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Towards A World-Class Energy Sector

Energy Malaysia

Suruhanjaya Tenaga
Energy Commission

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Ensuring National Energy Security

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Towards A World-Class Energy Sector

Energy Malaysia

Suruhanjaya Tenaga Energy Commission

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Safeguarding Growth

Malaysia's economy and industry is on a forward momentum. Therefore, it is vital to ensure that energy supply is able to keep up with demand. As the national energy regulator, the Energy Commission needs to ensure a steady supply of power in the country while taking other factors such as costs – including imports through interconnections, generation and supply of energy to the consumers – into account.

Presently, the two largest fuel sources for electricity in Malaysia are coal and gas, accounting for 33% and 58% respectively. Since Malaysia does not have an indigenous coal supply, it has to import from Indonesia and Australia, and be subjected to the risk of price variabilities in the commodities market.

As for gas, while Malaysia is a net exporter, Peninsular Malaysia also imports about 30% of its natural gas. However, the current system of subsidising oil and gas is resulting in the country having to support a value differential as it pays market price for the imported fuels and then sells it at a discount. There is a bigger picture that needs to be looked at.

Owing to the subsidies, Malaysia is able to offer one of the lowest electricity tariffs in the region. This in turn has helped us attract investors to start operations in the country. In addition, local SMEs are also dependent on the low costs of electricity to maintain their business, and without it, many will surely suffer, if not close down.

It falls on our shoulders at the Energy Commission to come up with ways to mitigate the cost without having to resort to hiking tariffs, as this will prove untenable to the economy. There has been much talk about alternative fuel sources. However, the reality of the situation is that coal and gas will still be dominant, owing to drawbacks of the other fuel sources.

For instance, renewable energy (RE) is still relatively new. Although there has been a concerted effort to encourage its growth so that it will comprise 5.5% of our energy mix by 2015, this only complements, and does not meet, our needs.

Therefore, the most feasible solution is to focus on maximising our output of energy without increasing our use of feedstock. Efficiency is the way forward for power production, distribution, transmission and use in our country. It is this which will guarantee our future prosperity.

In line with the urgency of this mission, the publication of **Energy Malaysia** – the Energy Commission's official magazine – is timely. Through it, we aim to provide a platform for energy expertise where all stakeholders can come together and share best practices and information to help create a world-class energy sector in Malaysia

Dato' Abdul Razak bin Abdul Majid
Energy Commission of Malaysia

"Just like our economy, power consumption has been on the rise in Malaysia. In 2011, electricity demand stood at 107,331 gigawatt hours (GWh), compared to 104,519 GWh in 2010. We at the Energy Commission of Malaysia are constantly looking at ways to ensure supply stays ahead of demand."

"Through Incentive Based Regulation, we are ensuring that both the needs of consumers and providers are balanced out in the most efficient and effective way possible."

Reaching Out

I am pleased to welcome you to the inaugural edition of **Energy Malaysia**, the dedicated magazine of the Energy Commission of Malaysia. As the statutory body regulating the supply of electricity and piped gas in Peninsular Malaysia and Sabah, we are committed to ensuring safe, secure, reliable and reasonably-priced access to these two amenities. At the same time, we also need to be aware of the needs of utility providers and ensure that they are able to provide their services efficiently and optimally, so that they may contribute to national development.

We understand the importance of communicating to our stakeholders – the public and private sectors, as well as the general population at large; hence our decision to create this publication. This magazine will be the medium that will showcase efforts heading towards a world-class energy sector, and ensure energy security through effective planning.

Just as **Energy Malaysia** will be our means of highlighting the Energy Commission's and the Government's initiatives, decisions and regulations to energy sector players and the public, it will also showcase their views and reactions to developments in the industry. This magazine will therefore be the 'one-stop' for all the news, views, innovations, and regulations regarding the energy sector, as well as safety and efficiency.

It is therefore apt that our inaugural issue features a topic that has been a subject of interest among both experts and laymen. It is the Incentive Based Regulation (IBR) which came into effect as of the 1st of January this year.

We aim for this feature to answer all the questions, and resolve the speculation and supposition of the effects of IBR on the public and providers. In light of the government's Subsidy Rationalisation Programme and our national mission to become a developed nation, it is clear that IBR is the best way to create a more efficient and competitive energy sector.

In addition, we explore other important and relevant topics such as the efforts being made to promote and encourage energy efficiency. We also analyse the second generation power purchase agreements (PPAs), and how a more balanced set of terms and conditions between IPPs and the utility will enhance the energy sector in Malaysia.

Ultimately, energy is what drives national growth. The Energy Commission is honoured to play a role in guiding the sector in Malaysia as we steer it towards world class standards.

Datuk Ir. Ahmad Fauzi Hasan
Energy Commission of Malaysia

Our Heartfelt Appreciation and Thanks To

YBhg Tan Sri Datuk Dr Ahmad Tajuddin Ali for his dedication and service as the Chairman of the Energy Commission of Malaysia (*Suruhanjaya Tenaga*) from the 1st of April 2010 to the 31st of March 2014. His guidance and mentorship were invaluable, and we at ST thank him for his leadership.

An Upcoming Power Plant

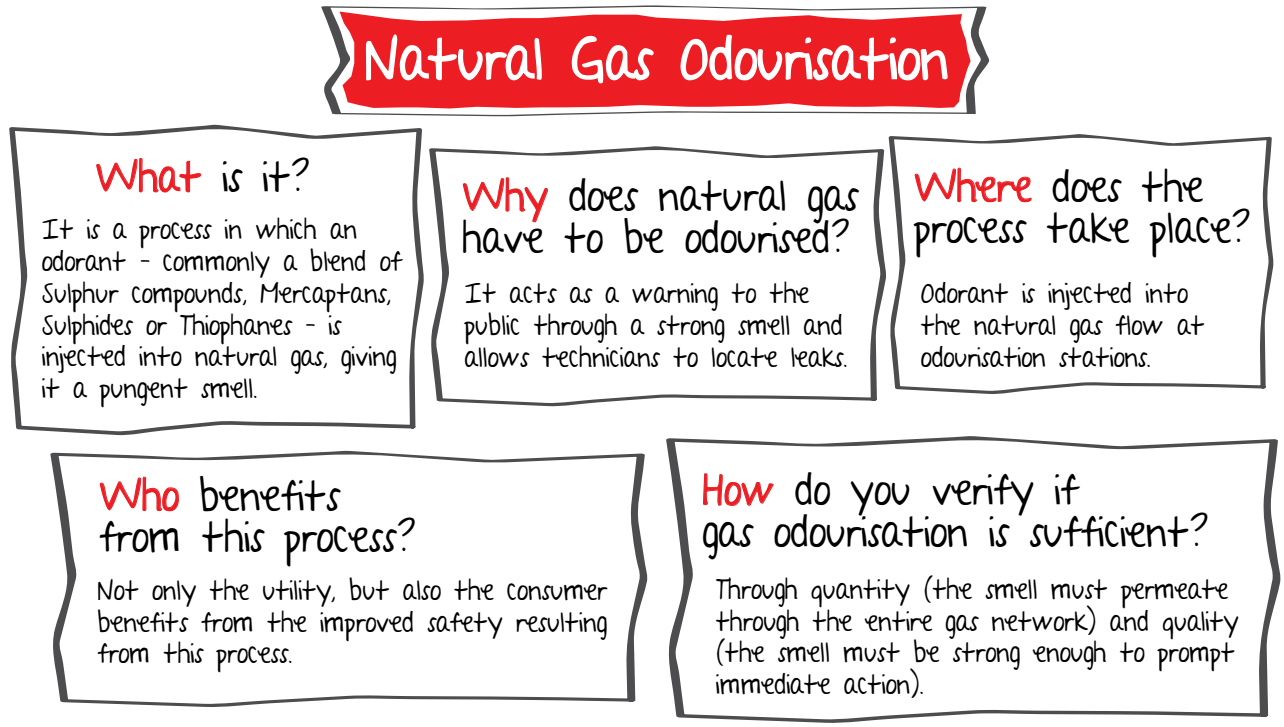
The upcoming coal-fired power plant proposed by 1MDB-Mitsui will be located near the Jimah Energy Plant, reducing its project costs as it shares the readily available infrastructure.

1MDB-Mitsui – a consortium of 1Malaysia Development (1MDB) and Mitsui has been selected by the Energy Commission to develop a new coal-fired power plant with a capacity of 2GW.

Expected to be located at Jimah, Negeri Sembilan, the power plant consists of two units of IHI ultra-supercritical technology steam generator and two units of Toshiba turbo generators, and complies with all the requirements set by the Energy Commission. It also offers a very competitive tariff of 25.33 sen per kWh.

1MDB-Mitsui's proposed plans had the lowest project cost per MW of all bidders, at RM5.40 million/MW, whereas its closest competitor, YTL Power International (YTL)-SIPP power (SIPP) consortium bid RM5.438 million/MW. The project will be commissioned in stages, with the first unit in October 2018 and the second by April 2019.

Effective Natural Gas Odourisation



Prompted by a number of undetected gas leaks in Malaysia, the Energy Commission appointed the Universiti Teknologi Malaysia (UTM)–MPRC Institute for Oil and Gas to conduct a study on the effectiveness of natural gas odourisation systems in commercial and residential buildings in Peninsular Malaysia.

Natural gas odourisers are important as they allow odourless and colourless yet flammable natural gas to emit an easily detectable smell.

Measurements on-site and various simulations revealed that gas flow was higher closer to stations. This reduces contact with the pipe wall and minimises odorant losses. Distribution pipe lines with intermittent service may experience non-equilibrium conditions, resulting in declining gas odorant concentration due to being adsorbed by the pipeline walls. Another factor affecting odorant concentration is the altitudinal position of the pipeline, with certain odorants settling at ground level.

These findings will allow service providers to utilise the most effective methods for odourisation. The conducted study also determined the level of odourisation, and observed if it was in compliance with local standards and international best practices, leading to improved safety in the country's gas installations.

Gaining Access

Owing to the growing demand for gas, the "Third Party Access" (TPA) system regulated by the Energy Commission, will soon be introduced to ensure security, reliability and sustainability of supply in Peninsular Malaysia and Sabah.

By implementing TPA, regasification terminals act as a new source of gas, while also allowing new players to access local gas facilities. This would enable additional gas to be secured, meeting current and future needs. In addition to liberalising the supply industry, this new system will allow for competition between suppliers, by allowing third parties to access the regasification terminal as well as the transmission and distribution pipelines.

To facilitate this system, the *Gas Supply Act* will also be amended this year to expand the Energy Commission's scope of regulating downstream economic, technical and safety regulations, by including the economic aspects of regasification and transportation activities. The Act will encompass the regulation of access arrangements, connection, regasification, transportation and distribution agreements, licences, guidelines and regulations and tariffs for the utilisation of gas facilities.

Introduction of TPA system will allow third parties to gain access to local gas facilities, enabling supply of gas from regasification terminal or international border pipeline to meet local demands.

Pledging for Efficiency

As Southeast Asia continues to expand, it is expected to be a net energy importer in the future, and there are concerns that a lack of energy security may affect the growing economies. In line with this worrying trend, the Minister of Energy, Green Technology and Water Datuk Seri Panglima Dr Maximus Johnity Ongkili revealed that a National Energy Action Plan was being finalised, which included actions to cut energy consumption by 6% – compared to the business-as-usual scenario – in the next 10 years.

Above: Datuk Seri Panglima Dr Maximus Johnity Ongkili revealed an action plan that would reduce energy consumption by 6%, which is necessary to improve local energy security.

Below: Energy performance contracting is another method that will be implemented in Malaysia, allowing the government to purchase energy strategically from sustainable sources.

At the *Powering Asia's Future Energy Needs* and *Asian Views on Power Market Integration* panel sessions held during the Singapore International Energy Week 2013, he explained that Malaysia is in the midst of implementing measures to ensure energy security, as reflected in the 2014 Budget focus on energy conservation and efficiency. These include energy audits, retrofitting energy efficiency measures and replacing existing lights with LED alternatives in government buildings.

Another initiative by the Ministry is energy performance contracting (EPC), which aims to control costs through strategic energy purchases. This will result in reduced bills, and the resultant savings will be invested in energy efficiency.

Ensuring Efficiency

Making Energy Tariffs Responsive to Market Factors through Incentive-Based Regulation

In the wake of rising global fuel costs, the Energy Commission has taken action as the energy regulator in Peninsular Malaysia, to safeguard the efficient and effective functioning of Tenaga Nasional Berhad (TNB), the nation's largest utility. In developing an improved mechanism to determine the electricity tariff rate, the Energy Commission took into consideration the interests of the consumer, and balanced them against the needs of the utility.

At the start of 2014, the Incentive-Based Regulation (IBR) system took effect after a full three years of development – helping mitigate the threat posed by unpredictable fuel costs resulting in a more consistent and transparent means of determining the tariffs applied to residences, commercial premises and industrial facilities across Peninsular Malaysia. Furthermore, the new system also allows the Energy Commission to fulfil another of its goals, by driving greater efficiency through the incentivisation of excellence among players in Malaysia's energy sector.

The Incentive-Based Regulation system is a vital mechanism to ensure that Malaysia's energy needs are always met in order to meet the demands of a growing economy.

Below right: The Regulatory Implementation Guidelines (RIGs) were developed to enable and guide the design and application of each element involved in the IBR system.

INNOVATING TARIFF CALCULATION

As a precursor to this system, the Energy Commission first assembled exhaustive Regulatory Implementation Guidelines (RIGs) in 2011, which outline 11 vital areas of work. Central among them is determining the annual revenue utilities require to carry out operations (called the Annual Revenue Requirement – ARR). As the Energy Commission CEO Datuk Ir Ahmad Fauzi Hasan explains, "The required income must be commensurate with the level of services offered and ensure that users get reliable supply at a reasonable cost."

Subsequently, TNB used this set of RIGs to prepare a proposed revision to tariff rates, as delineated in its IBR and Tariff Review Submission, which was provided to the Energy Commission in November 2012. the Energy Commission then verified that TNB's proposal satisfied the requirements set out in the RIGs, while aligning it with the government's priorities, such as subsidy rationalisation and ensuring the imposed tariff is both reasonable and affordable. Additionally, it conducted a series of frequent consultations with TNB and relevant stakeholders, which began in November 2012 and ended in July 2013, to review the utility's proposal.

