Reforming Peninsular Malaysia's Electricity Sector

Challenges and Prospects

Institute of Strategic and International Studies (ISIS) Malaysia

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ISIS Malaysia

The Institute of Strategic and International Studies (ISIS) Malaysia was established on 8 April 1983 as an autonomous, not-for-profit research organization. ISIS Malaysia has a diverse research focus which includes economics, foreign policy, security studies, nation-building, social policy, technology, innovation and environmental studies. It also undertakes research collaboration with national and international organizations in important areas such as national development and international affairs.

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Contents

List of Figures

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Introduction

In Malaysia and in most Asian countries, energy is seen as a social good that is critical to poverty alleviation and economic development. As such, electricity and transport fuel prices are controlled or managed by governments at very low levels, necessitating the subsidization of inputs or cash transfers to cover energy producers' operating losses.

In the case of the electricity sector in Peninsular Malaysia, gas input for electricity production is implicitly subsidized i.e. sold to utilities at a price fixed below its market level. Electricity tariff is also fixed through a less than transparent process.

Driven by industrialization and increasing standards of living, surging demand for electricity, hence subsidized gas, equates to growing opportunity cost. At the same time, and for the same driving factors, there is also a change in view on the role of government in energy provision, that is not unique to Malaysia. It is increasingly being seen that direct and dominating government involvement in business, including in the electricity sector, distorts the market and leads to market inefficiencies. This change has led to the privatization of the former National Electricity Board in 1990 and the emergence of Tenaga Nasional Berhad (TNB), and the entry of independent power producers (IPP) into the sector in the mid-1990s.

Even so, successive attempts to complete the reform of the sector and to bring tariffs in line with its market level have failed. This testifies to the endurance and prevalence of the view of electricity as a social good, and that it is the responsibility of the government to ensure that tariffs remain low through its involvement in the sector via government-linked companies (principally, TNB and PETRONAS).

It is worth noting that market pricing for input fuels and tariffs was the norm in Peninsular Malaysia right up until 1994, when gas price was delinked from that of medium fuel oil. Since then, gas price has been kept to below its own market price for reasons that are often more political than economic or financial. It is ironic, then, that the politicization of tariffs is a phenomenon that follows privatization. What it has resulted in is a public that is accustomed to subsidized tariffs and that is capable of halting sectorial reforms.

The Institute of Strategic and International Studies (ISIS) Malaysia and MyPower Corporation convened the *Public Forum on Reforms in Peninsular Malaysia's Electricity Sector* on November 7, 2013 at the Hilton Petaling Jaya, Selangor. The purpose of the forum was to bring together representatives of Malaysian society to discuss plans on sectorial reforms put forward by the government of Malaysia. Representatives were chosen from government bodies, energy suppliers, energy consumers, as well as regional figures with expertise in relevant areas. Participants on that day totaled 108 — 19 of whom are representatives from the civil society and 21 from think-tanks and academia — with a further 10 representatives from the media. The 17 role-players in the forum are listed in

the Appendix. Discussions revolved around four main themes: energy market outlook and regional experience with electricity market reform; electricity tariff review in Malaysia and its expected impact; reforms to increase competitiveness in Malaysia's electricity sector; and, transition and adaptation to a new sectorial structure. This e-book summarizes the discussions in the forum.

Synopsis of Presentations

Session 1
Energy Market Outlook and Regional Experience in Sectorial Reform

This session aims to provide an introduction to energy subsidies, and to distill relevant lessons and pointers from Indonesia's and Thailand's experiences in electricity sector reform. The first part of the discussion explores the trends in energy subsidies in Asia-Pacific, in the context provided by the latest energy outlook. The second part of discussion debates the circumstances that led to power sector reforms being undertaken in Indonesia and Thailand, obstacles and objections to reform, means and initiatives to overcome those obstacles and objections, and the degree to which the reforms have succeeded.

The session moderator was **Datuk Loo Took Gee**, the Secretary General of the Ministry of Energy, Green Technology and Water (KeTTHA). She highlighted a study, undertaken by KeTTHA and Khazanah in 2008, which reviewed the power sector in Malaysia with a focus on four aspects, namely governance issues, energy pricing, energy subsidies, and electricity tariff. The study came to the conclusion that — simply put — Malaysia's electricity sector is underperforming, and that energy subsidies have a lot to do with it. Malaysian consumers have enjoyed subsidies of 75% of the market price for gas for a long time and we now need to consider how to make prudent use of this precious and depleting natural resource.

Presentation: Energy and Subsidy Outlook to 2030

Mr Shahnaz Sharifuddin, Analyst, Institute of Strategic and International Studies (ISIS) Malaysia, made the opening presentation of Session 1. The energy and gas subsidy outlook is presented in order to provide context to further discussions on reforms in Peninsular Malaysia's electricity sector. His presentation attempted to answer two questions: how much fuel will the Peninsula have to import in the future, and how much will the subsidy on gas mount to?

The outlook is based on projections made by the International Energy Agency (IEA), Energy Information Administration (EIA) and the Institute of Energy Economic Japan (IEEJ) in cooperation with the ASEAN Energy Center (ACE). These projections indicate that the primary energy demand growth for Malaysia of between 2.0% and 3.1% per annum (p.a.) is expected to be higher than the global growth rate, about the same as that of non-OECD Asia, and lower than the ASEAN average.

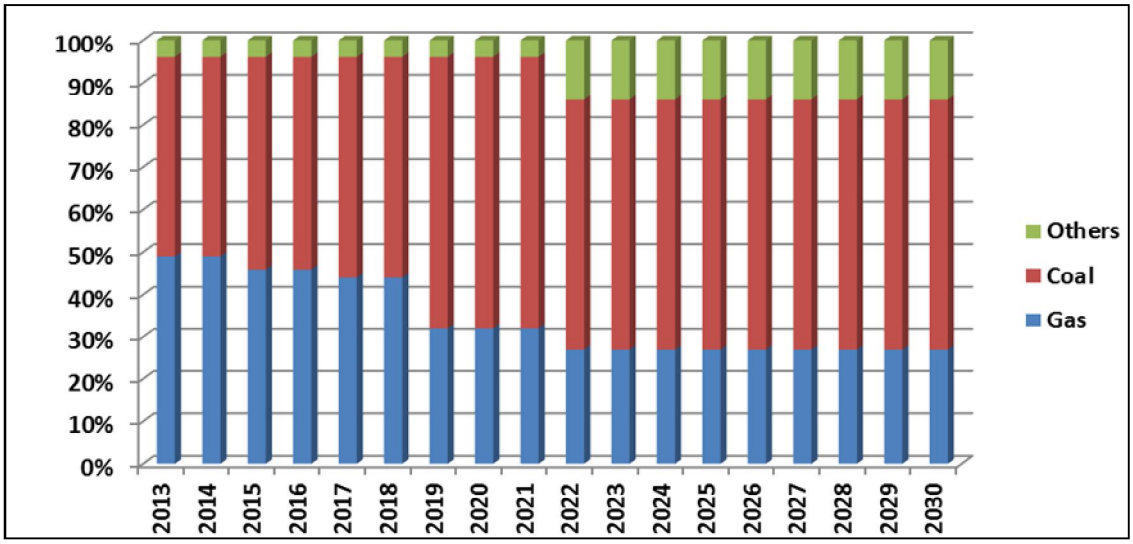
Malaysia's gas demand growth rate of between 2.3% and 2.9% p.a. is expected to be higher than the global growth rate, lower than that of non-OECD Asia, and about the same as the ASEAN average.

Malaysia's coal demand growth rate of between 2.7% and 4.6% p.a. is expected to be higher than that for the world and for non-OECD Asia, but lower than the ASEAN

average. The electricity demand growth rate for Peninsular Malaysia is projected by the Energy Commission (EC) to be 2.9% p.a. This is lower than the projection for Malaysia by other sources — which varies between 3.1% and 4.8% p.a. — and which is about the same as that for non-OECD Asia but lower than the ASEAN average.

