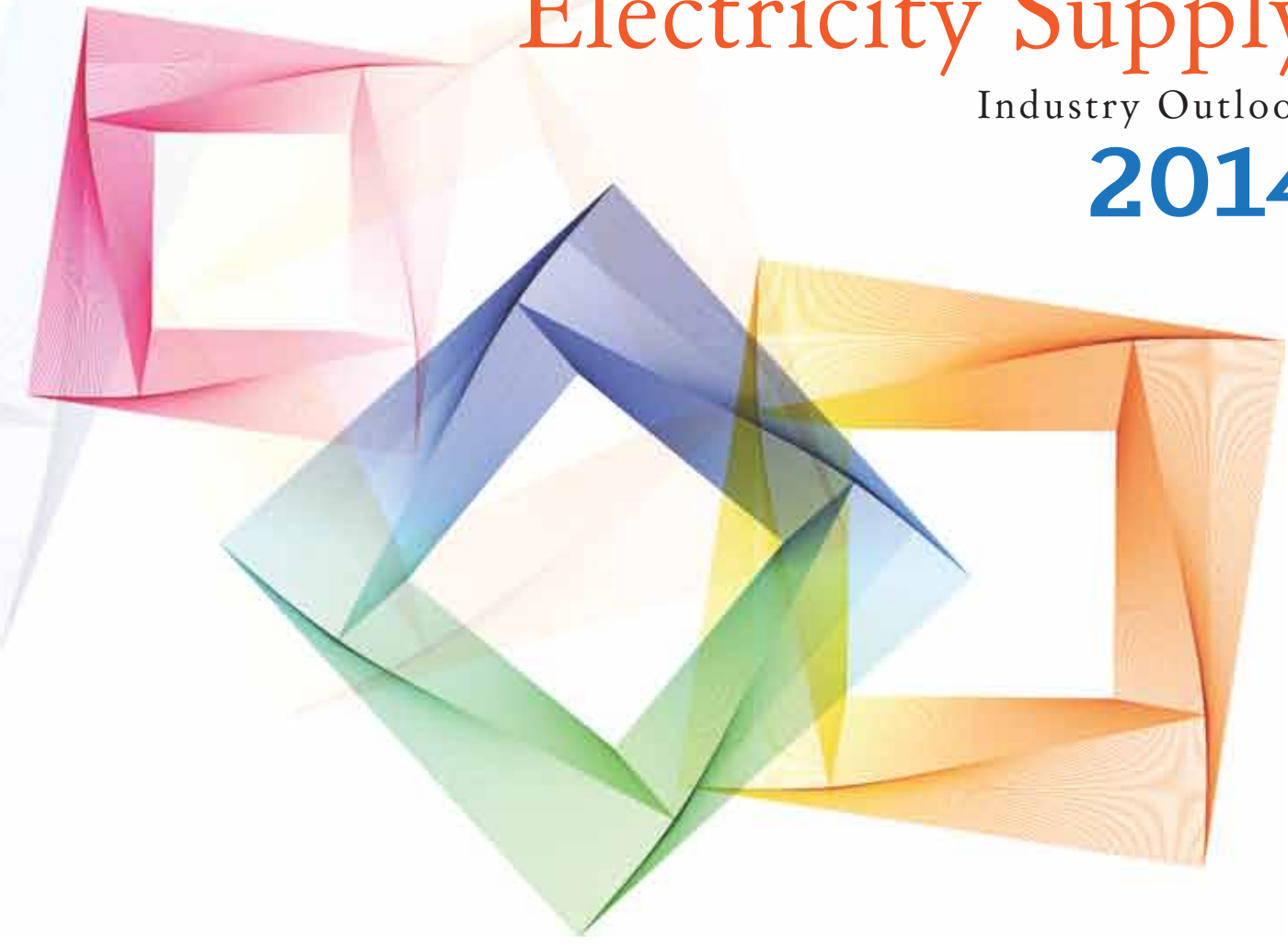
Suruhanjaya Tenaga
Energy Commission

Peninsular Malaysia Electricity Supply

Industry Outlook

2014



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A YEAR IN REVIEW

A YEAR IN REVIEW

Year 2013 has been a difficult year for Malaysia. The Government has gradually been reducing subsidies in the face of a mounting Government fiscal deficit, worsening debt and shrinking current account surplus. The huge subsidies bill has been a bone of contention over the last few year, its withdrawal would have a negative impact on consumption and prices, at least temporarily.

Under those circumstances, Malaysia recorded a gross domestic product (GDP) growth of between 4.7% in 2013, lower than 5.6% growth recorded in 2012 or earlier target of between 5.0 - 6.0%[1]. The prolonged weakness in external environments, which was similarly experienced by other export-oriented nations, negates growth achieved by domestic demand thus affecting overall performance for the year.

In terms of electricity growth, maximum demand of 16,562MW was recorded on 13th May 2013, surpassing the initial target of 16,324MW by 1.5% and the 2012 record of 15,826MW by 4.7%. The growth was by no means a blip as the system also registered a maximum daily energy of 344.42GWh against 328.72GWh recorded in 2012. In fact, the 2012 daily energy record was surpassed 54 times in 2013 indicating a sustained, high system demand profile.

Sales of electricity rose from 97,243GWh in 2012 to 100,566GWh in 2013. The cumulative growth of 3.42% was mainly driven by commercial and residential sectors that recorded annual growth rates of 4.42% and 6.02% respectively. While the growth in industrial sector was lower with 1.24%, but the sector remains the biggest consumer with market share of sales of 43% followed by commercial with 35% and residential with 2%.

Gas and coal remained the most used fuels for power generation at 49.4% and 42.6% respectively, followed by hydroelectric at 4.8% and oil/distillate at 2.5%. With estimated annual consumption of 21 million tonnes in 2013, coal is poised to be the main fuel for power generation as additional 5,000MW of coal-fired capacity will be commissioned in 2015-2019 period. Supply diversification initiative continues with more shipments coming from non-traditional suppliers and other potential suppliers also being looked into by TNB Fuel Services.

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1. Source: Quarterly Gross Domestic Product Fourth Quarter 2013 – Department of Statistics, Malaysia

The gas supply inadequacy to meet demand due to offshore problems and depleting resources over the last 5 years is surmounted with successful commissioning of liquefied natural gas (LNG) regasification terminal (RGT) in Sungai Udang, Melaka in May 2013. In addition to providing gas users in Peninsular with much needed additional source, the terminal also allows for supplier other than Petroliam Nasional Berhad (PETRONAS) to enter the Peninsular gas market. Development of third party access framework is currently underway to facilitate the fair, orderly and transparent process for usage of the gas regasification and transmission facilities.

With introduction of LNG, Government decided to use two-tier gas pricing formula for power generation. Under the two-tier pricing mechanism, PETRONAS supplies up to 1,000 million standard cubic feet per day (mmscfd) at a controlled price to power sector with any additional volume requirement to be charged at market rate based on Government-approved gas pricing formula. Therefore, beginning 23rd May 2013, for any new gas demand in excess of 1,000 mmscfd, the gas price is set at the discounted Malaysia free-on-board (FOB) ex-Bintulu LNG weighted average price plus all associated delivery costs.

With the approved pricing formula, gas price in excess of 1,000 mmscfd is expected to hover around RM42/mmBtu up to RM48/mmbtu as compared to controlled gas price at RM15.20/mmBtu. While it is still cheaper than distillate or MFO, huge price disparity between domestic piped gas and LNG will translate into higher electricity tariff although the volume of electricity generated from LNG is much less compared to domestic piped gas or coal. Nevertheless, this additional LNG cost is already included in the new average electricity tariff beginning 1st January 2014.Besides domestic piped gas and LNG, coal also plays a major role in electricity generation. For 2013, highest coal price recorded was at US$89/tonne in June 2013 while MFO prices were between RM55/mmBtu to RM60/mmBtu (US$100-116/barrel).

Coal-fired generation represents about one-third of the installed power generation capacity, and accounted for nearly 43% of the electricity produced in 2013. Hence the performance and reliability of the coal-fired power plant have a significant direct impact on the electricity supply situation in Malaysia. Due to “gas supply crunch”, most coal-fired power plants were operated at the maximum level continuously since 2011. The effect of such operation, coupled with lower quality coal and inadequate features in the boiler design had taken a toll on most coal-fired power plants, where in 2013 the reliability of the plants suffered heavily due to boiler tube failures which in turn contributed to significant reduction of the availability of the coal plants.

The special task force lead by Energy Commission (ST) was established to find the cause of the tube failures. Three areas of boiler’s technical and operation were reviewed i.e. design, plant operation, and quality of supplied coal as these three factors may inter-dependence in contributing towards the tube failures. Recommendations of the task force are implemented to minimise incidents of tube failures in the future.

Generation capacity procurement programme continues with announcement of new coal-fired capacity of 3,000MW to be commissioned in stages in 2017, 2018 and 2019. The first 1,000MW to be built next to existing plants in S.J. Sultan Azlan Shah, Manjung on fast track basis was awarded to Tenaga Nasional Berhad (TNB) while the greenfield 2,000MW project was awarded to Jimah East Power. To address the projected capacity shortfall and to ensure enough capacity available in central region, a 384.7MW combined cycle gas turbine (CCGT) repowering project in S.J. Jambatan Connaught, Klang was awarded to TNB for commissioning in September 2015.

In line with the subsidy rationalisation and the gradual trimming of gas subsidies, a 14.89% tariff hike was announced by the Government on 2nd December 2013 and the hike is to be effective from 1st January 2014. This unprecedented high increase is due to the inclusion of LNG usage in the fuel component which accounted for 10% of the whole tariff increase.

Similarly, a 15% tariff hike was announced for Sabah to partly offset the increase in cost of supply in Sabah, even though such increase is still not enough for Sabah Electricity Sdn. Bhd. to generate enough revenue to cover its costs, without assistance or subsidies from the Government.

For electricity tariff setting, implementation of incentive-based regulation (IBR) concept is to allow a more structured, transparent and informed way of tariff setting. Through this framework, average base tariff over a regulatory period of four years is set based on a forward-looking approach of matching revenue requirement with only efficient cost projection. In the past, tariff review processes were on ad-hoc basis as the utility would approach the regulator whenever there is a need for more revenue to cover increased costs.

Under the IBR, there is also an incentive for utility to save cost without jeopardising quality of services to consumers. This is based on a set of key performance indicators (KPIs) targets for operational and network performance of the utility. Penalty will be imposed for failure to meet the KPIs, likewise utility will be rewarded if the KPIs are met and exceeded certain threshold. At the end of each regulatory period, evaluation of overall performance will be done to determine any cost savings derived, for example in the form of lower operating and capital expenditure costs. The cost savings then will be shared with consumers in the form of reduced tariff.

Reform initiatives in the Peninsular Malaysia electricity supply industry continues with ring-fencing of Single Buyer (SB) and Grid System Operator (GSO). SB and GSO are responsible to procure power from power producers (TNB Generation and Independent Power Producer) and operate the National Grid power system respectively. The ring-fencing of a SB and GSO is to create a level playing field between TNB and other market participants, such as Independent Power Producers (IPP).

The principle of ring-fenced organisation like SB and GSO is to functionally separate their businesses from the other business activities of TNB by introducing separation of accounts, independence in decision-making, avoidance in sharing of confidential information and segregation of facilities for access in their operations. It is envisioned that ring-fencing the SB and GSO would enhance independence, fair play and transparency in the industry and would result in greater confidence of the market participants and investors. The ring-fenced SB and GSO organisations will commence in January 2014 which will coincide with the implementation first year of regulatory period under IBR.

PROSPECT FOR 2014

PROSPECT FOR 2014

Announcement of tariff increase of 4.99 sen/kWh starting from 1st January 2014 has received mixed reaction from the general public. While the increase is imminent to reduce subsidies for the health of the overall economy, the impact will be felt across all sectors. Under such circumstances, inflation rate is expected to increase as evidenced in the month of January 2014 with an annual percentage change in the consumer price index (CPI) from 3.2% in December 2013 to 3.4%. For the power sector, cushioning the impact of tariff increase to general masses and strategic industries will be challenging and need to done.

A year pilot trial of Incentive-Based Regulation (IBR) beginning January 2014 will help ST in assessing effectiveness of the mechanism which was roll out for the period of 2014-2017. As IBR is designed to motivate the utility to reduce costs and improve service levels, the consumers can expect a better overall performance that includes less supply interruptions and more appealing customer services experience.

In terms of GDP, the projected growth of around 5% - 5.5% is expected for 2014 compared to forecast electricity peak demand of 3.6% and sales of 3.9% as decoupling of GDP and electricity growths continue. The demand pattern will likely to follow historical trend with peak demand and energy are expected to be recorded between May to July subject to recovery of global trade, domestic demand growth and weather pattern.

Peak demand for 2014 as forecasted by TNB is at 17,152MW. Installed capacity will reduce to 21,060MW due to retirement of 240MW thermal generating units in S.J. Sultan Iskandar Pasir Gudang. The imminent retirement of the 31 years old units will result in reduction of reserve margin from 31% in 2013 to 23% in 2014.

The reduced reserve margin presents challenge to the Grid Operator as several coal and gas plants performed below specified target due to longer maintenance outages required after period of high utilisation and use of back-up fuel during gas curtailments period. In addition, close to 9% of the installed capacity consist of hydroelectric plants that are only suitable for peaking operation as realisable output is restricted by water inflow and storage capability. Therefore, Government decided to extend the operation of existing CCGT in S.J. Jambatan Connaught Klang for another 5 years because of its central location, uncertainty in critical transmission projects completion and to mitigate possible delay of new generation projects.

Generally, 40% of electricity produced is consumed in the central region. As the biggest load centre for Peninsular for years to come, in addition to more local generation capacity, strengthening the transmission network remains priority to the Grid Owner. Key to the initiatives is Central Area Reinforcement project that has suffered serious delay due to various impasses. Until the work can be resumed in order to catch up with project schedule, the central network will continue to be exposed to potential large disturbance as electricity demand rises every year.

To ensure balanced fuel mix while meeting future demand, announcement for 3,000MW capacity based on CCGT was made recently with the first 1,000MW is expected to be commissioned by June 2018 followed by remaining 2,000MW by January 2021. The tender process for the 2,000MW CCGT is most likely will follow previous bidding exercise in which potential bidders will be invited for pre-qualification process before announcement of short listed bidders being made. The exercise is expected to commence by the end of the year with the announcement of winner is to be made after all the requirement are fulfilled.

In addressing long term generation capacity requirement, pre-feasibility study on potential sites for gas-fired generation capacity will be carried out in 2014. The emphasis of the study will be on sites' suitability in terms of load requirement, access to existing gas pipeline and transmission network and land acreage. It is expected that this initial assessment will help in identifying potential sites together with required transmission system reinforcement.

ENERGY AND DEMAND PROJECTIONS

ENERGY DEMAND AND PROJECTIONS

Brief Economic Review

The 2014 Budget revealed strong measures put forth by the Government to tackle escalating national debt and overall Federal account deficit. The economic growth is expected to remain on a steady trajectory by Bank Negara Malaysia with support from domestic demand[2]. While the Malaysian economy has outperformed global growth at a rate of 4.7% against 2.9% in 2013, reducing the deficit from 4.0% in 2013 to 3.5% in 2014 requires implementation of tough and sometimes unpopular measures such as fuel subsidy reduction and tax regime reform such as introduction of Goods & Services Tax (GST).

The impact of upward adjustment of prices of petroleum products and sugar can be seen rapidly as the Consumer Price Index (CPI) for the month of December 2013 showed an increase of 3.2% to 108.9 from 105.5 for the same month in 2012. CPI for the period January-December 2013 increased 2.1% to 107.1 from 104.9 for the same period last year. On the other hand, the Producer Price Index (PPI) for domestic economy in December 2013 increased by 4.3% to 128.1 from 122.8 for the same month in 2012. Similarly, the PPI for local production also increased by 6.4% from 127.5 in December 2012 to 135.7 in December 2013. However, PPI for import decreased by -0.4% from 113.5 in December 2012 to 113.0 in December 2013.

Generally, both CPI and PPI indices are expected to follow similar rising pattern in 2014 due to electricity tariff increase, implementation of minimum wage and implementation of GST. Although such moves are necessary for long term sustainability, selective assistance initiatives from the Government are still required. In the face of increasingly competitive export environment, participation in broader market can only be a success with competitively priced and high quality products. On the home front, interest of households and consumers need to be fully addressed as well.

On the positive note, the enterprises in Malaysia have demonstrated resilience in the face of adversity before. According to the Global Economic Conditions Survey by the Association of Chartered Accountants and the Institute of Management Accountants, Small and Medium-sized Enterprise (SMEs) in Malaysia are matching and occasionally outperforming larger corporations in response to the global economic recovery[3]. Various initiatives to the SMEs under the Green Lane Policy programme were announced during the 2014 Budget presentation.