The finalised tariff rate was presented to the Ministry of Energy, Green Technology and Water for initial comment and subsequently tabled at the Ministry of Finance (MoF) and the Economic Planning Unit (EPU) under the Prime Minister's Department, as well as at a Special Meeting of the Economic Council for consideration. The final approval was then given by the Cabinet. The first Regulatory Period (RP) of IBR will start in January 2014 as a one-year trial period and end in 2017.

DRIVING ENERGY EXCELLENCE

As the regulator entrusted with safeguarding consistent and reliable energy supply in Peninsular Malaysia, one of the Energy Commission's

Regulatory Implementation Guidelines

RIG	Purpose
RIG 1	Define business entity, specify functions of each business entity, specify the flow of funds between business entities
RIG 2	Define the tariff setting framework for each business entity (price or revenue regulation, regulatory term)
RIG 3	Establish revenue requirement principles for each business entity (building block model) & establish incentive framework: clear principles for treating variances in forecasts (both cost and consumption)
RIG 4	Establish return requirement for each business entity (WACC)
RIG 5	Establish detailed operating cost, capital cost, asset and consumption templates for each business entity
RIG 6	Establish incentive framework for operational performance
RIG 7	Establish cost allocation principles (to allocate common costs)
RIG 8	Establish imbalance cost pass through mechanism
RIG 9	Establish tariff design principles
RIG 10	Establish regulatory accounts process: specify timing, reconciliation to audited accounts and explanation of variances
RIG 11	Establish process for establishing revenue requirements and tariff for each business entity

main priorities during the development of IBR was to ensure that maintenance of vital equipment and assets is not overlooked Additionally, the process has resulted in a more transparent and orderly procedure to determine the electricity tariff, by taking into consideration costs that are both realistic and current.

Simultaneously, the system allows the Energy Commission to drive constant progress through the adoption of the latest best practices.

COUNTING THE COSTS

In order to properly provide a steady supply to TNB's 8.4 million energy consumers, the utility integrates a number of different core functions, including Transmission, System Operations, Customer Service, Single Buyer Operations and Single Buyer Generation.

According to Datuk Ir Ahmad Fauzi, "IBR works by using forecasts of the utility's projected earnings, which are calculated by looking at Return on Assets, efficient Operating Expenditure (OPEX), depreciation and tax payable." Therefore, this separation of accounts also facilitates calculation of the ARR amount.

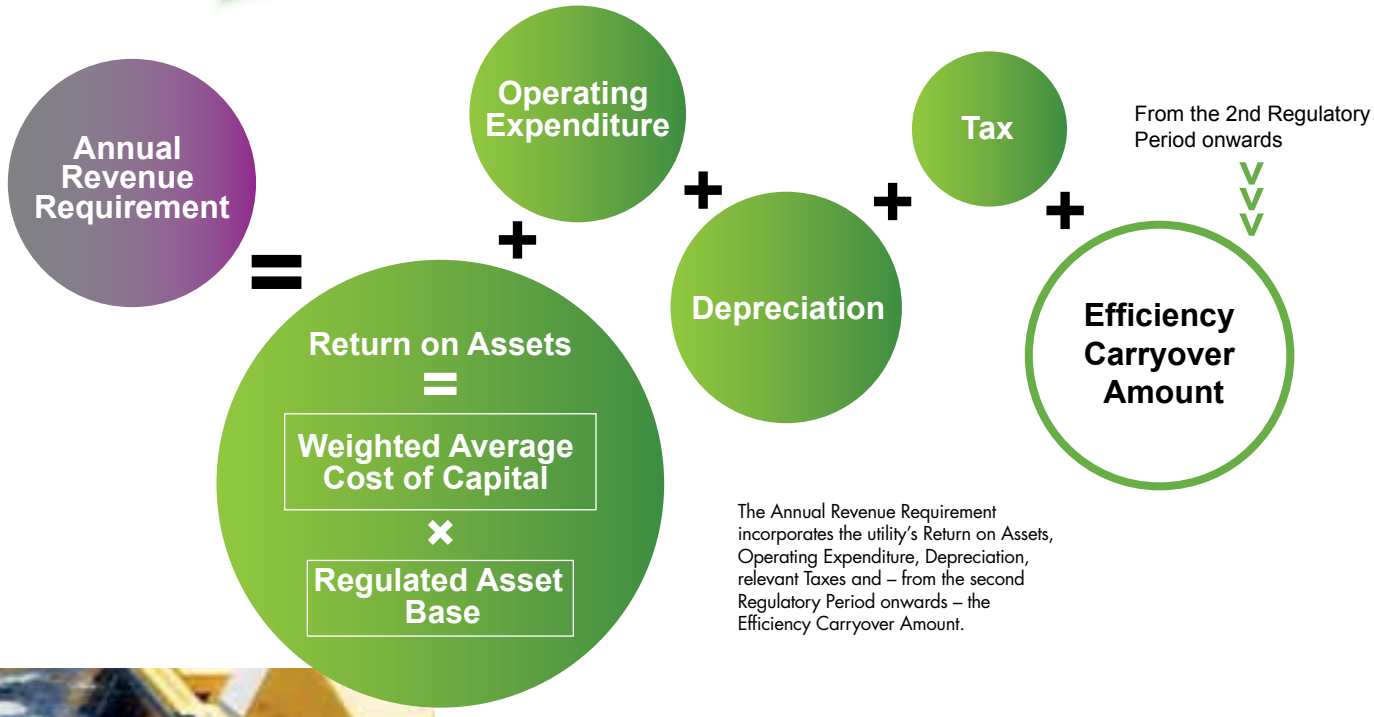
First, the Return on Assets is calculated by multiplying the figures for the Regulated Asset Base (RAB) and the Weighted Average Cost of Capital (WACC). The RAB is the average value of assets between the start and the end of the financial year and the WACC reflects the cost of obtaining new capital to finance the investment of infrastructure.

Next, OPEX – the total capital required to undertake operations – is factored into the ARR. The Energy Commission benchmarks against foreign utilities, reviews historical cost performance and assesses asset management policies to determine this value.

For the Single Buyer, the OPEX includes the working capital, and is derived by multiplying the WACC and the same working capital required. However, every payment must be substantiated with detailed information on debtor and creditor days and amounts.

As finite resources, conventional fuels such as coal have fluctuating global prices. The IBR system uses more realistic cost projections to mititgate this threat and promote better management of remaining supply.

Calculating the Annual Revenue Requirement



The Annual Revenue Requirement incorporates the utility's Return on Assets, Operating Expenditure, Depreciation, relevant Taxes and – from the second Regulatory Period onwards – the Efficiency Carryover Amount.

Procurements from parties related to TNB are only factored into the overall OPEX if they are obtained through competitive tendering, which reflect an efficient cost price and cost-competition with other alternatives available on the open market. Meanwhile, OPEX projections for Customer Service include interest payable on customer deposits.

To determine the average rate of value depreciation exhibited by industry-relevant assets (such as transformers, transmission poles, sub-stations and switchgear), the Energy Commission uses estimations of their efficient economic lifespans. To ensure this value is relevant to market factors and reflects industry best practices, the Energy Commission uses the utility's relevant accounting standards to determine the finalised annual depreciation forecast using the straight line method.

Tax payments are based on projections of taxable income and the applicable tax rates. Taxable income is calculated using forecasted Return on Assets, OPEX, Efficiency Carryover Amounts and Capital Allowances – which are determined according to the relevant Malaysian Tax Guide, with any tax losses carried forward to the next year of the RP.

The IBR system also features an Imbalance Cost Pass-Through mechanism to evenly distribute fluctuations in the global price of fuels used for energy generation – such as piped gas, Liquefied Natural Gas (LNG) and coal – among Malaysia's energy consumers.

This change affects the energy charge component of customers' bills and increments also reflect government subsidy rationalisation on piped gas, while global price drops result in savings for the consumer. Rate adjustments are calculated by comparing the projected fuel cost against actual fuel costs and are only applied upon receiving government approval, at half-yearly intervals.

SPURRING GREATER SUCCESS

The final contributor to ARR calculation is related to the incentivisation of

continuous improvement for the utility. While allowed to retain surplus capital as Base Incentives, the total value of cost savings the utility achieves from improving efficiency are also halved and added to the ARR of the following RP – as Efficiency Carryover Incentives – distributed at 50% during the first year, 30% during the second year and 20% during the final year. Naturally, this factor will only come into effect from the second RP onwards.

Additionally, divisions are also provided the impetus to pursue productivity enhancements through penalties and incentives that are allocated depending on their performance, in relation to a series of indicators relevant to their areas of activity. The rate of these incentives and penalties is currently fixed at 0.5% of the ARR until the first RP ends in December 2017.

The indicators and limits employed were determined through intensive negotiations between the Energy Commission and TNB. A complete list of these, as well as formulas for calculating performance under each indicator are laid out in the Energy Commission's report entitled *Incentive Framework For Operational Performance: TNB Performance Indicators Under Incentive-Based Regulation Regime*, which was published in January 2013. As IBR comes into effect, TNB is required to provide the Energy Commission with quarterly performance reports on each indicator, thus promoting monitoring and transparency.

BROAD BENEFITS

Ultimately, the IBR system has resulted in an average tariff rate increase of 14.89%, meaning an adjusted rate of 31.66 sen/kWh for domestic consumers, 47.92 sen/kWh for commercial premises and 36.15 sen/kWh for industrial facilities. This represents a comparatively marginal average increase of less than 5 sen/kWh, yet has huge implications on energy efficiency in Malaysia and the nation's development as a whole.

Primarily, the revised tariff rate provides the ideal platform for the government to continue pursuing rationalised fuel subsidies, in turn allowing for more efficient allocation of the national budget to developmental infrastructure projects, or simply to reduce public spending and help lower Malaysia's deficit.

Throughout its involvement in forming the IBR system, the Energy Commission ensured that the interests of low-income consumers were well represented, while at the same time setting its sights on the envisioned high-income society of 2020. As a result, IBR better exposes businesses of all sizes to international fuel cost trends, making them more competitive in the long run as they seek out new and innovative ways to meet current business demands at a more efficient cost. This is anticipated to give rise to a more robust economy with greater presence on the world stage.

The Efficiency Carryover Amount – an incentive offered to the utility on top of Base Incentives from efficiency savings – is identified by halving the total savings achieved and distributing the resulting figure over the following Regulatory Period.

Determining Carryover Incentives*

	First Regulatory Period				Second Regulatory Period		
	Year 1	**Year 2**	**Year 3**		**Year 1**	**Year 2**	**Year 3**
Initial Annual Revenue Requirement (ARR) Forecast	RM120	RM120	RM120		RM100	RM100	RM100
Actual ARR Cost	RM100	RM100					
Estimated ARR for Year 3			RM100				
Annual Cost Savings	RM20	RM20	RM20				
Total Cost Savings				RM60			
Carryover Total (50% of Savings)				RM30			
Efficiency Carryover Amount (ST-set Percentages)					50%	30%	20%
Annual Carryover Amounts					**RM15**	**RM9**	**RM6**
Revised ARR Forecast					RM115	RM109	RM106

Carryover Amount Calculated after Year 2

*Worked example based on a revenue of RM120

As a result of the IBR system, IPPs operating in Malaysia will also be encouraged to elevate efficiency as the nation's largest utility is likely to seek out more cost-effective agreements for the coming years.

In recent years, national energy utility TNB has been absorbing additional fuel costs amounting to nearly RM3 billion, due to rising coal prices between 2010 and 2012, and a national gas shortage in 2011 that caused higher distillate fuel consumption. As a result, regulators sought a far-sighted solution to overcome mounting costs, which could concurrently revamp Malaysia's tariff calculation while prioritising affordability for all. Moreover, the IBR system typifies the Energy Commission's emphasis on securing steady supply and guaranteeing constant improvement among all players in the energy industry. On top of this focus, these developments lay the groundwork for a more prosperous and innovative national economy in the long term.

The Challenges of Regulation

The Energy Commission's Senior Director of Electricity Supply & Market Regulation Department Ir Azhar Omar talked about how IBR will be good in the long run, and that its primary aim is to drive efficiency and cut costs.

The Incentive-Based Regulation (IBR) system aims to protect Malaysia's energy needs by creating a balance that would enable utilities and consumers alike to benefit from the power supply. **Energy Malaysia** spoke to Ir Azhar Omar, Senior Director of the Electricity Supply & Market Regulation Department of the Energy Commission, who explained why IBR is a must that will benefit the country and people in the long run.

IBR is being implemented to drive efficiency, and particularly to answer the question, "Is the utility passing the actual, efficient cost to consumers through the electricity tariff?" There is a need to balance the revenue required by the utility to deliver the expected level of services and affordability for the consumers as a whole. Ir Azhar clarified that IBR is not a new system – it has been used all over the world – and that the Energy Commission is merely formally introducing it.

The IBR's predecessor, however, worked differently. 'In the past, regulation was based on a utility's cost recovery – how much they spent and how they can try to recover it," the Senior Director said. "Now, instead of looking backwards, the utility has to submit its expected revenue requirement based on forecasted capital expenditure (CAPEX), operational expenditure (OPEX) and expected return for the next four years. "He explained that this four-year set term is known as a regulatory period, when the utility will have to operate within the approved CAPEX and OPEX to deliver the expected services. He explained that the utility stands to gain from this regulation because its expectations are set from the beginning.

Under IBR, accounting separation based on each regulated activity will have to be put in place by the utility – dispelling any hidden inefficiencies within the supply chain. To spur efficiency improvement, the Energy Commission has introduced the incentive-penalty scheme – if the utility performs above specific operational KPIs, it receives incentives, in the form of additional revenue of a certain percentage above its approved revenue requirement. However, when it does not achieve the KPIs, it is penalised – for instance with a reduction in its revenue requirement, which will affect its expected return.

In line with the Energy Commission's goal to introduce competition, which will in turn lower costs, the Energy Commission has also embarked on a competitive bidding process for procurement of new generation capacity required to meet demand. "As generation cost accounts for almost 74% of tariff, the competitive bidding process helps to keep costs down," said Ir Azhar. "At present, gas price for power generation is heavily subsidised, so we need to gradually remove these subsidies and move to market price – the sooner the better. Only then can we see the true cost of electricity supply," he explained.