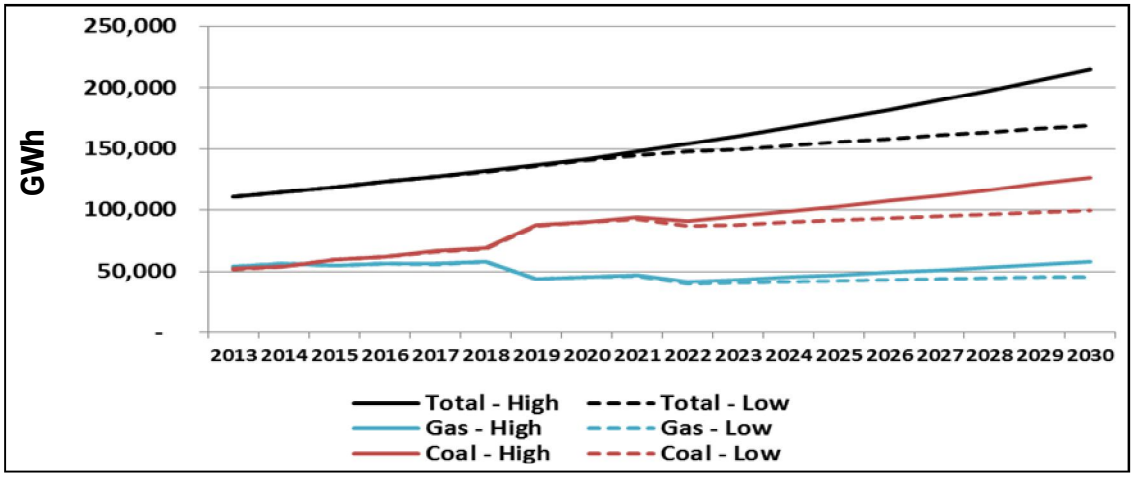
To project Peninsular Malaysia's electricity generation to 2030, two scenarios are developed: a low generation growth scenario (Low-Gen) and high generation growth scenario (High-Gen). EC's average growth rate of 2.9% p.a. is taken as the principal assumption for the Low-Gen scenario and 3.9% p.a. (from ACE-IEEJ's Business-as-Usual scenario) as that for the High-Gen scenario. Based on the approved Generation Development Plan for Peninsular Malaysia (Figure 1), the projections for the two scenarios are obtained and depicted in Figure 2.

Figure 1: Fuel-Mix for Peninsular Malaysia Based on the Approved Generation Development Plan



Source: Energy Commission

Figure 2: Peninsular Malaysia Electricity Generation (GWh), Low-Gen and High-Gen Scenarios



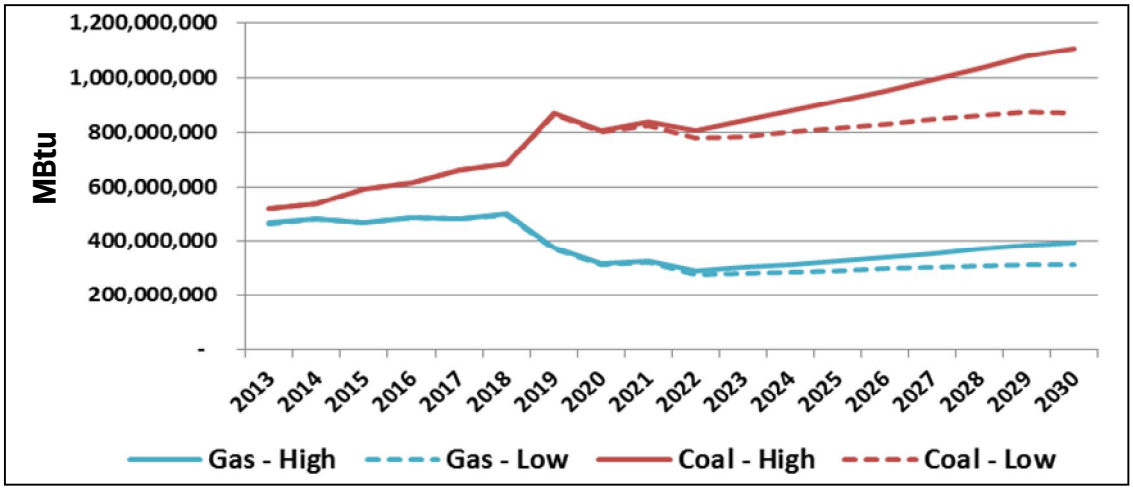
Source: Shahnaz Sharifuddin

As can be seen in Figure 2, significant impacts are made by: 1) a shift from gas to coal in 2019 (see also Figure 1) leading to a fall in the gas requirement and a hike in the coal requirement; and 2) the operation of interconnection with Sarawak in 2022 bringing in hydroelectric supply to the Peninsula (see also Figure 1) leading to a decline in the requirement for gas and coal from the preceding year.

Given this projection for electricity generation, the fuel input requirement is estimated and depicted in Figure 3. Again, the impacts from the three aforementioned events can be discerned in the projection below. In addition, the impact of an improvement in generation efficiency[1] can be discerned in 2020, leading to a decline in the requirement for gas and coal from the preceding year.

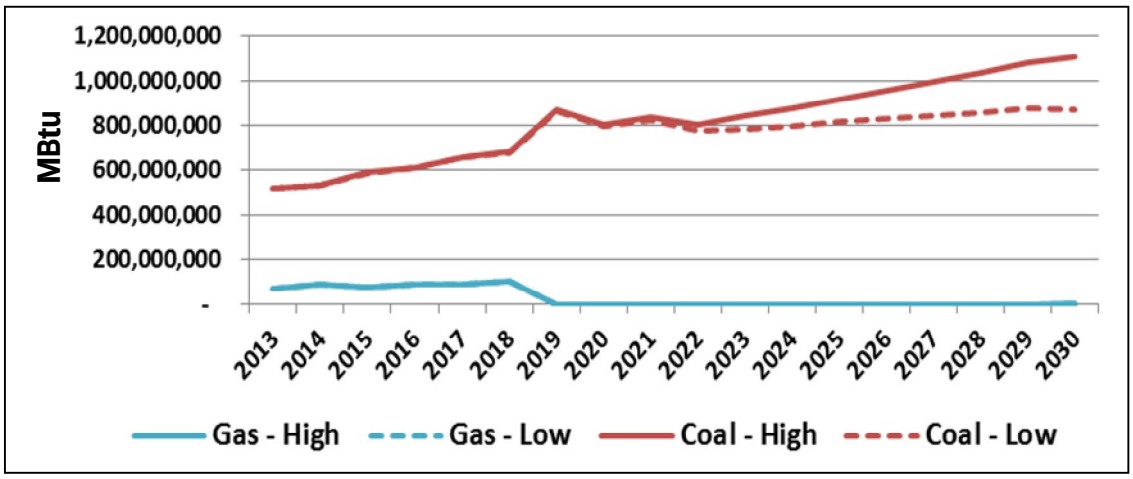
Given this projection for fuel input requirement, and assuming that domestic supply stays constant at 1,000 mmscfd (million standard cubic feet per day or 391,000 MBtu[2]) and coal is totally imported, the estimated requirement for fuel imports are depicted in Figure 4.

Figure 3: Peninsular Malaysia Fuel Input Requirement for Power Generation (MBtu)



Source: Shahnaz Sharifuddin

Figure 4: Peninsular Malaysia Fuel Imports for Electricity Generation (MBtu)



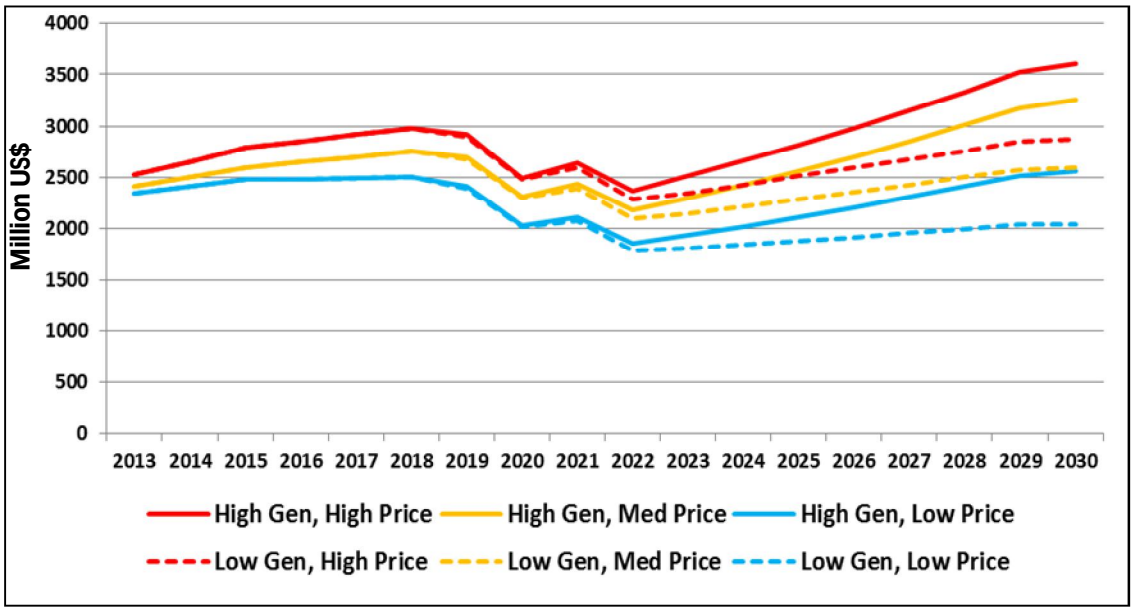
Source: Shahnaz Sharifuddin

Figure 4 above shows that, with the shift from gas to coal in power generation beginning in 2019, there is expected to be sufficient domestic supply of gas to meet the Peninsula's demand. With coal totally imported, imports of gas and coal are expected to grow between 2.3% and 3.8% p.a. (Low-Gen and High-Gen scenarios, respectively) to reach 22-28 Mtoe (million tonnes of oil equivalent) in 2030.

The export price for gas[3] (in real terms) is projected along three scenarios — Low-Price, Med-Price and High-Price — to grow at 0.3%, 1.1.% and 1.3% p.a., respectively, to reach between USD11.10 and USD13.80 per MBtu in 2030.