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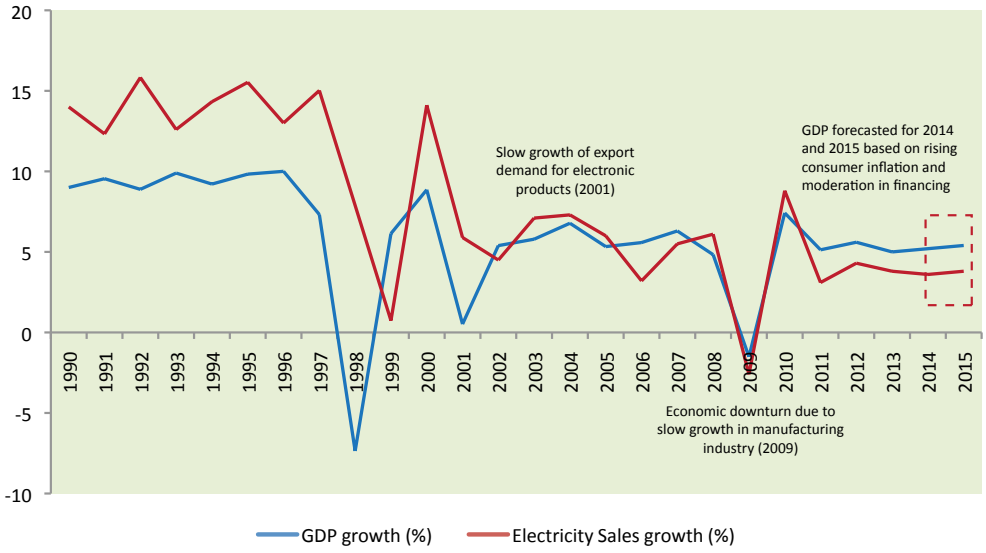
2. Source: Economic and Financial Developments in Malaysia in the Fourth Quarter of 2013 – Bank Negara Malaysia

3. Source: SME Volume 5 – International Business Review SME

For measures to reduce financial burden, maximum tax rate reduction and tax deduction on difference incurred by the company because of the minimum wage rule will be implemented.

Globally, economic activity is reportedly improving in major economies and projected to translate to a stronger global economy in 2014. As a result of improved conditions, International Monetary Fund in the latest World Economic Outlook update has upwardly revised the global growth projection at 3.7% in 2014 and rising to 3.9% in 2015[4]. Similarly, latest projection by MIER also put the real GDP growth for Malaysia ranging from 5.0 to 5.3% in 2014 and 5.3 to 5.4% in 2015[5]. The projected growths are driven by, among others, fiscal belt-tightening measures, generally tight monetary conditions and expected positive impacts of structural adjustments and reform measures. Compared to GDP, the electricity growth rates are projected to be lower with peak demand and sales at 3.6% and 3.8% respectively, which translates elasticity of electricity demand to GDP of less than 1.0 for four consecutive years.

Figure 1: Relative growth rates comparison - GDP and electricity sales (1990-2015)



4. Source: World Economic Outlook Update – January 2014
5. Source: Malaysian Economic Outlook – Malaysian Institute of Economic Research

While most of key energy indicators pointed to a reasonably steady level, electricity consumption per capita increased from 1,101kWh per person in 1990 to 3,902kWh per person in 2012 with compounded growth of 5.9% over the period of 22 years. As the nations becoming more electrified as a result of economic growth, higher income and technological innovations, demand for energy increased to almost 4 times since 1990. Going by recent trends, the energy demand is still growing and therefore requires timely supply infrastructure upgrades.

Table 1: Historical data for energy intensity, demand and elasticity

Peninsular Malaysia	2005	2006	2007	2008	2009	2010	2011	2012
GDP at 2005 prices (RM million)	453,451	479,450	509,486	534,981	524,726	567,605	597,866	635,163
Population ('000 people)	21,075	21,370	21,662	21,951	22,241	22,656	23,132	23,429
Final Energy Demand (ktoe)	32,195	34,390	37,921	38,530	34,521	35,593	35,968	36,683
Electricity Consumption (ktoe)	6,366	6,669	7,030	7,307	7,567	8,145	8,427	8,791
Electricity Consumption (GWh)	73,987	77,504	81,710	84,924	87,950	94,666	97,939	102,174
PER CAPITA								
GDP at 2005 prices (RM million)	21,516	22,436	23,520	24,371	23,593	25,053	25,846	27,110
Final Energy Consumption (toe)	2	2	2	2	2	2	2	2
Electricity Consumption (kWh)		3,627	3,772	3,869	3,955	4,178	4,234	4,361
ENERGY INTENSITY								
Final Energy Consumption (toe/GDP at 2005 prices (RM million))	71.0	71.7	74.4	72.0	65.8	62.7	60.2	57.8
Electricity Consumption (toe/GDP at 2005 prices (RM million))	14.0	13.9	13.8	13.7	14.4	14.4	14.1	13.8
Electricity Consumption (GWh/GDP at 2005 prices (RM million))	0.163	0.162	0.160	0.159	0.168	0.167	0.164	0.161

GENERATION CAPACITY

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Committed Generation Projects

Competitive bidding exercise for coal-fired capacity of 3,000MW was conducted in 2013 by ST in line with decision made by Jawatankuasa Perancangan dan Pelaksanaan Pembekalan Elektrik dan Tarif (JPPPET). The exercise was divided into two parts: Fast Track Project 3A for a 1,000MW capacity to be commissioned by 1st October 2017 and 2,000MW Project 3B to be commissioned in stages by 1st October 2018 and 1st April 2019.

In addition to the 2,253MW gas-fired capacities extended through Track 2 Restricted Tender exercise, four new gas-fired power plants projects with total capacity of 2,856MW are also slated for operation during 2015-2019 period. Meanwhile, new large-scale hydroelectric capacities with estimated capacity of 1,237MW will be developed and commissioned in stages from 2015 right up to 2024 to add to 1,899MW capacities already in operation. The total large-scale hydroelectric plant capacity of 3,136MW should be able to serve system peaking requirement for years to come.

For Renewable Energy (RE) projects, SEDA has targeted capacity of more than 800MW from the Feed-in-Tariff (FiT) scheme with the bulk of the capacity coming from small hydroelectric, biomass and solar PV. With surcharge of electricity bills for contribution to the Renewable Energy Fund revised from 1.0% to 1.6% effective 1st January 2014, the targeted capacity for RE will be revised accordingly to reflect increase in surcharge quantum. The long term capacity plan has already incorporated RE capacity as part of overall supply system with estimated contribution of more than 2.5% of the energy from RE power plants under FiT mechanism. Large scale RE capacity including solar PV does not fall under this FiT scheme, and will be considered on its merit as replacement of conventional power plants.

Table 2: New generation projects

No.	Projects	Fuel	Capacity (MW)	Commercial Operation Date
1.	TNB Janamanjung (Unit 4)	Coal	1,010	31st Mar 2015
2.	CBPS Redevelopment	Gas	384.7	1st Sept 2015
3.	Hulu Terengganu	Hydro	250	U1:16th Sept 2015 U2:17th Dec 2015
4.	Ulu Jelai	Hydro	372	U1:13th Dec 2015 U2:14th Mar 2016
5.	TNB Prai	Gas	1,071.43	1st Jan 2016
6.	Tg. Bin Energy	Coal	1,000	1st Mar 2016
7.	Hulu Terengganu (Tembat)	Hydro	15	U1: 15th Nov 2016 U2: 15th Dec 2016
8.	Pengerang Co-Generation	Gas	400	1st June 2017
9.	TNB Manjung Five	Coal	1,000	1st Oct 2017
10.	New CCGT	Gas	1,000	1st June 2018
11.	Jimah East Power	Coal	1,000 1,000	U1: 15th Nov 2018 U2: 15th May 2019
12.	Additional Chenderoh	Hydro	12	Oct 2018
13.	Tekai	Hydro	156	Dec 2020
14.	Telom	Hydro	132	Dec 2022

Existing Generation Capacity

As of 31st December 2013, installed capacity in Peninsular stood at 21,060MW after retirement of 240MW thermal generating units in S.J. Sultan Iskandar Pasir Gudang[6]. As the latest non-RE capacity will only be commissioned earliest by 2015, details of installed capacity and list of power plants in operation for 2014 are described in the following tables:

Table 3: Installed capacity by type

Type	Fuel	Capacity (MW)
Conventional Thermal	Coal	7,056
Combined Cycle Gas Turbine (CCGT)	Gas	9,200
Conventional Thermal	Gas	564
Open Cycle Gas Turbine (OCGT)	Gas	2340.4
Hydroelectric	Hydro	1,899.1
Total Capacity (MW)		**21,060**

6. Refer to capacity connected to transmission network (132kV and above)

Table 4: Operational thermal and hydroelectric power plants

PPA/SLA Expiry Year	Power Plant	Fuel	Type	Capacity (MW)
Aug 2014	S.J. Jambatan Connaught	Gas	OCGT	478
Aug 2015	S.J. Putrajaya	Gas	OCGT (GT1 - GT3)	324
Sept 2015	YTL Power Generation (Paka & P. Gudang)	Gas	CCGT	1,170
Jan 2016	Powertek Bhd.	Gas	OCGT	434
Jan 2016	Port Dickson Power Bhd.	Gas	OCGT	436.4
Aug 2016	S.J. Sultan Iskandar, Pasir Gudang	Gas	OCGT	210
Aug 2017	S.J. Sultan Ismail, Paka	Gas	CCGT	1,029
Dec 2018	S.J. Jambatan Connaught	Gas	CCGT	300
July 2019	Kapar Energy Ventures Sdn. Bhd.	Gas	OCGT (GT8 & GT9)	205
Aug 2020	Pahlawan Power Sdn. Bhd.	Gas	CCGT	322
Aug 2022	S.J. Sultan Iskandar, Pasir Gudang	Gas	CCGT	275
Aug 2022	S.J. Sungai Perak Scheme	Water	Hydro	649.1
Dec 2022	GB3 Sdn. Bhd.	Gas	CCGT	640
Feb 2023	Panglima Power Sdn. Bhd.	Gas	CCGT	720
March 2024	Teknologi Tenaga Perlis Consortium Sdn. Bhd.	Gas	CCGT	650
June 2024	Prai Power Sdn. Bhd.	Gas	CCGT	350
Aug 2024	S.J. Gelugor	Gas	CCGT	310

PPA/SLA Expiry Year	Power Plant	Fuel	Type	Capacity (MW)
Aug 2025	S.J. Putrajaya	Gas	OCGT	253
Aug 2025	S.J. Sultan Mahmud Kenyir	Water	Hydro	400
Feb 2026	Genting Sanyen Power Sdn. Bhd.	Gas	CCGT	720
June 2027	Segari Energy Ventures Sdn. Bhd.	Gas	CCGT	1,303
Aug 2027	S.J. Cameron Highlands	Water	Hydro	250
Aug 2028	S.J. Tuanku Jaafar, Port Dickson	Gas	CCGT PD1	703
July 2029	Kapar Energy Ventures Sdn. Bhd.	Gas	Conventional Thermal (U1 & U2)	564
		Coal	Thermal (U3 – U6)	1,486
Jan 2030	S.J. Tuanku Jaafar, Port Dickson	Gas	CCGT PD2	708
Aug 2030	TNB Janamanjung Sdn. Bhd.	Coal	Thermal	2,070
Sept 2031	Tanjung Bin Power Sdn. Bhd.	Coal	Thermal	2,100
Dec 2033	Jimah Energy Ventures Sdn. Bhd.	Coal	Thermal	1,400
Aug 2037	S.J. Pergau	Water	Hydro	600
	Total Capacity (MW)			**21,060**

Operational Extension of Existing Plant

Operational extension of Unit 2 Conventional Steam Plant in S.J. Sultan Iskandar Pasir Gudang for 1 year until 31st December 2013 was made due to prolonged gas curtailment and completion uncertainty of PETRONAS Regasification Terminal in Sg. Udang Melaka. As a standby unit that can run on MFO, Unit 2 was selected instead of Unit 1 due to minimal repair cost that has to be incurred for the extension. However, export capacity to the grid was limited to 65MW in order to comply with environmental requirement.

For 2014 onwards, a CCGT unit in S.J. Jambatan Connaught Klang was extended for 4 years 4 months. The extension was made due to its central location as the transmission networks to the central area becoming more highly loaded each year. As the impasse in the CAR project is yet to be resolved, the extension of the CCGT will help in reducing the probability of overloading incident and provide essential voltage support in the central area.

Table 5: Short-term extension of existing plant

Plants	Capacity (MW)	Dependable Capacity (MW)	Fuel	New SLA Expiry Date
S.J. Sultan Iskandar Pasir Gudang - U2GF3	120	65	Gas	31st December 2013 (1 year)
S.J. Jambatan Connaught - CCGT	300	300	Gas	31st December 2018 (4 years 4 months)
S.J. Jambatan Connaught - OCGT	362	362	Gas	31st August 2015 (1 year)

FUEL SUPPLY AND PRICES

FUEL SUPPLY AND PRICES

Fuel Supply Situation

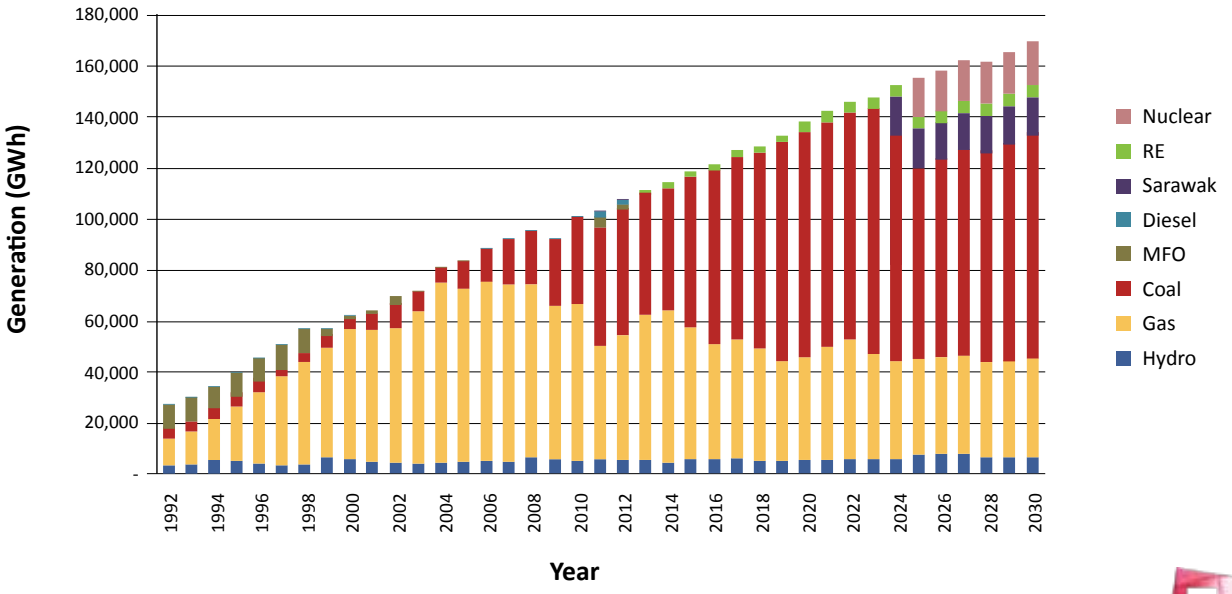
More than 10,000MW of new capacity will be commissioned between 2015 and 2020 in addition to 2,253MW of generation capacity extended through Track 2 Restricted Bidding and another 3,000MW through Track 3. With projected demand growth of between 3-4% per annum during that period, security of fuel supply is a definite pre-requisite to electricity supply continuity. Therefore, it is imperative that fuel diversification initiative to be further pursued to ensure continuous electricity supply to consumers.

Currently, power generation in Peninsular Malaysia relies heavily on natural gas and coal. Natural gas, being mostly from indigenous sources, has been the mainstay of power generation for more than two decades and will continue to be an important component for years to come. Regasification Terminal (RGT) in Sungai Udang, Melaka provides additional source of supply to the Peninsular Gas Utilisation (PGU) pipeline and also power sector with planning and operational flexibility albeit at unavoidable higher cost to the system.

Fuel diversification starts with optimising indigenous resources potential, in particular renewable energy resources that includes among other palm oil wastes, mini hydro and solar PV. Formation of SEDA in 2011 and subsequent implementation of Feed-in-Tariff provide further impetus to the development of renewable energy projects. Hence, the contribution of RE to overall fuel mix is expected to increase as there is now a specific agency and fund made available to drive the initiative. By 2020, RE is projected to contribute to 3.0% of overall generation mix from the estimated RE installed capacity of 700MW.

For large scale hydroelectric scheme, Peninsular potential development is considered to be already very active as more than 75% of potential capacity from estimated 4,000MW will be developed by 2024. As renewable indigenous sources being fully utilised, options such as power interconnection and nuclear power programme need to be further studied.

Figure 2: Generation mix



Malaysia is a net exporter of natural gas with considerable available reserve in relation to the size of economy. With national depletion policy curtailing over-production and over-usage of indigenous resources to sustain reserve for the future, proven oil reserves are estimated to last for another 20 years and natural gas for another 38 years. Whilst Malaysia is still a significant producer of oil and gas, proven reserves are declining against a backdrop of sustained economic growth.