> **"Utilities & consumers** alike stand to **gain** from these regulations because **expectations** are set from the **beginning."**

Since the reduction of subsidies will result in a hike in electricity tariff, the public does not respond with much positivity. Ir Azhar Omar believes that the people should keep an open mind. "People think we are just raising prices, but in fact we are trying to fix the gas price distortion by gradually removing the subsidy which is not sustainable in the long term," he said. "We have to constantly assure the public that we're doing this for cost-efficient tariff, to ensure only the actual cost is passed on to consumers, and not the inefficiencies within the supply chain."

Although the economy adjusts to increasing energy prices, in general, it always has a cascading effect. As the main energy regulator, the Energy Commission comes up with solutions to mitigate this, and one of them is to look at possible ways of offsetting some of the increase, and proposing new tariff schemes such as Time of Use Tariff to industries. "Industries that bring higher economic value will get preference," Ir Azhar said.

Nevertheless, Ir Azhar believes that the success of IBR implementation will be dependent on consistency and transparency in decision-making, to communicate to the public the need and rationale behind any tariff decision.

The Energy Commission continues to customise IBR to fit the national vision for the energy sector – to ultimately achieve sustainable and efficient energy, while balancing the needs of both the utility and the consumer. Spearheading this effort is the Electricity Supply & Market Regulation Department, which is directly involved in the implementation of IBR, and as can be seen in the words of its Senior Director Ir Azhar Omar, it is ready to take the challenge head-on.

Not only do energy saving light bulbs (right) use less power than older, incandescent ones, they are also brighter and last longer, thus lowering costs for both electricity producers and consumers.

Getting More from Less

Safeguarding Malaysia's Future Through Energy Efficiency

As Malaysia's economy continues to expand, the demand for electricity is also increasing. Presently, the bulk of the country's energy production comes from natural gas and imported coal, which are finite in supply and subject to foreign exchange fluctuations. Therefore, the need to find more efficient ways of producing, transmission, distribution and use of electricity has become an imperative.

Ultimately, this is not just a concern of power producers and utilities, but also of industries and ordinary consumers. The Energy Commission is taking the lead to promote energy efficiency in the country, and as its official publication, **Energy Malaysia** discusses the various ways to do so.

Energy efficiency (EE) implies employing less energy to accomplish the same everyday tasks. Being energy efficient simply requires monitoring energy use and making simple behavioural changes to conserve energy, which will translate to monetary savings.

The importance of EE in everyday processes cannot be over-emphasised. Electric utilities will benefit from the reduction and optimisation of power generation and supply to customers in the form of lower operating costs. Consumers, on the other hand will benefit from lower electricity tariffs.

To illustrate, in homes and offices, appliances such as air conditioners, refrigerators, lamps, televisions, and washing machines are among the biggest consumers of electricity. If kept running – even on standby – the electricity consumed quickly adds to a massive amount of squandered energy. By improving EE, less power will be used to accomplish such tasks.

These include lighting and heating/cooling systems in homes and offices, as well as making compressed air and drive systems more cost-effective in factories. At the same time, utility companies need to ensure that consumers have a consistent and

constant supply of power. Improving efficiency will result in reduced load which means that fewer power plants need to be developed.

TAKING THE LEAD

Because of the national need to ensure continued strong growth, the focus is on increasing energy efficiency, where the output is maximised while costs are minimised. Here is where the Energy Commission is taking the lead.

In 2009, it introduced the voluntary Energy Rating and Labelling Programme for Household Appliances programme which was the precursor to the establishment of Minimum Energy Performance Standards (MEPS). This covered air-conditioners, refrigerators, domestic fans, televisions, insulators, ballasts, and high efficiency motors (HEM), as well as fluorescent and LED lighting.

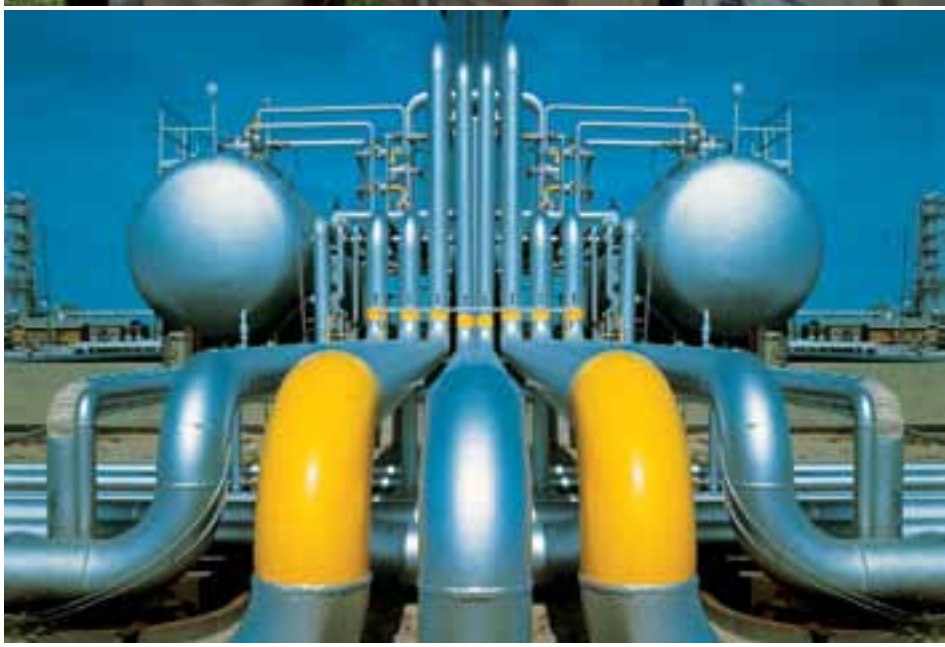
Following this, on the 3rd of May 2013, the Energy Commission made MEPS mandatory for five types of domestic electrical appliances – refrigerators, air conditioners, televisions, electric fans and lamps. To support the programme, the Malaysian Investment Development Authority (MIDA) offers incentives such as exemptions from sales tax and import duties for appliances that comply with MEPS.

Manufacturers and importers of the aforementioned appliances have to comply with certain requirements in order to obtain the Certificate of Approval (CoA) from the Energy Commission before they can be imported, produced, marketed and sold in the country. Refrigerators, air conditioners, televisions, domestic electric fans are required to obtain at least two stars on the Energy Commission's Energy Label, while lighting devices have to meet the minimum efficacy value. Appliances that fail to comply with MEPS may be removed from the market.

In addition, as of the start of 2014, the sale of incandescent light bulbs has been banned in Malaysia. This is

"The way forward for MEPS is to include more electrical appliances under the regulations. It can be expanded to industrial equipment and machinery to broaden the target of energy efficiency conservation measures and also promote the development of more efficient lighting such as LED or other new technologies."

- Datuk Ir Ahmad Fauzi Hasan,
CEO, Energy Commission of Malaysia



Above: Under the 10th Malaysia Plan, renewable energy is expected to account for 11% of generating capacity by 2020. Out of this, 22.3% will be derived from solar power. This will help alleviate the burden of electricity production in Malaysia which is currently dominated by coal and gas.

Top right: Ministry of Energy, Green Technology and Water (KeTTHA) Secretary-General Datuk Loo Took Gee (3rd from left) with the Energy Commission officials during a site inspection. As the regulator for the power sector in Malaysia, the Energy Commision is tasked with ensuring safe, reliable and efficient electricity supply.

Bottom right: One of the responsibilities of the Energy Commission is to regulate piped gas supply in the country. Presently, 58% of electricity generated in Malaysia comes from natural gas, and in order to ensure energy efficiency, it is imperative that the gas reaches power producers with minimum loss.

in line with the efforts of the Ministry of Energy, Green Technology and Water to phase them out, a process which started in 2011.

MEPS has also supported other government agencies in promoting energy efficiency. For instance, the Sustainability Achieved via Energy Efficiency (SAVE) programme by the Sustainable Energy Development Authority of Malaysia (SEDA) encourages the purchase of domestic appliances – such as refrigerators and air-conditioners – which have been rated highly under the aforementioned the Energy Commission programme.

Through SAVE, consumers are given rebates to buy such appliances from participating vendors and manufacturers. Industrial and commercial purchasers may also make use of SAVE when buying energy efficient chillers for their factories and/or offices.

MAXIMISING OUTPUT

Power generation is also one area where a lot of energy is wasted, as the electricity yield is not as high as possible. To illustrate, most Combined-Cycle (CC) plants in Malaysia have an average operating efficiency of about 45%. Thus 55% of potential power is lost.

The solution is to invest in newer and more efficient technology. In fact, national electricity provider, Tenaga Nasional Berhad (TNB) is investing RM9.7b (US$3.12b) over the next four years in new-builds or power plant extensions. This includes new CC plants with an operating efficiency of over 60%.

Through these efforts the need for electricity supply transmission and distribution system reinforcement will be reduced. This in turn will reduce the necessity for further capital investment by the utility to operate the service.

The lower the capital investment in the supply system infrastructure, the less the need for higher "revenue return" (profits) for the energy supply utility. This will automatically translate to a lower need for tariff escalation in the future, thus reducing the burden of higher energy costs for the consumer.

GET SMART

Another way to ensure EE is to upgrade power grids to become smart grids which are intelligently able to distribute power to areas where the need for electricity is greater, from those where there is little usage.

The term 'smarter wires' has been used to describe the manner in which smart grids work; electricity supply from the power generator to the end-user is calculated and varied by the grid, according to the needs of the end consumer. Making use of accessories such as smart meters, these intelligent

The total market share of energy efficient chillers compliant with MS1524:2007 Standard is 39.2% with a total of 80,611 refrigeration tonnes.

Saving Energy with SAVE Sales of 5-Star Rated Domestic Appliances
(2011 – 2013)

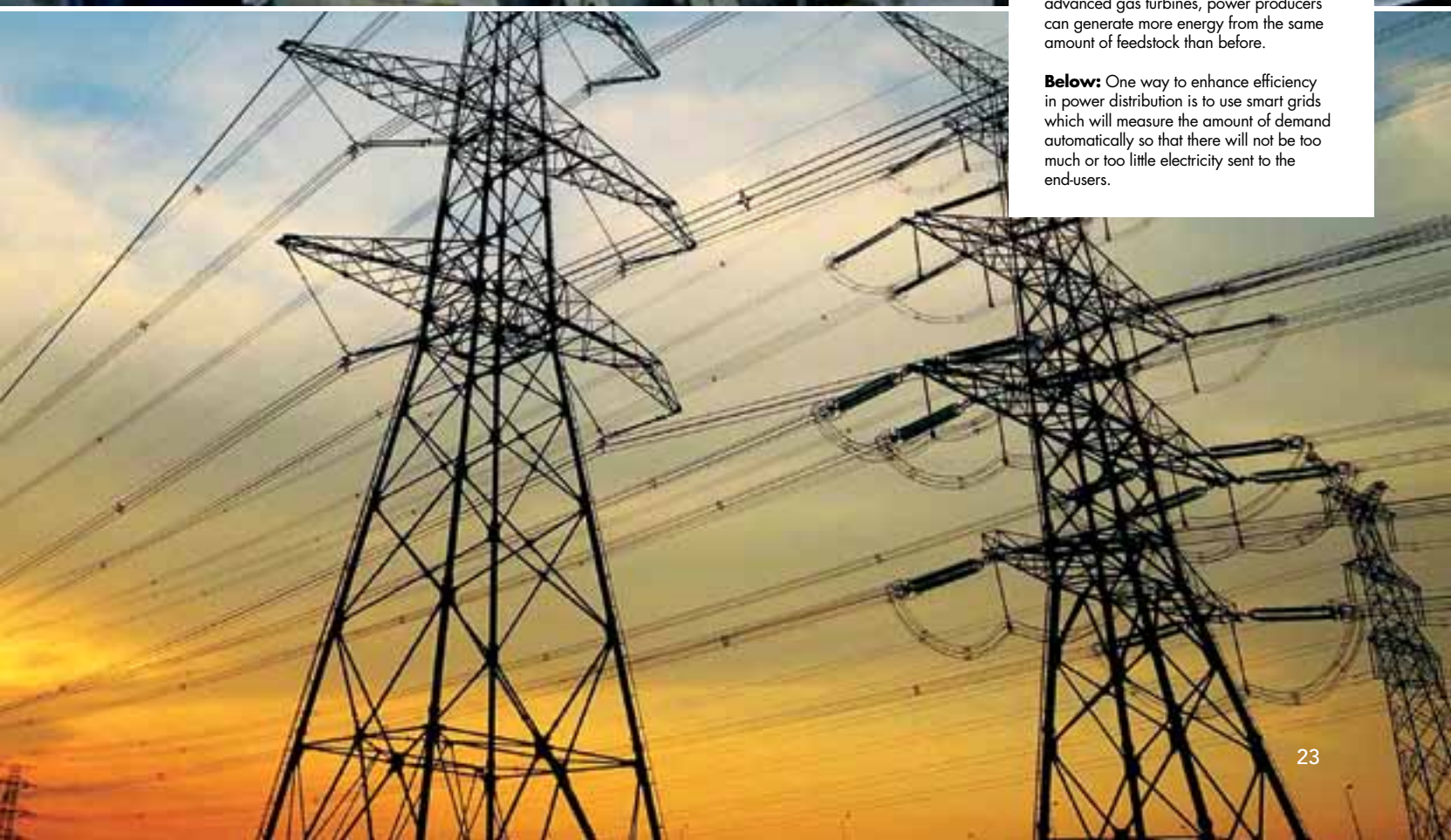
Appliance	Units	Market Share Percentage	Reduction in CO_2 Emissions
5-Star Rated Refrigerators	337,704	56.28%	57,180,041.28 tonnes
5-Star Rated Air Conditioners	166,505	27.75%	84,917,550 tonnes

Total energy savings: 208,967,046 kWh
Total carbon savings: 142 million tonnes.

The Energy label by the Energy Commission allows consumers to know the energy efficiency of appliances, with Five Stars being the best.

Above: Among the major challenges of energy generation is to extract the maximum amount of power from feedstock. Thanks to advanced gas turbines, power producers can generate more energy from the same amount of feedstock than before.

Below: One way to enhance efficiency in power distribution is to use smart grids which will measure the amount of demand automatically so that there will not be too much or too little electricity sent to the end-users.