Given this projection for gas export price and gas input requirement laid-out previously, and assuming that the selling price for domestic gas stays constant (in real terms) at USD4.57 per MBtu, the gas subsidy is imputed[4] and depicted in Figure 5. Projection is carried out along six scenarios defined by generation level and price: Low-Gen and Low-Price; Low-Gen and Med-Price; Low-Gen and High Price; High-Gen and Low-Price; High-Gen and Med-Price; High-Gen and High-Price.

Figure 5: Imputed Subsidy on Domestic Supply of Gas for Power Generation (USD million 2010)



Source: Shahnaz Sharifuddin

In all six scenarios, gas subsidy is expected to see a dramatic fall between 2019 and 2020 due to the switch from gas to coal in the fuel mix and generation efficiency improvement. Another dramatic fall in gas subsidy is expected in 2022 due to the operation of interconnection with Sarawak in 2022. Even though these events will lead to a decrease in the volume of subsidized gas, the value of subsidy will increase from 2022 onwards due to a subsequent increase in volume and higher market price. In all but one scenario (Low-Gen and Low-Price), the value of subsidy is to be higher in 2030 than today.

In the Low-Gen scenario, the subsidy in 2030 can be 13% lower than today (Low-Gen and Low-Price scenario) or it can be up to 14% higher. Over the 18 years, subsidy can total to between USD38 and 48 billion (in real terms).

In the High-Gen scenario, the subsidy in 2030 can be 9% and 43% higher than today. Over the 18 years, subsidy can total to between USD 41 and 52 billion.

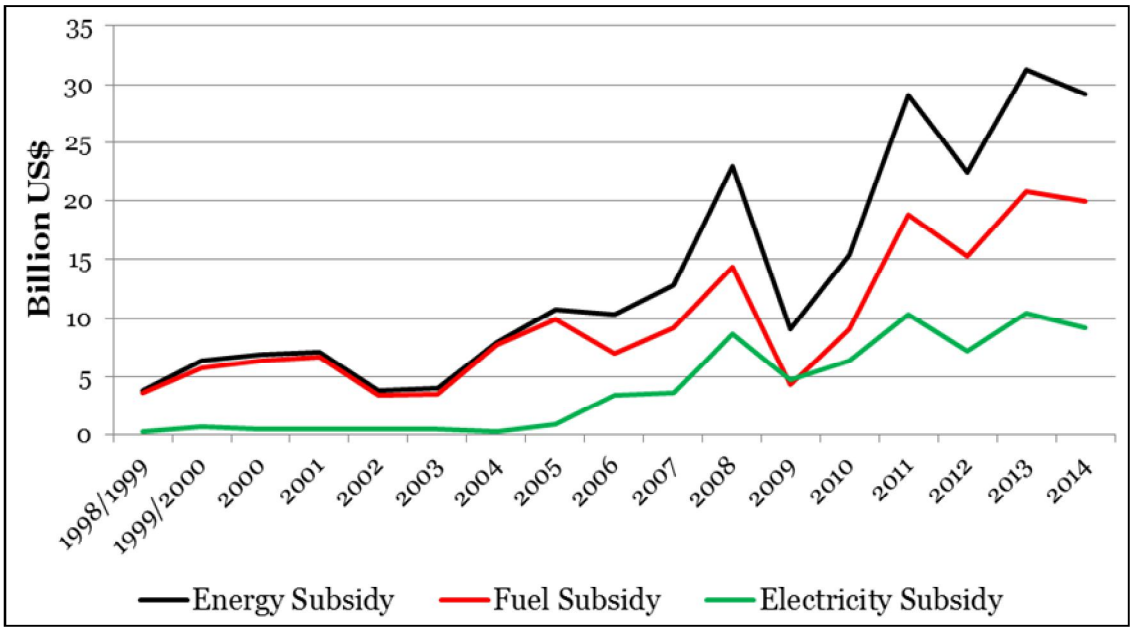
Presentation: Finding Exit Strategies of Electricity Subsidies: Experiences of Indonesia

Dr Maxensius Tri Sambodo, a researcher from the Economic Research Centre, Indonesian Institute of Sciences (LIPI) outlined five facts which are drawn from Indonesia's experience with electricity subsidies:

- it has seen the higher growth in the last 10 years compared to fuel subsidies (the other type of energy subsidy);
- it is open to all levels of society and is largely mis-targeted with the rich being the main beneficiary;
- it is correlated to fuel subsidies and increasingly so as electricity subsidies grow at a faster rate;
- it adds to the growth of energy subsidies; electricity tariffs are heavily influenced by politics as they are set by the parliament and the expectation of the impact of a tariff increase on prices contributes more to inflation than does actual tariff increase; and
- electricity subsidy is making up a larger share of state-owned utility PT PLN's operating income.

Figure 6 below shows that electricity subsidy has grown at an average rate of 2.4% p.a. from 5% of total energy subsidies in 1998/99 to reach almost USD8 billion in 2012, or about one-third of total energy subsidies.

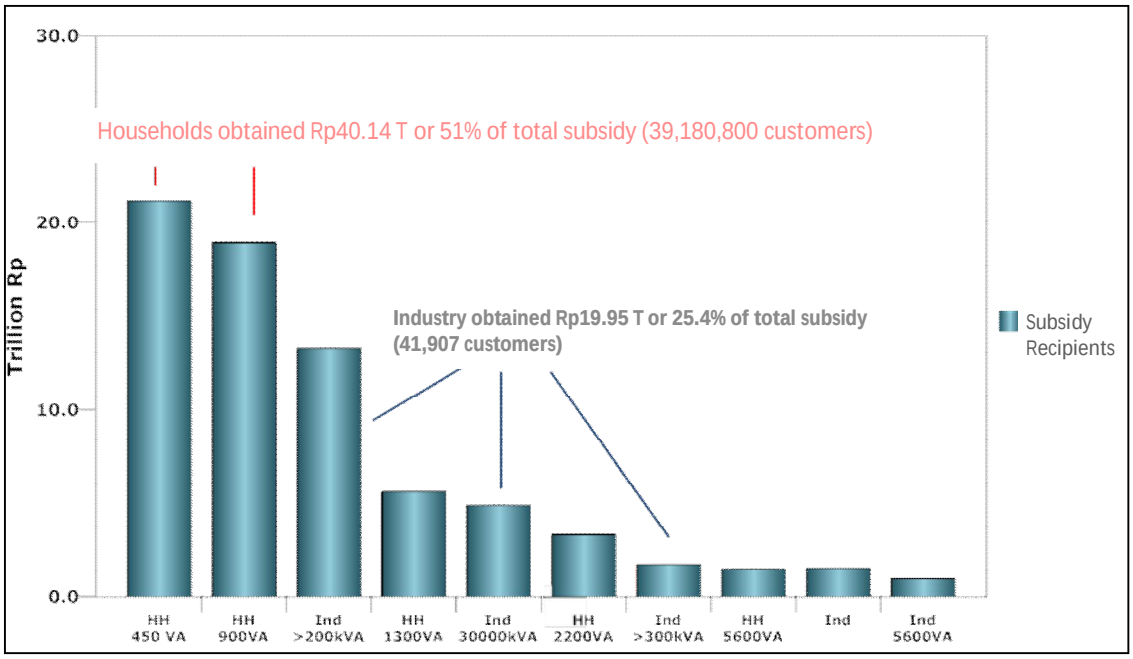
Figure 6: Energy, Fuel and Electricity Subsidies in Indonesia, 1998 to 2014



Source: Maxensius Tri Sambodo

Figure 7 shows that the main beneficiaries of electricity subsidy are the 450 Volt-Ampere (VA) and 900VA household customers of PLN who receive 51% of this subsidy. This group is the most vulnerable to tariff increases and, as such, any tariff revision will have to consider how to protect this group. On the other hand, the same chart shows that 49% of electricity subsidy goes towards industries and high-usage households. Therefore, a tariff revision may be necessary to encourage a more efficient consumption of electricity among the high-voltage consumers.

