Jan-01	337.50
				<i>Sukuk Al-Ijara</i> Notes Issuance Facility	8	31-Mar-05	521.50
				Conventional Fixed-Rate Bonds	12	11-May-06	708.00
				Fixed Rate Facility	15	11-May-06	1,500.00
				<i>Sukuk Ijarah</i> Bonds	6	11-May-12	930.00
Genting Sanyen Power Sdn Bhd *	762	Gas	Kuala Langat, Selangor	Fixed-Rate Facility	10	14-Feb-01	1,000.00
				Serial Bonds	3	7-May-04	320.00
				Serial Bonds	3	7-May-04	230.00
Sarawak Power Generation Sdn Bhd *	320	Gas	Bintulu, Sarawak	<i>Al-Bai' Bithaman Ajil</i> Islamic Debt Securities	6	15-Dec-06	160.00
Sandakan Power Corporation Sdn Bhd *	34	Diesel	Sandakan, Sabah	Fixed-Rate Serial Bonds	7	6-Aug-07	65.00
Powertek Berhad *	440	Gas	Alor Gajah, Melaka	Commercial Papers/Medium-Term Notes Programme	7	13-Aug-08	250.00
				Redeemable Unsecured Bonds	10	30-Aug-11	350.00
YTL Power Generation Sdn Bhd *	390	Gas	Pasir Gudang, Johor	Fixed-Rate Facility	15	14-Nov-08	1,500.00
	780	Gas	Paka, Terengganu	Fixed-Rate Facility	11	14-Jul-14	1,300.00
Pahlawan Power Sdn Bhd *	334	Gas	Tanjung Keling, Melaka	<i>Al-Murabahah</i> Commercial Papers/Medium-Term Notes	7	21-Jan-09	100.00
				<i>Al-Bai' Bithaman Ajil</i> Islamic Debt Securities	10	31-Jan-12	450.00
GB3 Sdn Bhd *	640	Gas	Lumut, Perak	<i>Al-Murabahah</i> Commercial Papers/Medium-Term Notes Programme	8	21-Feb-09	350.00
				Senior Secured <i>Al-Bai' Bithaman Ajil</i> Bond Facility	13	19-Dec-14	850.00
ARL Power Sdn Bhd	86	Diesel	Tawau, Sabah	<i>Al Bai' Bithaman Ajil</i> Secured Serial Bonds	10	1-Dec-09	177.00
				Islamic Medium-Term Notes	7	1-Dec-09	50.00
Sejingkat Power Corporation Sdn Bhd *	100	Coal	Kuching, Sarawak	<i>Al-Bai' Bithaman Ajil</i> Islamic Debt Securities	9	15-Dec-09	195.00
Panglima Power Sdn Bhd *	720	Gas	Teluk Gong, Melaka	Commercial Papers/Medium-Term Notes Programme	7	20-Jan-10	306.00
Serudong Power Sdn Bhd *	36	Diesel	Tawau, Sabah	Fixed-Rate Serial Bonds	10	18-Aug-10	75.00
Musteq Hydro Sdn Bhd *	20	Hydro	Sungai Kenerong, Kelantan	<i>Al-Bai' Bithaman Ajil</i> Fixed-Rate Serial Bonds	15	26-Jan-12	108.00
Tanjung Bin Power Sdn Bhd *	2,100	Coal	Tanjung Bin, Johor	<i>Istisna</i> Medium-Term Notes Programme	15	5-Sept-12	5,570.00
Mukah Power Generation Sdn Bhd *	270	Coal	Mukah, Sarawak	Junior Sukuk Programme	25	20-Sept-12	285.00

IPPs	Capacity (MW)	Plant Type	Location	Facility	Tenure (Years)	Maturity Date	Amount (million)
Teknologi Tenaga Perlis Consortium Sdn Bhd *	650	Gas	Kuala Sungai Baru, Perlis	<i>Al-Istisna</i> Fixed-Rate Serial Bonds	15	6-Feb-13	1,515.00
Kapar Energy Ventures Sdn Bhd	2,420	Multi Fuel	Kapar	<i>Bai' Bithaman Ajil</i> Islamic Debt Securities	15	8-Jul-14	3,402.00
Panglima Power Sdn Bhd *	720	Gas	Teluk Gong, Melaka	Redeemable Secured Serial Bonds	13	18-Mar-16	830.00
Prai Power Sdn Bhd *	350	Gas	Prai, Penang	<i>Al-Istisna</i> Fixed-Rate Serial Bonds	15	26-Feb-16	780.00
Ranhill Powertron Sdn Bhd *	190	Gas	Kota Kinabalu, Sabah	Islamic Medium-Term Notes Programme	14	27-Jun-19	540.00
							25,215.68

Source: FAST, BNM and publicly available information.

* Rated by RAM

The above is an updated excerpt from RAM's commentary on the Malaysian power sector, *Energising a Steady Growth Path*, which was published in July 2015. Subscribers can retrieve the full report at www.ram.com.my.

Singapore Power Sector

Empowered through liberalisation

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- **Minimal government support to encourage efficiency.** Singapore's power sector is the most developed among its ASEAN-5 peers. Its electrification rate stood at 100% as at end-2015, against a population of 5.5 million. While the country's transmission and distribution (T&D) network assets are entirely managed by the Government of Singapore (GoS) via Singapore Power Group (SP), its power-generation segment experiences minimal government intervention and support to promote its efficiency; energy prices are market-driven and no subsidy is provided. In this regard, Singapore's wholesale electricity market - operated by the Energy Market Company (EMC) - is Asia's first liberalised electricity market. The GoS's presence is only felt in the non-contestable market segment, where electricity tariffs are regulated by the Energy Market Authority (EMA) and revised every quarter, to reflect the latest generating costs.
- **Electricity sold through SPS and electricity retailers.** Consumers in the retail market are divided into 2 categories – contestable and non-contestable. Those with an average monthly consumption of 2,000 kWh (monthly electricity bill of about SGD550 (USD407)¹⁷ and above are categorised as contestable consumers. The contestability threshold was lowered from 4,000 kWh (monthly electricity bill of about SGD1,100 (USD797) on 1 July 2015. Contestable consumers are able to purchase electricity from selected electricity retailers, directly from the wholesale market as market participants, or indirectly from the wholesale market through SP Services Ltd (SPS). Meanwhile, non-contestable consumers – households and small businesses – purchase from SPS at regulated rates. For July-September 2016, the average electricity tariff for non-contestable consumers stood at SGD0.1927/kWh (July-September 2015: SGD0.2241/kWh).
- **Keener competition amid ongoing regulatory reforms.** The GoS has been implementing a series of measures since 1995, to gradually liberalise the Singaporean power sector and encourage competition. The EMA plans to fully open up the electricity retail market to competition by 2H 2018, when consumers who are still paying regulated tariffs - mainly households - will be able to choose a power provider based on their preferred rates and electricity utilisation. This will increase more pricing pressure on generating companies (gencos). Meanwhile, the vesting contract level, which refers to a certain amount of electricity allowed to be sold at a fixed price, has thus far offered partial revenue protection to the major players. Given the gradual decline in the vesting contract level to 20% in 2016¹⁸ (1H 2015: 30%; 2H 2015: 25%), further competition is envisaged as more capacity will be sold in the wholesale market.
- **Limited resources heighten dependence on imported fuels.** Given its limited resources, Singapore is highly dependent on imported fuels to support its economy. Fuels accounted for 21.8%¹⁹ of its total imported goods as at end-2015 – the second highest in terms of value of imports; Singapore imports crude oil from the United Arab Emirates, Saudi Arabia and Qatar. Meanwhile, the island republic sources its natural gas from piped natural gas (PNG) and LNG from countries such as Malaysia and Indonesia. LNG constituted 24.9% of Singapore's natural gas imports as at end-2015.²⁰ We expect LNG imports to rise in the medium to long term, given

¹⁷ SGD1.38 = USD1.00 as at 31 May 2016 (source: Monetary Authority of Singapore)

¹⁸ Source: EMA

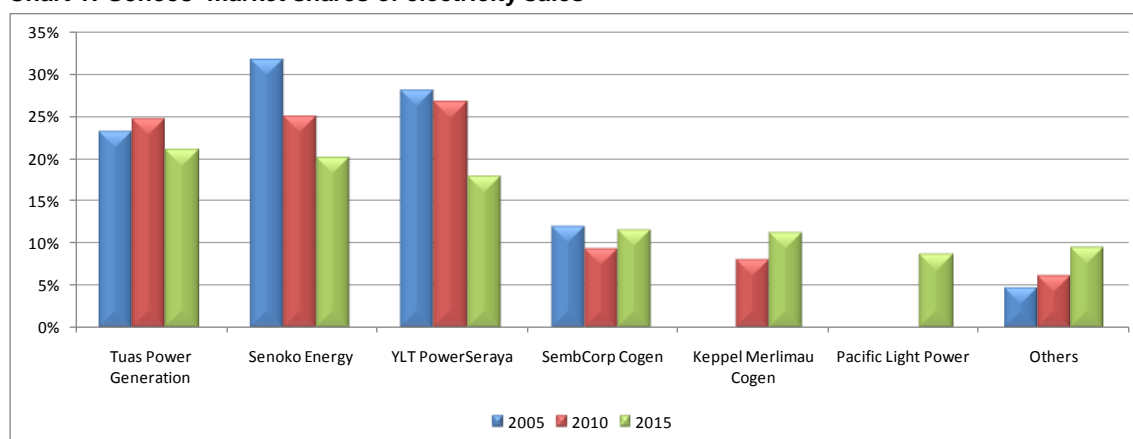
¹⁹ Source: Singapore Department of Statistics

²⁰ Source: EMA

the GoS's import controls on PNG to build up demand for LNG and the commencement of the nation's first LNG-receiving terminal in 2013.