The Energy Commission's iconic diamond headquarters is not just a marvellous sight but also one of the energy efficient buildings in Malaysia, and the recipient of a Platinum rating by the Green Building Index (GBI).

grids can result in significant financial savings, by turning devices and equipment on or off as required, based on the wishes of the customer.

For instance, lighting can be switched on or off at pre-arranged times, or certain home appliances, such as washing machines, air conditioners and deep freezers, can be setup to operate only at off-peak periods when electricity tariff is much lower. This way, only the maximum required electricity is generated and supplied, saving costs to utility companies, and reducing wasted energy and preventing further damage to the environment.

BUILDING GREEN

Being energy efficient does not only encompass electrical equipment and engineering. Civil engineering and architecture also helps in achieving EE as can be seen in the benefits of Green buildings.

Generally, a Green building is a structure whose constructor is environmentally responsible, and which is energy efficient throughout its life cycle, from design to demolition. The use of energy and water is controlled, and the type of materials incorporated in its structure reduces the impact on its inhabitants' health as well as the environment. Green buildings enhance quality of life while maintaining the ecosystem locally and globally.

In Malaysia, a Green building should conform to the Green Building Index (GBI), established in February 2009 by Malaysian Institute of Architects (PAM) and the Association of Consulting Engineers Malaysia (ACEM). Driven by environmental needs, GBI was introduced to lead the property industry towards becoming more environment-friendly. It is specifically designed to suit Malaysia's tropical climate, and in fact, is the only rating tool for tropical zones in the world, apart from the Singapore Government's Greenmark.

There are three steps to obtain GBI certification, namely application and registration, design assessment and completion and verification assessment, with each stage taking about six to eight weeks. A company applying for certification is assessed in six categories: Energy Efficiency, Indoor Environmental Quality, Sustainable Site Planning and Management, Materials and Resources, Water Efficiency and Innovation.

Incidentally, the Energy Commission's headquarters – the Diamond Building – has received Platinum certification from the GBI as well as by Greenmark, confirming it as one of

the most energy efficient buildings in the country. In addition, it also won the ASEAN Energy Awards 2012 for Energy Efficient Building – New and Existing Category.

To illustrate, the Diamond Building uses an average of 65 kWh/m^2/year – or 65 kilowatt hour energy per square metre per year. In contrast, a normal building uses 210 kWh/m^2/year. Through its iconic headquarters, the Energy Commission of Malaysia is definitely leading by example.

At the end of the day, being energy efficient does not require a major outlay of finance such as commissioning and purchasing a Green building or investing in advanced power management systems. The simplest of acts also helps, such as turning off lights and appliances when not in use, or changing light bulbs to those that do not consume as much power. Every little bit counts in the mission to guarantee the energy security of Malaysia, and your contribution can, spur its continued growth.

Safeguarding Interests

New Power Purchase Agreements Create A More Competitive Energy Market

As part of its efforts to ensure that the people are given access to a safe, secure, reliable and reasonably priced supply of energy, the Energy Commission ensures that the new power purchase agreements (PPAs) are more stringent. The latest generation PPAs are notably more balanced, with guidelines set in place to ensure efficiency and transparency, and to prevent exploitation.

The new generation PPAs have also given way to a level playing field within the industry, with IPPs sharing costs among each other, and the elimination of the common occurence of some IPPs getting financial gains from discrepancies. These changes ultimately result in benefits for everyone - power consumers, utilities and IPPs.

Owing to the latest generation Power Purchase Agreements, consumers can enjoy more competitive rates of electricity. In addition, the Energy Commission's introduction of the competitive-bidding exercise has also resulted in lower buying rates, thus cutting costs for the people. Thanks to its efforts in creating a system that is fair to all stakeholders – IPPs, utility and end-users – the Energy Commission is taking another important step in creating a world-class energy sector.

The Advantages of the Latest Generation PPAs

Area of Concern	Previous Generation PPAs	Latest Generation PPAs	Significance
Structure of Power Purchase Agreements	Under Take-or-Pay conditions, TNB has to either take the electricity generated by the IPPs even if they do not need it or they will need to pay compensation to the IPPs.	Take-or-Pay is not applicable and IPPs will be paid based on capacity and energy payment structure.	A more structured technical and commercial arrangement
Heat Rate	Contracted heat rate is higher than the actual heat rate, resulting in IPPs receiving extra payment.	Contracted and actual heat rates are more in-line with each other.	Lower generation costs in the system
Sharing of Savings in Project Cost, Refinancing and Tax Exemption	No sharing mechanism for 1st, 2nd and 3rd generation IPPs.	Sharing of savings is provided for in the first bidding exercise under the capacity rate financial (CRF) revision in the financial model. The amount of savings will be reported to the Energy Commission for tariff review under Incentive-Based Regulation (IBR).	Sharing of savings allows for reduction of generation costs
Performance Requirements Availability Rate	85-87%	91-93%	A higher availability rate signifies more efficient machines in place for lower electricity generation cost

Area of Concern	Previous Generation PPAs	Latest Generation PPAs	Significance
Performance Requirements Outages	No distinction between forced (unexpected) and planned (scheduled) outages. Both are set at a tolerance threshold of 13-15%.	A distinction is made between forced and planned outages. The former has a tolerance threshold of 4-6% while the latter is 7-9%.	A lower tolerance threshold aims to increase efficiency in plant management
Power Plant Readiness	No conditions set for power plant readiness.	Conditions are clearly defined at each level, namely • When the agreement takes effect • Commencement date • Initial operation date (IOD) • Commercial operation date (COD)	Clearly defined terms and conditions ensure that each step of the power purchase process from commencement to operation is monitored and adhered to properly

Area of Concern	Previous Generation PPAs	Latest Generation PPAs	Significance
Liquidated Damages	Liquidated damages are applicable for failure to follow dispatch instruction.	Liquidated damages are clearly defined, and fixed monetary penalties will be imposed for • Failure to follow dispatch instruction • Failure to meet scheduled commercial operation date (SCOD) • Failure to meet technical requirements • Failure to achieve Contractual Available Capacity • Abandonment of project	Clearly defined conditions create greater transparency and accountability

A gas turbine – under the terms of the new PPAs, the price that the utility pays for power produced by gas, has gone down by 12.31 sen per kWh.

Area of Concern	Previous Generation PPAs	Latest Generation PPAs	Significance
Force Majeure	TNB has to make capacity payments to IPPs even if there is a force majeure event.	Payment in force majeure events under latest generation PPAs is dependent on whether TNB or the IPP is affected. If the former and the commercial operation date (COD) is delayed beyond the scheduled commercial operation date (SCOD), TNB will pay the IPP the cost of servicing its debt. However, if the latter, TNB has no obligation to pay.	A fairer system is in place in the event of force majeure which ensure that TNB and IPPs are not being penalised for factors outside its control
Financing Arrangement	Financing is less competitive with expected DSCR (Debt Service Coverage Ratio) of 1.75 to 3.56.	Financing is more competitive with interest rates between 4.5 – 5.5%. Also DSCR is estimated at 1.2 to 1.25.	Lower generation cost in the system
Energy Price for Coal	Levelised tariff of 22-23 sen/kWh at a coal price of US$87.5/tonne.	Levelised tariff of 18-21 sen/kWh at a coal price of US$87.5/tonne. Conditions are clearly defined at each level, namely • When the agreement takes effect • Commencement date • Initial operation date (IOD) • Commercial operation date (COD)	The cost of purchasing power has gone down
Energy Price for Gas	Levelised tariff of 45-47 sen/kWh at a gas price of RM44/mmbtu.	Levelised tariff of 34-35 sen/kWh at a gas price of RM44/mmbtu.	The cost of purchasing power has gone down

Licensing Guidelines

Regulations and Procedures for Energy Generation Activities

Energy is a precious commodity, and like other vital goods, it is important to protect the rights of the consumers by ensuring the quality of supply and the safety of the facilities. Thus, the Energy Commission is entrusted with the role of granting licences for the operation of such facilities and the regulation of electricity and piped gas in Peninsular Malaysia and Sabah.

Those using, working or operating facilities that supply electricity without approval can be fined up to RM50,000 (with additional fines of RM1,000 for each day the offence persists) under the Electricity Act 1990, while those supplying electricity from such a facility is punishable by not more than RM100,000 (with additional fines of RM1,000 for each day the offence persists). **Energy Malaysia** provides key information on licensing to raise awareness of these processes.

TYPES OF LICENCES

There are two types of licences available.

1. **Public Licence** – For the licensee to operate a public installation to supply energy to others.

   Activities allowed under this licence include:

   a. Supplying electricity to consumers. **e.g. Tenaga Nasional (TNB) and Sabah Electricity (SESB)**

   b. Generating electricity to supply/sell to utilities. **e.g. Independent Power Plants (IPPs)**

   c. Generating electricity through efficient technology such as co-generation for own use and selling excess energy to others within the licensed area. **e.g. Gas District Cooling in KLIA**

   d. Supplying/selling electricity and providing other services to users in a complex or high rise building using electricity purchased from utilities. **e.g. Malakoff Utilities in the KL Sentral Complex**

   e. Generating electricity using Renewable Energy to be sold to utilities. **e.g. Projects benefiting from the Feed-in-Tariff Scheme**

2. **Private Licence** – For a licensee to operate a private installation to generate electricity for their own use or at their own property.

   Activities allowed under this licence include:

   a. Managing own power lines or underground cables which traverse across roads/rivers/bridge/ telecommunication lines/ railways owned by others.

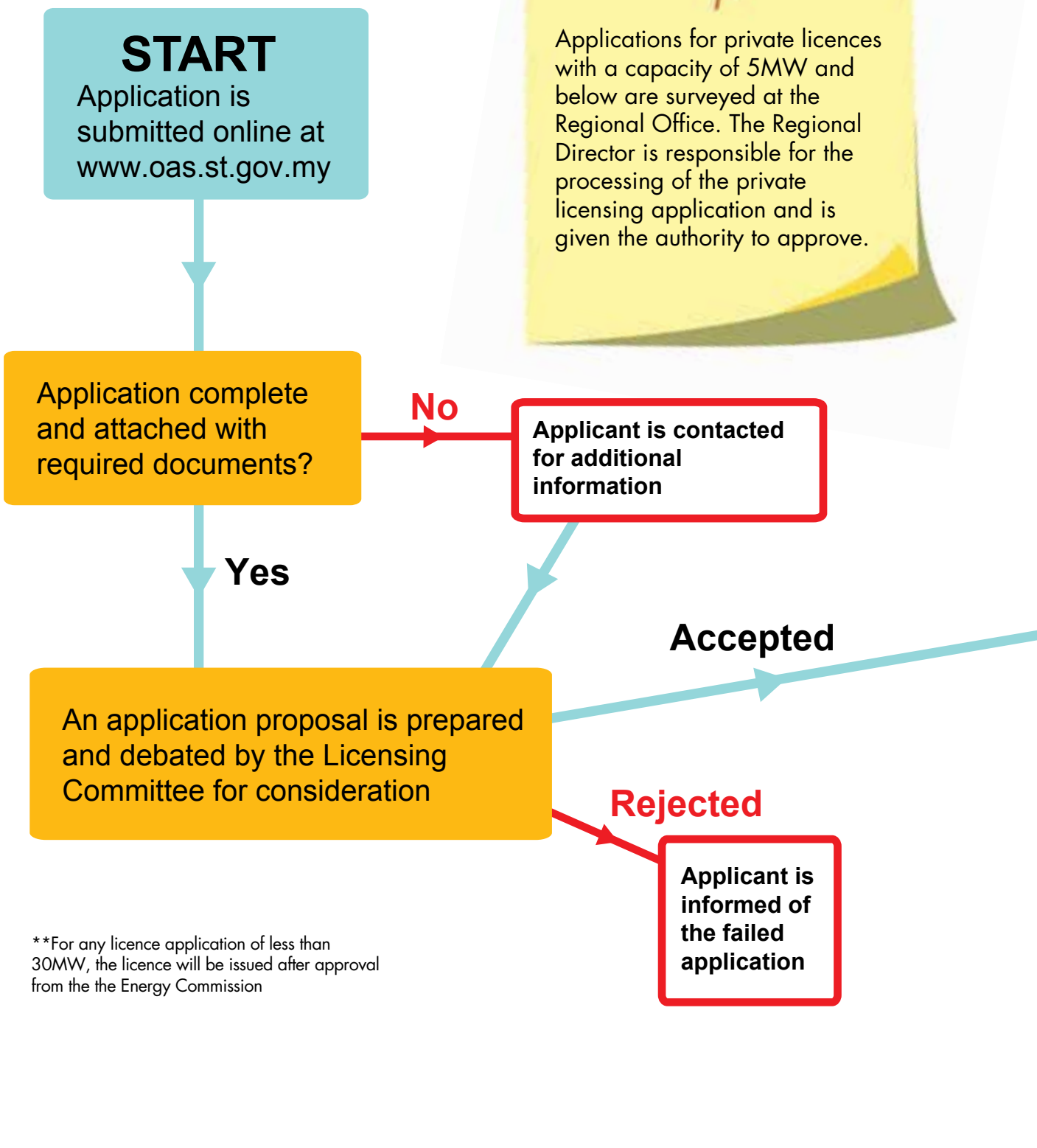
   b. Managing electricity generation for own use in an area that does not supply electricity.

   c. Managing temporary electricity generation for own use in construction sites, funfairs, exhibition sites etc.