Figure 7: Top 10 Recipients of Electricity Subsidies in Indonesia, 2013



Source: Maxensius Tri Sambodo

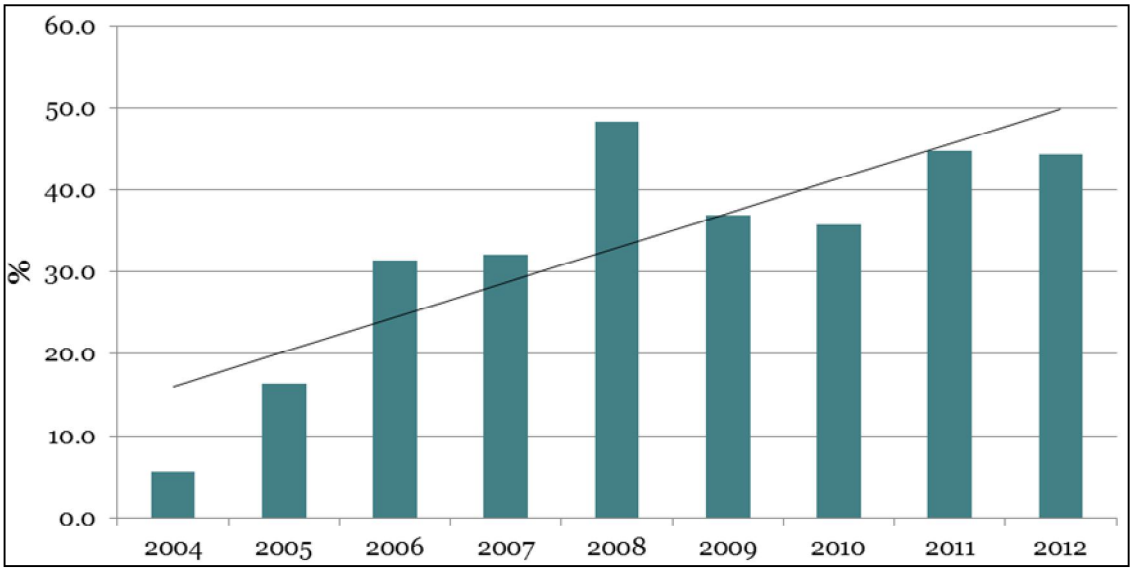
PT PLN's operating income is derived from two sources: sales of electricity and government subsidy. Figure 8 shows that electricity subsidy made up around 5% of PT PLN income in 2004, growing to 45% in 2012, with a high of almost 50% during the Asian financial crisis of 2007/2008. This is a worrying trend as the subsidy is vulnerable to government budgetary constraints which may lead the government to delay payments, resulting in cash flow issues for PT PLN. In order to help PT PLN fund investments, the government in 2009 allowed the utility to impose a margin on electricity tariff, which was set by the parliament at 5% and which has increased to 7% presently.

There are several reasons for the increase in electricity subsidy. One is that it is a subsidy open to all groups on a 'pay-as-you-go' basis, which means that it has no set limit.

Second, fuel cost is making up an increasing share of total operating cost. Third, there is a delay due to financial, technical and land issues in implementing the Fast Track Programme put in place in 2006 to construct 10 GW of coal-fired generation, with only 11 of 36 projects implemented to date, leaving generation to continue to depend on more

expensive oil and gas. Fourth, generation systems outside of Java continue to depend on rented diesel-fired power plants. As a result, even though diesel capacity has been flat in the past 14 years, the share of diesel and lubricant costs has increased from just over 40% of total operating cost in 2004 to almost 70% in 2012.

Figure 8: Share of Electricity Subsidy in the Operating Income of PT PLN



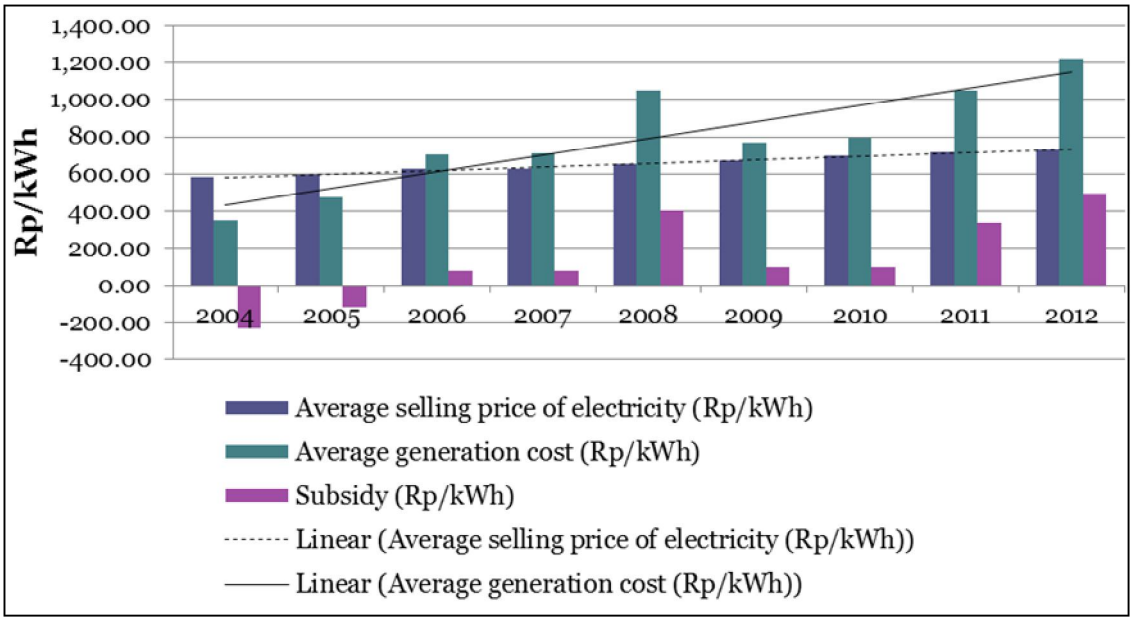
Source: Maxensius Tri Sambodo

Fifth, residential consumers have grown to become the largest category of electricity consumers — this has partly to do with industrial consumers generating their own power in order to assure themselves of a quality power supply. Sixth, low-voltage households have grown to become the largest group of electricity consumers and they are a group that requires subsidy protection. Electricity sold to low-voltage consumers has increased 24% between 2001 and 2012 to increase its share from 53% to 57% of total electricity sold. On the other hand, although electricity sold to high-voltage consumers has increased 38% over the same period, this group's share of the total has actually decreased from 12% to 8%. And lastly, electricity tariff revision requires the approval of parliament. Moreover, as Figure 9 shows, average generation cost has outstripped average selling price of electricity thus entailing more and more subsidy.

In conclusion, the electricity sector in Indonesia is facing four major problems: the increasing demand of low-voltage consumers who require subsidy protection; the lack of political will and consensus to revise electricity tariff; the delay in implementing the Fast Track Programme to expand coal-fired capacity; and, a lack of public trust in PLN to deliver quality energy service.

To address these problems, Indonesia must turn back to its Energy Law 30/2007 which calls for a fair energy price ('*nilai keekonomian berkeadilan*') reflecting cost of production, cost to the environment, conservation cost and profit. There should also be a stricter application of the law's call for national and local governments to provide subsidy

Figure 9: Approximate Average Selling Price of Electricity, Generation Cost and Subsidy



Source: Maxensius Tri Sambodo

for the poor, meaning that electricity subsidy need not be kept open to all levels of society. If the subsidy cannot be closed off to the higher-income groups, then perhaps it should be shut-off altogether and a different way sought to channel aid to the poor.

Indonesia must also invest in higher-technology generation capacity such as super ultra-critical coal power plants, gas infrastructures and hydropower storage pumps. There is room for solar photovoltaic, which is becoming increasingly competitive, especially outside Java. In addition, barriers to the implementation of the Fast Track Programme must be reduced.

Presentation: Thailand's Experience in Power Sector Reform

Dr Pallapa Ruangrong, Commissioner, Energy Regulatory Commission, highlighted Thailand's experience in reforming its power sector. The reform started in the early 1990's, aiming first and foremost to improve the security of power supply. Its important driver was the transfer of the investment burden to the private sector to develop power generation capacity. With the success of programmes to increase competition in the sector i.e. the Independent Power Producer (IPP), Small Power Producer (SPP) and Very Small Power Producer (VSPP) programmes, the reform objectives evolved to include improving service quality and efficiency through competition, and to develop public participation.

There have been many milestones along Thailand's path of power sector development. The early 1990's saw the first small private power projects which turned into a successful private power procurement process. Associated with the increase in private participation was the restructuring of the electricity tariff to be reflective of costs and to include an automatic fuel adjustment mechanism. At the same time, state utilities were

given financial criteria to make them more self-sustaining and commercially-oriented. An attempt to introduce a wholesale power generation market or power pool was abandoned in the early 2000's; and in 2004 the Government adopted a single-buyer policy. The most recent step in the process was the passage of the Energy Industry Act in 2007 and the establishment of the Energy Regulatory Commission (ERC). With that, the industry was unbundled for accounting purposes with the issuance of licenses and the ERC was mandated to ensure non-discriminatory open-access to electricity and gas networks.

The state-owned Electricity Generating Authority of Thailand (EGAT) owns 45% of power generation; the rest of this segment is shared between private-sector power producers i.e. IPPs (38%), SPPs (10%), VSPPs (less than 1%) and imported electricity (7%). Under the enhanced single-buyer model, EGAT also owns and operates the transmission system and the ring-fenced network system. At the distribution & retail level, there are two state-owned distribution utilities: the Metropolitan Electricity Authority (MEA) which serves Bangkok and two adjacent provinces, and the Provincial Electricity Authority (PEA) which serves the rest of Thailand.

The Energy Industry Act defines the division of responsibility between policy-making and regulatory functions in the electricity and natural gas sectors. Under this act, the policy and framework for tariff determination such as uniform tariff for residential customers will be recommended by the Energy Ministry to the National Energy Policy Council (NEPC); the ERC, working under the policy framework set by the NEPC, will then issue regulations and criteria for tariff setting. The priorities that guide the ERC's regulations include protection of consumer interests, provisions for disadvantaged consumers, ensuring supply stability and ensuring commercial returns on investment for utilities.