- LNG terminal catalyses development of CCGT plants.** As the region's leading oil-trading hub and pricing centre, Singapore aims to establish itself as Asia's LNG trading hub. This is supported by the LNG-receiving terminal, which started operations in early 2013 to meet the greater demand for natural gas, in line with increasing electricity demand. The operations of the LNG terminal have led to a sudden surge in combined-cycle, gas-turbine (CCGT) plants in the city state, as local gencos ride on the additional supply to tap these higher-yielding plants. This is reflected in Singapore's proportion of generation capacity from CCGT plants, which augmented from 47% in 2005 to 76% as at end-1Q 2016. We expect this trend to be maintained in line with the country's plans to expand its LNG-receiving terminal.
- Rising competition among gencos.** The increased market capacity of CCGT plants should reduce the need for more costly and less efficient oil-fired plants. As a conduit to gain access to the global gas market, the LNG terminal will provide Singapore the opportunity to source for competitively priced LNG. Competition is thus expected to intensify amid the further decline in electricity tariffs, which in turn will further compress the gencos' margins. Moreover, the commencement of the LNG terminal has been followed by the establishment of a Singapore-based LNG spot price index, also known as the Singapore Exchange LNG Index Group (SLInG), paving the way for gas pricing that is independent of oil indexation in the long term.

Chart 1: Gencos' market shares of electricity sales



Source: EMA

- Competition to gradually erode incumbents' positions.** The Singaporean power-generation sector is currently dominated by 3 gencos: Tuas Power Generation Ltd, Senoko Energy Ltd and YTL PowerSeraya Ltd. Against the backdrop of ongoing liberalisation and the debut of new entrants, keener competition has been gradually squeezing the incumbents' profitability and market positions. As at end-2015, their combined market share fell to 59.0% (end-2014: 61.7%); PacificLight Power Pte Ltd commenced operation of its 800-MW new capacity in 2014 and boosted its market share to 8.7% in 2015 (2014: 8.3%; 2013: 1.0%). This year, another debutante – Tuaspring Pte Ltd – joined the competition with 411 MW of installed capacity. Overall, the market's total generation capacity has surged 19.5% in the last 3 years, to 13,404.7 MW as of end-1Q 2016 (2013: 11,221.1 MW).

- **Electricity futures market to manage price volatility.** To enhance and spur competition in the wholesale and retail electricity markets, the EMA has been working on the development of an electricity futures market, to enable industry players to manage electricity price volatility. Ultimately, this will benefit end-consumers as retailers will be able to better package their energy plans. Competition is expected to heighten as the futures market will lower entry barriers by providing new independent retailers a platform to secure fixed-price contracts for their consumers, resulting in downward pressure on electricity rates. Contestable consumers can also leverage on the electricity rates provided by the futures market to negotiate packages with retailers, indirectly inducing competition as retailers compete for sales.
- **Power sector expected to maintain growth momentum.** In 2015, Singapore's electricity consumption increased 2.4% to 47,514 GWh (2014: 46,403 GWh), in line with its slower GDP growth of 2.0% (2014: 2.9%) and mostly supported by energy-intensive industries such as the manufacturing and transport-related sectors. In the long term, large projects to address infrastructure bottlenecks are expected to boost power demand growth within the construction and transport-related industries. These ongoing projects include the Land Transport Authority's target of doubling Singapore's rail network to about 360 km by 2030, and the expansion of Terminal 5 of Changi Airport (expected to be completed in 2028). Furthermore, the increase in net foreign direct investment, which advanced an average of 13.1% from 2010 to 2014, is anticipated to fuel the growth of electricity consumption, which bodes well for the sector.
- **Plans to import electricity.** According to the EMA, electricity demand is expected to rise more than 30% over the next decade. It is therefore looking at importing electricity from the ASEAN Power Grid (APG) to meet increasing demand. There are currently 4 ongoing inter-connection projects, with the remaining proposed networks expected to be completed by 2020. Nonetheless, differences in standards among ASEAN members – disparities in electricity markets and tariff structures – will impede the progress of the APG. We, however, do not believe that the delay will have a significant impact on Singapore as its power sector currently has sufficient capacity to meet demand, as indicated by the high reserve margin of 86.9% in 2015 (2014: 87.3%).²¹
- **Deep financial market supportive of development.** Singapore hosts some of the world's best financial institutions, which has earned it the status of a regional financial hub. Hefty capital inflows provide long-term financing for infrastructure projects, extended by larger Singaporean banks. In addition, the republic's deep capital markets serve as alternative funding sources for infrastructure-related entities, accounting for SGD8.4 billion or 12.5% of the top 30 local-currency (LC) corporate bond issues as at end-2015. For example, close to half of SP PowerAssets' borrowings are LC-denominated fixed-rate notes (47.4% of its total outstanding debts as at end-March 2016), with the rest comprising various foreign currencies – Japanese yen, US dollars and HK dollars. Meanwhile, Singapore's LC corporate bond market was valued at SGD133 billion or 33.0% of its GDP as at end-June 2016²². Notably, Singapore has embarked on several initiatives to promote LC bonds as a financing option for infrastructure projects within the region, such as the public-private partnership initiative jointly launched by International Enterprise Singapore and Asian Development Bank (ADB) as well as the establishment of Clifford Capital by the GoS.

The above is an updated excerpt from RAM's report on the Singaporean power sector, *Empowered through Liberalisation*, published in July 2015. Subscribers can retrieve the full report at www.ram.com.my.

²¹ Source: EMA

²² Source: AsianBondsOnline.

Singapore

• Key Statistics 2015 •

POPULATION:

5.5 million



NOMINAL GDP:

USD293 billion



GDP PER CAPITA:

USD52,889



ELECTRIC POWER CONSUMPTION:

8,638.9kWh per capita



**HIGHLY EFFICIENT &
LIBERALISED Power Sector**



**Minimal
GOVERNMENT INTERVENTION**

ELECTRICITY PRODUCTION

Electrification Rate:
100%

Electricity Production:
50,272 GWh

Installed Capacity:
13,405 MW

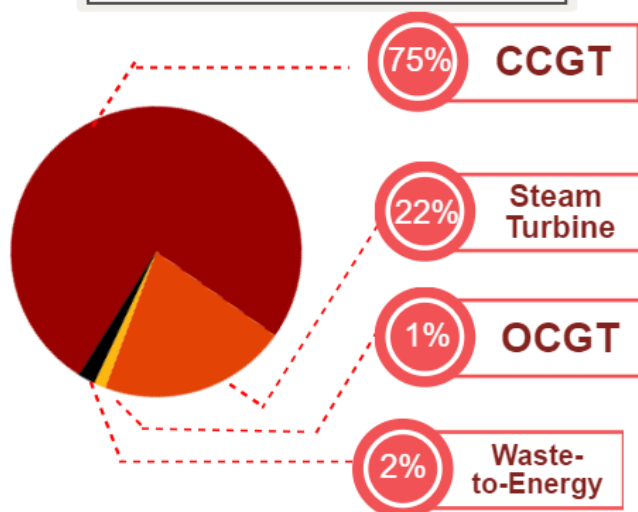
Peak Load:
6,960 MW

Reserve Margin:
86.9%

Average Tariff (non-
contestable):
USD0.15/kWh

Transmission and
Distribution Losses:
0.49% (2013)

Generation Mix



Source: EMA, Singapore Department of Statistics and World Bank

Indonesia Power Sector

Power up or power out

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- Pressing need for rapid capacity expansion.** Indonesia aspires to achieve “developed country” status by 2025, and to join the league of the world’s 10 largest economies. However, the Government of Indonesia (GoI) faces the challenge of accelerating the nation’s electricity supply to support its ambitious objective. Despite its population of more than 250 million, Indonesia’s electrification ratio is low – at 88.3% as at end-2015²³ – relative to most of its ASEAN neighbours, the electrification rates of which mostly exceed 99%. Indonesia’s capacity deficiency is underlined by uneven capacity distribution throughout the country, which has resulted in frequent power rationing and outages, especially in rural and isolated areas. Given this, Perusahaan Listrik Negara’s (PLN) reserve margin of 21.7% as at end-2015²⁴ is low compared to its target of 30%-35%.²⁵ Given its strong electricity demand growth (CAGR of 6.6% in 2005–2015),²⁶ Indonesia is likely to encounter an acute supply shortage if plant-up efforts are not hastened. The GoI aims for 99% of the population to be connected by end-2020.