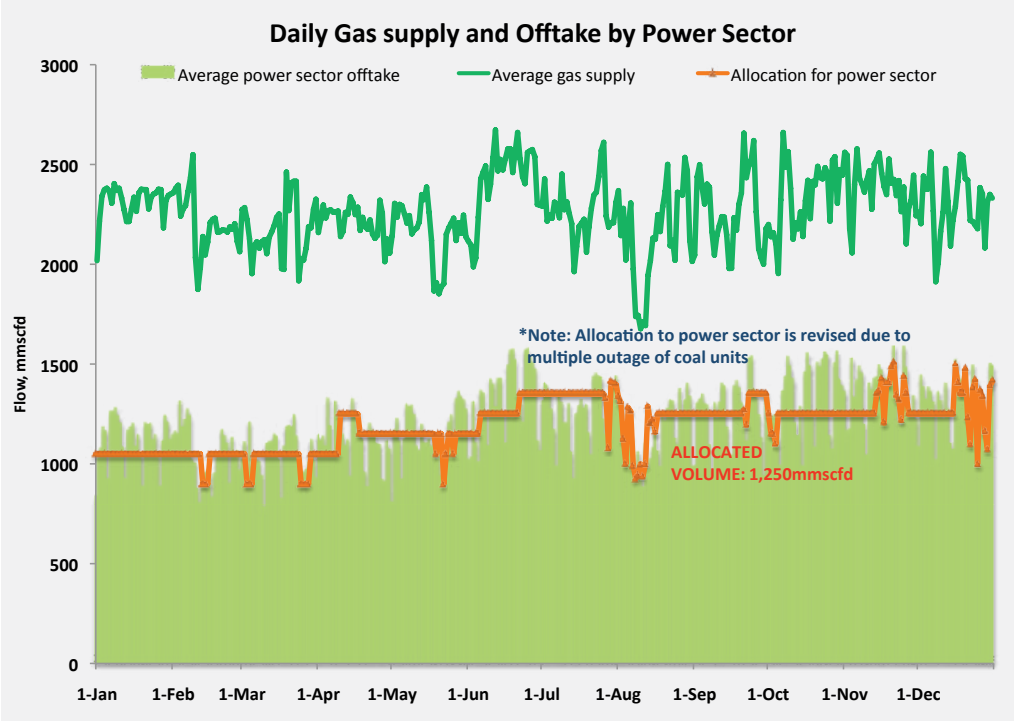
From 2011 until the commissioning of RGT in May 2013, the power sector in Peninsular was faced with acute gas curtailment that, at times, threatened the continuity of electricity supply, if not for closely coordinated actions of all parties related to the sector. Injection of Liquefied Natural Gas (LNG) from RGT is expected to boost PGU supply capacity by another 500 mmscfd and addresses gas curtailment issue to the power sector. At the end of 2013, the RGT has received LNG cargoes originated from Europe, Africa, Middle East and South East Asia. Plans are already afoot for another RGT under Refinery and Petrochemical Integrated Development (RAPID) complex in Pengerang, Johor to be commissioned in 2017.

Figure 3: Gas supply infrastructure in Malaysia

Gas supply-demand situation in the year 2013 followed similar trend to previous years as inadequate supply persists before RGT in Sungai Udang, Melaka finally made its first delivery to PGU pipeline system on 23rd May 2013. Until then, power sector experienced gas curtailments on daily basis whereby gas-fired plants had to resort to distillate and Medium Fuel Oil (MFO) fuels as gas allocation reduced, not only to power sector but to other customers as well. Consequently, electricity supply cost to the consumers increased due to high aggregate fuel price.

With the successful commissioning of RGT Terminal, gas supply to the power sector improved tremendously with marked reduction in the volume of distillate and MFO used to generate electricity as shown in Figure 2. On average, volume of gas made available to power sector after 23rd May 2013 increased by 18% from 1,087 mmscfd to 1,280 mmscfd. In ensuring security of supply, PETRONAS as a strategic reserve has allocated supply with a buffer of 20% at RGT and 10% at Kerteh gas terminal to cater for any emergency conditions.

Figure 4: Daily gas supply and consumption by power sector



As for the coal consumption, the power sector utilises 21 million metric tonnes of coal annually with the present generating capacity of 9,477MW. By 2020, coal-fired plants will make up 64% of total installed capacity compared to 45% in 2014 due to additional coal capacity of 5,010MW. As a result, annual coal consumption is expected to increase by more than 75% from existing utilisation rate to 40 million metric tonnes by 2020.

For power generation, coal is fully procured from the international market for both IPPs and TNB plants. The supply is managed and coordinated by TNB Fuel Services Sdn. Bhd. (TNBF) a wholly-owned subsidiary of TNB to match the projected energy requirements annually. TNBF is a sole coal supplier to all coal-fired power plants in Peninsular. At present, 71% of coal requirements are procured from Indonesia followed by Australia (16%), South Africa (11%) and Russia (2%). The supplies ranges from medium to high graded coal, with a range of caloric value of 4300 kcal/kg to 5500 kcal/kg for sub bituminous coal and caloric value of 6000 kcal/kg to 6750 kcal/kg for bituminous coal.

Going forward, imported coal demand in Asian region is expected to grow by almost 50% in 2030 as other nations are also increasing coal imports to meet electricity demand. Therefore, further investment on supply infrastructure upgrades are expected to take place in order to address growing concern on supply reliability in the face of seasonal adverse weather condition. While seaborne coal market is considered mature and provides steady revenue stream to major exporter nations, any policy direction change could still affect future supply. As for the country, procuring and managing such large quantity of coal will be a big challenge in the future. As such the Government is looking at option of setting up of another entity to manage the procurement and ensuring security of coal supply, including the possibility of liberalising the coal procurement.

Nevertheless, the demand for clean power supply and also source of electricity made from renewable or environmentally friendly energy sources are gaining momentum. This does not favour coal power plants very well, as they were labelled as 'dirty fuel'. In the rising trend of strict environmental codes and standards, coal power plant operators realised the importance of moving towards providing solutions that comply with standards. In Malaysia, there are guidelines by the Department of Environment and World Bank where all coal power plants can draw reference to. Malaysia's coal power plants must practice efficient clean coal technology to be able to deliver cleaner power supply to the country.

It is a known fact that during the Copenhagen Accord in 2009, Malaysia has pledged to reduce 40% of its carbon emission per capita compared to 2005 levels. In fuelling our economic growth, diversifying more towards gas based plants and hydro will be the ultimate choice, but due to limited resources, the use of coal for power generation will still feature significantly in the energy mix. However, increasing the capacity of power from coal will increase the nation's carbon footprint. As such, the future for coal power generation will definitely have to be based on a more efficient technology with clean coal mitigation measures in place.

In Malaysia, the move towards more efficient technology such as supercritical and ultra supercritical power generation will reduce the coal requirement for production and hence a much lesser carbon emission. In balancing the environmental requirement, security of supply and affordability of the country, the choice of fuel of future plant-up will be based on the guiding principle of the optimum fuel mix to achieve a Herfindahl-Hirschman Index (HHI) of less than 0.5 in a medium term and less than 0.4 in a long run.

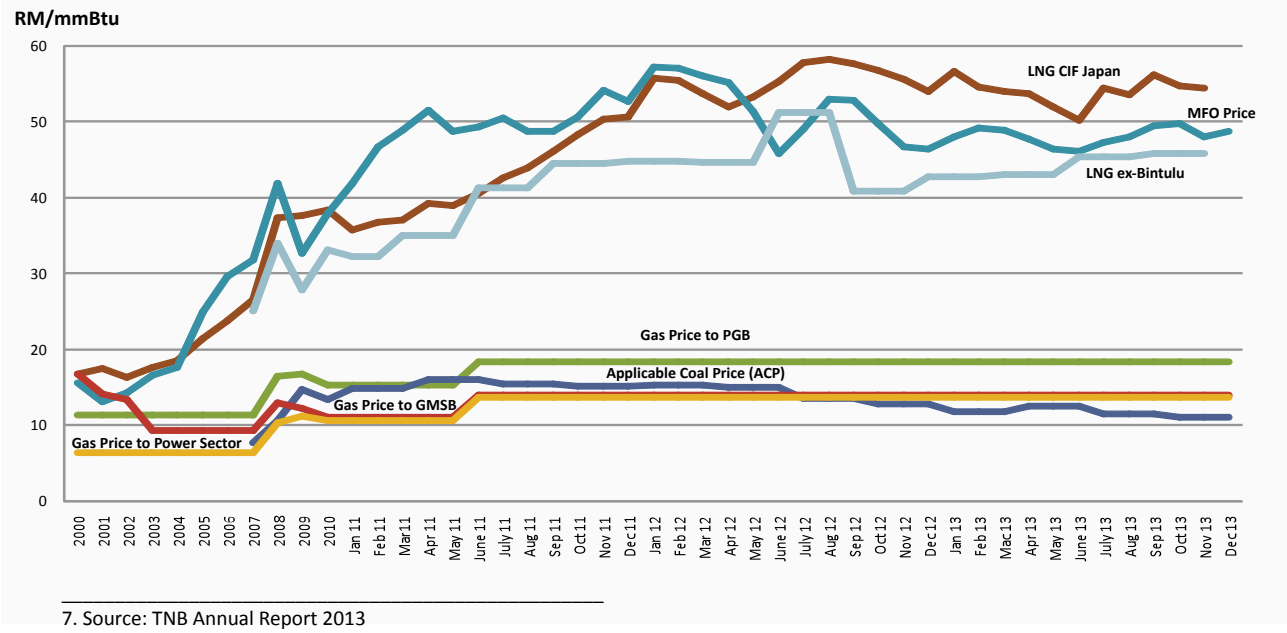
Fuel Pricing

Regulated gas price to non-power sector remained unchanged at RM13.70/mmBtu throughout 2013 despite introduction of LNG in the middle of the year. On average, LNG price ex-Bintulu for 2013 was almost 3 times higher than regulated gas price. However, the LNG price of RM41.68/mmBtu was still cheaper than average MFO and diesel prices of RM48.17/mmBtu and RM66.63/mmBtu respectively, hence provided a more cost-efficient alternative fuel option to the system. For 2014, gas price is set at RM15.20/mmBtu for the first 1000 mmscfd and RM41.68/mmbtu for quantities exceeding 1000 mmscfd.

Coal price for 2013 followed similar trend to 2012 as average coal price continues to drop by 19% from average price of US$103.6 to US$83.6 per tonne, lower than benchmark price of US$85/tonne used for tariff review in 2011[7]. While lower coal price translates to reduction in fuel cost, it was partially offset by the weakening of Ringgit against US Dollar, which is the primary currency used for coal transaction.

For 2014, coal price is expected to be stable below the new tariff benchmark price of US$87.50/tonne. However, current price of LNG ex-Bintulu and potential further strengthening of US Dollar against Ringgit could trim potential gain to be derived from lower coal price. As the new electricity tariff effective from 1st January 2014 already incorporated base tariff, further tariff revision can be attributable to adjustment in fuel cost components such as LNG, pipeline gas and coal.

Figure 5: Average fuel price trend in RM/mmBtu

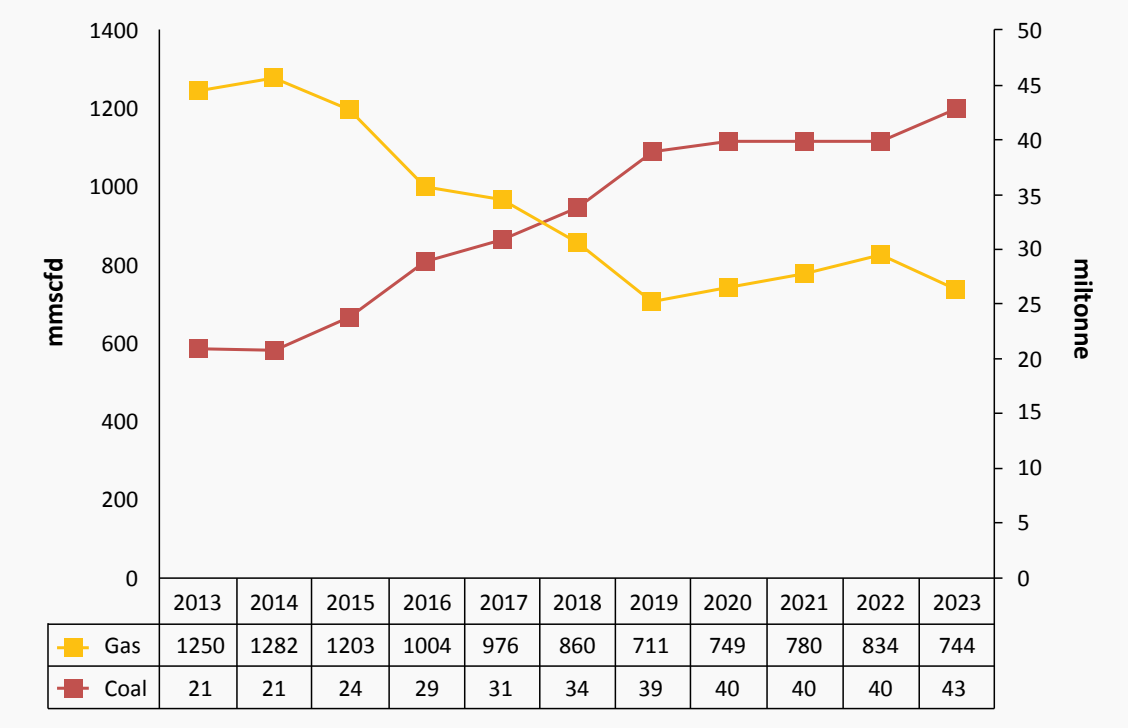


7. Source: TNB Annual Report 2013

Outlook on Fuel Utilisation

Based on the approved generation development plan, gas usage will substantially decrease due to shift in baseload fuel from gas to coal and admission of Sarawak Interconnection that is expected to materialise by 2024. In addition, scores of existing gas-fired plants will be retired and replace by more efficient, new-generation plants, thus contribute to further reduction of gas consumption post 2016. On the other hand, coal consumption will steadily increase due to introduction of new coal-fired generating units with a combined capacity of 5010MW by 2019.

Figure 6: Projected gas and coal consumptions



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Gas	1250	1282	1203	1004	976	860	711	749	780	834	744
Coal	21	21	24	29	31	34	39	40	40	40	43

GRID SYSTEM PERFORMANCE

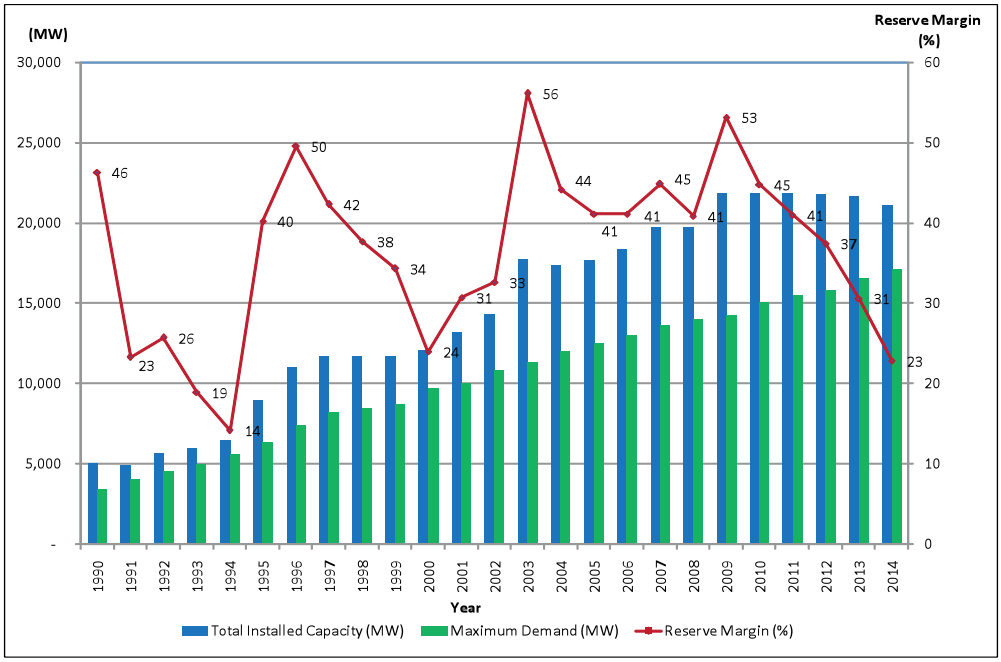
GRID SYSTEM PERFORMANCE

Status of System Reserve

The Malaysian Grid Code, Transmission System Reliability Standards and Transmission System Power Quality Standards are the documents used in Peninsular grid system to govern the Grid System development and operation. System reserve margin is the criteria used for planning to cater for any loss of generating capacity due to faults, planned maintenance and refurbishment to meet the reliability criteria of annual loss of load expectation (LOLE) of 1 day/year. Meanwhile, operating reserve and spinning reserve are the most common criteria used during to ensure safe and secure operation.

The system is designed to always have adequate generation capacity including operating reserve to cost-effectively meet anticipated consumer demand at all times. Getting the amount of the reserve right is the difficult part. Too much is a huge waste of money, putting upward pressure on electricity prices. Too little is disastrous, leading to potential system brownouts or blackouts and customer dissatisfaction.

Figure 7: Peninsular Malaysia reserve margin



The operating reserves is the generating capacity available to the system operator within a short interval of time to meet demand in case any generator goes down or there is another disruption to the supply. Operating reserve consists of spinning reserve and non-spinning reserve.

Generally, spinning reserve may be defined as the online reserve capacity that is available, synchronized and ready to compensate additional demand within a certain period of time. It is also used to arrest decay in the system frequency in the event of sudden outage of any generating unit and to return the system frequency close to the nominal frequency. The current practice of spinning reserve allocation is to cover for the Loss of System Largest Unit and Regulating Reserve which is determined by the GSO.