The ERC regulates the power sector through the issuance of 5 categories of licenses. In order to promote competition, the ERC is in the process of developing codes to allow 3rd party access to the grid system. With this, purchase of excess capacity of SPPs and IPPs via bidding will be possible.

Thailand's gas industry is operated by Petroleum Authority of Thailand (PTT), a company in which the government is the major shareholder. The industry is separated into the supply and wholesale, pipeline transportation, and distribution and retail systems. ERC regulates the natural gas industry through 4 types of licenses, and it also regulates the tariffs for gas transmission and LNG re-gasification.

The ERC is also in the process of developing codes to allow 3rd party access to gas transportation pipelines. With this, consumers will have the option to purchase gas from new suppliers or from LNG importers.

In Thailand, the electricity tariff consists of 3 parts: the base tariff; the Automatic Tariff Adjustment Mechanism, also called fuel adjustment charge; and the value added tax (VAT), which is 7%. The first tariff review managed by ERC was completed in July 2011. The tariff approved from that review was consistent with the previous tariff but some elements were reset. The initial base tariff was based on utilities' investment cost in power plants, transmission and distribution lines, and retail operations. Following the power tariff reform,

the new base tariff includes the base fuel adjustment charge and the cost incurred from the Public Service Obligation (PSO), that is, the cost of electricity provided free-of-charge to residential consumers. Consumers who qualify to receive this are those whose electricity consumption is not over 90 kWh per month — this policy was initiated as a result of the 2008 global financial crisis and was paid for by the government. In June 2012, however, this qualification was tightened to a maximum of 50 kWh per month. By reducing the limit from 90 to 50 kWh, the number of subsidized consumers was reduced from 8 million to around 4 million. This is seen to be fairer to the other consumers who bear the burden of this cross-subsidy, as the cost was reduced by around 70%, from about 12 billion baht per year to 3-4 billion baht per year. The base tariff will be reviewed every 3 to 5 years.

The fuel adjustment charge is reviewed every 4 months and is based on changes in fuel cost of EGAT generation which constituted 27% of the total fuel adjustment charge, power purchase cost from private producers (72%), and the Adder cost for promoting renewable energy and contributions to the Power Development Fund (1%). This means that the tariff will be fair, transparent and it reflects the actual power supply cost. Besides the provision of free electricity to low-voltage households, the other key subsidy programme is the maintenance of a uniform tariff throughout Thailand. This is achieved through financial transfers between the two state-owned utilities at the distribution and retail levels i.e. the Metropolitan Electricity Authority (MEA) which serves Bangkok and two adjacent provinces, and the Provincial Electricity Authority (PEA) which serves the rest of Thailand.

Since PEA's power distribution costs are higher than those of MEA, it is necessary to subsidize PEA to maintain the uniform tariff. The mechanism for calculating financial transfer to PEA is based on the Return on Invested Capital (ROIC) criteria assigned to the three power utilities. EGAT's ROIC is 7.5% while the ROIC for both MEA and PEA is 5.73%.

MEA which has lower costs per customer will generally earn more than its ROIC criterion, so the difference is transferred to PEA to cover its higher costs per customer. In 2010, the cross subsidy from both MEA and EGAT to PEA was made in a lump sum of 12.5 billion Baht. In 2011, the cross subsidy was set at a maximum of 13.4 billion Baht.

The Power Development Fund set up under the Energy Industry Act requires electricity industry licensees to contribute to the Fund to pursue objectives specified in Section 97 of the Act. The contributions are ultimately passed on to customers through tariffs. For example, power producers levy a charge on their output and that goes to the Fund with the aim of developing and rehabilitating communities surrounding power plants. This cost is in turn passed on to electricity retailers who also levy a charge on their sales and that goes to the Fund with the aim of expanding coverage in rural areas.

The ERC is now reviewing the tariff structure for the period 2014-2016 with the objectives of better reflecting actual costs and efficient operation, and to ensure that the subsidy mechanism supports the government's policy on decentralization of development. Electricity bills will clearly reflect the costs of generation, transmission, distribution and retail, as well as the fuel adjustment charge. The power purchase cost from private power

producers and imports will be removed from the charge and included under the 'cost of generation' instead, while network charges will be the 'use of system' charge. The efficiency factor will also be introduced.

Presentation: Energy Sector Outlook and Regional Experience in Energy Sector

Professor Dr Darryl Jarvis, Associate Dean, Faculty of Liberal Arts and Social Sciences, and Head, Department of Asian and Policy Studies, The Hong Kong Institute of Education, ended the presentation for Session 1. He argued that energy has been viewed as one of the foremost drivers of economic development and Asia has seen a very intimate and very positive correlation between electrification programmes and industrialization and productivity growth. As such, electricity has been seen as a 'core' sector and has occupied a prime place in national economic planning.

States in Asia have thus tended to 'ring-fence' electricity as a social good, in many cases building into national constitutions 'rights' to electricity, affordability clauses and connection guarantees, mandating governments to subsidize electricity and infrastructure provision. These political guarantees have created long-term fiscal implications for governments as the price of energy has increased and energy demand grown.

Policy designs in Asia, including in Malaysia, have tended to 'socialize' energy costs in the interests of providing electricity as a 'social good' and making energy affordable to poor and marginal groups, particularly rural communities. We tend to observe across the region the electricity sector operating on below-cost production models reliant on large injections of cash subsidies. As energy cost and energy demand increase, this raises the issues of opportunity costs to governments, mispricing of energy and inefficient consumption of energy. Given the heavy involvement of the state in energy provision, there is a strong tendency to politicize energy issues (such as costs, tariffs and tariff rebasing). There are instances in where energy pricing and business opportunities are used by political parties as a means of dispensing political patronage. As a result, Asian countries are riddled with legacies and constraints on the way governments are able to operate and reform the sector.

These legacies and constraints lead to serious problems in adequately and appropriately resourcing the electricity sector. In this regard, Indonesia is widely seen as the stand-out case, requiring 6% to 8% of GDP for electricity provision, although this is not as bad as in India where state electricity boards are reliant on subsidies hidden in their operating costs and where under-investment has led to grid collapses. China, which has rolled-out phenomenal amounts of power infrastructures since the mid-1990's, still heavily utilizes cross-subsidies and fiscal transfers to keep input costs, transmission fees and tariffs in rural and certain key regions low. Yet it suffers from persistent energy shortages and brown-outs as investments are not able to keep abreast of demand.

If we put the economic and developmental needs of Asian states in context, then the mass roll out of electricity infrastructure (generating capacity, grids, distribution networks, network reliability, etc.) between the 1950's and the 1980's have been

remarkably successful. Asian countries have achieved very high rates of electrification (notable laggard states are India, Indonesia, Cambodia, Philippines, Myanmar), contributing greatly to development in the region. Moreover, the state-driven models of electricity provision (including subsidization of the sector) have proven effective for establishment and development of the sector.

Beginning in the 1980's we see a movement towards reforming the electricity sector, driven by a number of reasons that are largely economic and financial. Increasing cost to state treasuries of energy subsidies is certainly one of them, particularly with early power purchase agreements that are not necessarily struck in a way that produced optimal financial outcomes. Moreover, many state-owned enterprises in the power sector became bankrupt in the wake of the Asian financial crisis of 1997 and needed large cash injections that drained fiscal reserves. This brought to the fore the growing opportunity costs to governments of state-driven models of electricity provision, in terms of difficulty in meeting demands from other sectors such as healthcare, education, water, sanitation and transportation. There were also concerns about the efficiency of state-owned or state-linked electricity providers in terms of their fiscal management, bloated staffing, responsiveness to consumers, rate of technical innovation and corruption.

There has also been a very strong change in the way governments view the role of the state in the economy, particularly as to how the markets and new public management strategies that bring in greater private-sector involvement can lead to better financial outcomes, efficiency gains and lower prices. That is, by mobilizing the private sector investments in infrastructure roll-out and technical capacity building, the fiscal burden on the state is reduced, and the sector is de-politicized by putting issues such as tariffs and subsidies in the hands of technocrats. This was strongly backed and pushed by multilateral lending agencies such as the World Bank and Asian Development Bank, which changed their policies on lending and technical assistance towards market building activities.

Indonesia, Philippines, China, Singapore, Malaysia, Laos, Nepal, Pakistan, Taiwan have all experimented with various reform efforts. Many of these have been situated around limited forms of privatization of the generation segment, nominal levels of unbundling of state-owned utilities and some attempts at creating pooled real-time electricity markets, most notably in the Philippines.

These reforms, however, have not always been successful. The early contract designs (cost–plus models supported by the World Bank and the Asian Development Bank) were generally skewed towards the independent power producers and failed to deliver to consumers the material benefits of technology, and efficiency gains in terms of lower prices and enhanced provision. Indeed many further indebted the sector, as in the case of Indonesia where the state-owned utility was — as a result of having to maintain a strong state presence in a sector that was semi-privatized — forced to absorb significant losses from paying high prices to independent power producers and charging low prices to consumers.