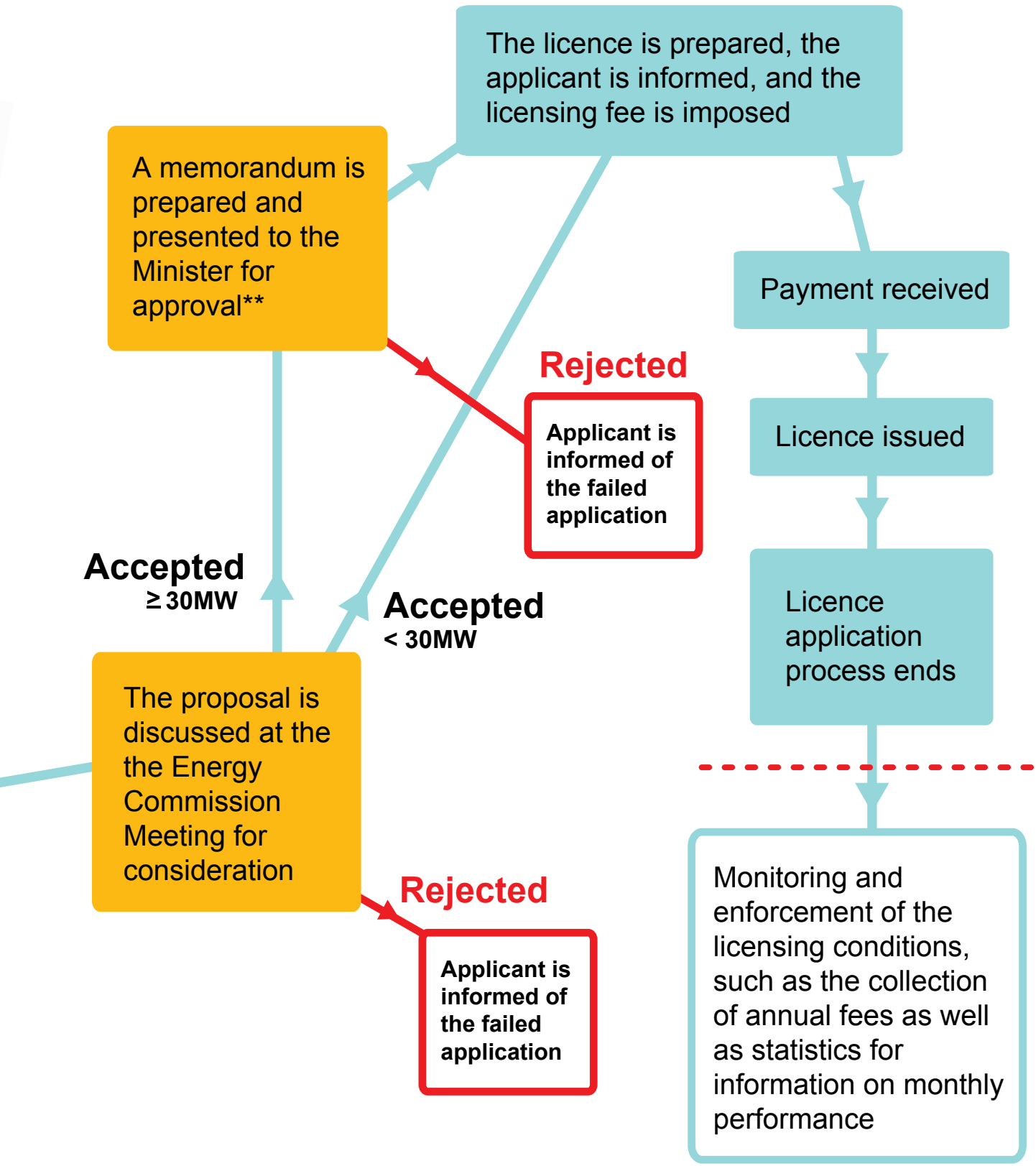
   d. Managing electricity generation for own use using efficient technologies such as co-generation or power generation using Renewable Energy sources.

PUBLIC LICENSING AND PRIVATE LICENSING PROCEDURE

(for a capacity greater than 5MW)



**For any licence application of less than 30MW, the licence will be issued after approval from the the Energy Commission


The licence is prepared, the applicant is informed, and the licensing fee is imposed
A memorandum is prepared and presented to the Minister for approval**
Payment received
Rejected
Applicant is informed of the failed application
Licence issued
Accepted
≥ 30MW
Accepted
< 30MW
Licence application process ends
The proposal is discussed at the the Energy Commission Meeting for consideration
Rejected
Applicant is informed of the failed application
Monitoring and enforcement of the licensing conditions, such as the collection of annual fees as well as statistics for information on monthly performance

CRITERIA FOR CONSIDERATION

For an application to be evaluated, it must comply with the following provisions in the *Electricity Supply Act 1990* and the *Energy Commission Act 2001*:

1. Promote competition in generation and supply of electricity to ensure it is offered at reasonable prices.
2. Promote and encourage the generation of energy for the economic development of Malaysia.
3. Ensure all reasonable claims for electricity supply are met.
4. Ensure consumer needs in terms of affordable prices, security, reliability of supply and quality of services are met.
5. Ensure the licensee can finance the activities as set out in the licence.
6. Encourage efficient use and supply of electricity.

Additionally, the aim of the government to create a quality power supply industry are to be considered.

1. To increase fuel diversity and reduce dependency on a particular fuel.
2. To use renewable energy such as biomass (e.g. palm oil waste, sawdust), industrial waste (e.g. industrial waste gas) or solid waste (e.g. municipal waste and landfill gas).
3. To use efficient technology.
4. To use technology and methods that are efficient in energy management, and provide value-added services to end-users.
5. To give efficient, economical and satisfactory service to the users.
6. To use environmentally friendly electricity generation technology.
7. To encourage the growth of new methods.

REQUIRED DOCUMENTS

Aside from the legal requirements, the Energy Commission has also outlined important terms to determine public and private licensing needs. Therefore, the applicant has to include the following documents:

1. A copy of the business or company registration as proof that the business or company exists and is registered under the *Companies Act 1965*.
2. Form 24, Form 32A and Form 49 and the Form of Annual Return to verify the shareholders, percentage of *bumiputera* shares and paid-up capital.
3. The location and site plans, including the distribution system.
4. A Project Financial Run (for generation activities) or Simple Financial Analysis (for supply activities) to ensure the viability of the company throughout the licence period.
5. A summary of the project detailing the activities to be licensed.

Note that these are just a few of the important supporting documents. Other necessary documents may depend on the project, and can be found online when applying at www.oas.st.gov.my. Issuance of the licence requires approval from the government and other agencies. Some of these include the Ministry for Energy, Green Technology and Water (KeTTHA), the Economic Planning Unit, local authorities, the state government, the Department of Environment, Tenaga Nasional and financial institutes.

Provisional Licence

Meeting certain requirements set by the Sustainable Energy Development Authority (SEDA) is necessary for a renewable energy project to enjoy the Feed-in-Tariff rate. For these developers, a provisional licence may be necessary to receive funding from financial institutions. This licence is only temporary, and a developer must get a permanent licence before the commissioning of the project.

LICENCE TO GENERATE

The Provisional Licence is meant for Feed-in Approval (an approval granted under the *Renewable Energy Act 2011*) Holders operating a public installation that generates renewable energy using biogas, biomass, solar photovoltaic or mini hydro sources. These fuel sources have set tariff rate incentives, tenures and annual rate reduction.

GETTING THE PROVISIONAL LICENCE

In order to obtain a provisional licence, several conditions must be fulfilled. The document, Approval of Tariff issued by the Sustainable Energy Development Authority (SEDA), is necessary to obtain this licence, because it ensures the project has been recognised. Other papers required for this licence are similar to those required to apply for public or private permanent licences. The Energy Commission will evaluate the project and determine if a provisional licence should be issued based on these documents.

PROCESSING PROCEDURE

The application will be processed by the Licensing Unit of *Jabatan Kawal Selia Pembekalan dan Pasaran Elektrik* (JKPPE) at the Energy Commission headquarters.

Once the the Energy Commission *(JKPPE)2011 – PL Application Form* and accompanying documents are received by the JKPPE, the Energy Commission officer will check and evaluate the document to ensure it fulfils the criteria. A draft licence is submitted to the Heads of Department Meeting for approval.

Upon approval, the applicant will be asked to pay the licensing fees according to the rate set by the legislation, and the licence will then be granted. However, failure to comply with the conditions may lead to the licence being revoked. The Energy Commission officers will monitor and inspect the project regularly to enforce compliance to the licence.

ACCESS TO BENEFITS

When a renewable energy project is commissioned, a permanent licence must be obtained in order for the licence holder to gain the benefits of the Feed-in-Tariff (FiT) system. To smooth the transition between licences, the Energy Commission advises holders of provisional licences to apply for a permanent licence and submit the necessary documents three months before the initial operation date.

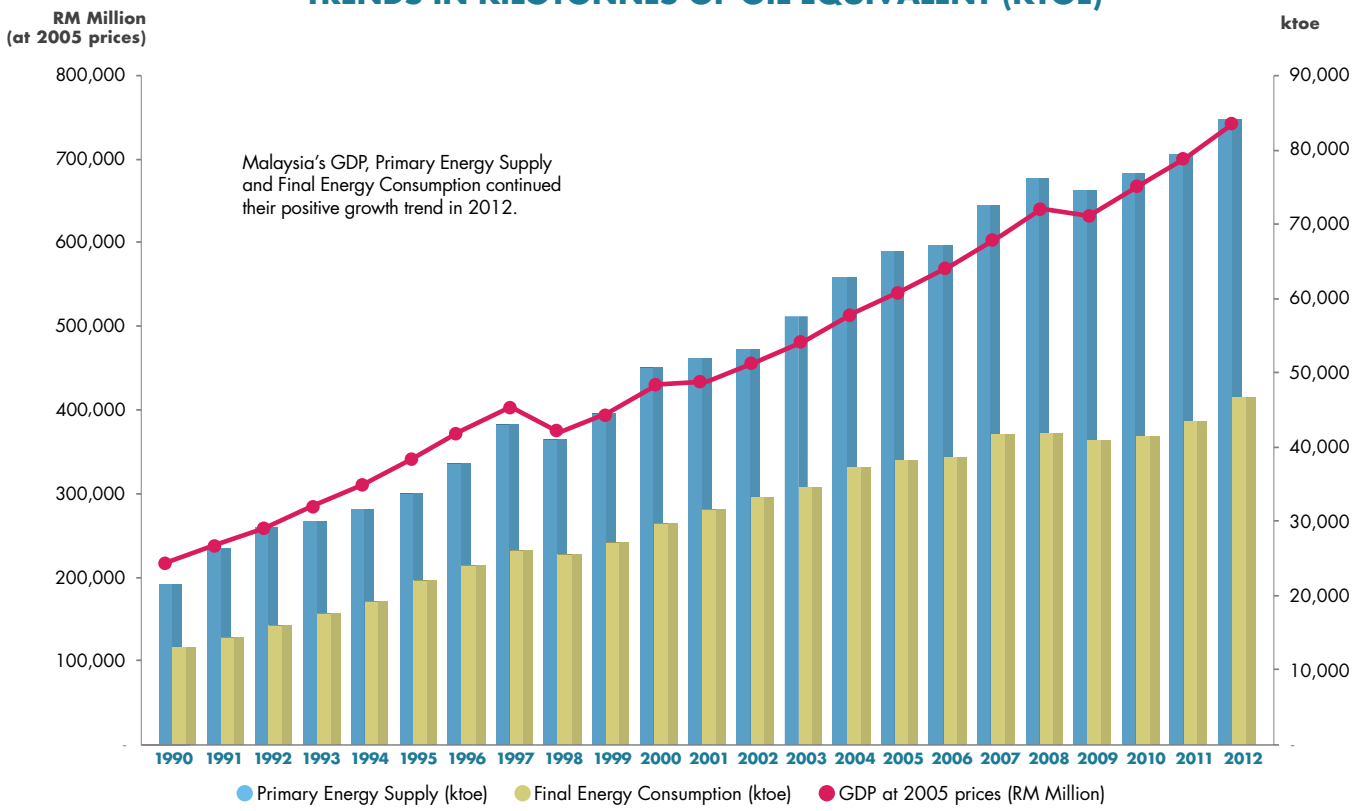
As energy plays a key role in the advancement of an economy, it is vital for this asset to be regulated to protect consumer rights and secure a reliable supply at affordable prices. The Energy Commission has put a great deal of effort into controlling the electricity industry in Malaysia, and provides a variety of resources such as this guide to help interested parties understand the processes required to legally own and operate electricity generation facilities.

Taking Stock

Keeping Malaysia Energised

Malaysia's total production and consumption of energy demonstrated healthy growth in 2012, as the nation continued its efforts to diversify and secure its energy sources. *The National Energy Balance 2012 Report* by the Energy Commission indicates that while Malaysia's industries have moved towards more energy-intensive areas – placing a greater strain on the national grid – the country's efforts to satisfy this heightened demand have consequently also progressed.

GDP, PRIMARY ENERGY SUPPLY AND FINAL ENERGY CONSUMPTION TRENDS IN KILOTONNES OF OIL EQUIVALENT (KTOE)



Source: The Energy Commission of Malaysia

OVERVIEW

In spite of the sluggish global economy, Malaysia's GDP posted healthy growth in 2012, largely due to resilient domestic consumption. This trend resulted in a 0.5% increase in year-on-year economic growth, putting the annual figure for 2012 at 5.6%. Domestic consumption recorded its highest rate of expansion for the decade, supported by investment spending.

Energy supply and demand both recorded strong growth in 2012, with total primary energy supply and final consumption achieving increases of 5.9% and 7.5% respectively. The higher growth rate of the latter indicates that economic activities in 2012 were dominated by industries that consume large quantities of energy.

PRODUCTION AND IMPORTS

In 2012, total primary energy supply increased by 5.9% compared to 3.2% in 2011. The growth was motivated by higher

crude oil production at 29,115 kilotonnes of oil equivalent (ktoe), an increase of 2.8% from the previous year. However, natural gas production dropped 10.4% to 62,581 ktoe, due to lower production from gas fields in Peninsular Malaysia and Sarawak. In order to fulfil local demand, Malaysia imported natural gas from Thailand and Indonesia. These imports increased by 12.7% in 2012, settling at 7,866 ktoe.

Malaysia's coal and coke production increased steadily by 1.2% to settle at 1,860 ktoe, with locally produced coal and coke, mainly from the Mukah-Balingian area in Sarawak, accounting for nearly 78% of the nation's total production. For Peninsular Malaysia, coal and coke is mostly imported from Indonesia, South Africa and Australia. Total coal and coke imports rose by 6.7% to 14,220 ktoe in 2012. Meanwhile, hydropower production posted an increase of 16.2% or 2,149 ktoe, compared to the previous year's 1,850 ktoe.

ENERGY MIX AND RESERVES

In terms of total share, crude oil and petroleum products reduced by 1.5% to 32.5% in 2012. Natural gas increased by 0.9% to 46.0%, while the shares of coal and coke and hydroelectric both rose 0.3% to 18.9% and 2.6% respectively.