System Reserve Margin, Operating Reserve and Spinning Reserve are defined as follows:

Figure 8: Definition of system reserve margin, operating reserve and spinning reserve

System Reserve Margin (%) =	**[(Installed Capacity - Peak Demand) x 100]/ Peak Demand**
Operating Reserve (MW) =	**Installed Capacity - Scheduled Outage - Peak Demand - Generation Constraint**
Spining Reserve (MW) =	**Loss of System's Largest Unit + Regulating Reserve**

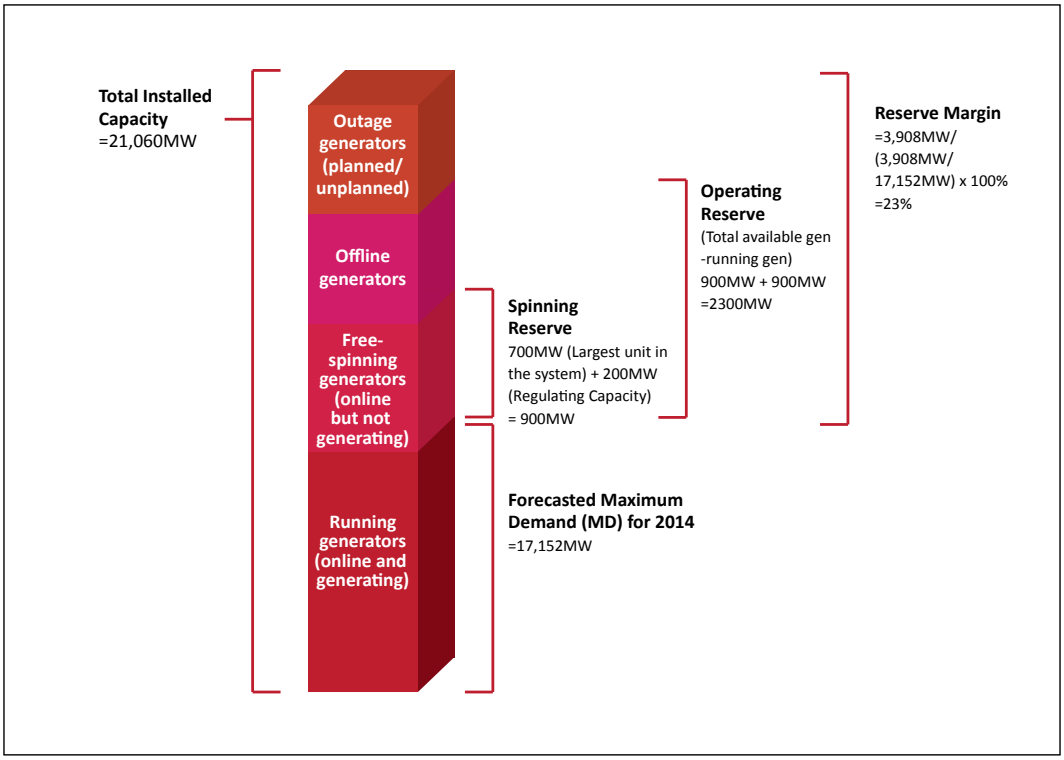
The Operating Reserve requirement must cater for the following parameters:

Figure 9: Operating Reserve requirement

Loss of System Largest Unit	700MW	Spinning Reserve
Regulating Reserve	200MW	
Forced Outage of Largest Coal Unit	700MW	
Forced Outage of Largest CCGT Unit	700MW	

The Operating Reserve for the System is initially set at 2,300MW, taking into account the above criteria with Spinning Reserve Requirement of 900MW. However, due to unreliable generating units, the Operating Reserve is revised downward by Grid System Operator to 1,800MW.

Figure 10: Reserve margin classification and operating reserve



Planning wise, the system is designed to always have at least an operating reserve of 2,300MW at all times. However, there were many instances whereby reserve fell to below 2,300MW due to unplanned outages especially to large baseload coal or gas units. The situation exacerbated in 2013 as deteriorating performance of plants due to punishing operating regime, design flaws, varying fuel quality and prolonged use of alternative fuel resulted in higher forced outage rate especially to baseload plants of coal and CCGT.

Gas supply constraint prior to the commissioning of RGT in August 2013 has negatively impacted the performance of both coal and gas-based generating units due to tight maintenance window and frequent utilisation of alternative fuel. In 2013, a record of 94 days in which generation capacity fell below planned operating reserve of 2,300MW was registered compared to 6 days in 2012 and 3 days in 2011, of which Orange Warning was issued from 22-23rd May 2013. The declining operating margin trends for the past 3 years represent as follows:

Figure 11: System margin in 2011

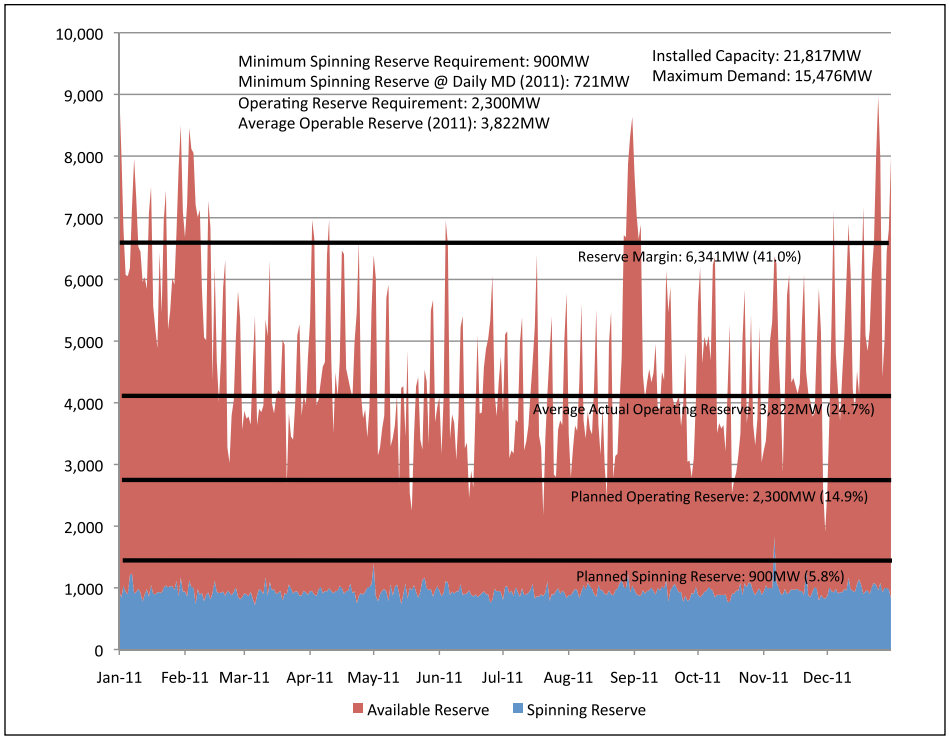


Figure 12: System margin in 2012

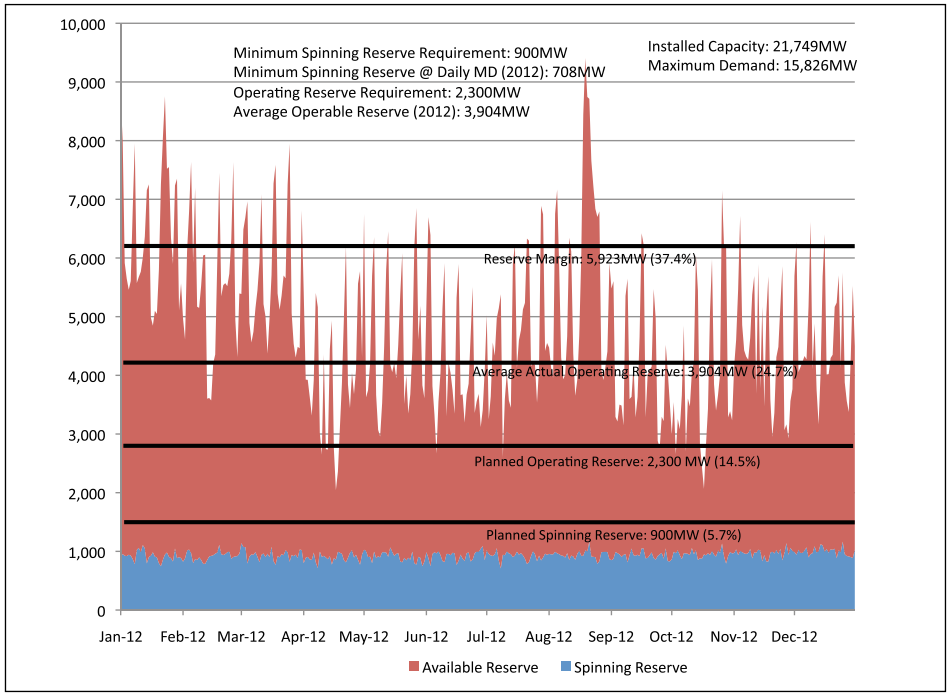


Figure 13: System margin in 2013

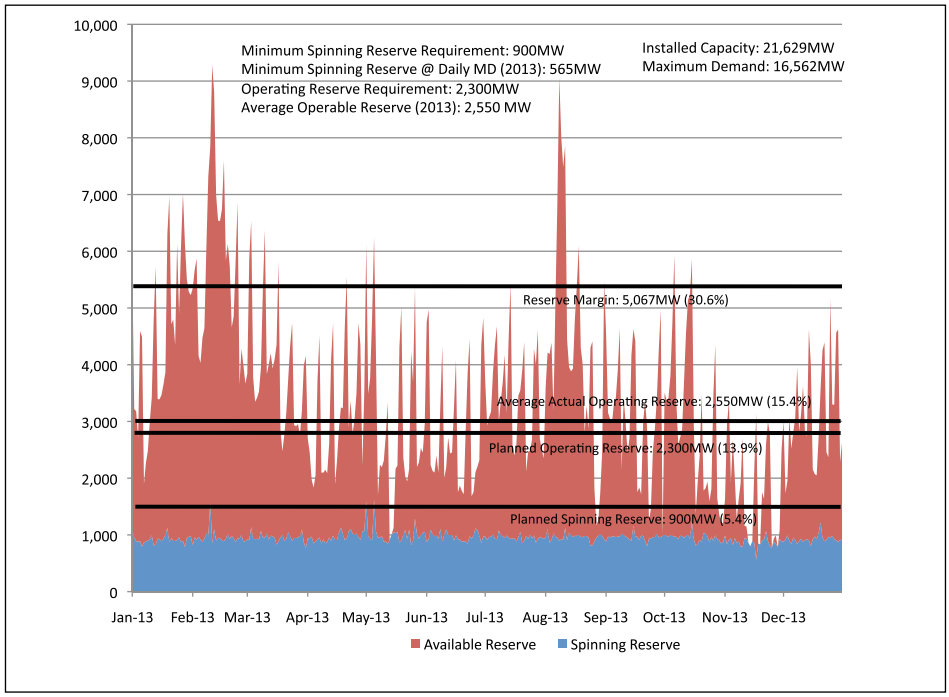


Figure 14: System margin in 2014

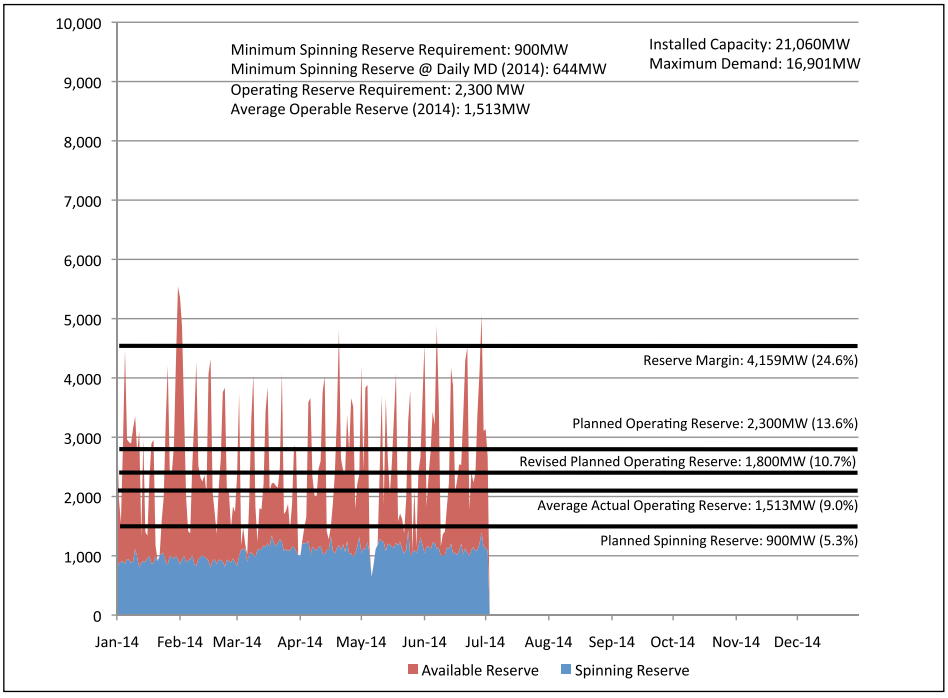


Figure 15: Forced outage rate

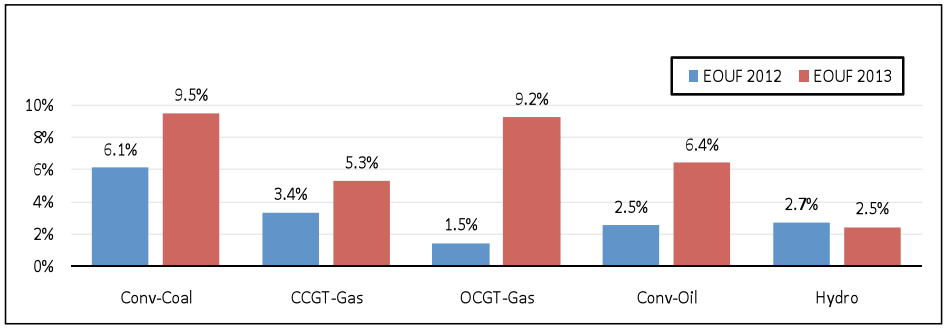
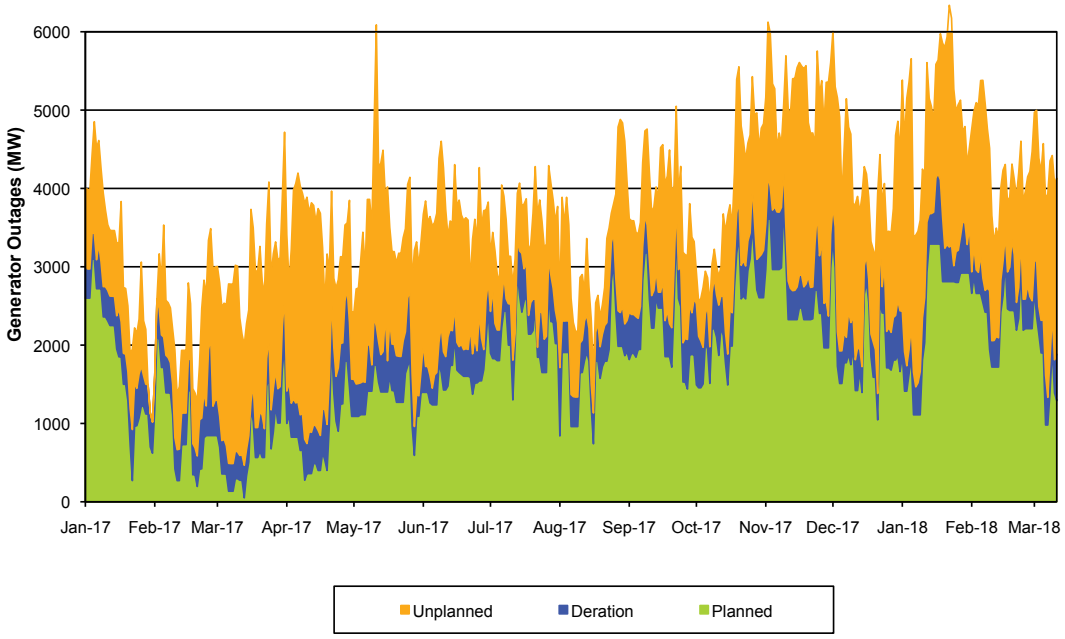


Figure 16: Generator outages in 2013

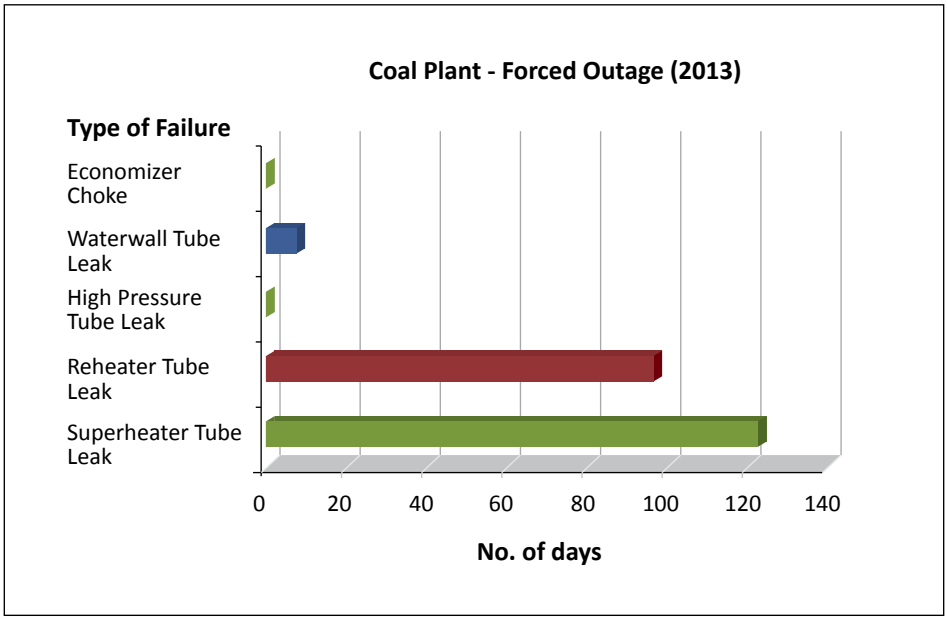


Boiler Tube Failure Task Force

During gas supply shortage due to curtailment imposed to the power sector, all four coal-fired power plants in Peninsular Malaysia were operating continuously at full capacity. This situation in return triggered frequent incidents of force outages due to boiler-related problems, such as tube failure. Consequently, to make up for the lost of such major coal-fired unit, gas-fired generating units have to be on-line to meet the grid system demand by operating with alternative fuel, which is distillate, when the gas allocation to the power sector has been exhausted.