Chart 1: Indonesia’s electrification ratio

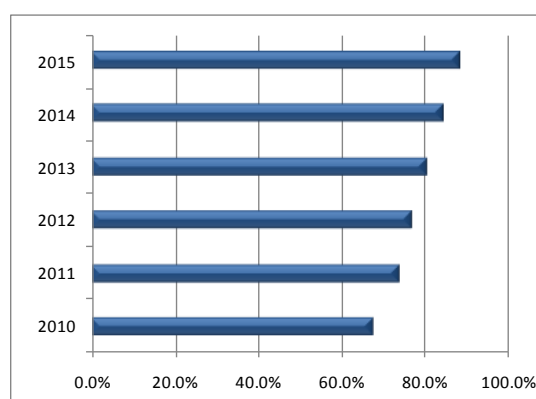
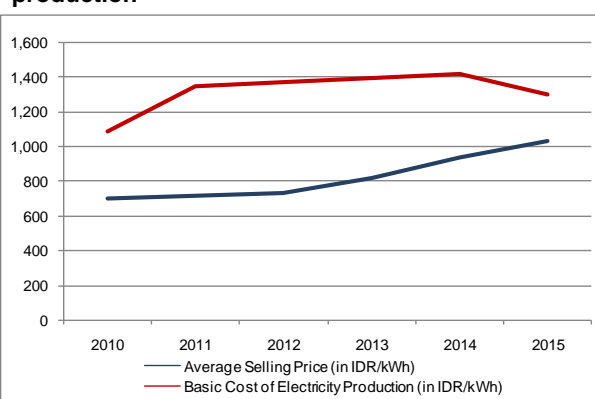


Chart 2: Average electricity selling price vs cost of production



Source: PLN

- Fast-Track Programmes encountered delays.** To meet its target for additional power, the GoI has directed PLN to accelerate the development of 10,000 MW of power-generating capacity under Fast-Track Programme I (FTP-1) in 2006–2010, and another 10,000 MW under FTP-2 in 2010–2016. Nonetheless, these programmes had been severely delayed by various obstacles. The GoI had subsequently revised the agenda for FTP-2 to a total capacity requirement of 17,563 MW, to be completed in 2014–2022. 7,894 MW or 79.5% of FTP-1 projects had been completed as at end-2015 while FTP-2 remained in various stages of development.²⁷ In June 2016, the Ministry of Energy and Mineral Resources (MoEMR) ratified PLN’s 2016-2025 Electricity Power Supply Business Plan (RUPTL),²⁸ including 35,000 MW of new capacity (including those under FTP-1 and FTP-2) that will be prioritised and completed by 2019, together

²³ Source: PLN Annual Report 2015

²⁴ Based on estimated 2015 figures. Source: PLN Annual Report 2015 and RUPTL 2016-2025

²⁵ Source: RUPTL 2016 - 2025

²⁶ Source: PLN

²⁷ Source: PLN Annual Report 2015

²⁸ RUPTL 2016–2025

with 46,597 circuit-km of transmission network.²⁹ Along with other projects in the pipeline, these will contribute an additional 42,940 MW to the grid by 2019.³⁰ Given the mammoth task, IPPs are expected to play a prominent role; private investments are expected to fund and develop 25,000 MW. The 10-year plan calls for a total investment of USD153.7 billion, with 71.6% comprising generation assets.³¹

- PLN key facilitator of nation's electrification goals.** Wholly owned by the GoI, PLN is Indonesia's national electricity company; it owns the country's 931,783 circuit-km of transmission network and also controlled 76.2% of Indonesia's 52,889-MW generating capacity in 2015.³² Under Law No. 19/2003, the GoI is obligated to provide subsidies to PLN in the form of public service obligation (PSO) payments to cover the shortfall between its electricity production cost and regulated tariffs while ensuring it earns an allocated profit margin. In fiscal 2015, PSO payments accounted for 20.6% of PLN's IDR273.89 trillion revenue (USD19.9 billion).³³ Given its pivotal role and strategic function, PLN benefits from a high level of government support and involvement. PLN's credit profile is therefore viewed to mirror that of the GoI. Notably, the GoI, under Presidential Regulation No. 82 of 2016, is allowed to provide guarantees for direct loans acquired by PLN from international financial institutions.
- Tariff increases in line with reducing energy subsidies.** Meanwhile, in line with the GoI's efforts to gradually remove electricity subsidies, the proportion of PSO payments to PLN's total revenue has been gradually declining, from 45% in 2011 to 21% in 2015. PLN is expected to cover the shortfall via increases in tariffs. In January 2015, the GoI introduced floating tariffs to non-subsidised customers,³⁴ which are updated monthly based on 3 main indicators: the exchange rate of the IDR to the USD, oil prices, and the country's inflation rate. That said, the GoI still retains full control over tariffs charged to end-users and allocates subsidies from the government budget. Of late, tariffs have declined in line with the drop in fuel prices, albeit partly moderated by the weakening of the IDR against the USD. Electricity tariffs have remained below production costs and some consumers still enjoy lower tariffs. Nonetheless, PLN recently signalled an increase in electricity tariffs as the GoI had rejected its application for a higher subsidy allocation. Without a corresponding rise in tariffs, PLN may have to take on additional borrowings to cover the shortfall. That said, the GoI has, to date, promptly paid PLN; continuous government support is imperative given the GoI's reliance on PLN for policy implementation.
- Land acquisition still an impediment against speedy plant-ups.** Capacity plant-up has been a lengthy process in Indonesia, primarily due to prolonged delays in land acquisition. This is particularly evident in undeveloped areas, where the bulk of the land has no registered title, with little evidence of ownership. Complicated licensing procedures, non-synchronous regulations and overlapping project sites with forest-conservation areas have also contributed to the delays. As of June 2016, only 170-MW out of the 35-GW programme had begun commercial operations. However, recent developments at the 2,000-MW Batang coal-fired power plant in Central Java may set a precedent for power projects facing land disputes. The project recently reached financial close and has finally started construction following the enforcement of Law No. 2/2012 on land acquisition, which allows the GoI to seize the land for public interests. Despite this progress, it is immensely challenging to complete this massive project on time, given that the

²⁹ Source: PLN Sustainability Report 2015

³⁰ Source: PLN Annual Report 2015

³¹ Source: RUPTL 2016 - 2025

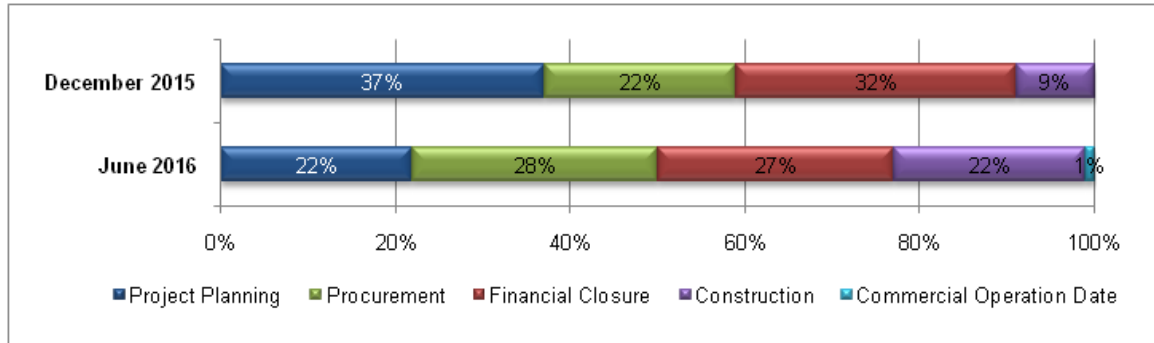
³² Source: PLN Annual Report 2015

³³ USD1.00 = IDR13,795.00 (as of December 2015); Source: Bank of Indonesia

³⁴ The tariffs can be set at different levels for each region, business area and type of customers.

projects in the pipeline remain plagued by various setbacks. Meanwhile, the Gol's ongoing reforms to overcome structural challenges, such as complicated bureaucracy, will also help set the pace for successful and timely plant-ups.