As of the 1st of January 2012, Malaysia's crude oil reserves rose 1.6% to 5.954 billion barrels compared with the previous year's 5.858 billion barrels. This was mainly due to a 3.7% increase in the projected capacity of wells in Peninsular Malaysia and Sarawak which brought their total output to 4.013 billion barrels. At the same time, Malaysia's natural gas reserves increased by 2.3% to 92.122 trillion standard cubic feet (tscf) as of the beginning of 2012. This was mostly driven by two gas reserve discoveries in the Kasawari and NC8SW fields off the coast of Sarawak.

DEMAND AND CONSUMPTION

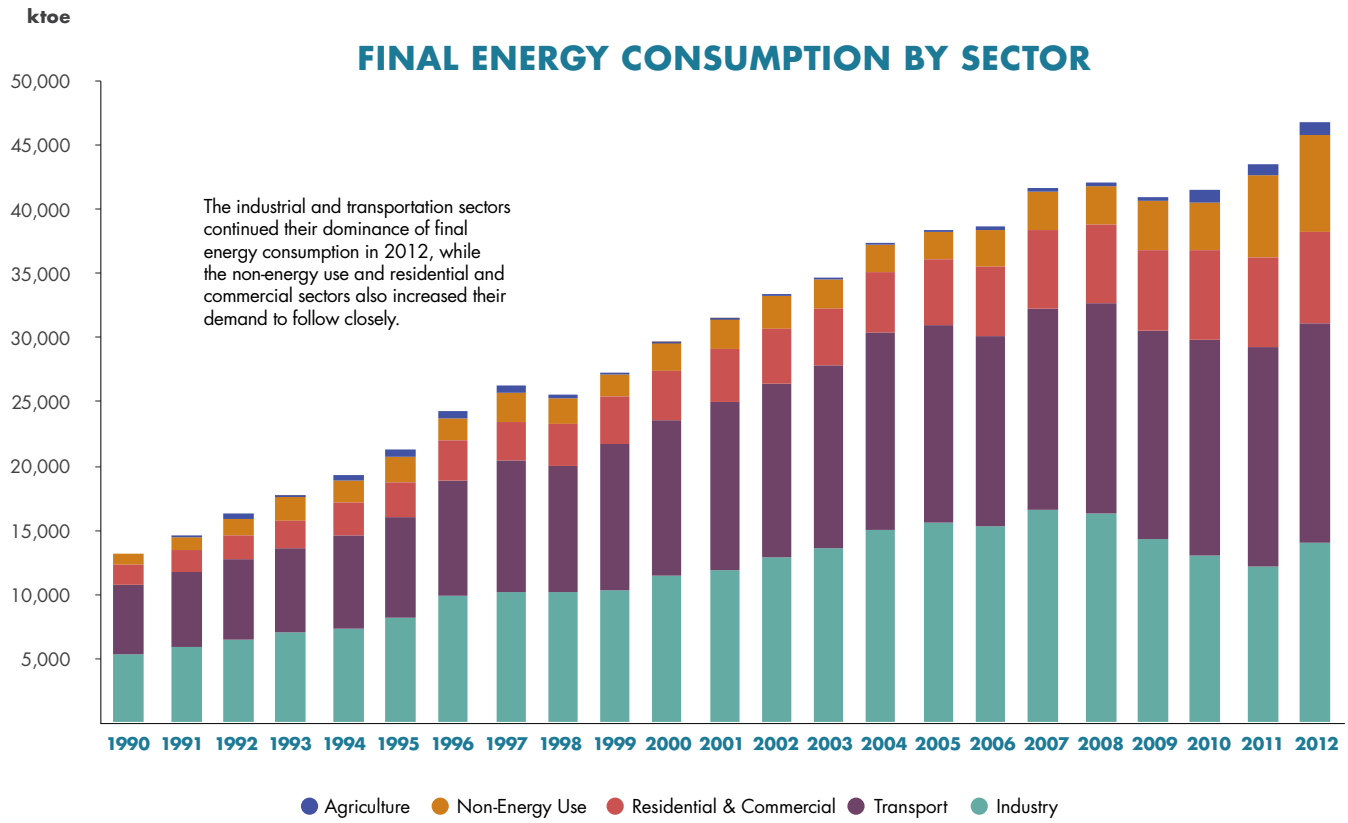
In 2012, growth in final energy consumption increased by 2.7% year-on-year to reach 7.5%, or 46,711 ktoe, as compared to the previous year's

PRIMARY ENERGY SUPPLY IN KTOE

	CRUDE OIL	PETROLEUM PRODUCTS & OTHERS	NATURAL GAS (SALES GAS)	COAL & COKE	HYDRO POWER	TOTAL	ANNUAL GROWTH RATE (%)
1999	17,643	1,807	21,476	1,940	1,668	44,534	8.6
2000	21,673	1 ,431	26,370	2,486	1,612	50,710	13.9
2001	23,590	1,917	25,649	2,970	1,687	51,979	2.5
2002	22,647	523	26,101	3,642	1,329	53,196	2.3
2003	25,344	1,408	27,257	5,316	1,056	57,565	8.2
2004	25,335	82	29,145	7,109	1,329	62,836	9.2
2005	24,339	243	33,913	6,889	1,313	66,211	5.4
2006	24,910	1,670	34,917	7,299	1,567	67,023	1.2
2007	26,571	1,190	36,639	8,848	1,522	72,390	8.0
2008	26,776	1,780	39,289	9,782	1,964	76,031	5.0
2009	26,386	96	35,851	10,623	1,627	74,583	1.9
2010	22,487	2,521	35,447	14,777	1,577	76,809	3.0
2011	24,679	2,248	35,740	14,772	1,850	79,289	3.2
2012	28,054	795	38,649	15,882	2,149	83,939	5.9

Long-term trends reveal that while Malaysia has progressively reduced its dependence on petroleum products, natural gas remains relatively unchanged from late-1990s levels and coal and coke has assumed increased significance.

Source: The Energy Commission of Malaysia



Source: The Energy Commission of Malaysia

4.8%. Up to 36.8% of the final energy demand came from the transport sector, while the industrial sector consumed 29.8%, the non-energy sector used 16%, and the residential and commercial, and agricultural sectors were responsible for 15.1% and 2.3% of demand respectively.

Energy demand from crude oil and petroleum products rose 3.4% to 53% or 24,749 ktoe in 2012, while demand from natural gas and electricity also rose at 19.8% and 0.1% year-on-year to rest at 21.8% (or 10,206 ktoe) and 21.4% (or 10,011 ktoe) respectively. Meanwhile, the share of energy demand from coal and coke continued to fall in 2012, dropping 0.8% to 3.7% – equivalent to a total of 1,744 ktoe.

OUTLOOK

In line with the Economic Transformation Programme (ETP) and the government's high-income aspirations for the year 2020, activity has begun to intensify in the industrial sectors relevant to the National Key Economic Areas (NKEAs) for electronics, communication, plantations and infrastructural development.

Consequently, manufacturing and processing facilities, as well as construction operations, continue to place an increasing load on the national grid. Beyond providing adequate resources to fuel this growth trend, Malaysia currently stands at a crossroads where it has the opportunity to ensure lasting energy independence by systematically easing reliance on imported fuels.

Admittedly, these import limitations may drive prices up due to diminished supply and impact negatively upon the profitability of industries of all sizes. Nevertheless, by engendering more efficient practices in both the production and consumption of energy, the nation has the potential to prevent final energy consumption from ballooning beyond control and thereby maintain consistency and reliability of supply.

While Malaysia's domestic energy consumption outpaced production in 2012, the nation also aggressively moved to enhance the safety and security of supply to vital industries, such as the manufacturing and transportation sectors. Indeed, these efforts were mainly buoyed by increasing imports and the discovery of greater supplies in both new and existing stockpiles in Malaysia.

Energy Balance

Recording National Progress

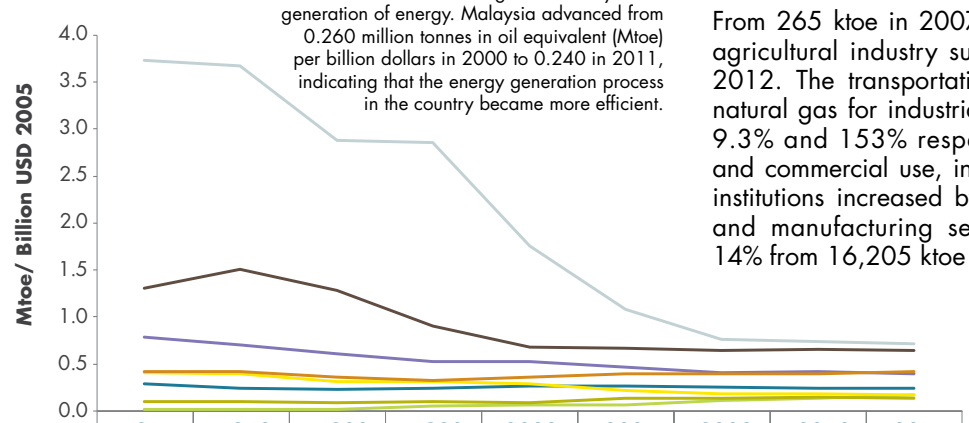
As Malaysia's population grows, so does its rate of energy consumption. According to the International Energy Agency's *South-East Asia Energy Outlook 2013* special report, the country is the third largest energy consumer in Asean, with its population growing at an average of 1.2% and GDP by 4%. This has been accompanied by a 2.3% rise in the country's annual primary energy demand. In order to better estimate the energy requirements of the future, **Energy Malaysia** examines some key statistics of Malaysia's power needs over the past few years.

Power supply and prices play a major role in the economy of Malaysia, which is one of the reasons why there is a continuous search for renewable and sustainable sources of energy. Historical trends indicate that petroleum has been the major source of energy, particularly in the transportation sector. However, in recent years, Malaysia has increasingly looked into other means of generating it.

Between 2007 and 2012, energy supply from crude oil and petroleum products across Malaysia declined from 35.1% to 32.5%. In the same period, natural gas energy supply also reduced from 50.6% to 46% while supply from coal and hydropower surged from 12.2% to 18.9% and 2.1% to 2.6% respectively. As at 2012, energy supply from renewable sources such as biomass, biogas and solar was 0.4%.

Final Energy Intensity in Asean

Smaller values denote higher efficiency in the generation of energy. Malaysia advanced from 0.260 million tonnes in oil equivalent (Mtoe) per billion dollars in 2000 to 0.240 in 2011, indicating that the energy generation process in the country became more efficient.



	1971	1973	1980	1990	2000	2005	2009	2010	2011
Brunei	0.024	0.021	0.024	0.051	0.067	0.066	0.115	0.133	0.172
Indonesia	0.790	0.710	0.614	0.532	0.530	0.469	0.410	0.413	0.394
Malaysia	0.292	0.238	0.227	0.243	0.260	0.262	0.257	0.243	0.240
Myanmar	3.729	3.667	2.883	2.848	1.753	1.082	0.762	0.741	0.712
Philippines	0.406	0.396	0.315	0.319	0.292	0.222	0.188	0.182	0.174
Singapore	0.099	0.101	0.091	0.102	0.096	0.132	0.135	0.143	0.137
Thailand	0.424	0.419	0.363	0.325	0.368	0.396	0.401	0.404	0.420
Vietnam	1.305	1.503	1.282	0.905	0.681	0.668	0.648	0.656	0.652

Source: Energy Balances of Non-OECD Countries, 2013 Edition, International Energy Agency (IEA)

REGIONAL DEVELOPMENT

In Peninsular Malaysia, electricity consumption between 2007 and 2012 increased by 25% from 81,710 GWh to 102,174 GWh compared with Sarawak, which recorded a massive 116% spike, from 4,277 GWh to 9,237 GWh and Sabah which grew 38.6% from 1,061 GWh to 1,471 GWh. In all three regions however, energy intensity – which measures the quantity of energy required per unit of GDP product – decreased significantly.

Higher energy intensity signifies a higher cost of converting energy into GDP. For instance, Peninsular Malaysia recorded a 4% rise in GDP from 2007 to 2012 while energy intensity only rose 0.63% from RM160,000 to RM161,000 per GWh of energy consumed, compared to 2005 when it was RM163,000. If the economy grows without an accompanying rise in energy intensity, this signifies a degree of efficiency involved in the national production process.

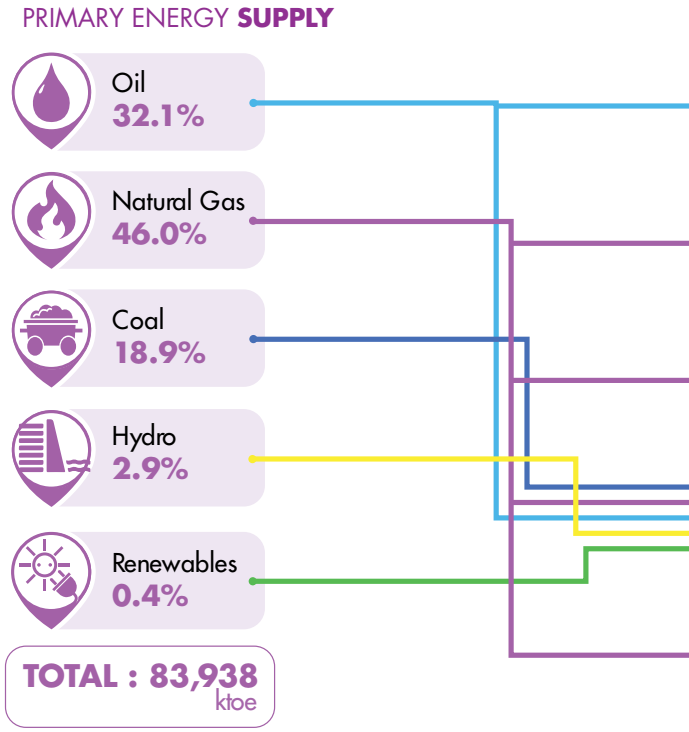
From 265 ktoe in 2007, final energy consumption in the agricultural industry surged by 297% to 1,052 ktoe in 2012. The transportation and non-energy use (such as natural gas for industrial feedstock) sectors also grew by 9.3% and 153% respectively. Additionally, residential and commercial use, including government buildings and institutions increased by 13.7%. However, the industrial and manufacturing sectors experienced a decline by 14% from 16,205 ktoe to 13,919 ktoe.