Moreover, the regulatory and institutional designs were often impaired (or un-defined). Regulation is a highly complex and costly exercise that is generally seen as a

panacea; but there was a poor level of capacity for this, coupled with frequent political intervention (especially over tariffs). Re-politicization of the sector has been exacerbated by energy security concerns arising as Asia becomes a net importer of energy.

Regulatory/institutional design is not easy — the 'perfect' regulatory model has not yet been identified anywhere, as even the best model has implementation and operational challenges. Even so, regulatory and institutional capacity remains less than optimal in the region (regulation by contract has proven it has severe limitations).

Electricity sectors across Asia also have to contend with powerful legacies that are not easily overcome; the early contracts with independent power producers continue to have big fiscal implications. Power purchase agreements have been historically tainted with corruption and lack of transparency. A new mechanism is needed but incentive regulation is still in its infancy in the region.

Likewise, the legacy of state involvement and control over the sector and over tariffs are not easily overcome and continue to have big fiscal implications. The populace has become used to highly subsidized electricity prices — educating people in terms of the true cost of electricity, the need for efficient consumption and energy conservation are major challenges. The question of social justice i.e. who pay for subsidies, will continue to be a dominant, politicizing factor in the provision of electricity. An independent regulator may not be enough to address this question as regulation has a poor history in terms of tariff rebasing, cross subsidization (rural/urban, rich/poor); subsidies have historically been inefficient and blunt across the board.

Session 2
Increasing Competition in Malaysia's Electricity Sector

This session aimed to establish the reasons for reforming the structure of Malaysia's electricity sector. Following an outline of the aims and methods of the reform, discussion focused around the challenges of creating a competitive, responsive and efficient electricity sector. **Dr Rozali Ali**, Distinguished Fellow of ISIS Malaysia moderated the session. He began the session by asking what is the structure that will achieve the objectives of an effective and efficient electricity sector? This was not the question before; but developments such as technology that allows near real-time competition have led us to ask this. The *modus operandi* for financing this important social good i.e. our idea as to the role of government in electricity provision, has also shifted considerably. Governments no longer see themselves as wholly responsible for this and are encouraging the private sector to be involved as much as possible. These changes tend to have ramifications — some intended, some accidental — on society as a whole.

Datuk Sharol Azral, Director, Performance Management and Delivery Unit (PEMANDU), began Session 2 by highlighting the macro perspective of why the power sector needs to be reformed. Malaysia aims to become a high-income economy (GDP of USD15,000 per capita) by 2020 through the Economic Transformation Program (ETP). Competition and transparency are two of the thrusts of the ETP. One of the key Entry Point

Projects (EPPs) within the ETP is the unlocking of premium gas demand i.e. to increase utilization of unsubsidized gas, through a review of infrastructure and the regulatory framework. Another one of the EPPs is to improve energy efficiency, including efficiency in the provision of electricity.

Reform of the electricity sector will take a very long time, perhaps 30 to 50 years. This is simply because infrastructures and frameworks are locked-in for a very long time in the industry — power purchase agreements (PPAs), for example, last for over 20 years. Sectorial liberalization, therefore, can be done only incrementally. Nonetheless, the most important thing is to ensure transparency for the government and the consumer as to efficiency within the energy value chain. In this regard, the public should bear in mind that the average thermal efficiency of power plants in Peninsular Malaysia is about 40% — this means that some 60% of subsidies are burned to no benefit to anyone.

Dato' Zulkifli Ibrahim, Managing Director, Jimah Energy Ventures Sdn Bhd delivered the second panel intervention. He began by highlighting that the issue of tariff is politically-charged in every country around the world. The current economic conditions in most parts of the world are such that the current pricing of energy is too high for the average person. At market prices, even Malaysia's middle-income would have problems purchasing sufficient quantities of fuel. Moving to market-pricing in the electricity sector would create a knock-on effect on prices throughout the economy, hence raising the cost of living, and that would deeply affect even the middle-class. It would also negatively impact upon the competitiveness of Malaysian industries. As such, Malaysia cannot remove fuel subsidies at this point in time. Rather, Malaysia must focus on how these subsidies are given out and how they can be made more effective.

In every trade, there is a middleman. We need to ensure that, within the energy trade, the middleman is not profiting too much at the expense of the producer and the consumer. There is a need to be able to secure affordable and sufficient quantities of fuel from the world energy markets. In this regard, Malaysia is not ready to move to a market-driven electricity sector.

Datuk Ahmad Fauzi Hassan, Chief Executive Officer, Energy Commission (EC) served as the final panelist for Session 2. He stated that the objective of the reform of the electricity sector is to improve the transparency, efficiency and reliability of electricity supply services. In order to liberalize the market, it is necessary to unbundle the dominant player in the market i.e. Tenaga Nasional Berhad (TNB), which is integrated from the generation through to the transmission, distribution and retailing levels. With unbundling, the players at each level — to be more specific, at the generation and retailing levels — will be able to compete on a more equal footing with each other. In this way, electricity wholesalers and consumers will be able to choose the best provider for them.

Many countries have unbundled their dominant national utilities, spurred by the sectorial crisis in California in 2000, as well as similar episodes in several states in Canada, Norway and New Zealand. Malaysia initiated this process in the 1990's, but without result thus far. Although sectorial reform is intended to increase economic efficiency and bring about the optimum allocation of resources and optimum prices, it does not guarantee low

prices. In fact, sectorial reform tends to bring about high prices. This is because subsidies have led to the underpricing of electricity.

The Energy Communication has been working with MyPower, the Ministry of Energy, Green Technology and Water (KeTTHA) and other stakeholders to first put into place a governance framework that allows the regulator i.e. EC, to ensure optimal pricing. The governance framework is also designed to ensure a certain degree of transparency and to minimize information asymmetry among industry players, the regulator, consumers and other stakeholders.

Programmes have also been put into place to improve the efficiency of industry players, particularly TNB, so that existing inefficiencies do not lead to failures when the sector is liberalized. These include ring-fencing of the single-buyer and the system operator, and the establishment of an oversight panel (chaired by the EC) over the single-buyer and the system operator. Also put into place is the competitive bidding programme for capacity additions which, since 2010, has seen 5 exercises that have led towards improvement in efficiency at the generation level.

Power purchase agreements (PPAs) have also been reviewed, fine-tuned and standardized to ensure they do not lead to obscene profits and unintended gains. The PPAs now include a gas billing mechanism, coal price-setting framework and other mechanisms to bring about prices that are fair and efficient. EC has also begun publishing statistics, the National Energy Balance report, the Electricity Supply Industry Outlook report, and set up the Malaysia Energy Information Hub website to enhance information dissemination to the public. The grid system operator now has a website, too, accessible through the EC website.

The National Gas Task Force has been established to bring together industry players to ensure security of gas supply in Peninsular Malaysia. The Third-Party Access framework is being developed to allow industry players to import gas from their choice of source, as the national gas reserves are depleting. In addition to these, PETRONAS is developing an emergency response plan and a security code to deal with the possibility of failures in gas supply infrastructure. There are also working committees (chaired by EC) that oversee the importation of coal and other aspects of fuel supply security. MyPower has developed the Fuel Mix Policy to achieve a balanced fuel mix in electricity generation, which goes towards ensuring energy security, affordability and stability.

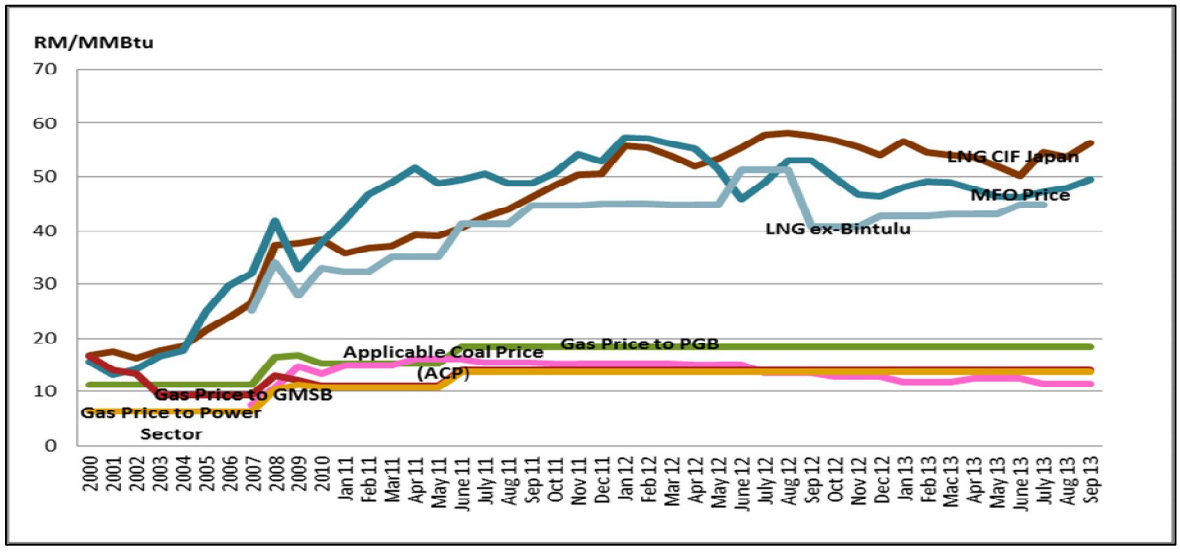
A performance-based regulatory framework (the Incentive Based Regulation or IBR) has been put into place to regulate TNB's tariff setting and review process, and to incentivize by means of performance indicators and penalties TNB's cost control initiatives, without jeopardizing its quality of service. For the first 3 years of this exercise (starting 2014), TNB will be allowed to enjoy the benefits of its cost control initiatives; but for the subsequent 3 years, it will be obliged to pass on these benefits to its customers. This is normally the last step before liberalization of the electricity sector, notwithstanding other impediments such as legacy issues, PPAs, stranded assets, etc. What we require now are circuit breakers built into the system such as price caps, vesting contracts and other mechanisms such as those in the electricity sector in Singapore to ensure that the market does not spin out of control.