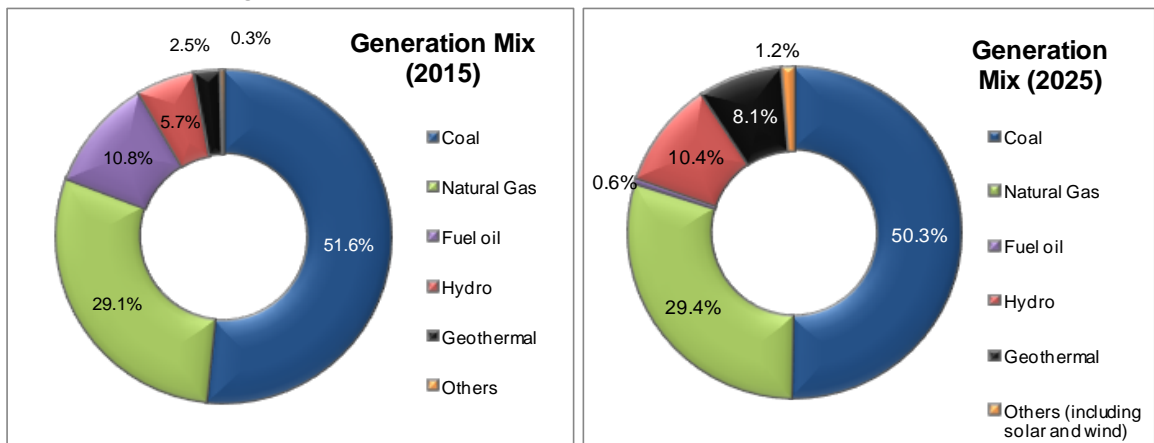
Chart 3: Stages of completion for the 35,000-MW programme



Source: PLN

- Generation mix to capitalise on abundant resources.** Despite being one of the world's largest producers of natural gas, Indonesia faces supply shortages due to massive exports of its natural gas, a decline in gas exploration amid lack of investment, and decreasing output from ageing fields. On the other hand, coal counts among its cheapest fuel sources and is easily and abundantly available there, with an estimated reserve of 21.1 billion reserves.³⁵ To capitalise on its abundant coal resources and low generation costs, Indonesia's generation mix is expected to remain skewed towards coal, which is envisaged to comprise half of its generation mix by 2025. RUPTL 2016-2025 also seeks to increase the use of RE, from the current 8.2% to 19.7% by 2025.³⁶ Among the Gol's initiatives to accelerate plant-ups of RE is via the issuance of MoEMR Regulation No.19 of 2016, under which developers of solar power plants are selected based on a "first come, first served" basis instead of a more lengthy competitive tender process.

Chart 4: Indonesia's generation mix



Source: PLN Annual Report 2015, PLN's RUPTL 2016-2025

³⁵ Source: Indonesian Coal Book 2013, Petromindo

³⁶ Source: RUPTL 2016

- Promising geothermal market.** The GoI also plans to tap the country's underdeveloped geothermal potential, raising its geothermal proportion of the generation mix from 2.5% in 2015 to 8.1% by 2025.³⁷ With an estimated 28,000 MW, or 40% of the world's geothermal potential, Indonesia could become a geothermal powerhouse and present a promising greenfield market, which could help solve its poor electrification. To make geothermal exploration more attractive and viable to investors, the GoI included geothermal power plants in its FiT programme and passed a new Geothermal Law in 2014, which eases restrictions on developments in protected areas. The GoI's interest is further reflected in the expected commissioning of 4 geothermal power plants by on a fast-track basis this year, and the construction of the world's largest geothermal plant – the 320-MW Sarulla geothermal project in North Sumatra. The latter had previously been delayed by land-acquisition issues and unfavourable tariffs, but is now on track towards achieving its targeted commercial operation date in 2017. Nevertheless, the complicated regulatory framework to determine risk-sharing, uncompetitive power tariffs and limited access to hedging facilities remain hurdles for developers and investors.
- Regulatory reforms to attract private investment.** The GoI has made several revisions to its public-private partnership (PPP) framework to improve investor confidence and the bankability of projects. Effective 2015, Badan Koordinasi Penanaman Modal (BKPM) will offer private investors one-stop services to swiftly and systematically obtain licensing approval. In addition, projects under the PPP scheme may secure certain guarantees against infrastructure risks under the Indonesia Infrastructure Guarantee Fund, whereas projects under the FTP-2 may secure explicit guarantees from the GoI to ensure PLN's ability to honour PPAs via a Business Viability Guarantee Letter. The GoI recently issued Presidential Regulation No. 4/2016, which introduces a third form of guarantee that enables any project listed in the RUPTL to also obtain a government guarantee against PLN's payment ability. The same regulation aims to accelerate the issuance of necessary permits for the development of power-generation projects. These are lauded as positive steps in the right direction. RAM believes that successful implementation of regulatory reforms will help attract long-term funding for Indonesia's sizeable power projects.
- Banking on international lenders.** The lack of a matured local-currency bond market, along with a ready pool of long-term institutional investors, has also hindered Indonesia's infrastructure development. Indonesia's local-currency corporate bond market was only equivalent to 2.3% of its GDP as at end-June 2016.³⁸ Most IPPs rely on export credit and support from multilateral lending agencies for financing. Project financing in Indonesia is largely provided by the ADB, the European Investment Bank and the World Bank, as well as governmental agencies such as Japan Bank of International Cooperation, China EXIM and Korean EXIM. The recent establishment of the Asian Infrastructure Investment Bank is viewed favourably as it will provide another funding avenue for Indonesia vis-à-vis meeting its urgent infrastructure needs. Indonesia may also seek alternative funding from the more matured debt capital markets of its ASEAN neighbours, such as Malaysia.

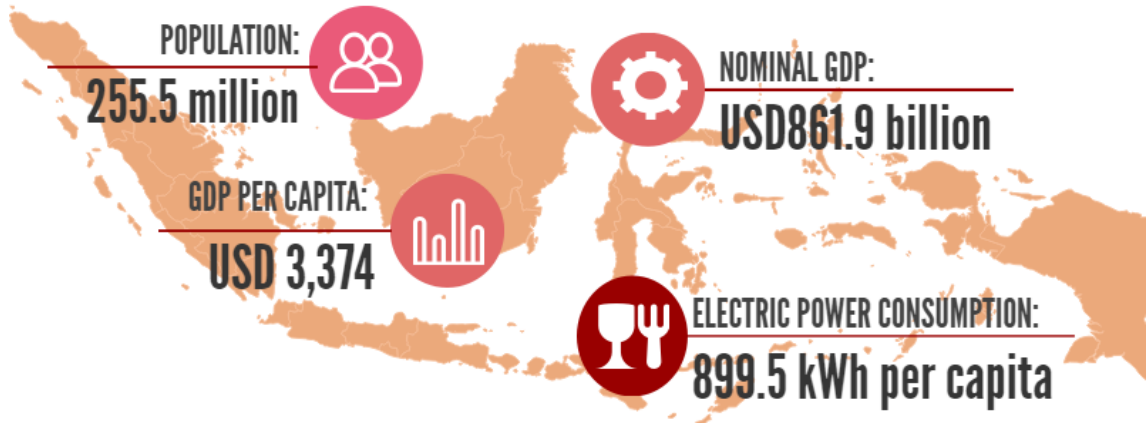
The above is an updated excerpt from RAM's report on the Indonesian power sector, *Power Up or Power Out*, published in August 2015. Subscribers can retrieve the full report at www.ram.com.my.

³⁷ Source: PLN Annual Report 2015 and RUPTL 2016-2025

³⁸ Source: AsianBondsOnline

Indonesia

• Key Statistics as at 2015 •



Fuel Cost Pass Through
SUBSIDISED MARKET



Electricity Market Structure
NON-COMPETITIVE

ELECTRICITY PRODUCTION

Electrification Rate:
88.3%

Electricity Production:
233,982 GWh

Installed Capacity:
52,889 MW (Total)
40,295 MW (PLN)