One-Stop Energy Information Centre

Established in 2009 within the Department of Energy Management and Industry Development of the Energy Commission, the Energy Information Unit (EIU) of the Energy Commission, provides current and historical data on supply, transformation and demand of commercial energy sources, as well as other related information, to local and international stakeholders. These include regulators, policy makers, planners, investors, analysts, researchers, academicians, consultants and other professionals.

An online version of the National Energy Balance report – The Malaysia Energy Information Hub (MEIH) – enables easy access to the data. Currently, the input is based on data voluntarily supplied quarterly on-line by 75 organisations, including relevant government agencies, power utilities, independent power producers, private oil and gas companies, and cement, iron and steel manufacturers.

The Energy Commission is also responsible for providing information on energy use to international organisations such as the International Energy Agency (IEA), United Nations Statistics Division and the Asia-Pacific Economic Cooperation (APEC).



KEY ECONOMIC AND ENERGY DATA BY REGION

PENINSULAR MALAYSIA

GDP at 2005 prices (RM million)
Population ('000 people)
Electricity Consumption (GWh)

Energy Intensity

Electricity Consumption
(GWh/GDP at 2005 prices (RM million))

SABAH

GDP at 2005 prices (RM million)
Population ('000 people)
Electricity Consumption (GWh)

Energy Intensity

Electricity Consumption
(GWh/GDP at 2005 prices (RM million))

SARAWAK

GDP at 2005 prices (RM million)
Population ('000 people)
Electricity Consumption (GWh)

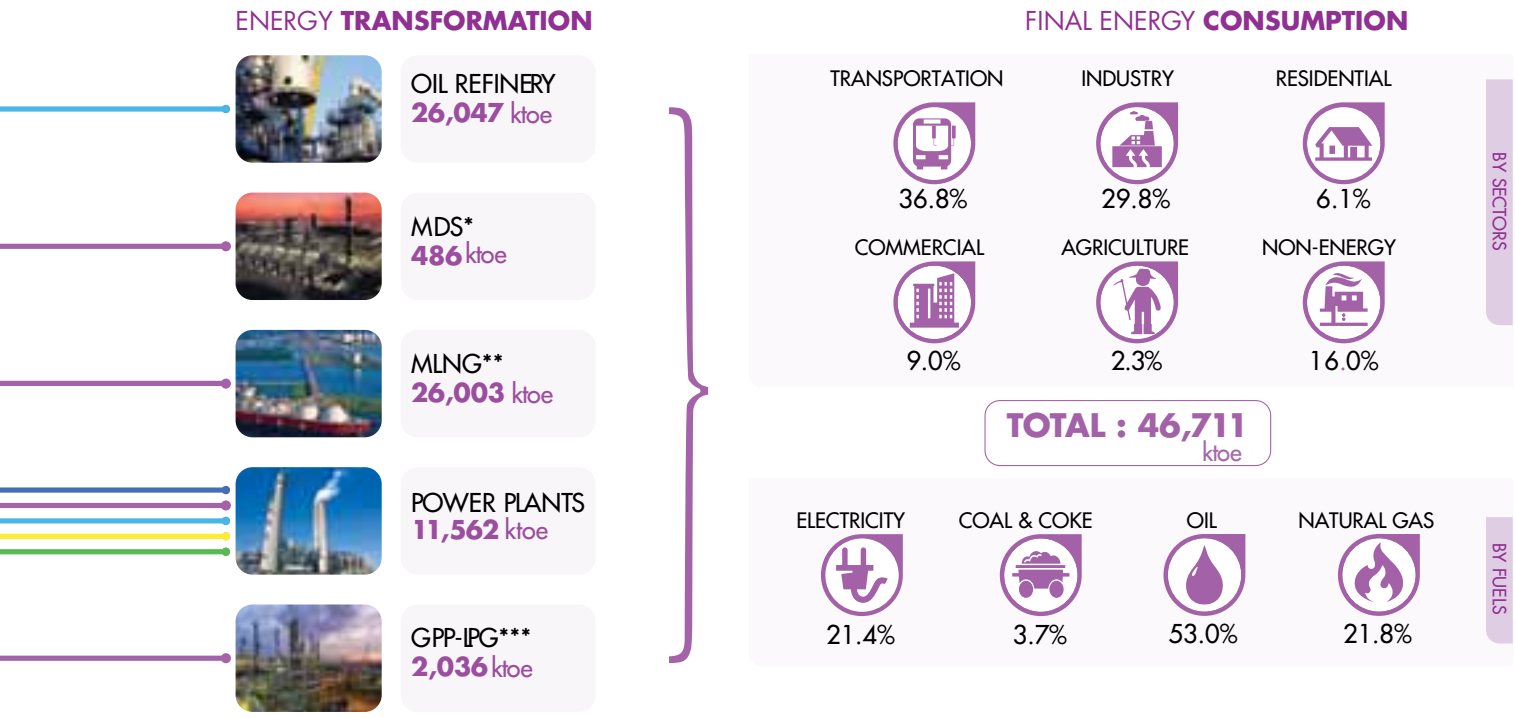
Energy Intensity

Electricity Consumption
(GWh/GDP at 2005 prices (RM million))

"One of the challenges the EIU currently encounters is collecting recent, up-to-date information. We are resolving this by communicating more often with the data providers and encouraging them to submit the necessary information for the data compilation as early as possible and within the target deadline."

– Datin Noor Aizah Abdul Karim,
Head of the Energy Information Unit,
Energy Commission of Malaysia

Energy Services and Consumption in ktoe (kilotonnes in oil equivalent) by Different Sectors of the Economy



*Middle Distillate Synthesis (MDS) plant
**Malaysia Liquefied Natural Gas (MLNG) plant
***Gas Processing Plant - Liquefied Petroleum Gas (GPP-LPG) plant

Source: Energy Commission of Malaysia

Higher energy intensity signifies a higher cost of converting energy into GDP. For instance, Peninsular Malaysia recorded a 4.5% per annum rise in GDP from 2007 to 2012 while electricity intensity only rose 0.06% annually from RM160,000 to RM161,000 per GWh of electricity consumed, compared to 2005 when it was RM163,000. If the economy grows without an accompanying rise in electricity intensity, this signifies a degree of efficiency involved in the national production process.

2007	2008	2009	2010	2011	2012
509,486	534,981	524,726	567,605	597,866	635,163
21,662	21,951	22,241	22,656	23,132	23,429
81,710	84,924	87,950	94,666	97,939	102,174
0.160	0.159	0.168	0.167	0.164	0.161

2007	2008	2009	2010	2011	2012
35,318	39,114	40,986	42,101	42,664	44,434
3,125	3,154	3,184	3,207	3,316	3,359
3,317	3,474	3,818	4,127	4,275	4,943
0.094	0.089	0.093	0.098	0.100	0.111

2007	2008	2009	2010	2011	2012
65,283	65,470	64,173	66,947	70,821	71,874
2,399	2,435	2,471	2,507	2,516	2,549
4,277	4,416	4,544	5,730	5,172	9,237
0.066	0.067	0.071	0.086	0.073	0.129

All factors considered, the *National Energy Balance* indicates that in 2012, Malaysia recorded increases in energy supply and consumption as well as higher economic performance. It also signifies that despite its growing energy requirement, through the assistance of mandated agencies, the country is powering towards its 2020 goal of being a high-income nation while actively seeking out ways to reduce dependence on any one fuel type.

Micro-grids utilise sustainable and renewable energy sources such as hydro, wind and solar to create an 'island of power' which can be isolated or connected to a major grid when required.

Source: openei.org

Micro-Grids

The Sustainable Solutions for Energy Needs

According to the International Energy Agency (IEA), more than one-fifth of the global population, most of whom are in rural areas, lack access to electricity. This forms a crucial part of what governments around the world are increasingly considering a significant requirement in achieving international poverty and basic human rights targets. However, it is estimated that by 2030, providing electricity to rural populations will require five times the current level of investment. One solution rapidly gaining global attention, momentum and implementation is distributed energy resources (DER), particularly the micro-grid.

ELECTRIC ISLAND

By definition, according to the US Department of Energy, "a micro-grid is a group of interconnected customer loads and DER within clearly defined electrical boundaries that acts as a single controllable unit that can connect and disconnect from the national grid." A key factor in the definition is the ability of micro-grids to be isolated from the larger electricity supply network, known as islanding.

In regions where local sources of energy (in particular, renewable energy) are available, micro-grids combine power from the utilities with the local sources. An analogy to describe the process is a home garden of vegetables and fruits – which may have enough produce to enable the homeowners to do without purchasing vegetables and fruits from the grocery shop. And in case the garden has extra produce, it can be sold to the public or even the grocery shop.

Micro-grids operate in the same way. They offer a measure of semi-independence and empower population clusters – typically in rural settlements – to use their own electricity when it is available, knowing they can depend on the utility companies when it is not.

EFFICIENT SUPPLY

In practice, micro-grids reduce electricity loss owing to long distance travel from the generating plant to the customers – estimated to be over 15% of the transmitted amount. It also significantly decreases carbon emissions, since power does not have to travel long distances from fossil fuel plants and generators, and through the utilisation of on-site renewable sources such as solar photovoltaic, mini-hydro and biomass plant installations.

Another advantage that micro-grids offer, in addition to the optimisation of alternative power sources, is allowing users to make smarter decisions and choices regarding their electricity use. In the event of a power disruption, either from the larger conventional power grid or the local one, a properly equipped micro-grid can selectively shut off all non-essential electrical outlets to maximise available power.

REMOTE POWER

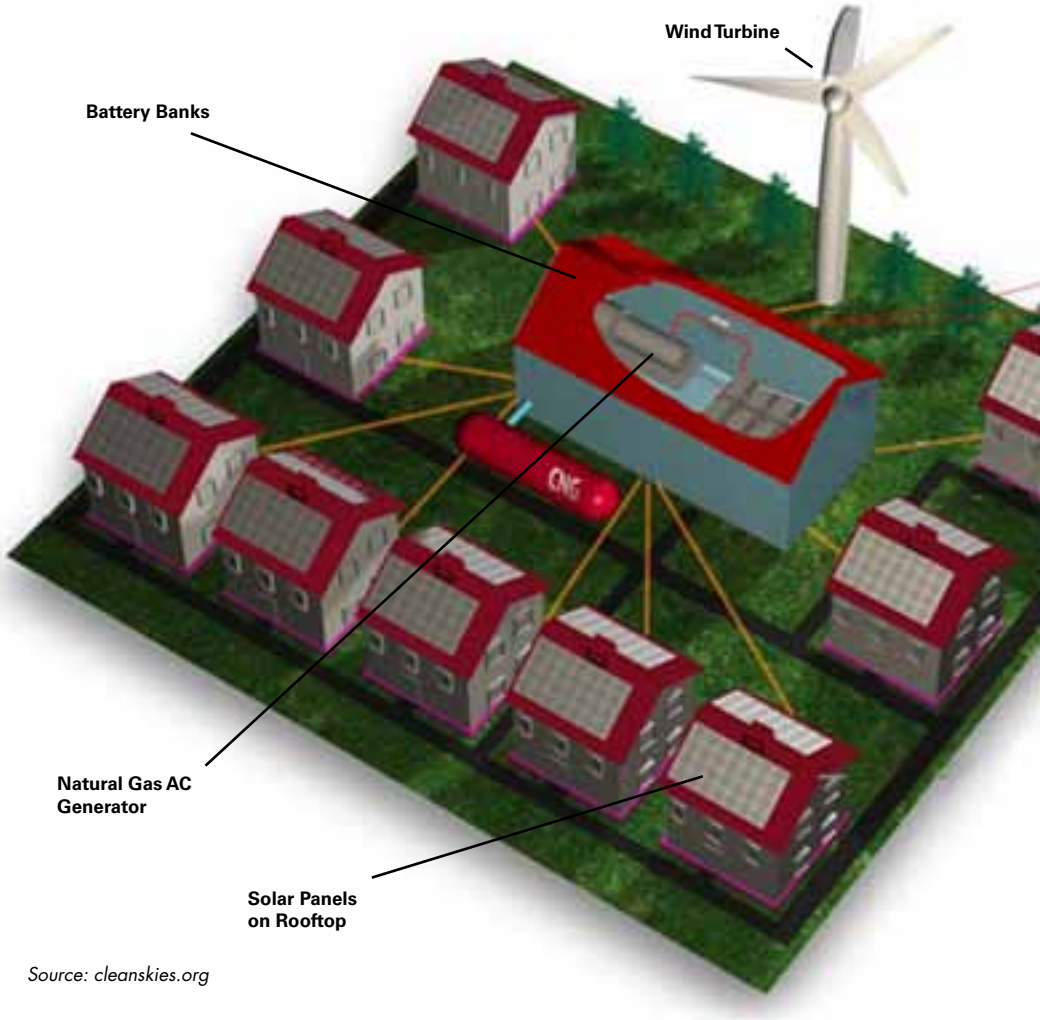
While the technology is relatively new, micro-grids have found a place in various industries around the world, from the military to remote island locations. In Malaysia, micro-grids are more typically implemented in rural, hard-to-reach areas. One of these is Kampung Tanjung Batu Laut in Sabah. The village, with a population of just over 200 people, depends on a solar-diesel hybrid generator micro-grid system which provides 24 hours of electricity.

The hybrid system comprises a solar farm which powers the village in the daytime, a battery storage facility and a diesel generator which helps generate additional electricity for the village at night, enabling the residents of Tanjung Batu Laut to enjoy uninterrupted power supply.

From a community that had to rely on polystyrene foam boxes to store ice for cool drinks to one that can afford to have refrigerators, televisions and even computers, the sociological benefits of micro-grids are evident. Economically, the possibility of having a refrigerator has enabled the village's central grocery store improve its storage and sales, as well as open the community to promising opportunities available in other regions of the country and the world.