For the coal-fired power plants to sustain their generating unit's availability and reliability, it is essential to identify and mitigate the cause of forced outages due to boiler tube failures. Generally, there are several contributing factors to the incident occurrence that were identified such as equipment design, coal quality and operational practices. The following graph shows the number of forced outage days due to tube failures, which are classified by the type of failures.

Figure 17: Classification of forced outages by type of failures



Under the auspices of the Coal Supply Committee, a Boiler Tube Failure task force led by ST was commissioned, with membership comprised of representatives from coal-fired IPPs and fuel supplier. The task force is to study the causes by which the boiler tubes fail during the services and to propose suitable recommendations to prevent repeat of such failures.

Through the task force, information such as coal consumption, types of coal usage, past incident reports and remedial efforts by the operators is shared between all members.

The task force recommended several mitigation measures to minimize tube failure which include among others, integrity check of all tube panels, to replace identified thinning tube, replacing existing fin type boiler economizer to straight tube, install additional soot-blowers and burner retuning. The other recommendation is additional criteria to be included in the specification of coal procurement to manage ash deposit on boiler tube i.e. slagging and fouling which can cause ash-related problems to the boiler. The above mitigation measures are being implemented by the IPPs through maintenance outage window provided by GSO.

SUPPLY-DEMAND OUTLOOK

SUPPLY-DEMAND OUTLOOK

Revised Demand Forecast

Electricity demand growth is heavily influenced by prevailing economic condition due to industrial and commercial sectors being the two largest electricity users in Peninsular Malaysia. For the revised forecast, Gross Domestic Product (GDP) for 2014 was projected to increase from 5.0% to 5.3% in line with strong economic projection of around 5.0% in the long term. The approved Demand Forecast is as follows:

Table 6: Revised long term load forecast

	Year	Sales (GWh)	Growth (%)	Generation (GWh)	Growth (%)	Peak Demand (MW)	Growth (%)	MW increase
HISTORICAL	**2007**	79,575	5.5%	90,283	4.4%	13,620	4.8%	630
	2008	84,464	6.1%	94,370	4.5%	14,007	2.8%	387
	2009	82,276	-2.6%	92,623	-1.9%	14,245	1.7%	238
	2010	89,533	8.8%	100,991	9.0%	15,072	5.8%	827
	2011	92,291	3.1%	103,354	2.3%	15,476	2.7%	404
	2012	96,257	4.3%	106,884	3.4%	15,826	2.3%	350
	2013	99,921	3.8%	111,020	3.9%	16,562	4.7%	736
FORECAST	**2014**	103,804	3.9%	114,549	3.2%	17,152	3.6%	590
	2015	107,563	3.6%	117,834	2.9%	17,697	3.2%	545
	2016	111,366	3.5%	121,794	3.4%	18,282	3.3%	585
	2017	115,275	3.5%	125,860	3.3%	18,880	3.3%	598
	2018	119,301	3.5%	130,045	3.3%	19,492	3.2%	612
	2019	123,446	3.5%	134,350	3.3%	20,111	3.2%	619
	2020	127,383	3.2%	138,421	3.0%	20,721	3.0%	609
	2021	131,310	3.1%	142,474	2.9%	21,288	2.7%	568
	2022	134,982	2.8%	146,243	2.6%	21,794	2.4%	506
	2023	136,680	1.3%	147,869	1.1%	21,979	0.8%	185
	2024	141,360	3.4%	152,718	3.3%	22,524	2.5%	545
	2025	144,340	2.1%	155,725	2.0%	22,938	1.8%	414
	2026	147,008	1.8%	158,390	1.7%	23,300	1.6%	363
	2027	149,519	1.7%	160,886	1.6%	23,637	1.4%	337
	2028	151,982	1.6%	163,328	1.5%	23,965	1.4%	328
	2029	154,457	1.6%	165,781	1.5%	24,294	1.4%	329
	2030	156,781	1.5%	168,070	1.4%	24,598	1.3%	304
	2031	159,008	1.4%	170,458	1.4%	24,934	1.4%	337
	2032	161,292	1.4%	172,907	1.4%	25,279	1.4%	345
	2033	163,474	1.4%	175,245	1.4%	25,608	1.3%	329
Average period growth rates, % pa:								
2014-2023			**3.1%**		**2.9%**		**2.8%**	
2014-2033			**1.6%**		**1.5%**		**1.4%**	

Electricity sales are projected to grow at average rate of 3.9% in 2014. For forecasted sales breakdown according to sectors, the largest customer is still the industrial sector with 42%, followed by commercial sector with 35%, domestic sector with 21% and others comprise of mining, public lighting and agriculture sectors with 2%. However, the commercial sector is projected to experienced higher growth and will be the largest customer, replacing the industrial sector by 2030.

Revised Generation Development Plan

Generation Development Plan was revised as a result of higher demand forecast and expected delay of interconnection with Sarawak. Under the revised Plan, the CCGT that was initially planned to be commissioned in 2020 will be brought forward to 2018 in anticipation of higher demand growth and to reduce short-term extension requirement. Also, additional 2,000MW of CCGTs are required to come on stream in 2021 as direct replacement of Sarawak Interconnection. However, the power transfer from Sarawak Interconnection have been further delayed to 2024 causing an additional 1,000MW coal fired power plant to be build in 2023 as compensation. The approved Generation Development Plan up to 2024 is as follows:

Table 7: Revised generation development plan

Year	Recommended Plant-Up
2014	S.J. Jambatan Connaught CCGT Extension (300MW)
2015	TNB Janamanjung (Unit 4) (1,010MW), CBPS Redevelopment (384.7MW)
2016	Hulu Terengganu (250MW), Ulu Jelai (372MW) Tg Bin Energy (1,000MW), Tembat (15MW), TNB Prai (1,071.43MW), KLPP/ GSP Extension (675MW)
2017	Pengerang Co-Generation (400MW), Segari Extension (1,303MW), S.J. Sultan Iskandar CCGT Extension (275MW), TNB Manjung Five (1,000MW)
2018	Additional Chenderoh (12MW), Jimah East Power (1,000MW), New CCGT (1000MW)
2019	Jimah East Power (1,000MW)
2020	Tekai (156MW)
2021	New CCGT (2,000MW)
2022	Telom (132MW)
2023	Coal (1000MW)
2024	Sarawak: 2 x 1000MW, Nenggiri (416 MW)

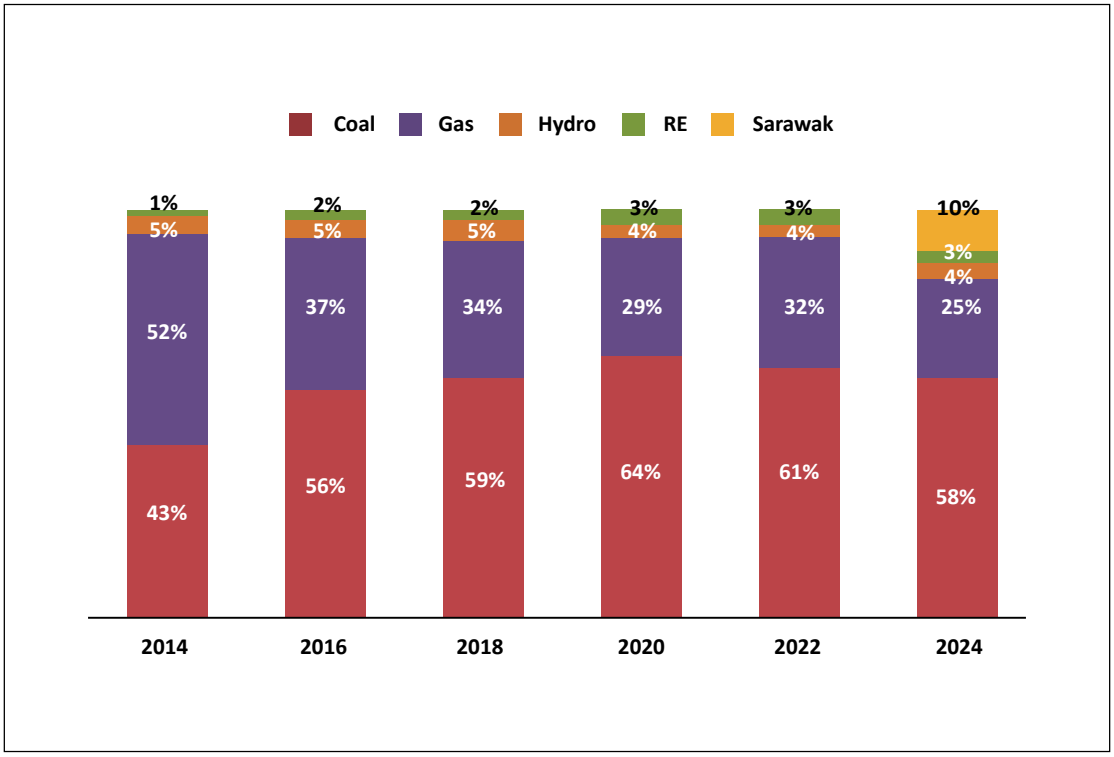
Generation Mix

With the surcharge of electricity bills for Renewable Energy Fund increased from 1.0% to 1.6% starting from 1st January 2014, implementation of Renewable Energy (RE) projects are expected to intensify and will contribute in no small way to overall generation mix. In terms of capacity, it is expected that cumulative annual growth rate of RE capacity for the next 10 years will be more than 9% to reach at least 750MW of installed capacity consists of mini hydro, biomass, biogas and solar PV plants.

Latest generation fuel mix forecast includes contribution from RE plants due to sizable output expected in the future. RE share in overall fuel mix is projected to gradually increases to up to 3% of total energy generated in 2020. However, RE is anticipated to play complementary role to fossil fuels due to factors such as output intermittency, location, technology development and potential limitation.

The generation mix for Peninsular Malaysia based on the approved Generation Development Plan is as follows:

Figure 18: Generation mix



INVESTMENT OPPORTUNITIES

INVESTMENT OPPORTUNITIES

Competitive Bidding for New Capacity

In 2013, ST conducted a competitive bidding process for 3 x 1,000MW coal-fired power plants based on the earlier approval by JPPPET and Government in 2012. The process was divided into 2 tracks, with a fast track bidding process on brownfield sites for 1,000MW to be commissioned by 1st October 2017 known as Project 3A, and another bidding process for 2 x 1,000MW on greenfield sites to be commissioned in stages by 1st October 2018 and 1st April 2019.

1,000MW Fast Track Project 3A

Project 3A is slated for commissioning in 2017 to replace the earlier planned CCGT of similar capacity. As the gas price increase is expected to reach market parity by 2017, JPPPET decided to re-evaluate earlier decision in order to lessen the price increase impact to consumers' tariff.

Project 3A will be implemented on the brownfield site whereas the proposed site is required to be adjacent to the existing Interconnection Facilities which has the ability to evacuate at least 1000MW of generation capacity. On 21st January 2013, TNB and 1 Malaysia Development Berhad (1MDB) submitted their offer to ST for pre-qualification. TNB chose site adjacent to TNB Janamanjung Sdn. Bhd. while 1MDB chose site adjacent to Jimah Energy Venture Power Station. Both potential bidders were qualified and shortlisted to enter the bidding process.

Both bidders submitted their bid proposal on 28th May 2013. After two months of bid evaluation and approval processes, ST in 2nd August 2013 issued a Letter of Award to TNB Manjung Five Sdn. Bhd., a special purpose vehicle wholly-owned by TNB as the successful bidder to build a new coal-fired power plant with capacity of 1,000MW and at levelised tariff of 22.78 sen/kWh. The new coal-fired power plant will be governed with separate arrangements in terms of PPA and CSTA from the previous projects.

2,000MW Project 3B

Project 3B requires a greenfield site with scope of the project inclusive of power plant, coal-receiving jetty, interconnection facilities and power evacuation line to evacuate 2,000MW of generation. Project 3B offers more flexibility as potential bidders are free to propose site for power plant unlike Track 1 whereby all the bidders are required to bid at common identified site. However, the successful bidder will be required to construct power evacuation line to any one of six pre-assigned nodal points to national grid system.

Similar to any other power plant projects, project developer is required to adhere to all requirements and regulations set by Federal and State authorities.

By the end of pre-qualification deadline at noon 11th March 2013, ST received seven RFQ submissions, out of which five potential bidders were shortlisted for the bidding process. Four bids were received during the bid closing deadline on 30th October 2013. The announcement of the successful bidder i.e. Jimah East Power was made on 28th February 2014 with expected financial close to be achieved by September 2014.

Table 8: List of bidders for RFQ submission

No.	RFQ submission by:
1	1Malaysia Development Bhd. and Mitsui & Co. Ltd.
2	Automan Energy Sdn. Bhd.
3	Formis Resources Berhad SIPP Energy Sdn. Bhd. POSCO Engineering and Construction Ltd.
4	Global Power Ventures Sdn. Bhd. Tenaga Nasional Berhad and China National Machinery Import & Export Corporation (CMC)
5	Malakoff Corporation Berhad and Sumitomo Corporation
6	Tadmax Energy Sdn. Bhd.
7	YTL Power International Berhad and Ranhill Power Sdn. Bhd.

Table 9: Pre-qualification shortlisted bidders

No.	Shortlisted bidders
1	1Malaysia Development Bhd. and Mitsui & Co. Ltd.
2	Formis Resources Berhad SIPP Energy Sdn. Bhd. Posco Energy and Posco Engineering & Construction Co. Ltd.
3	Tenaga Nasional Berhad Global Power Ventures Sdn. Bhd. and China National Machinery Import & Export Corporation
4	Malakoff Corporation Berhad and Sumitomo Corporation
5	YTL Power International Berhad and Ranhill Power Sdn. Bhd.

Transmission Development Plan

New transmission capacity requirement is primarily dictates by projected area load-level and location of new and retiring power plants. In addition to new transmission capacity, network strengthening exercises such as equipment replacement will be carried out regularly to ensure that the system can cater for load-level set by the Grid Owner.

The 10-year Transmission Development Plan (10-Year Plan) was developed by TNB development plan. The 10-Year Plan is to ensure that the transmission system in Peninsular Malaysia will be adequate and secure under normal operating conditions as well as under (N-1) contingency conditions, in compliance with the License Conditions, TSRS and MGC requirements. The 10-Year Plan is formulated based on the concept of load–level whereby it is a load dependent, and not time dependent analysis. The plan was to develop a future system which will be adequate and secure to cater for a particular load level irrespective of the year which the load level will occur.

The 10-Year Plan is then reviewed by Transmission Development Planning Working Group to ensure that it is cost-effective and in compliance with Licence Conditions. The Working Group, established in 2011, consist of representatives from Ministry of Energy, Green Technology and Water, Economic Planning Unit, Public Private Partnership Unit, Energy Commission, TNB and Sabah Electricity Sdn. Bhd. with functions as follows:

Table 10: Function and responsibility of transmission development plan working group

No.	Function and responsibility
1	To review Peninsular Malaysia & Sabah transmission development plans, discussed and recommended system requirement which is submitted by TNB and SESB.
2	Ensuring transmission development plan for Peninsular Malaysia & Sabah is cost effective and in compliance with the Electricity Supply Act and other legislations.
3	Monitor the projects implementation progress in accordance with plan and schedule.
4	Identify and propose solutions to issues that are related to the planning, implementation and development of the transmission system in Peninsular Malaysia & Sabah.
5	Recommend to JPPPET any transmission development plan in Peninsular Malaysia & Sabah if required.

Transmission system development generally can be divided into two (2) categories, project associated with generation plant-up or project associated with system reinforcement. Out of 14 generation-related projects approved for implementation, 10 transmission projects already underway and progressing well as scheduled. However, majority of the 9 system reinforcement projects are plagued with local issues and public objection causing some projects to be behind schedule and in danger of further delay until route finalisation by local authorities.

Table 11: Generation-related transmission projects

No.	Projects	Project Progress
1	Hulu Terengganu	Currently ongoing and is expected to complete as scheduled.
2	Ulu Jelai	Project faces slight difficulties for transmission line due to tough terrain and earthworks in substation area.
3	TNB Prai	Currently ongoing and is expected to complete as scheduled.
4	TNB Janamanjung (Unit 4)	Currently ongoing and is expected to complete as scheduled.
5	Tg. Bin Energy	Currently ongoing and is expected to complete as scheduled.
6	CBPS Redevelopment	Currently ongoing and is expected to complete as scheduled.
7	Pengerang Co-Generation	- Final investment decision made by PETRONAS on 3rd April 2014. - PETRONAS already started land acquisition works for transmission line.
8	Additional Chenderoh	Currently ongoing and is expected to complete as scheduled.