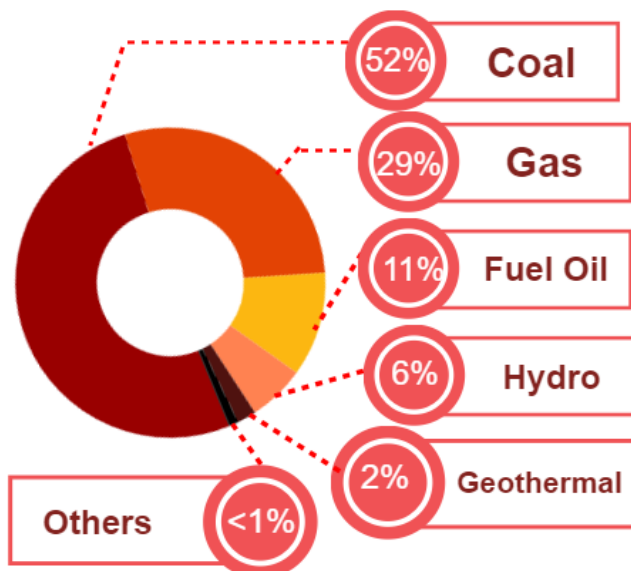
Peak Load (PLN only):
33,112 MW

Reserve Margin (PLN only):
21.7%

Average Tariff:
USD0.09/kWh

Transmission and
Distribution Losses:
9.77%

Generation Mix



Source: MoEMR, PLN and World Bank

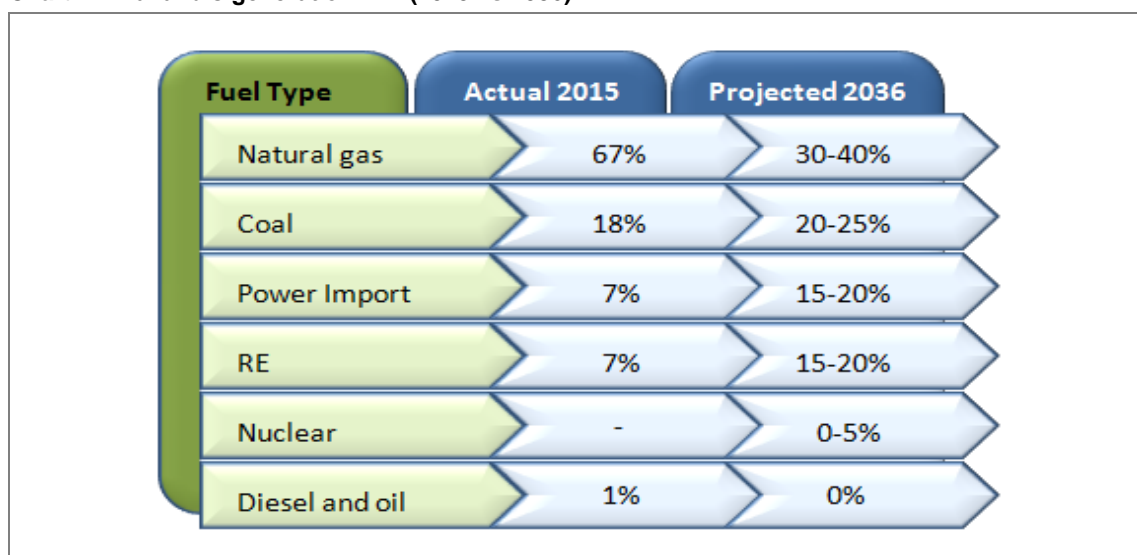
Thai Power Sector

Powering ahead with solar energy

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- Solar power leader in South-East Asia.** Thailand (the Kingdom) is the largest solar power producer in South-East Asia, with a solar capacity of 1.3 GW (as at end-October 2015) - 5 times higher compared to 3 years earlier.³⁹ The rapid growth of solar energy in Thailand has been mainly driven by its supportive policies, such as FiT and import duty exemptions, which have attracted substantial solar investments into the Kingdom. Between 2009 and 2013, Thailand was the recipient of USD3.9 billion of solar-related investments.⁴⁰ The Kingdom has set its sights on boosting the contribution by RE - particularly solar power - to its generation mix, from the current 7% to an estimated 20% by 2036. Meanwhile, in terms of proportion of RE capacity, solar power's contribution is expected to advance from 16.7% in May 2015 to 30.6% in 2036.

Chart 1: Thailand's generation mix (2015 vs 2036)



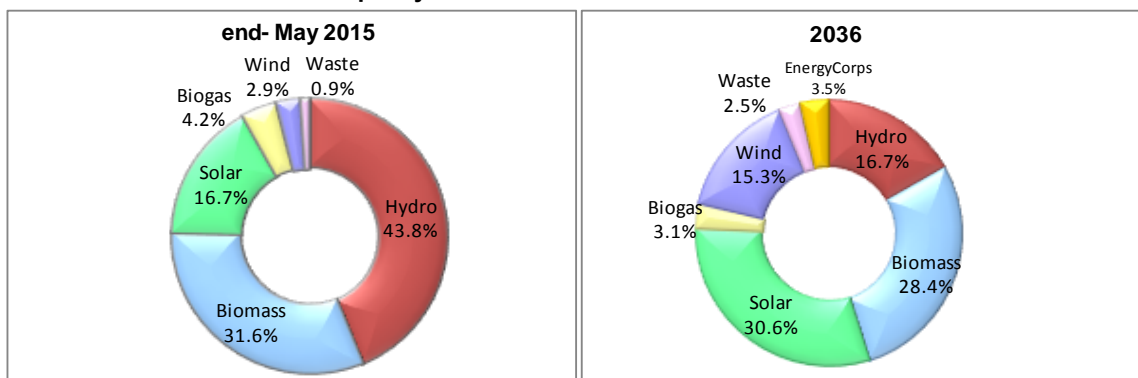
Source: PDP 2015 & EPPO

- FiT programme to spur solar potential.** To spur investment in small-scale RE power generators, the FiT programme was introduced in 2015, guaranteeing greater financial certainty by offering more favourable rates and longer concession periods to investors, compared to the previous RE programme. While the FiT differs according to the type and size of the power plants, they consist of 3 components: a fixed remuneration, a variable portion to reflect inflation, and a premium granted to selected power plants based on a certain renewable fuel and location.

³⁹ Source: International Energy Agency's Annual Report 2015

⁴⁰ Source: The Pew Charitable Trusts

Chart 2: Thailand's installed capacity for RE



Source: PDP 2015

Notes: Energy crops are crops grown specifically to be used as fuel.

- Active government participation to promote solar power.** In July 2013, the National Energy Policy Council (NEPC) approved a “solar rooftop” policy to encourage public participation (i.e. households and commercial entities). Eligible participants are entitled to receive FiT for the solar rooftop installations. In August 2014, the Government of Thailand (GoT) laid out another programme, i.e. the Governmental Agency and Agricultural Cooperative Programme (Agro-Solar), which targets to add 800 MW of solar capacity by forming public-private partnerships involving government agencies or agricultural cooperatives. This allows the public partners to act as project owners and PPA holders. The GoT’s ongoing commitment to solar policies has yielded promising results; some 70% of the USD5.6 billion of clean-energy investments between 2009 and 2013 was invested in solar power.⁴¹
- Strong regulatory framework.** The Electricity Generating Authority of Thailand (EGAT) – the Kingdom’s state-owned national utility company – is responsible for power generation and purchases for onward selling and transmission to the entire country. EGAT fully owns and operates 33,278 circuit-km of transmission network throughout Thailand. It is also the largest power producer and controls 40% of the Kingdom’s 38.8 GW of installed capacity (as at end-December 2015).⁴² The GoT and EGAT develop its national energy policies via the Power Development Plan (PDP), which outlines its long-term energy strategies for the Kingdom vis-à-vis fuel diversification, optimal reserve margins and capacity targets.
- EGAT lacks flexibility to determine tariffs.** When confronted by escalating fuel prices, EGAT lacks the flexibility to set its tariffs as they are dictated by the GoT. There have been instances where EGAT has been forced to shoulder heavier fuel costs on the GoT’s directive, for the benefit of its consumers. In 2008, EGAT was made to bear approximately THB19.6 billion of uncollected revenue (equivalent to about 5% of its revenue). Despite registering improvements compared to 4 years earlier, EGAT’s OPBDIT margin of 16.3% in 2015 is lower than those of its regional peers, such as Malaysia’s TNB and Indonesia’s PLN, largely due to relatively less subsidy support from the GoT. Any increase in fuel prices without a corresponding rise in tariffs will have an adverse effect on its margins.

⁴¹ Source: The Pew Charitable Trusts

⁴² Source: EGAT

- **Depleting natural gas reserves and hefty gas expenditure.** The Thai power sector relies substantially on natural gas, which constituted approximately 67% of Thailand's generation mix in 2015. Some 80% of the gas requirement was sourced from the Kingdom's depleting natural gas reserves, which is estimated to last another 13 years; the rest was imported from Myanmar at a hefty price. In the last decade, the value of energy imports has consistently accounted for more than half of its energy consumption expenditure, which came up to 10% of the Kingdom's GDP on average for the same period. On top of imported natural gas from Myanmar, the Kingdom also imports LNG, mainly from the Middle East. Thailand's increasing dependence on imported fuels may pose a threat to its energy security, as any unforeseen events or unfavourable policy changes by the originating countries may have an adverse impact on the Kingdom's fuel supply.
- **Increased coal generation as part of diversification strategy.** Under PDP 2015, Thailand also aims to increase the proportion of coal in its generation mix, from 18% in 2015 to up to 25% by 2036, by adding an estimated 7,390 MW of clean-technology power plants.⁴³ Nonetheless, there is a lack of indigenous coal supply; the Kingdom's domestic coal output of 17.9 million tonnes (mostly lignite) is insufficient to meet its consumption of 18.4 million tonnes.⁴⁴ Given that Thailand would need to import more coal to meet rising demand, this would necessitate enlarged capital expenditure to accommodate improvements in port and rail infrastructure.

Table 1: Thailand's total installed capacity, peak demand and reserve margin

	Installed Capacity* (MW)	Peak Demand (MW)	Generation (GWh)	Reserve margin (%)
2012	32,600	26,418	179,484	24.8
2013	33,681	27,085	181,205	26.6
2014	34,668	27,634	186,024	28.7
2015	38,815	27,346	192,189	41.9

Source: EPPO and EGAT

*Includes power imported from neighbouring countries

- **Slower electricity demand growth led to oversupply.** As an ASEAN manufacturing hub, Thailand's industrial sector is its largest electricity consumer, accounting for 43% of the Kingdom's energy consumption in 2015.⁴⁵ Given that energy consumption typically tracks a country's economic growth, Thailand's sluggish economy and colourful political landscape had contributed to a slower electricity demand growth of 3.6% in 2015. In the absence of key growth drivers, the Thai economy is expected to moderate further with a projected GDP growth of 3% in 2016.⁴⁶ That said, the proposed additional plant-ups, including coal-fired power plants and RE power generators, may exacerbate its current overcapacity. Thailand's power reserve margin stood at 41.9% as at end-2015, which is above the minimum target of 15%.