Session 3
The Need for Electricity Tariff Review and Its Impact

The aim of this session is to establish the reasons for reviewing electricity tariff in Malaysia and to explore its possible consequences — intended or otherwise. Following an outline of the aims and methods of the review, the discussion then focused on the impact to the economy, industry and society. The Managing Editor of *New Straits Times (Business Times)*, **Mr Mustafa Kamil Mohd Janor**, moderated the session. He began the session by highlighting that in recent months, Tenaga Nasional Berhad (TNB) has been dropping hints that an increase in electricity tariffs is imminent. It has given its reasons: world fuel prices have been escalating, and tariff increase is a part of the government's plan to rationalize all subsidies in order to address its budgetary weaknesses. But when we say the word 'reform', no matter how we say it, the public will always come back to say, 'So how much more do we have to pay?' What is good for the government budget may not also be good for people's bank balances. And when it comes to our bank accounts and our wallets, it's every man for himself.

Ir Azhar Omar, Senior Director, Energy Commission, began Session 3 by deliberating on the links between subsidy and electricity reforms in Malaysia. He stated that any discussion on electricity tariff cannot avoid the issue of subsidy. That the size of subsidies in Malaysia is very large is widely known — in 2012, the government spent a total of RM42.4 billion on subsidies. The allocation for 2013 is RM37.6 billion, of which RM20-25 billion is for fuels, with subsidies on gas for power generation mounting to RM16 billion. These subsidies contribute towards the government budget deficit, the cost of servicing which was RM20.45 billion in 2012 and set to increase going forward. This state of affairs is unsustainable and subsidies must be reduced. As Figure 10 shows, gas supply for the electricity sector has been heavily subsidized, with the domestic sales price about 30% of the market i.e. LNG ex-Bintulu export price. With domestic gas reserves depleting and with the Peninsula's supply from Kerteh being insufficient to meet demand, it is almost inevitable that this subsidy will be reduced in the coming round of subsidy cuts that have already affected subsidies for petrol and sugar.

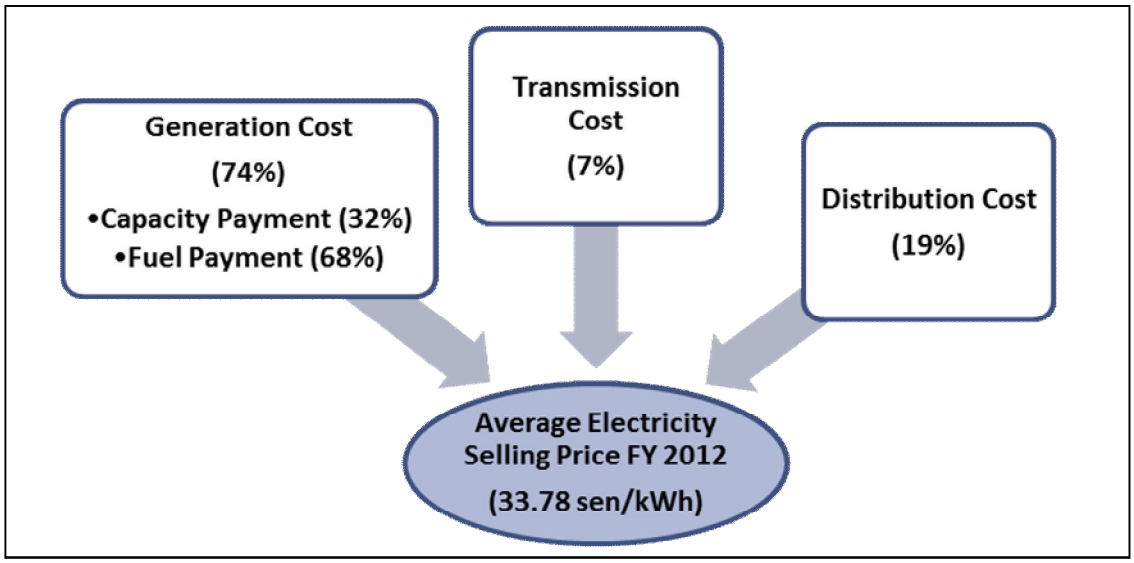
Figure 10: Domestic and Market Prices of Natural Gas (RM per MBtu)



Source: Azhar Omar

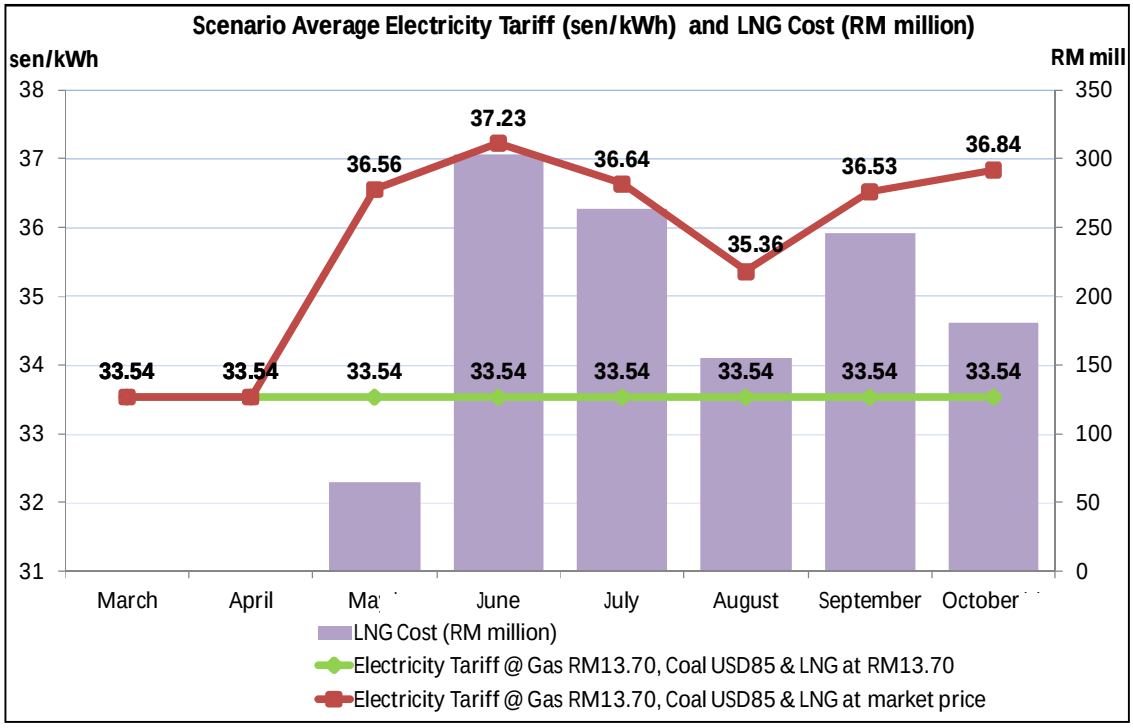
The cost component within the electricity tariff (Figure 11) shows that 74% of the 33.78 sen per kWh average electricity tariff is composed of the cost of generation, 68% of which is made up of fuel cost. This means 50% of our electricity bill is composed of fuel costs.