BACK-UP PLAN

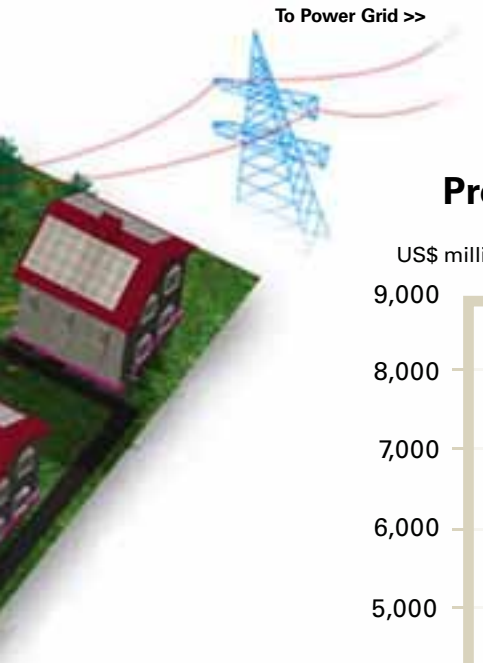
Apart from its application in remote and inaccessible regions, micro-grids can also be implemented in urban locations, particularly close to essential economic and social facilities such as factories, mines, oil and gas extraction sites and health centres. With recent forecasts predicting increased populations in cities, micro-grids can be used to relieve pressure on the central utility companies while reducing carbon emissions.



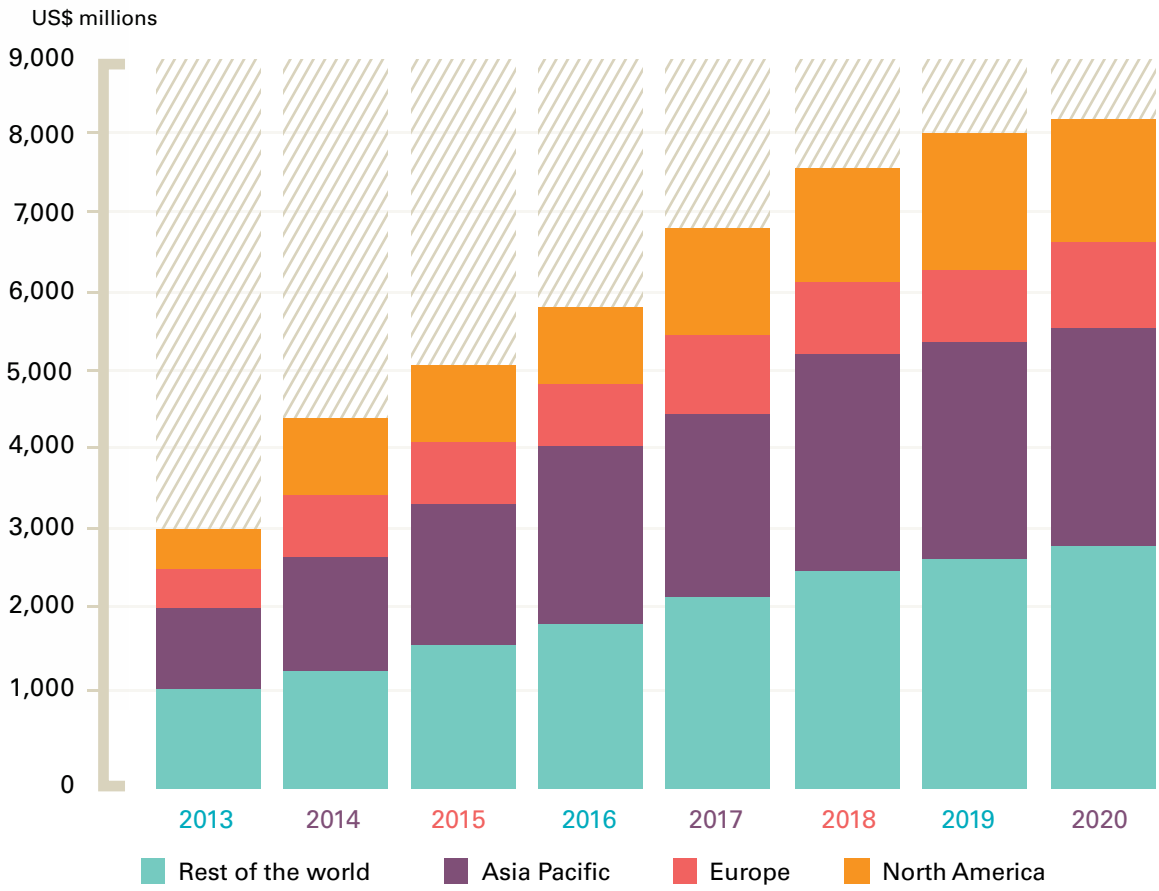
Source: cleanskies.org

Micro-grids are especially useful in locations where renewable and sustainable energy sources are present. This will reduce the need to transport electricity over long distances. In Malaysia, where there are abundant renewable and sustainable energy sources such as solar, hydro, biomass and biogas, micro-grids can be implemented.

> *"1.4 billion people live without access to modern sources of energy. Sustainable energy for all is the golden thread that links development, social inclusion and environmental protection – including addressing the growing threat of climate change."*
>
> **- Ban Ki-moon,**
> **UN Secretary-General**



Projected Total All-segment Micro-Grid Revenue: 2013-2020



Source: Navigant Research

Top left: While a larger grid network supplies power over a wider area, micro-grids ensure power in smaller regions, typically near to alternative power sources, which reduces electricity lost due to longer transmission distance.

Top right: According to the International Energy Agency, by 2020, developing countries will need to double their electrical power output as demand for energy is growing much more rapidly in these nascent economies than the rate of expansion of conventional electricity grids in the major industrialised world. Navigant Research forecasts that global remote micro-grid revenue will grow from over US$3b in 2013 to more than US$8b in 2020.

While micro-grids can form an important part of any nation's economy, they are not meant to be a replacement. Rather, the objective is to complement larger conventional grids. In urban areas, they will ensure that there is a fall-back in case of a power failure in the national grid. As the agency tasked with promoting and ensuring efficiency in the generation, transmission and distribution of electricity and piped gas in the country, the Energy Commission is committed to ensuring that all avenues are explored, as it supports the Malaysian government's goal of becoming a high-income nation by 2020, and ensures security, reliability and quality in electricity and piped gas supply.

Safety at Home

Aside from the efficient use of energy, its safe utilisation is also crucial to prevent avoidable accidents, particularly in homes. In line with the objectives of the Energy Commission to ensure an efficient energy industry in the country, the Commission highlights ways in which residents can avoid preventable electricity hazards and optimise electricity use.

Found in all homes connected to the national grid, the distribution board features circuit breakers, fuses and a Residual Current Device (RCD) to ensure safe and consistent electricity supply. Circuit breakers and fuses are designed to prevent electrical fires caused by overloading and short circuits, and do so by interrupting the flow of electricity when the volume of current reaches dangerous levels.

On the other hand, the RCD is a safety device designed to prevent electrocution by cutting the power when earth leakages occur – typically when current flows to the earth through a person's body. These leakages are usually caused by faulty appliances or wiring systems, thus RCDs are needed to protect lighting and power circuits, including socket outlets.

- Further safety is ensured through RCD test buttons which when pushed, simulates an earth leakage and indicates whether or not the device is functioning correctly. Follow these simple steps to test your RCD regularly:

1. Turn off all electronic equipment and sensitive appliances before opening the cover on the indoor unit of your electrical distribution board.
2. Refer to the picture on the left to identify your RCD. It should indicate a sensitivity of 100mA or 0.1A.
3. Look for a button marked 'T,' which is usually located on the front of the device.
4. Press and release the test button. If operating normally, the RCD should trip and cut the supply of electricity to the circuits it is connected to. Check that all lights and socket outlets in the affected circuits are not operational.
5. If the supply of electricity is not interrupted, it indicates that your RCD is malfunctioning. Please contact an electrical contractor registered with the Energy Commission to check the device professionally.
6. Having completed testing, restore electricity supply by simply returning the power switch to its 'on' position.

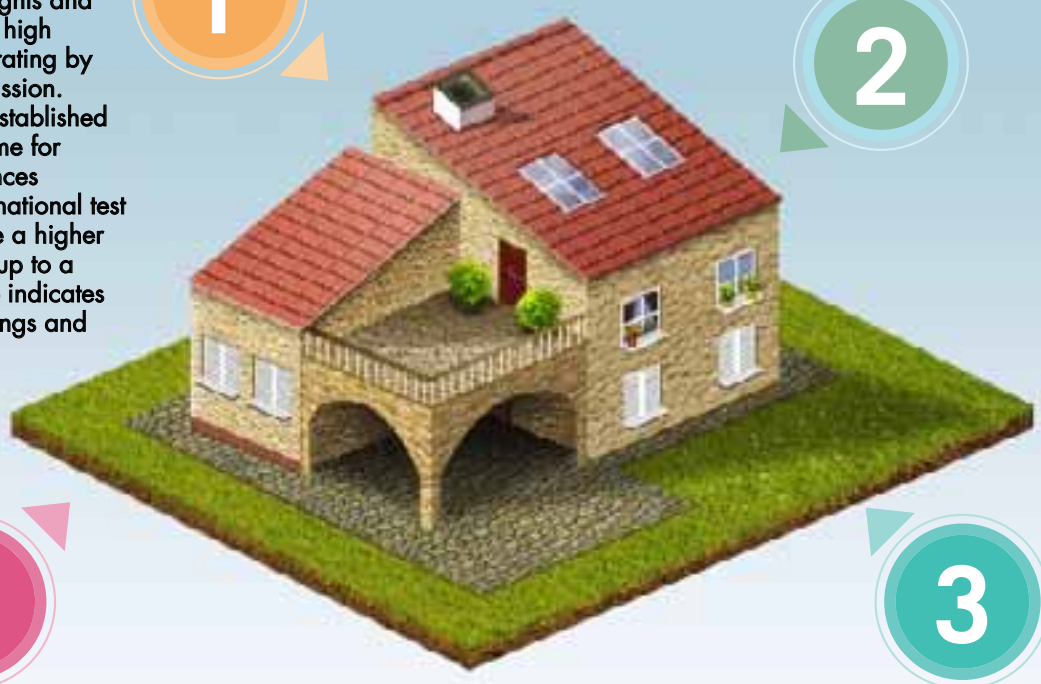
- Please ensure that additional RCDs are installed for each storage or instantaneous water heater in your home. These RCDs must have a sensitivity of 10mA or 0.01A.
- To further protect your family, prevent electrocution while using handheld appliances by installing dedicated RCDs with a sensitivity of 30mA or 0.03A for socket outlets.

Efficient Electricity Use

Efficient or optimised use of electricity can lessen a homeowner's financial burden, and reduce the amount of carbon emission into the environment. Some ways to minimise energy consumption in the home include:

Purchasing electrical appliances – such as television sets, refrigerators, air conditioners, lights and fans – that have a high energy efficiency rating by the Energy Commission. The Commission established the labelling scheme for household appliances according to international test procedures, where a higher number of stars – up to a maximum of five – indicates larger energy savings and better quality.

Running electrical appliances – such as air conditioners – at moderate temperatures or load. Air conditioners should be set at 24 degrees celsius for optimal coolness and efficiency.



Monitoring the energy consumption regularly by checking the electricity meter on a regular basis.

Using natural lighting and ventilation – such as opening curtains and windows – whenever possible to reduce the use of electrical appliances.

Tenaga 2014 Webinar

Sustainability Development

On the 11th of March, the Energy Commission organised a webinar in conjunction with *Tenaga 2014 Expo and Forum*. The event was held in collaboration with United Business Media (UBM). Attended by professionals in different industries and streamed live on the internet, the discussion revolved around developing sustainability in Malaysia by creating and implementing energy efficiency (EE) and energy management initiatives.

The seminar was moderated by Ir Dr K S Kannan, National Project Manager of the United Nations Industrial Development Organisation (UNIDO) in Malaysia, who introduced the panelists to the audience.

The first speaker, the CEO of the Energy Commission Datuk Ir Ahmad Fauzi Hasan, noted that "although there exists issues and challenges in EE development, the implementation of broad strategies and action plans are the catalysts for change and marked improvement in the field."

"The government's assistance is crucial in the development of industries' EE," added the second speaker – Prof Ir Abd Halim Shamsuddin, the Director of the Centre for Renewable Energy. "Energy efficiency can be achieved, but it requires understanding and buy-in of the public as well."

Held at the Energy Commission's headquarters – the Diamond Building – in Putrajaya, the webinar was concluded with a Q&A Session, in which members of the audience were invited to ask questions regarding their businesses and how they can transition to systems that implement EE. The webinar is a precursor of the power and electrical industry show Tenaga Expo & Forum 2014, which will take place in June 2014.

Datuk Ir Ahmad Fauzi Hasan spoke about the initiatives being implemented by the Energy Commission of Malaysia as a way of moving towards "smart city" living – Green, efficient and cost-effective.

From left: The Tenaga Webinar 2014 moderator Ir Dr K S Kannan of the United Nations Industrial Development Organisation (UNIDO) in Malaysia, with the Panelists – the CEO of the Energy Commission Datuk Ir Ahmad Fauzi Hasan and the Director of the Centre for Renewable Energy Prof Ir Abd Halim Shamsuddin

Smart Cities, Smart Living

A Seminar on Urban Management

The Energy Commission of Malaysia, Datuk Ir Ahmad Fauzi Hasan, spoke on energy efficiency (EE) efforts in Malaysia at the *Smart Cities, Smart Living* seminar. Held on the 12th of March, the seminar is part of the trade mission of the same name which promotes UK excellence in urban development solutions.

In his speech, Datuk Ir Ahmad Fauzi spoke of the Energy Commission's initiatives to improve EE in the industrial, commercial, institutional and domestic sectors. "These are beneficial to any Smart City project," he asserted. "Educating businesses as well as the public, auditing buildings and building Green, efficient ones such as the Energy Commission headquarters, rebate schemes – these are all examples of what we can do to assist cities in moving forward in terms of efficiency and sustainability."

Opened by UK Cabinet Minister Grant Shapps and Director General of the Kuala Lumpur City Hall (DBKL) Datuk Hj Mohd Amin Nordin Abd Aziz, the seminar was attended by professionals and representatives from various Green industries in Malaysia.

Suruhanjaya Tenaga
Energy Commission

In order to further enhance the performance of the energy supply industry, the Malaysian Government established the Energy Commission of Malaysia (*Suruhanjaya Tenaga* - ST) under the *Energy Commission* Act 2001. It is a statutory body responsible for regulating the energy sector, in particular the electricity and piped gas supply industries in Peninsular Malaysia and Sabah. The Energy Commission ensures that the provision of electricity and piped gas to consumers is secure, reliable, safe and reasonably priced.

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