⁴³ Source: PDP 2015

⁴⁴ Source: EPPO

⁴⁵ Source: EPPO

⁴⁶ Source: IMF

- **Supportive policies aid bank funding.** Thailand's growing local-currency bond market was valued at a sizeable THB10.37 trillion or USD295 billion as at end-June 2016, equivalent to 75% of the Kingdom's GDP.⁴⁷ Nevertheless, power bonds remain scarce as their appeal is muted by the availability and easy accessibility of bank financing to fund power projects. The GoT has set up the Energy Conservation Promotion Fund to promote energy-efficient and RE projects, by offering assistance in securing project financing and technical advisory. Moreover, the Energy Efficiency Revolving Fund, a collaboration with the finance sector to provide low-interest loans to large-scale, energy-efficient and RE project developers, has been introduced to manage initial capital costs through tax holidays or exemptions under the Investment Promotion Act. Although power-related bonds are limited, we believe that the bond market could become an attractive alternative platform for long-term financing in Thailand's journey towards becoming South-East Asia's solar power leader.

The above is an updated excerpt from RAM's report on the Thai power sector, *Powering Ahead with Solar Energy*, published in March 2016. Subscribers can retrieve the full report at www.ram.com.my.

⁴⁷ Source: Energy for Environment Foundation. The exchange rate on this note and all subsequent references is USD1.00 = THB36.08 (as at 31 December 2015); Source: Bank of Thailand.

Thailand

• Key Statistics as at 2015 •

POPULATION:
65.7 million



GDP PER CAPITA:
USD 6,013



NOMINAL GDP:

USD395.7 billion



ELECTRIC POWER CONSUMPTION:

2,660 kWh per capita



Fuel Cost Pass Through
SUBSIDISED MARKET



Electricity Market Structure
SINGLE BUYER MODEL



ELECTRICITY PRODUCTION

Electrification Rate:
100%

Electricity Production:
192,189 GWh

Installed Capacity:
38,815 MW

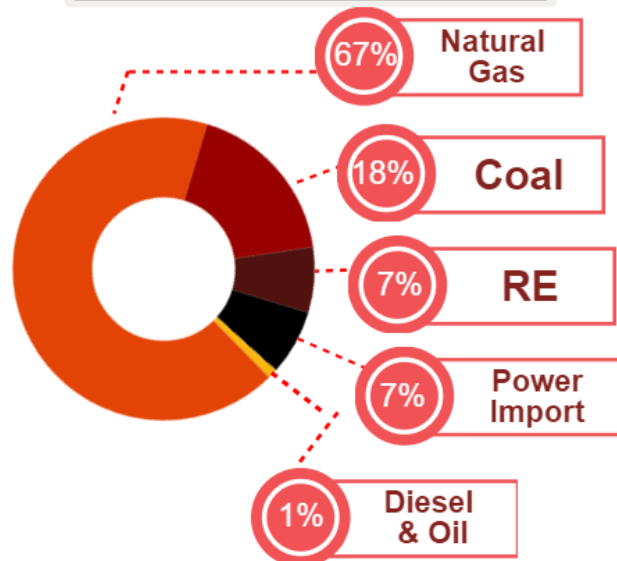
Peak Load:
27,346 MW

Reserve Margin:
42%

Average Tariff:
USD0.10/kWh

Transmission and
Distribution Losses:
8.0% (as at 2012)

Generation Mix



Source: EPPO, EGAT, IEA, IMF and World Bank

Philippines Power Sector

Bridging the supply-demand gap

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- **EPIRA created competitive power market.** Prior to the 1990s, the National Power Corporation (NPC), a government-owned and controlled company, had been the sole vertically integrated electricity provider in the Philippines. Under the Electric Power Industry Reform Act (EPIRA) of 2001, the Philippines power industry has evolved into 3 distinct sectors – generation, transmission, distribution – and become regulated by the Energy Regulatory Commission (ERC). While the bulk of NPC's generation assets have been privatised under the EPIRA, it continues to operate and maintain the remaining undisposed generation assets via an operation and maintenance agreement with Power Sector Assets and Liabilities Management (PSALM).⁴⁸ Following the liberalisation under EPIRA, the Philippines' power market has evolved into a competitive landscape, similar to Singapore's, where energy prices are market-driven with no government subsidies.
- **Fragmented generation and distribution sectors, monopoly in transmission.** According to the 27th EPIRA Status Report, the generation sector was dominated by San Miguel Energy Corporation (24%), followed by First Gen Corporation (17%) and Aboitiz Power Corporation (15%) as of 2014.⁴⁹ The distribution sector is made up of numerous private distribution utilities, electricity cooperatives and local government units. Manila Electric Company (Meralco) is the nation's largest privately owned distribution utility, which accounted for 55% of the total electricity sales in the Philippines in 2015.⁵⁰ Meanwhile, the country's transmission assets are managed by a single entity – the National Grid Corporation of the Philippines (NGCP)⁵¹ – via a 25-year concession awarded in December 2007.
- **Merchant market in Luzon and Visayas akin to Singapore's.** The nation's power grid is demarcated geographically by the 3 regions: Luzon, Visayas and Mindanao. Similar to Singapore's power sector, the Philippines established a competitive wholesale electricity spot market for the Luzon grid and Visayas grid in 2006 and 2010, respectively. The Wholesale Electricity Spot Market (WESM) for Luzon and Visayas are operated by Philippines Electricity Market Corporation (PEMC). Each generator must sell its physical output on an hourly basis to the WESM. The generator with the lowest marginal cost will have an edge as it will rank higher in the merit order, thus securing a higher priority on dispatch. In Mindanao, the wholesale electricity spot market was established (under Interim Mindanao Electricity Market) in 2013 but suspended in 2014.
- **Consumers comprise Contestable Customers and Captive Market.** End-users with a monthly average peak demand of at least 1 MW are categorised as Contestable Customers. Contestable Customers have the option to purchase electricity from either generator with a Retail Electricity Supplier licence issued by the ERC, or from the WESM. Meanwhile, the Captive Market – households and small businesses – will have to purchase electricity at retail rates charged by

⁴⁸ PSALM had been established under the EPIRA to take over the assets and liabilities of the NPC, privatise generation assets and utilise the proceeds to pay down the outstanding debts of NPC.

⁴⁹ The other power generators in the Philippines include GN Power Limited, AES Corporation, SPC Power Corporation, FDC Utilities Incorporation and Alsons Power Group.

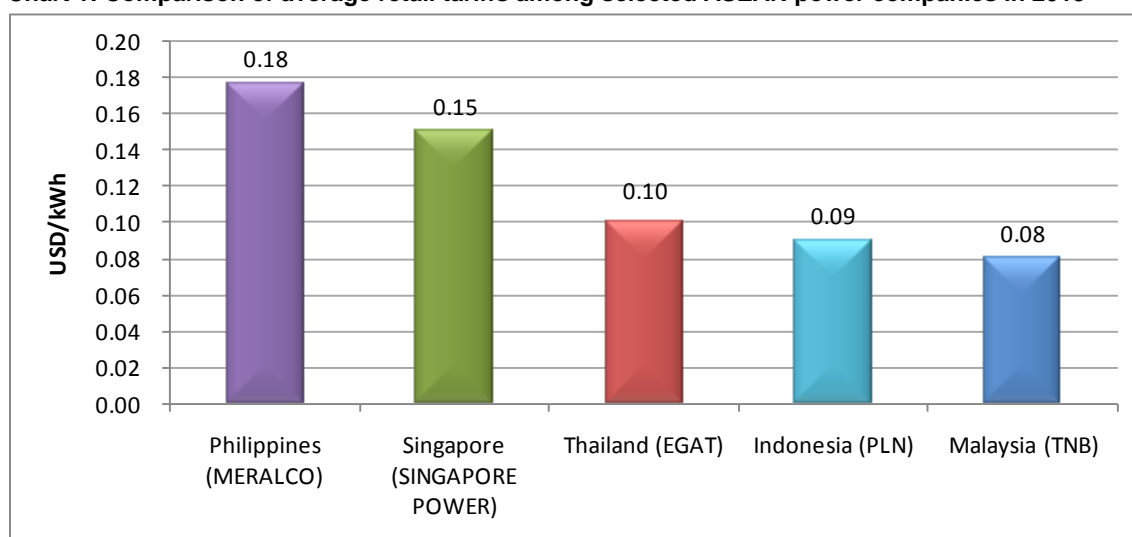
⁵⁰ Source: Meralco's Annual Report 2015

⁵¹ NGCP is owned by Monte Oro Grid Resources Corporation, Calaca High Power Corporation, and State Grid Corporation of China.

their respective area's private distribution utility, electricity cooperative or local government (collectively known as distribution utilities). The tariffs set by the respective area's distribution utility are reviewed each quarter, and are regulated by the Government of the Philippines (GoP) through ERC to reflect the actual cost of electricity.