In line with the Government's effort to reduce direct fuel subsidy to the power sector, the approved Generation Development Plan already taken into consideration removal of the diesel and MFO subsidies by 2015. At the moment, diesel and MFO price of 49.5 sen/litre and 42 sen/litre for power sector in Sabah are heavily subsidised. Piped gas price is at the rate of RM6.40/mmBtu compared to Peninsular at RM15.20/mmBtu. For ESPC project, LNG price to the project is yet to be decided.

The approved Generation Development Plan up to 2023 is as follows:

Table 12: Transmission system reinforcement projects

No.	Project	Project Progress
1	275kV Bukit Tarek - Chubadak	11km alternative route has been identified.
2	275kV Port Klang - Bukit Rajah GIS	Expected to complete by May 2014
3	275kV Kg Pandan - Ampang East	Pending route finalisation.
4	275kV Olak Lempit - Puchong Perdana	Successfully commissioned on 11th September 2013
5	275kV Lenggeng - Mahkota Cheras - Salak South	Pending decision on transmission line alignment by the State Government and Forestry Department of Selangor.
6	275kV Segari - Bukit Merah	
7	500kV OHL Bentong South - Lenggeng	
8	275kV Bentong South - Ampang East	
9	275kV OHL Lenggeng - Mahkota Cheras	

Demand for electricity is projected to grow at a rate of 3% to 4% annually, which requires transmission system to be further upgraded and expanded. Peak demand is projected to surpass 25,000MW mark by 2032 while total installed generation capacity connected to the transmission system will be more than 30,000MW, an increase of 40% from generation capacity in 2014.

In the long run, the 500kV transmission lines will be the backbone for transmission system for inter-regional power transfer and possible interconnection with other systems. Experiences in recent new transmission line projects have shown that such development needs to be expedited as it is becoming more difficult to secure land corridor for that purpose. Therefore, JPPPET in 2012 approved for construction of two 500kV transmission line projects that will link PMU Ayer Tawar with PMU Tapah and PMU Yong Peng East with PMU Lenggeng.

Table 13: Approved 500kV transmission projects

No.	Project	Completion Date
1	500kV Ayer Tawar - Tapah - Bentong South 500/275kV substation - Extension of Ayer Tawar 500kV substation	September 2017
2	500kV Lenggeng - Yong Peng East - Yong Peng East 500/275kV substation - Extension of Lenggeng 500kV substation	December 2019

Both projects are important because additional generation from projects under Track 3A, Track 3B and future immediate projects are targeted for supply to the central area. For Ayer Tawar – Tapah lines, the scheduled operational date is in September 2017, while the Yong Peng East – Lenggeng lines is expected to complete before December 2019. Both projects are being implemented by the Grid Owner and are expected to be completed as scheduled.

Figure 19: 500kV transmission line from Ayer Tawar to Tapah and Yong Peng East to Lenggeng

Transmission Network Outlook

The major 500kV and 275kV network in the system for year 2014 and 2017 are shown in Figure 20 (a) and 20 (b) respectively.

Figure 20 (a): Peninsular Malaysia national single line grid diagram 2014 (500kV and 275kV)

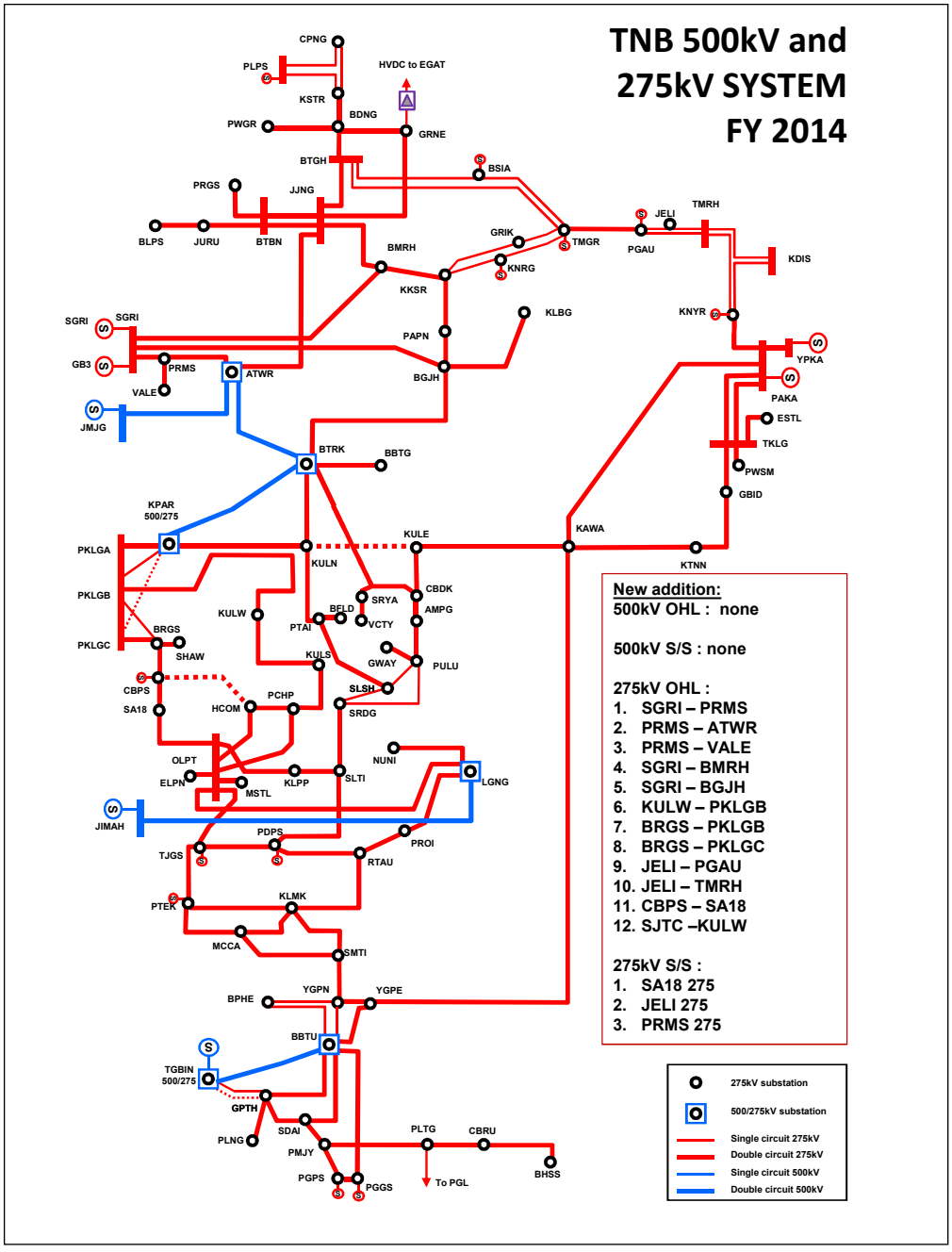
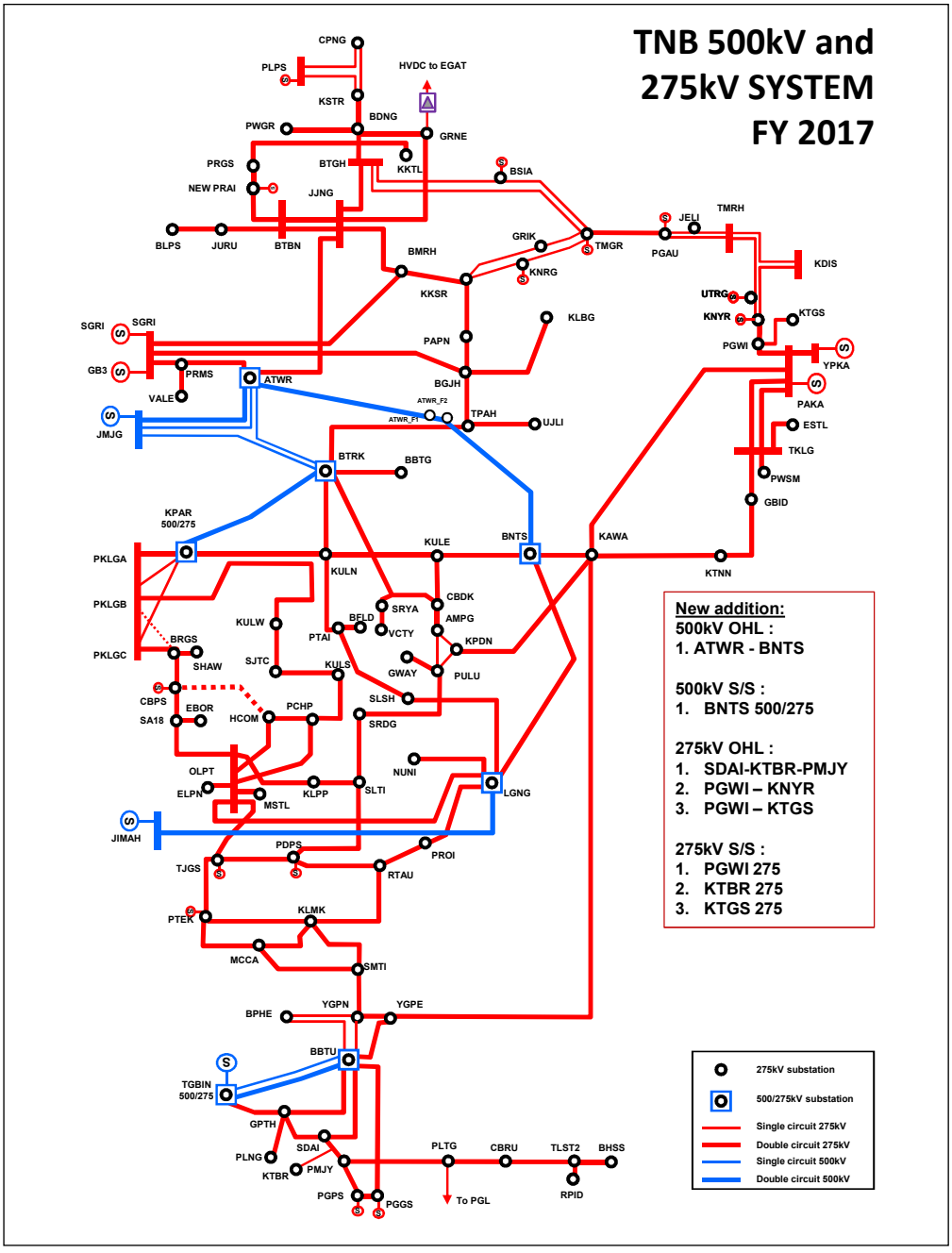


Figure 20 (b): Peninsular Malaysia national single line grid diagram 2017 (500kV and 275kV)



Capital Expenditure and Future Plans for Transmission and Distribution

As part of the requirement under the Licence condition, TNB as the main utility is required to submit capital expenditure plan to ST on project development and maintenance.

A five years annual projection will be provided to cater for projects related to the transmission system expansion, improvement to cater for new generation plant-up and demand growth as well as mitigating any system constraint and limitation. These projects are divided into two (2) categories, namely:

i) Projects with contracts i.e. the on-going projects that have contracts awarded for construction; and
ii) Pre-award projects i.e. projects under implementation in various stages such as planning, land and wayleave acquisition, engineering stages or procurement.

The projected spending will also includes allocation for maintenance activities such as replacement of identified equipment, refurbishment or overhaul of equipment and expected expenditure for bulk capital such as vehicles, furniture and fitting, software and tools and testing equipment.

The breakdown of forecasted capital expenditure for the FY 2014 - FY 2018 is illustrated in following table:

Table 14: Proposed capital expenditure for transmission

Financial Year	FY 2014 RM mil.	FY 2015 RM mil.	FY 2016 RM mil.	FY 2017 RM mil.	FY 2018 RM mil.	5-years RM mil.
Developments Projects	1,580	1,891	2,135	2,266	1,684	9,555
Assets Maintenance	116	120	125	131	139	631
Bulk Capital	15	19	20	21	21	96
Total CAPEX	1,711	2,030	2,279	2,417	1,844	10,281

For distribution business, TNB carries out annual power system development review in order to adequately meet the electricity demand of the customers in timely manner. For planning purposes, a 10-year period of electricity demand projections, a 5-year period of sub-transmission capacity review and a 3-year period of distribution network master plan studies are being carried out by TNB on regular basis.

The breakdown of forecasted capital expenditure for the FY 2014 - FY 2018 is illustrated in following table:

Table 15: Proposed capital expenditure for distribution

Financial Year	FY 2014 RM mil.	FY 2015 RM mil.	FY 2016 RM mil.	FY 2017 RM mil.	FY 2018 RM mil.	5-years RM mil.
Ongoing and Estimated	3,320	3,380	3,480	3,590	3,710	17,480

For improvement and reinforcement of 33kV distribution system network, 341 projects were initiated and planned throughout Peninsular Malaysia. Generally, distribution network projects can be divided into two; System Development / Improvement and Supply to Customer. The number of planned major distribution projects is as tabulated below:

Table 16: Planned major distribution projects

Financial Year	Number of Projects		Cost of Projects (RM mil.)		
	System Development	Supply to Customers	System Development	Supply to Customers	Total Cost
FY 2013	47	19	723	173	897
FY 2014	106	49	1,894	502	2,396
FY 2015	99	21	1,712	250	1,962

INDUSTRY REFORM INITIATIVES

INDUSTRY REFORM INITIATIVES

New Energy Policy Study

The need for a new, comprehensive energy policy was identified as part of larger structural and economic transformation process by the Government. The study was undertaken by the Economic Planning Unit (EPU) of Prime Minister's Department with involvement of all energy sectors' stakeholders.

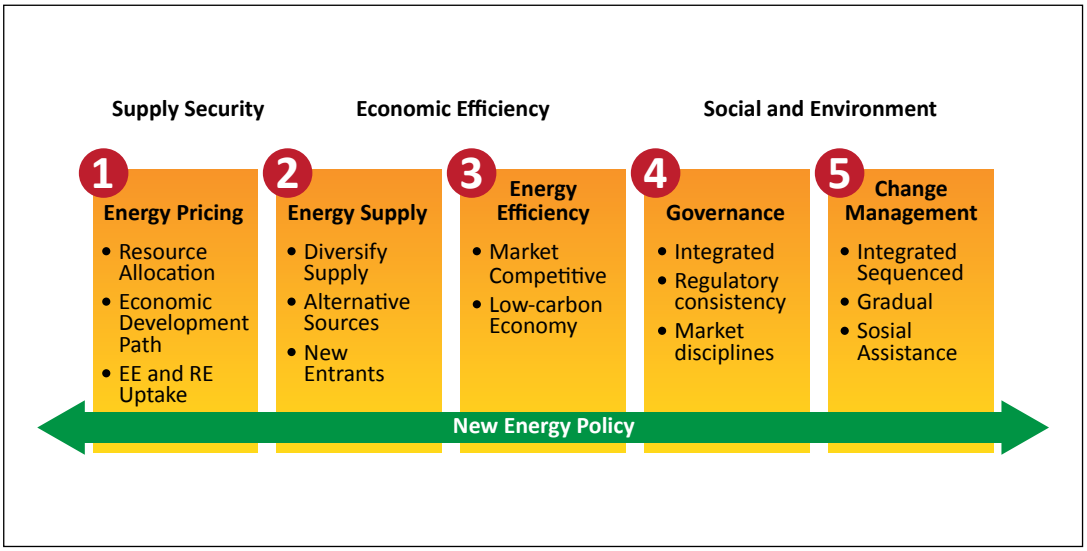
The study covers almost all aspects of activities and policies related to energy sector in the country for up to 2050 and addresses energy supply challenges such as competitiveness, accessibility, security, environmental impact, efficiency of use and affordability. Thorough review was made on Gas & Liquified Natural Gas (LNG), Power, Transport, Renewables, Oil, Petrochemicals, Energy Security, Energy Efficiency and Emergency Preparedness.

While the 2010 National Energy Policy provides a suitable framework for energy policy, addressing the main issues and setting a generally realisable set of targets, there is a general belief that the implementation of many of the initiatives is falling short of expectations. Studies have identified two underlying issues that are responsible for implementation not being clearly demarcated.

First, although multiple entities have energy policy, planning, and implementation responsibility, there is no overall co-ordinating entity has sufficient authority to ensure implementation and integration across the relevant energy supply chains. Secondly, there are inconsistent approaches to energy policy definition, particularly the formulation of clear quantified targets and facilitating processes. This has led to unclear timelines, inconsistent targets, sub-optimal priorities, and a general mismatch of facilitating processes.

The main elements of 2010 National Energy Policy are illustrated in Figure 21.

Figure 21: Main elements of 2010 national energy policy



The new energy policy study focussed on the elimination of costly direct and indirect subsidies for energy products in an efficient and minimal disruptive effort. While existing monopoly-regulated arrangements are considered to be suitable for the medium term, the study is also recommending a steady movement towards competitive markets with interim conservation of regulated price and allocation mechanisms for long term sustainability. As share of LNG in the market is expected to increase in the future, domestic prices will need to move to a level consistent with international market prices for natural gas.

In terms of energy production, though Malaysia remains as a significant hydrocarbon producer, it is becoming a larger importer of oil and oil products, and a significant importer of coal. Nevertheless, the study indicated that gas will remain a net export during the 2030s and beyond even if depletion of gas reserves in Peninsular Malaysia prompting the import of LNG.

Along with a clear vision, the study contends that successful implementation of the Energy Policy for Malaysia requires a governance structure with clearly defined responsibilities. Subsidies should be explicit and targeted at vulnerable group of society, not implicit and provided for all. Implicit drivers such as responses to market price and cost signals, open competition, and adoption of technologies with long-term advantages can also drive significant efficiency improvements over time. Controlled pricing and monopoly positions could potentially obscure such drivers.