- Highest electricity tariffs in ASEAN, largely influenced by international fuel prices.** The Philippines' electricity retail rate is made up of the following key components: generation, distribution, transmission, system loss charges, taxes and universal charges as well as FiT.⁵² The retail tariff is adjusted on a monthly basis; changes reflect variations in electricity demand, the availability of different generation sources, fuel costs, and power plant availability. Generation cost is typically the largest component of the average retail rate (approximately 55%) and is influenced by the prices of fossil fuels. Given that coal, oil and gas are purchased at international market prices without any government subsidy, the Philippines' average retail rate is among the highest in the region (refer to Chart 1). Meralco's average retail rate has been declining since 2014, from 9.42 peso/kWh (USD0.21/kWh)⁵³ to 7.58 peso/kWh (USD0.16/kWh)⁵⁴ as at end-June 2016, largely due to weaker oil and coal prices.

Chart 1: Comparison of average retail tariffs among selected ASEAN power companies in 2015



Source: TNB, SESB, SEB (Malaysia), EMA, Singapore Power (Singapore), PLN's Annual Report 2015 (Indonesia), EGAT, EPPO (Thailand) and DOE, MERALCO's Annual Report 2015 (Philippines)

Note: Bloomberg exchange rates as at 31 December 2015: USD/PHP = 46.905; USD/SGD = 1.4185; USD/RM = 4.29; USD/THB = 36.03; USD/RPH = 13,788

- Low electrification rate and declining reserve margin, particularly in Mindanao.** According to the World Bank, the electrification rate in the Philippines stood at only 87.5% against its population of 100.7 million in 2015. The reserve margin⁵⁵ trended downwards between 2011 and 2015 for the country's 3 main regions; Luzon's declined from 55.4% to 36.4%, Visayas' shrank from 62.2% to 26.1%, and Mindanao's declined from 63.6% to 33.4%. The causes of the electricity supply deficiencies include constant mismatches between the planned and unplanned outages of large power plants, lack of coordination between the government and the generation companies vis-à-vis commissioning plants on a timely basis, and slow progress in planting up

⁵² Source: 27th EPIRA Status Report and Meralco's Investors and Analysts Briefing, Half Year Ended June 30, 2016.

⁵³ Source: Exchange rate as at 27 December 2014 on Bloomberg: PHP/USD=PHP44.70

⁵⁴ Source: Exchange rate as at 30 June 2016 on Bloomberg: PHP/USD=PHP47.10

⁵⁵ Calculated as the excess of installed capacity over peak demand.

due to land-acquisition issues and lengthy permit processes.⁵⁶ Recognising this, the GoP created the Philippines Energy Plan 2012-2030 (PEP), to expand the power sector and encourage the participation of the private sector. However, the progress of the PEP has been sluggish. Given the rampant power shortages, the GoP established the Interruptible Load Programme (ILP) in 2014 as a near-term measure.

- **ILP to address power-supply shortfall in short term.** Under the ILP, participants with stand-by generation capacities and an average monthly consumption of about 1 MW will be compensated if they use their own generating facilities during instances of power-supply deficit, instead of obtaining their electricity supply from the main grid. Upon the commencement of the ILP, only captive customers or those that are directly served by distribution utilities, such as Meralco, had been allowed to participate in the programme. In April 2015, the ERC extended the ILP to include contestable customers or those who have their own retail electricity suppliers. While this has helped reduce the frequent power outages in the Philippines, the planting up and smooth integration of new power plants into grids will address the long-term lack of electricity supply.
- **Planting up needed to address current supply deficit.** The Philippines' economy posted a solid economic growth of 5.8% in 2015, and was one of the fastest-growing economies in Asia. In 2015, demand for electricity increased 6.7% y-o-y to 82,413 GWh, driven by the expansion of electricity sales in the residential (+8.5%) and commercial (+7.1%) sectors. However, it is not possible to sustain such robust economic growth without a sufficient and stable electricity supply for households and companies. The Philippines posted a combined installed capacity of 20,055 MW as at end-June 2016. According to the Department of Energy (DOE), as at end-June 2016, the committed plant-ups coming on-stream in the grid will contribute approximately 6,179 MW by December 2026.⁵⁷ Meanwhile, the indicative plant-ups that are envisaged to be connected to the grid by December 2026 account for 13,853 MW.⁵⁸

Chart 2: Capacity mix in the Philippines as at end-June 2016

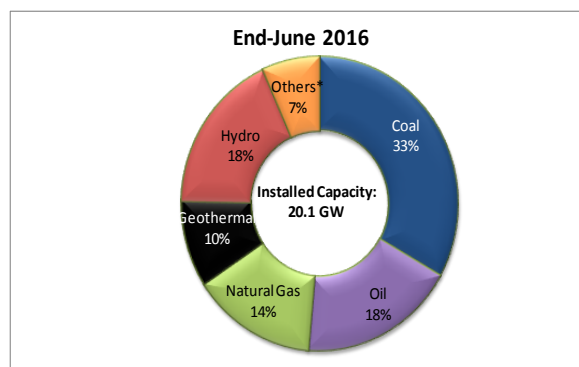
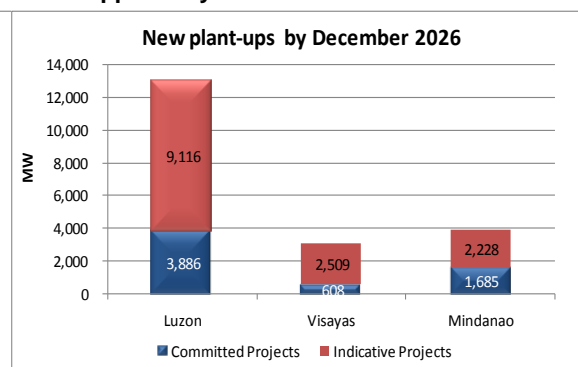


Chart 3: Committed and indicative projects in the Philippines by December 2026



Source: January-June 2016 Power Situation Highlights by the DOE.

Note: Others* include wind, solar, biomass and battery.

⁵⁶ Presentation at the Asian Power Utility Forum 2016-Manila Leg, Asian Power, 30 June 2016

⁵⁷ Source: January-June 2016 Power Situation Highlights, DOE

⁵⁸ Source: January-June 2016 Power Situation Highlights, DOE

- **New plant-ups to be mainly powered by coal.** Each of the country's 3 main island regions has distinct generation profiles. Luzon's capacity is mainly powered by coal-fired power plants, Visayas relies on geothermal energy and coal, and Mindanao depends heavily on its hydropower resources. As of end-June 2016, coal accounted for 33% of the Philippines' total combined capacity mix, followed by oil-based (18%), hydropower (18%), natural gas (14%), and geothermal sources (10%).⁵⁹ Given the economic advantage of coal over gas, capacities which will be coming in the pipeline by December 2026 are largely composed of power plants which utilise coal, attributable to its favourable prices, which have declined in the last few years – from USD127.63/metric tonne in May 2011 to USD56.97/metric tonne in June 2016⁶⁰. According to the Philippine Energy Plan 2012-2030, coal consumption is anticipated to continue growing at an annual average rate of 7.8%, as more coal-fired power plants come on-stream over the next few years.
- **Reliant on coal, natural gas and oil imports.** The Philippines' fuel mix is fairly diversified, mainly relying on coal, oil⁶¹ and natural gas imports. According to the Energy Information Administration, almost 30% of the coal consumed is produced locally while the rest is mainly imported from Indonesia.⁶² While the Indonesian government currently imposes a moratorium on coal-delivery ships to the Philippines,⁶³ the Energy Secretary notes that the country still has sufficient inventory in the near term, along with the option of procuring coal from other countries such as Australia, Russia or Vietnam. While coal-fired power plants rely on coal imports, the 3 major gas-fired power plants in Luzon⁶⁴ face a high level of concentration risk as they source their gas supply from the Malampaya field. When the Malampaya gas platform is under maintenance shutdown, these gas-fired power plants have to resort to more expensive (including transportation cost) imports of natural gas. Prolonged maintenance of the Malampaya gas platform had also caused blackouts in Luzon in the past. This further highlights the deficiency in the country's electricity supply.

Table 1: RE installed capacity (actual vs planned)

RE	Installed capacity as at end-June 2016 (MW)	%	Target installed capacity by 2030 (MW)	%
Geothermal	1,917.0	28	3,461.0	23
Hydro	3,609.0	53	8,724.1	57
Biomass	233.0	3	315.7	2
Wind	427.0	6	2,378.0	16
Solar	684.0	10	285.0	2
Ocean	0.0	0	70.5	0
Total	6,870.0	100	15,304.3	100

Source: DOE and Investment Opportunities in the Philippine Energy Sector, presented at the 5th Asia-Singapore Infrastructure Roundtable in October 2015 by the DOE; Philippine Power Situation (January–December 2015), DOE.

⁵⁹ Source: January-June 2016 Power Situation Highlights, DOE

⁶⁰ Source: Newcastle Coal Index, Australian Thermal Coal

⁶¹ The diesel-fired power plants rely on oil imports from the Middle East.

⁶² Source: US Energy Information Administration and Philippines Energy Plan 2012-2030

⁶³ The moratorium was imposed by the Indonesian government following the kidnapping of Indonesian sailors by the Abu Sayyaf in June 2016. Source: Philippine Power Supply Jeopardised by Indonesian Ban, Philstar Global, 27 June 2016.

⁶⁴ The 3 plants are the 560-MW San Lorenzo, the 1,000-MW Santa Rita and the 1,200-MW Illijan facilities.

- Diversifying into RE to reduce exposure to price fluctuation of fossil fuels.** The Renewable Energy (RE) Act was passed into law on 28 July 2008, to reduce the Philippines' dependence on fossil fuels and minimise its exposure to price fluctuations in the international markets. According to the Philippines Energy Plan 2012-2030, the country intends to achieve a targeted RE installed capacity of 15,304 MW by 2030 (approximately 37%⁶⁵ of the capacity mix in 2030). Since early 2015, RE plants (including geothermal, hydroelectric, solar and wind) have been fully integrated into the WESM⁶⁶ and are entitled to "must dispatch" status, whereby they get priority in dispatch into the grid over non-intermittent and fossil-fuelled plants. The FiT was implemented at the same time, whereby the RE plants are entitled to a guaranteed payment of a fixed rate for each kilowatt-hour of energy it supplies to the grid.⁶⁷ However, progress on this front has been slow despite the various incentives⁶⁸ offered by the GoP; total RE installed energy rose from 5,439 MW in 2010 to 6,870 MW as at end-June 2016 (refer to Table 1).
- Energy mix under review following change of government in May 2016.** In July 2016,⁶⁹ President Rodrigo Duterte - who assumed power following his election in May 2016 - stated that he would consider honouring the Paris Agreement, under which the Philippines has committed itself to a 70% reduction in carbon emissions by 2030, provided that it took into consideration the economic needs of the country.⁷⁰ Meanwhile, the DOE is reviewing the energy mix for the country. Newly appointed Energy Secretary Alfonso Cusi has stated that the Philippines will endeavour to strike a balance between coal and RE.⁷¹ During the recent International Atomic Energy Agency Conference on Prospects for Nuclear Power in the Asia Pacific Region in August 2016, the Energy Secretary mentioned in his speech that the Philippines is open to tapping nuclear power as it is "high on productivity and reliability, low on cost and emissions".⁷² However, this could take a while as it will require necessary assessments and there will be a need to hold discussions with various stakeholders.
- Dependent on domestic banks and foreign lenders to fund power sector development.** The lack of a matured local-currency bond market, along with a ready pool of long-term institutional investors, has also hindered the development of the Philippines' power sector. The Philippines' local-currency corporate bond market was valued at only 6% of its GDP as at end-June 2016.⁷³ The nation's power projects are largely funded by loans from domestic and foreign banks. Apart from bank loans, power projects have also been receiving financial support from multilateral agencies such as the World Bank (via its private arm, International Finance Corporation (IFC)) and the ADB. Financial support in the past includes ADB's USD300 million Power Restructuring Programme Loan in 1998⁷⁴ and the IFC's provision of a 15-year loan worth USD75 million to the

⁶⁵ Source: Philippine Energy Plan 2012-2030

⁶⁶ <http://www.philstar.com/business/2015/02/15/1423757/power-spot-market-ready-integrate-renewable-energy>

⁶⁷ Under the FiT system, RE companies are entitled to the following FIT rates: P8.53 per kWh for solar power, P6.63 per kWh for biomass power, P8.53 per kWh for wind and P5.90 per kWh for run-of-river hydroelectric power.

⁶⁸ Other incentives provided by the GoP include exemption from income taxes for the first 7 years of commercial operations, 10-year duty-free importation of RE machinery, equipment and materials, and no value-added tax on the sale of fuel or power from RE sources.

⁶⁹ In April 2015, more than 150 countries signed the Paris climate deal that seeks to limit global warming "well below" 2 degrees Celsius above pre-industrial levels. The Philippines, under then-President Benigno Aquino III, had committed to a 70% reduction in its carbon emissions 70% by 2030, even if it is not a major source of greenhouse gases.

⁷⁰ Source: <http://www.manilatimes.net/duterte-reverses-stance-on-paris-climate-pact/280776/>

⁷¹ Source: <http://www.gmanetwork.com/news/story/572323/money/companies/coal-fired-power-plants-are-acceptable-to-doe>; We will follow what's good for us, DOE, 19 July 2016

⁷² Source: <https://www.doe.gov.ph/secretarys-corner/keynote-speech-iaea-international-conference-prospects-nuclear-power-asia-pacific>, 30 August 2016

⁷³ Source: AsianBondsOnline

⁷⁴ Source: *With ADB Support, Reliable and Cheaper Power is Within Reach in the Philippines*, May 2008, Asian Development Bank

Energy Development Corporation⁷⁵ in 2008. In February 2016, the ADB offered supportive funding to AP Renewables Incorporated's PHP12.5 billion bond for the development of the Tiwi-MakBan geothermal energy facilities.⁷⁶

The above was published in RAM's report on the Philippines power sector, *Bridging the Supply-demand Gap*, published in September 2016. Subscribers can retrieve the full report at www.ram.com.my

⁷⁵ Source: *Philippines Energy Development gets USD75 million loan from IFC*, May 2011, Reuters

⁷⁶ Source: *ADB Backs First Climate Bond in Asia in Landmark USD225 million Philippines Deal*, February 2016, Asian Development Bank

Philippines

• Key Statistics 2015 •

POPULATION:
100.7 million



NOMINAL GDP:
USD292 billion



GDP PER CAPITA:
USD2,879



ELECTRIC POWER CONSUMPTION:
818.40 kWh per capita



Diversified capacity mix, mainly
COAL, OIL AND NATURAL GAS



Electricity Market Structure
COMPETITIVE MARKET



ELECTRICITY PRODUCTION

Electrification Rate:
87.5%

Electricity Production:
82,413 GWh

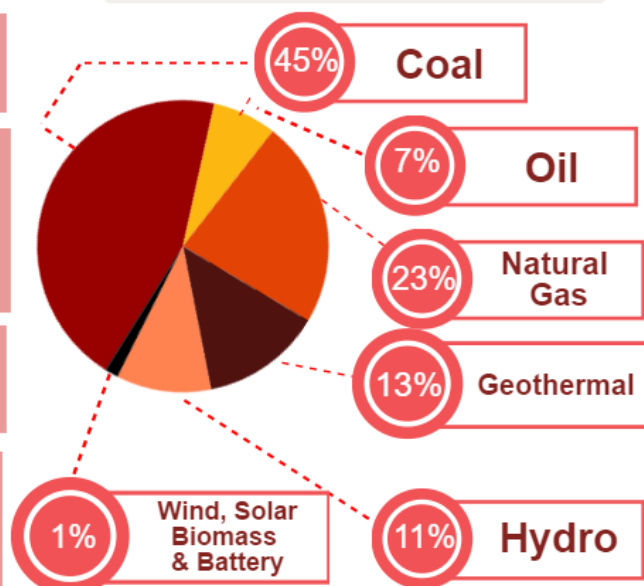
Installed Capacity:
18,765 MW

Peak Load:
Luzon: 8,928MW
Visayas: 1,768MW
Mindanao: 1,517MW

Average Tariff (Meralco):
USD0.18/kWh

Transmission and
Distribution Losses:
9.1%

Generation Mix



Source: Department of Energy (Philippines) and World Bank

About RAM

RAM Rating Services Berhad was established in 1990 by the Malaysian central bank, as part of the institutional infrastructure to support the development of Malaysia's debt capital market – now the third-largest bond market in Asia and the biggest in ASEAN. With more than 25 years' experience, RAM is now the leading credit rating agency in ASEAN and was recognised as the *Most Influential Rating Agency in the Region* in 2011. Operating out of the world's largest Islamic finance hub, our experience and expertise in sukuk ratings are widely recognised through numerous awards such as *Best Islamic Rating Agency* in 2012, *Most Outstanding Islamic Rating Agency* between 2011 and 2013, and 1st runner-up as *Best Islamic Rating Agency* in 2015.

Our rated portfolio is defined by our strong presence in Malaysia as well as the coverage of foreign ringgit issuers across the globe. In our continuous quest for excellence and innovation, RAM launched its ASEAN and global rating scales in January 2013. Since then, our franchise has been steadily gaining traction on the international front. In June 2013, the Tokyo Stock Exchange for the PRO-Bond Market recognised RAM as one of 6 globally accredited rating agencies for its bond listings. In May 2016, RAM joined the ranks of the first 6 global credit rating agencies to participate as a signatory to the United Nations-supported Principles for Responsible Investment's *Statement on Environment, Social and Governance in Credit Ratings*.

The power sector has been a vital part of RAM's journey. We pioneered the rating of the first project-finance sukuk in Malaysia in 1993. With over 2 decades of experience in rating power bonds featuring various technologies, RAM is the leading voice in Malaysia's power-sector financing. RAM has rated over RM95 billion of bonds in the power sector since its inception.

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