In terms of efficient of use and supply of energy, promotion is essential to maximise benefits for the economy whilst contributing to energy security and to realising energy sustainability objectives. Efficiency programmes in industry and service provision can also be progressed on a much wider basis than just in energy usage, and as such will support strong economic benefits.

The New Energy Policy Study is expected to form the basis of national long term energy policy as the study underlines all important aspects related to the use of energy and in-line with economic, environment and social objectives as envisioned by the Government.

Ring Fencing of the Grid System Operator

Peninsular electricity supply industry continues to undergone reform process, most notably the introduction of Independent Power Producers in 1990s. Prior to opening up of generation sector, Department of Electricity and Gas Supply, a precursor to Energy Commission, was established under the Electricity Supply Act 1990 to regulate the industry with emphasis on the safety aspect of supply and use of electricity. The economic regulation aspect came to the fore with operationalisation of the Energy Commission in 2002.

Nevertheless, amid all the reform initiatives that are implemented thus far, electricity supply industry is still largely a vertically-integrated industry with TNB dominantly features in the overall supply chain. As generator, off-taker, grid system operator and grid owner, TNB's position in the system requires a clearly defined mechanism to enable most cost-efficient, fair and transparent despatch of electricity.

GSO plays a central role in an efficient electricity market. In order to promote efficiency and ensure a 'level playing field' for all market participants, it is important that GSO acts in a non-discriminatory manner. Some countries have decided to separate system operation from all potentially competitive parts of the electricity value chain, i.e. generation, wholesale and retail. However, this option requires major changes to the existing industry structure and may result in significant risks for the safe and reliable operation of the power system if not properly enacted.

As an alternative, other countries have therefore opted for the option of ring fencing the system operator, i.e. for introducing certain changes and safeguards, in order to ensure that the system operator acts in a transparent and non-discriminatory manner, and to avoid any cross-subsidies between the system operator and other parts of a vertically integrated utility.

Organisational unbundling or ring fencing of the GSO was chosen for Peninsular Malaysia as it provides most of the benefits to the system with lower cost and level of complexity compared to legal unbundling or ownership unbundling practices. As the objective is for GSO to operate in transparent and non-discriminatory manner, it is important that ring fencing fulfils the following criteria:

Transparency:
- a) Documentation for processes is well defined, endorsed and published
- b) Operational practices and conduct are compliant with the documented processes

Non-discriminatory:
- a) Access to information is fair and equal
- b) Decisions taken can be perceived as being non-discriminatory
- c) Clear separation of cost, avoidance of cross-subsidies

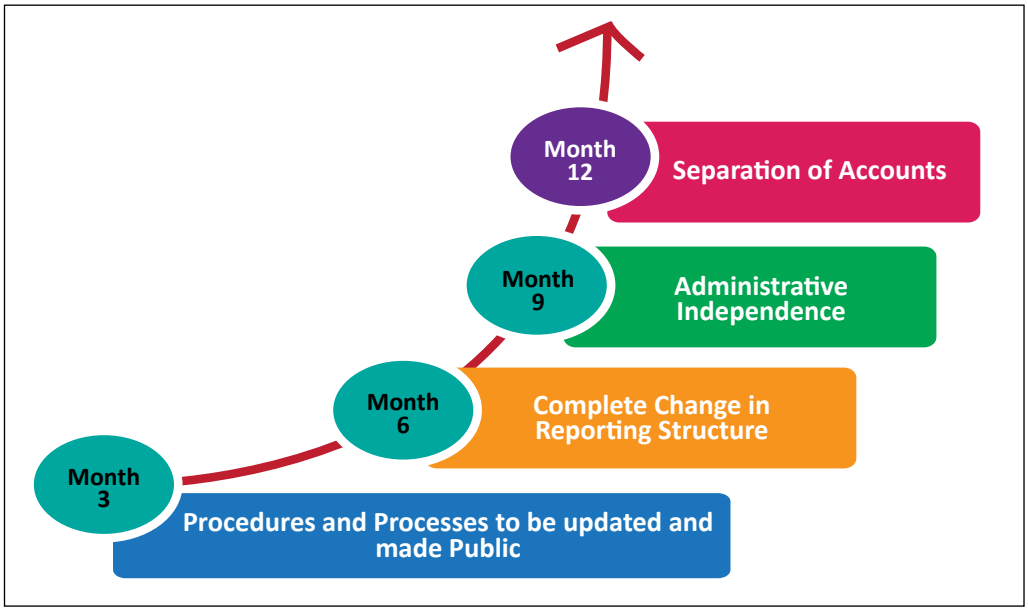
Study on the review of the GSO was done by MyPower Corporation, a special purpose agency under KeTTHA, as part of wider study on the development and implementation of a competitive electricity supply industry in Peninsular Malaysia. The review focussed on the:

- Organisation structure
- Industry codes/rules/practices/procedures
- Legal and regulatory framework
- Governance and oversight mechanisms
- Accounting and financial procedures and practices
- IT systems and software
- Human resources and competencies
- Transparency in information dissemination

While the key objective of the review is to ensure accountability and independence of GSO, and identifying potential conflict of interest, equally important is the need to instil confidence to industry players to the conduct of the GSO. Therefore, GSO has to be seen as an independent grid system operator that is operated based on set of rules prescribed by regulator.

The roadmap for ring fencing of the GSO is summarised in the following diagram. In essence, these steps represent the "no regrets" steps that can be smoothly undertaken within 12 months period in order to demonstrate efficient, transparent and non discriminatory manner practiced in the GSO.

Figure 22: Proposed roadmap for ring fencing the GSO



Ring Fencing of the Single Buyer

The ring-fenced Single Buyer procures electricity from the Generators, based on contractual terms and conditions in the PPA and SLA. The Single Buyer provides daily unit commitment and dispatch schedule to the GSO based on the generating units' availability declaration by Generators.

The Single Buyer is tasked:

a) To minimise the cost of electricity procurement to meet demand, subject to:
   i) consistency with the terms of the contracts with Generators
   ii) generation and transmission network constraints
   iii) any other requirements relevant to the Single Buyer as specified in the Malaysian Grid Code

b) To promote transparency in the procurement of electricity by ensuring that it undertakes its functions in a transparent manner, subject to any constraints imposed by the terms and conditions of Generator Contracts

c) To facilitate competition in the generation sector and promote confidence in the Electricity Industry by ensuring that it performs its functions in a fair and balanced manner and in compliance with the Single Buyer Rules

d) To facilitate security of electricity supply by proactively reporting any issues it identifies that may adversely affect security of supply to the Energy Commission

The Single Buyer Rules govern the operation of the Single Buyer market and conduct of several parties to comply with the Single Buyer Rules in Peninsular Malaysia. All parties have different rights and obligations under the Single Buyer Rules and must be registered by ST. The different categories of participant under the obligation of the Single Buyer Rules are as follows:

a) Generator
b) Directly Connected Customer
c) Grid System Operator
d) Grid Owner
e) Distributor
f) Nominated Coal Supplier
g) Nominated Gas Supplier
h) Single Buyer
i) Any other party approved by the Energy Commission

The Single Buyer Rules apply in conjunction with the following documents:

a) Electricity Supply Act 1990
b) Energy Commission Act 2001
c) Malaysian Grid Code
d) Regulations, codes, rules, guidelines or directions issued by the Minister or Energy Commission
e) Licences issued by the Energy Commission under the Electricity Supply Act 1990
f) Generator Contracts

Operationalisation of Ring Fencing of Grid System Operator and Single Buyer

Implementation of Single Buyer Framework and Single Buyer Rules was approved on 24th June 2013 while implementation of ring fencing of GSO was approved on 28th November 2013 by Minister of Energy, Green Technology and Water. With the approval, ring fencing of Single Buyer and GSO begin on 1st January 2014 and 1st February 2014 respectively. Through Single Buyer Rules, transparency of electricity procurement will be enhanced that eventually will benefit consumers in a long run.

Oversight Panel was established to monitor the ring fencing of Single Buyer including compliance to Single Buyer Rules and performance of a ring fenced GSO. Meanwhile, Grid Code Committee will monitor the technical aspect and compliant of both Single Buyer and GSO to the Grid Code. Rule Change Panel is established to ensure both Single Buyer Rules and Grid System Operator Guidelines documents are up to date.

Both Single Buyer and GSO are monitored by ST using relevant performance indicators in line with implementation of IBR starting from January 2014.

Incentive-Based Regulation Mechanism

Development of incentive-based regulation mechanism started in 2010 with a study commissioned with the objective to evaluate the regulatory framework and management processes of ST against best practice principles and policies. Through the study, it was observed that existing form of regulation may lead to overcapitalisation as utilities have little incentive to pursue economic efficiencies. Going forward, IBR was proposed as replacement for the regulation that was in existence prior to IBR.

Subsequently, Regulatory Implementation Guidelines (RIGs) for electricity was developed after undergone consultation process with stakeholders. TNB was provided in January 2012 with the RIGs in preparation for the transition from the old regime to IBR upon approval by the Minister of Energy, Green Technology and Water in October 2011.

Through this mechanism, incentives in the form of additional revenue allowed for the next tariff revision will be given to TNB if improvement can be made on efficiency of supply activities without compromising the performance of services. At the same time, all savings resulting from increased operational efficiency will be shared by TNB and consumers via reduction of tariff increases in the next IBR cycle.

In essence, IBR is implemented to ensure that electricity tariff setting is conducted in orderly and transparent manner with emphasis on more efficient utility performance. In implementing the IBR mechanism, TNB is subjected to specific performance indicators' targets in which incentives and penalties are introduced. The business entities in which the indicators will be monitored and subject to incentives and penalties are customer services, transmission, system operator and single buyer.

The IBR is used for 2014 tariff revision whereby 0.90 sen/kWh (2.7%) out of 4.99 sen/kWh (14.89%) increase in average electricity tariff is due to base tariff. Prior to latest revision, base tariff was reviewed twice in June 2006 and June 2011. Trial period for one year commenced in 2014 and will be followed by first cycle from 2015 to 2017. As IBR involves incentives and penalties to utility, implementation will be monitored closely in order to achieve continuous improvements, which ultimately will benefit the consumers.

End User Tariff and Stabilisation Fund Framework

The End User Electricity Tariff study was conducted by MyPower Corporation in 2013 with the objective to come out with cost reflective and efficient tariff structure. Through the study, end user tariff model with option for time-of-use (ToU) was produced. Present structure contains cross-subsidy element across the consumer categories that does not reflect actual cost of supply.

The study also outlined implementation strategies to allow for transition from present structure to structure that better reflect cost of supply according to consumer categories. However, implementation of the end user tariff model requires consultation sessions and analysis on impact to consumers.

The component of ToU in the end user tariff structure is one of the alternatives that will be introduced to the industrial and commercial consumers as option to replace Special Industrial Tariff that will cease by year 2016. ToU will not only applicable to industrial but to commercial users as well as commercial consumers are projected to be the biggest sectoral users by 2030.

Study on TNB Connection Charge

Connection charge is the upfront payment made to utility by customers who require a new electricity supply infrastructure and/or to upgrade existing infrastructure to cater for additional power supply. Imposition of connection charge is allowed under the Electricity Supply Act 1990 if infrastructure cost cannot be recovered through published tariff. In general, connection charge will be imposed to 25% of total infrastructure cost to connect the supply to consumer while 75% will be recovered through published tariff. Consumers are categorised based on the supply voltage level, as follows:

- Category 1: Supply voltage of 132kV and above
- Category 2: Supply voltage from 6.6kV and below 132kV
- Category 3: Supply voltage below 6.6kV

The study was commissioned due to the fact that since its introduction in 1995, criteria and rate were not revised although major cost components such as cables, transformer, metals and workmanship have increased. Requests by TNB to revise the connection charge rates were turned down in 1998, 2000, 2004 and 2009 due to priority given to tariff revision. In 2012, TNB has again requested for revision of connection charge, in which after series of discussions and workshops, was finalised in 9th September 2013.

Consultation session was held on 30th September 2013 participated by Government agencies and consumer associations for consumer awareness on proposed new connection charge terms and to get views that will be incorporated in the final submission to the Government. Proposal paper of the connection charge review was submitted to KeTTHA for review and approval in December 2013.

Market Share

Liberalisation of generation sector in Peninsular Malaysia started in the 90s has brought dramatic changes to business landscape previously dominated by utility as market share of incumbent was reduced over time from 100% in 1990 to 53% in 2010. In the space of 20 years, while the market share was eroded, actual generation capacity belongs to TNB was actually increased from 4,915MW to 11,530MW.

Going forward, as the nation embarked in a more cost-effective generation procurement through competitive bidding, question was raised whether the market share especially in generation sector will be skewed towards several dominant players. Hence, a study was conducted to assess the level of market share of generation sector players in terms of absolute share and majority share.

The study looks at market concentration and diversification employing established methodologies widely used i.e. Concentration Ratio (CR) to gauge market concentration and Herfindahl-Hirschman Index (HHI) for diversification as follows:

CR is defined as the market share of the n largest undertakings competing on the market. In more distributive market environment such as in Europe, market dominance is presumed if CR1 or market share of single largest company is more than 33.3%, CR3 or market share of three largest company is more than 50% or CR5 is more than 66.6%.

HHI is calculated by squaring each of the market shares and summing the resulting numbers. Taking into account the relative size and distribution of companies in a market, the market can be considered unconcentrated at HHI of less than 1,750, moderately concentrated at HII of between 1750 to 3500 and highly concentrated at HHI of more than 3500.

The result shows that market dominance prevails for all the concentration ratio of CR1, CR3 and CR5 and the market is also highly concentrated as a result of significant market share of major players in generation sector.

Figure 23: Current status based on absolute share

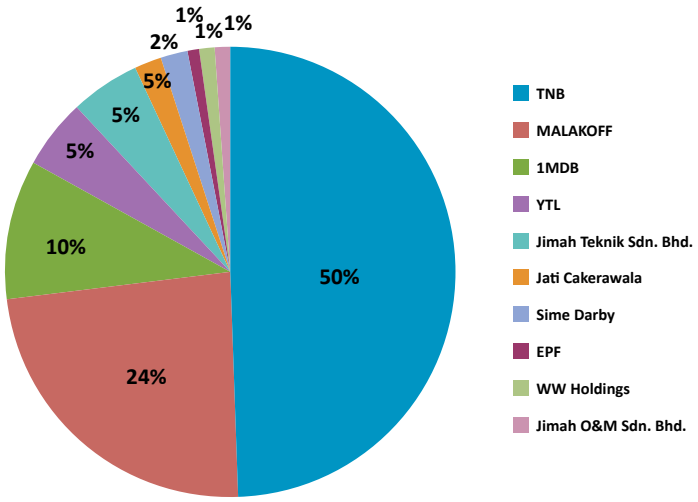
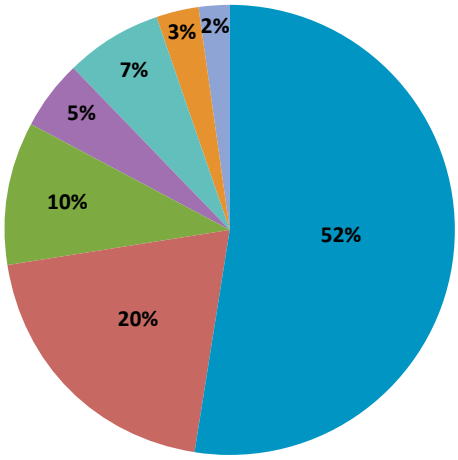


Figure 24: Current status based on majority share



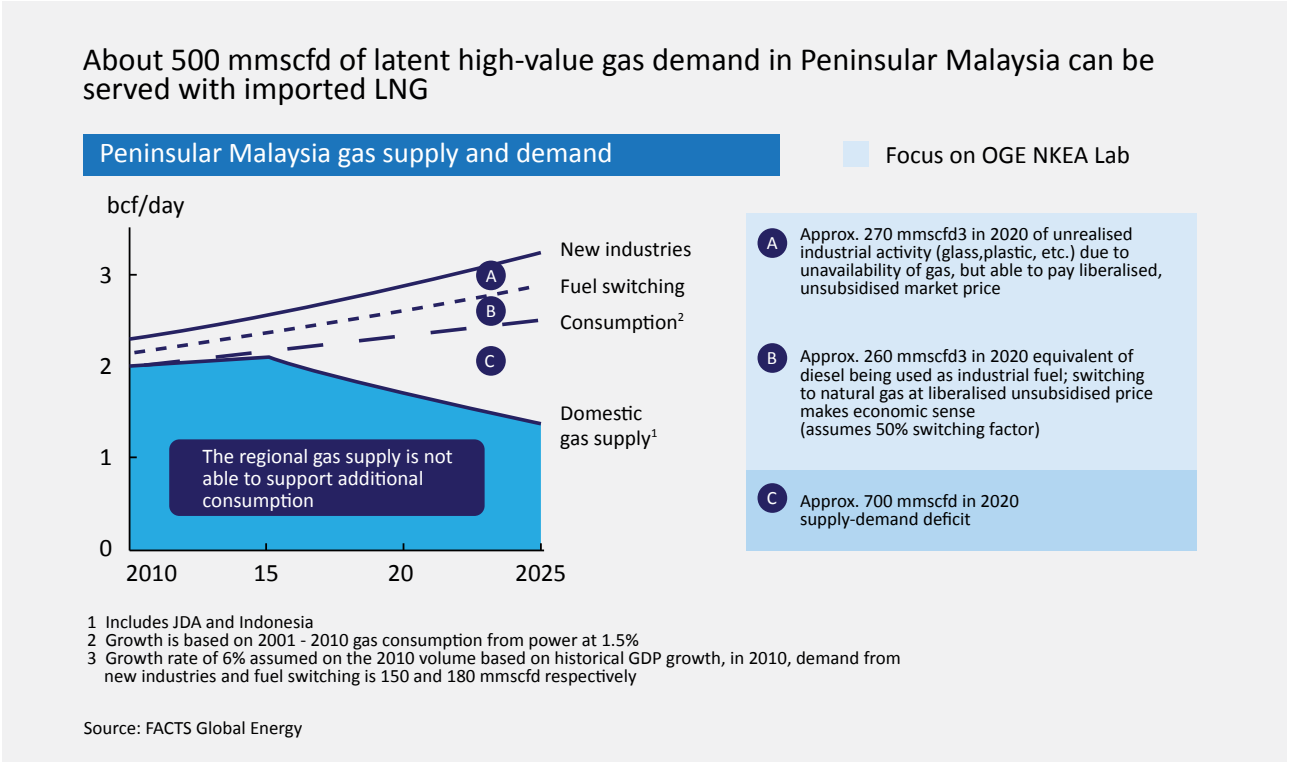
Gas Market Reform

The Gas Supply Act 1993 (Act 501) is currently applicable to natural gas supply activities in the downstream sector of the distribution of city gate stations to consumers. Economic aspect of natural gas supply activities upstream from production platform to city gate station is under the jurisdiction of PETRONAS in accordance with the provisions of the Petroleum Development Act 1974.

In the span of 10 years, the quantity of natural gas that is regulated through the Gas Supply Act 1993 increased by more than 400% from 70 million cubic feet per day in 2002 to 380 million cubic feet per day in 2012. That volume contributed to 18% of the total gas supply in peninsular. Meanwhile, the quantity of gas supplied by PETRONAS through the Petroleum Development Act 1974 was much higher, at 1,750 million cubic feet per day or 82% of total gas supply in the Peninsular.

Going forward, while long-term power sector demand is expected to taper to less than 1,000 mmscfd, additional supply is still required to meet the growing demand in other sectors in addition to declining gas production from domestic fields. Due to declining production from domestic gas fields and constraints in increasing gas imports through pipelines, one of the alternatives to address the shortage is to bring in liquefied natural gas (LNG) from Sarawak or import LNG from overseas through LNG regasification terminal (RGT). The Government, through PETRONAS has developed the RGT facility in Sungai Udang, Melaka (2013), Pengerang, Johor (2017) and in Lumut, Perak which is still in the planning stages.

Figure 25: Domestic gas supply in the future

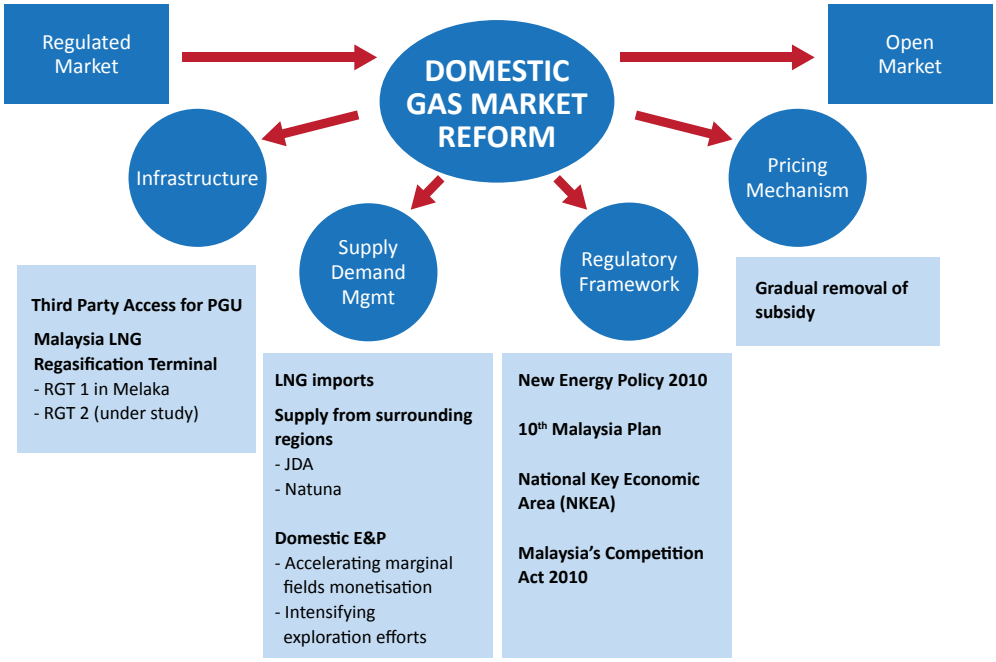


1 Includes JDA and Indonesia
2 Growth is based on 2001 - 2010 gas consumption from power at 1.5%
3 Growth rate of 6% assumed on the 2010 volume based on historical GDP growth, in 2010, demand from new industries and fuel switching is 150 and 180 mmscfd respectively

Source: FACTS Global Energy

Operating framework required for domestic market reform will deal with gas supply, transmission pipeline and regasification facilities, third-party access transportation tariff and natural gas pricing mechanism. The proposed reform by the EPU will result in natural gas prices being systematically increased until it meets market prices by predetermined date.

Figure 26: Gas subsidy rationalization reform



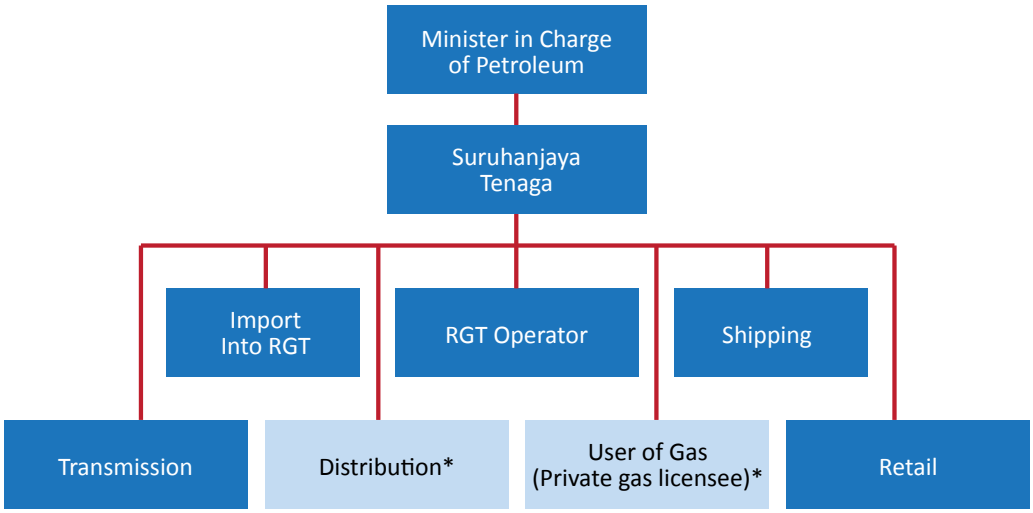
Third Party Access

Gas supply industry in Malaysia is in the process of a structural transformation as the first LNG cargo delivered in 2013. Introduction of RGT as another means to transport gas into Malaysia is expected to provide competition between gas suppliers. TPA broadly defined as a party other than the asset owner or operator gaining access to and using excess capacity in the natural monopoly infrastructure of the asset owner, will enable entities other than PETRONAS to bring in LNG using the RGT and deliver the gas using gas pipe delivery or gas pipe distribution system to provide gas supply to the user's premises.

Key to the successful implementation will be creation of an environment which is conducive, transparent and fair for the gas industry. TPA is being introduced to ensure security, reliability, and sustainability of gas supply. TPA concept is in line with the Government efforts to create open gas market which will be implemented in the Peninsular when the price of the domestic gas reaches the market price.

In line with the Economic Transformation Programme, the New Energy Policy and the Tenth Malaysia Plan with emphasis on improved governance in the energy sector to increase productivity and efficiency, the proposed TPA regulatory framework is as shown in Figure 27.

Figure 27: Proposed TPA regulatory framework

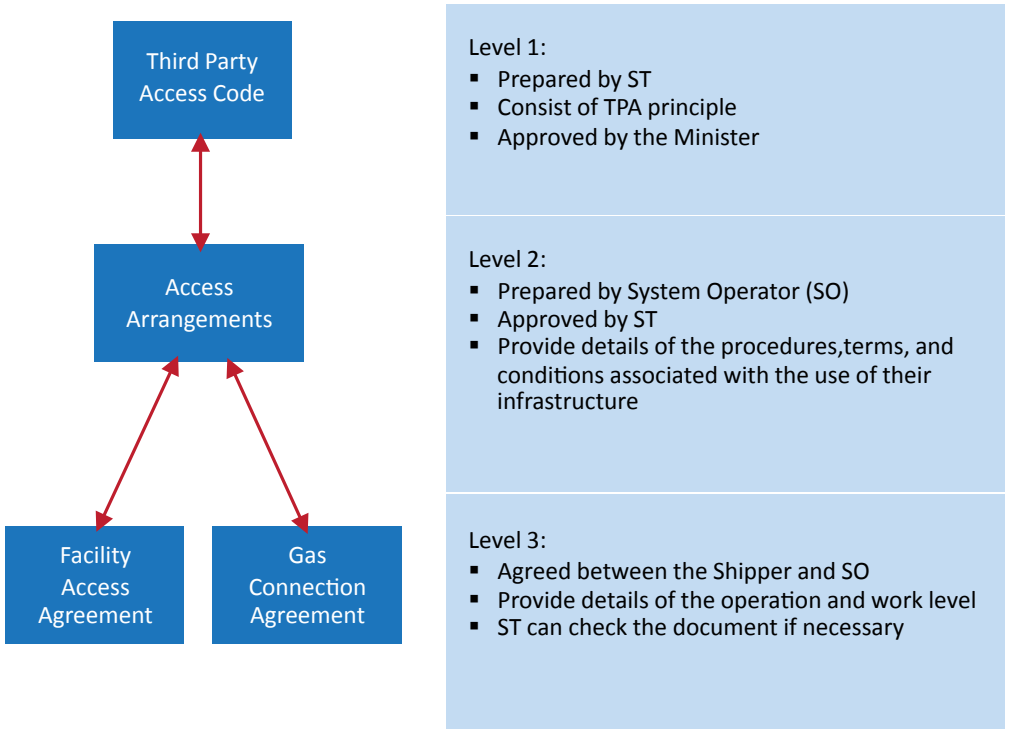


* Existing scope under GSA 1993

Gas Supply Act 1993 need to be amended in order to enable the implementation of TPA to the RGT, delivery and distribution system, and for TPA to be implemented and regulated by the ST. From safety aspect, ST responsible to supervise the activities from downstream to the city gate station while the upstream is still regulated by the Department of Occupational Safety and Health under the provisions of the Factories and Machinery Act 1967 and the Petroleum Act 1984.

Proposed amendments to the Gas Supply Act which have undergone consultation process with the gas industry stakeholders resulted in the Recommended Malaysian TPA Regime as follows:

Figure 28: Recommended Malaysian TPA regime



CLOSURE

Over the past few years, Malaysia has achieved high economic growth amidst huge subsidies to ensure reasonable and affordable energy prices. Such subsidies are hard to remove, but as energy costs rise, so does the cost of Government subsidies, which will rise to levels that may damage the country's economy. The 2014 Budget has introduced several bold measures to strengthen the economy, focussing on reducing the overall deficit as a percentage to GDP of the Federal Government account to 3.5% in 2014 and 3.0% in 2015. One of the measures instituted is the subsidy rationalization program, which aimed at correcting the price distortion and gradually bringing the price levels to market pricing in line with the affordability of the people.

As part of the plan, the price of gas from PETRONAS was raised from RM13.70/mmBtu to RM15.20/mmBtu. Additionally, the higher price for imported liquefied natural gas (LNG) from the newly completed re-gasification plant in Melaka to supplement the indigenous gas was set at RM41.68/mmBtu. There was also a slight upward adjustment for the price of coal, to US$87.50/tonne. As such, starting 1st January 2014, the electricity tariff in Peninsular was increased by 4.99 sen or 15%. In all, higher fuel costs for gas, LNG and coal accounted for the largest slice, some 82%, of the 4.99 sen per unit tariff hike.

The latest rate increase also includes a 0.9 sen/kWh hike in the base tariff, after taking into account an upward revision in the rate of return on the TNB's regulated assets (mainly the transmission and distribution assets) to 7.5%. This base tariff increase includes a forecasted capital expenditure which is likely to top RM8 billion annually for the next three years, on average. The new base tariff level will remain unchanged until end 2017.

With the announcement of electricity tariff hike, incentive-based regulation (IBR) frameworks for electricity and gas tariff determination was introduced. The framework is designed to drive efficiency, reduce costs and improve service levels of the utility, with incentives for exceeding performance targets and penalties for non-performance. Under the IBR framework, a fuel cost pass through mechanism will be implemented to take into account the variability in fuel prices, particularly the coal and LNG prices, apart from the gradual removal of subsidies of indigenous gas. As things stand, the imbalance cost pass through will be implemented every six months is to review the uncontrollable costs such as the variation in actual fuel costs. Any variation will be reflected as an adjustment (upwards or downwards) to the current tariff levels.

Without doubt, there will definitely be some pain in moving towards market-based pricing of the currently subsidized-costs of essential food items, fuel and energy. The pain is further accelerated by additional costs caused by the ringgit's depreciation and the expected tight business environment, as the effect of rising fuel prices and its chain reaction will be felt by the population. Inflation is on the uptrend, rising persistently from the low of 1.2% in December 2012 to 2.6% year-on-year in September 2013, attributed to continuing higher food and energy prices. With the forthcoming full scale implementation of minimum wage in early January 2014 and the planned GST implementation on 1st April 2015, this inflationary pressure will continue in the near future.

As such moving forward, it will be a challenging period for the power sector. Apart from rising cost of doing business, the challenges of depleting natural resources, sourcing for new resources, migrating talents and increasingly tough competition from neighbouring countries and other key emerging economies, are realities of the future. The focus will be to expand market access and maintain high standards, in terms of product and service quality as well as integrity of key institutions in an increasingly competitive global marketplace. These are the necessary conditions in ensuring there is an increase in the overall standard of living and, most importantly nation's long-term competitiveness.

There is hardly any doubt that energy security will remain high on the Government's agenda. Malaysia's energy security is dependent not only on developing our indigenous energy resources but also on diversifying our energy supplies from foreign sources. Natural resources, such as oil and gas need to be managed in an optimal and sustainable manner, avoiding excessive exploitation for short-term gains.

With regards to electricity, plan is put in place to ensure adequate supply to meet demand and a diverse range of sources, from gas and coal, to hydro and renewables. With gas it has to be considered that it is important to the three major sectors, that is, for power generation, for cooling requirements in the commercial sector, and for industrial usage. Efforts are taken to maintain a diverse range of suppliers, which at the moment includes domestic production, connection to neighbouring countries, and importation through the LNG regasification terminal which was recently commissioned in May 2013. This need for diversification of supplies is also pertinent for the coal imports for the country.

Under this present situation, balancing supply and demand is complex enough but the situation is further complicated by the climate challenges. The "painful truth" is that fossil fuel consumption is generally and remarkably firm. Balancing the apparently conflicting requirements of ensuring affordable pricing to consumers and minimize the impact to the environment, will pose major challenge in the choice of new generation plant-up in years to come, as generation reserve margin comes to close optimum level of 20-25% by 2020.

However, the risk of a supply-demand crunch caused by unplanned outages of overworked coal-fired power plants remains, at least until 2016. The situation will be more challenging in managing the grid to ensure system security, with year-to-year demand increase coupled with yearly planned maintenance and a few unplanned incidents of offshore gas facilities, which sometime leads to unavoidable gas curtailment to the power sector. With the introduction of new single largest unit of 1,000MW into the system, mitigating such huge loss of a single unit will need to be relooked in the overall system security.

Alternative energy sources, particularly renewables, can complement conventional energy sources. Without doubt, it will take some time to solve all the technical issues through research and operating experience, before it can be considered as a credible replacement for conventional energy. Nevertheless, the Feed-in-Tariff (FiT) mechanism introduced by the Government in 2012 will spur further the development of RE projects. The increase in levy on the monthly bill of consumers to 1.6% starting in 2014 will increase additional funding for FiT for RE projects.

However, the trend to review the FiT system is gaining momentum globally. In Europe, Italy and Spain have already stopped the FiT system due to inability to withstand the social burden caused by the system. In Germany, the soaring premium is becoming a major political issue. As for Malaysia, the policy of awarding RE quota based "first come first serve basis" on will need to be relooked and replace with a more competitive basis.

As for large scale development of Renewable Energy (RE) plants, particularly for connection to the transmission grid, several proposals are still under consideration. However, a new policy has to be developed to integrate it with the overall generation planning, taking into consideration the technical complexities and economic viability of such proposal.

In conclusion, delivering a sustainable energy future for Malaysia will be of paramount importance and this will not be very different from the approaches in other countries. Critical issues surrounding energy security, climate change, energy prices, subsidy rationalization, reliability and intermittency of RE plants, and initiatives for energy efficiency and demand side management will be high on the Government's agenda for sustainability.

Most countries will harness "green energy" such as solar, wind and other renewable energy, to provide distributed power sources to complement conventional power plants. It is anticipated that new demand-side equipment, including electric vehicles and hybrid electric vehicles will become more widely adopted. The energy management system needs to be able to support the diversified energy sources and new issues that come along with it.

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