Figure 11: Cost Components within the Electricity Tariff



Source: Azhar Omar

Figure 12: Average Electricity Tariff Resulting from LNG Imports and Actual Tariff Based on Subsidized Gas Supply (sen per KWh)



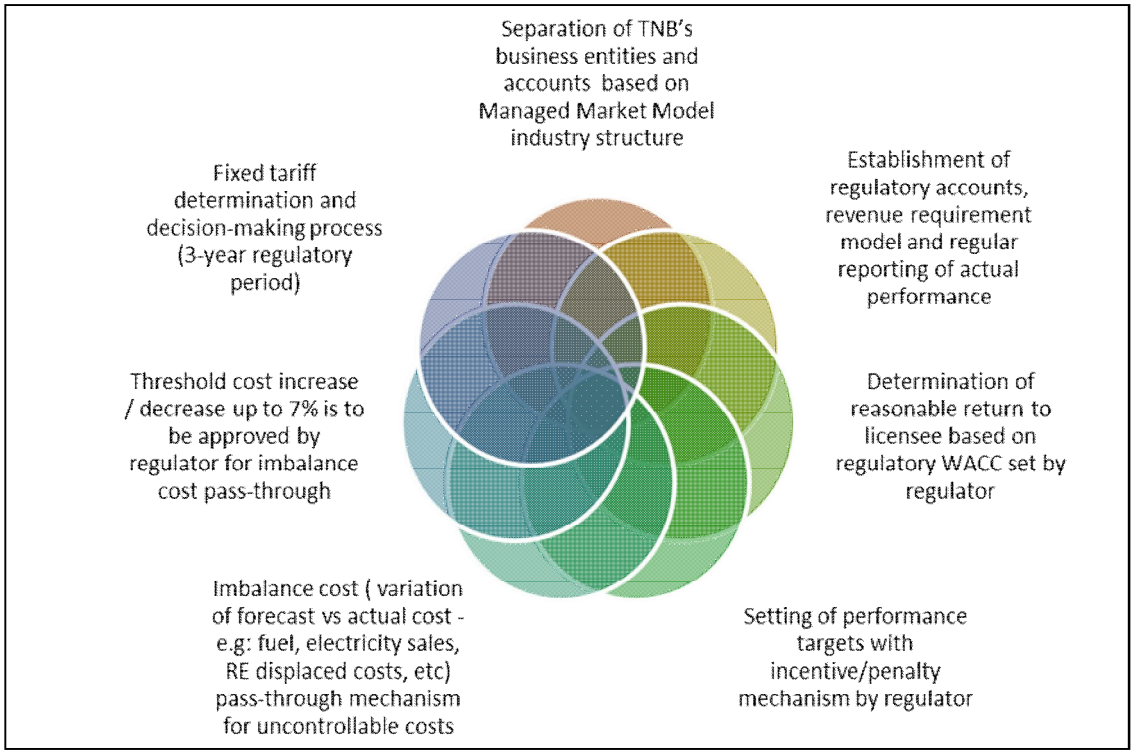
Source: Azhar Omar

Since May 2013, gas for electricity generation has been sold according to a two-tiered pricing scheme, with the first 1,000 mmscfd (million standard cubic feet per day or 391,000 MBtu) sold at a subsidized price and subsequent volumes sold at market price (currently between RM40 and RM44 per MBtu). The subsidized price will be gradually increased from the current RM13.70 per MBtu according to the government's subsidy rationalization programme. As a result of having to import gas at market price to make up for falling domestic supply and having to sell that at a tariff based on subsidized gas pricing, TNB has accrued a loss of RM700 million within a space of 5 months. This is depicted in Figure 12 .

In addition, there is also a need to raise electricity tariff in order to finance capacity replacement and addition, as well as expansion and improvement to the grid and installation of smart meters. The average electricity tariff if gas subsidy is reduced by RM3 per MBtu every six months, will also depend on what returns utilities will be allowed for the year (in 2011 it was 7-8% and in 2012 it was 5.5%).

The current tariff setting framework lacks scrutiny on regulated and unregulated functions of the utilities and their cost elements. As such, the Incentive-Based Regulation (IBR, see Figure 13) will be adopted as the new framework for tariff setting in order to promote efficiency within the electricity supply chain and bring about cost-reflective tariffs that are more transparent. To go along with the IBR, TNB will be re-organized into 5 separate business entities each with its own account, and each with its own targets. These

Figure 13: Salient Components of the Incentive-Based Regulation (IBR)



Source: Azhar Omar

targets will bring about rewards if they are exceeded and penalties if not met. The tariff will then be adjusted according the performance of these entities.

In order to drive down generation cost, competitive bidding for capacity installation has been instituted. Competitive bidding has brought down gas plant levelized tariff (calculated at the market price for gas) to 32-39 sen per kWh, compared to 38-44 sen per kWh of the second generation Power Purchase Agreements (PPAs), and 47-61 sen per kWh of the first generation PPAs. For coal plants, the levelized tariff has been brought down from a high of 27.14 sen per KWh to 22.51 sen per kWh.

Mr Ramamuthie Varathan, Vice Chairman, Federation of Malaysian Manufacturers (FMM) served as the second panelist for Session 3. From the point of view of FMM, even though it understands that the government cannot continue subsidizing gas as it has been doing, there are several points that need to be seriously considered. First, Malaysia aims to achieve developed country status by 2020 — it cannot achieve this without continued industrialization. And it cannot continue industrializing without a proper subsidy mechanism remaining in place. Energy is an important input for the manufacturing industry and it should be well managed, as should other important inputs such as land, labour and capital. As such, FMM requests the government to rationalize subsidies, in particular gas subsidy, in a gradual manner that does not hurt the manufacturing industry.

The government should also take into consideration the cumulative impact on the manufacturing industry and foreign investments of tariff revision as well as the goods and services tax that will take effect in 2015, and the 1% levy on electricity bills to finance renewable energy development. A better explanation of the proposed stabilization fund that is supposed to accompany tariff revision would help to defray industry's apprehension at subsidy removal. Further, the government should ensure that the revised tariff does not result in excessive profits accumulating to electricity suppliers. In this regard, the government should conduct public hearings that will allow the performance of electricity suppliers to be scrutinized.

FMM does not agree that the price set for piped gas should be equal to the price of liquefied natural gas (LNG). This is because the former does not incur liquefaction, shipping and regasification costs. Further, in line with the principle that domestic users should not subsidize exports, the price for LNG should be set at the lowest contracted price and not the weighted average of contracted prices. FMM notes that coal price has lowered considerably; it looks forward to new coal-fired capacity additions from 2015 that will help to keep generation cost to the minimum. FMM is also of the opinion that the burden of responsibility for reducing carbon dioxide emissions should not fall on Malaysia until it has achieved developed country status. Rather the burden should fall on developed countries that are responsible for most of the emissions to date.

Some companies in Malaysia have been proactive and taken steps to improve energy efficiency. They do this because they have to compete in the global market with industries in other countries. However, most registered businesses in Malaysia are small-medium enterprises that have done the same. The government should ensure that Malaysian industries are not rendered uncompetitive by the tariff revision. It should

support undertaking of energy efficiency measures by means of soft loans, tax breaks, human capital development and industry-academia collaborations. It should also take cognizance of the fact that other countries are subsidizing their industries, including by indirect means such as export rebates even while they are increasing energy costs and investing in energy efficiency measures.

FMM also believes that a clear policy decision must be undertaken, and implemented accordingly, as industries require certainty in order to undertake the necessary strategies and investments. In this regard, the failure to follow through with raising the domestic gas sales price since June 2011 has not instilled confidence within the industry on government policy decisions.

Dr Khalid Abdul Hamid, Head of Division (Econometrics), Ministry of Finance, presented a paper entitled 'An Integrated Input-Output Analysis'[5]. He said that the Malaysian Institute of Economic Research (MIER) is in the process of assessing the impact to the economy of a tariff revision. This study is based largely on the input-output table published by the Department of Statistics and the results of the T21 modelling exercise undertaken by the Economic Planning Unit.

How firms and households are affected by a tariff revision depends directly on the intensity of electricity consumption in production (for firms) and expenditure (for households), and indirectly on inter-industry linkages. Other dimensions that contribute towards economic impact (as measured using a general equilibrium model) are sectorial price impact and income distribution. The results show that a 10% increase in electricity tariff will result in an average of 0.21% increase in sectorial prices, with the consumer price index (CPI) increasing by 0.28%. 59% of the sectorial price increase occurs directly i.e. through electricity bills, and 41% occurs indirectly, through inter-industry linkages i.e. output prices increasing as a result of electricity bill increases.

The most electricity-intensive sectors (other than the gas and electricity sector) that will be most directly impacted are: yarn and cloth, accommodation, port and airport operations services, waterworks and restaurants.

In terms of welfare, although electricity consumption is positively correlated with income i.e. wealthier households consume more electricity, the share of expenditure on electricity in the household budget is negatively correlated i.e. poorer households devote more of their budget on electricity bills. Therefore, while the increase in electricity bills may be greater for wealthier households, the impact to household budgets may be greatest for the lower income households. Therefore, a tariff revision will be regressive.

Session 4
Transition and Adaptation

This session aims to explore the potential and means by which energy efficiency improvements can help Malaysian electricity consumers to adapt to a new electricity sector structure. The moderator was **Dato' Abdul Razak Abdul Majid**, Chief Executive Officer, MyPower Corporation. He argued that Malaysia is moving away from its traditional model of sectorial domination by a state-owned utility with a mandate to provide the greatest coverage at the lowest price. Why we are moving away is something that was discussed in earlier sessions; but we have to ask, also, what will happen to traditional utilities? Are they robust enough or flexible enough to meet new consumer demands for improved efficiency, quality of service and environmental stewardship?

Tan Sri Dr Fong Chan Onn, the former Chairman of the Sustainable Energy Development Authority (SEDA) began Session 4 by arguing that Malaysia is well behind its peers in renewable energy (RE) development. RE comprises only 1% of total electricity generation capacity. The major obstacle to RE development is low electricity tariffs, such that consumers do not feel the compulsion to invest in self-generation. As such, the first step towards a more balanced fuel mix is a tariff revision towards market-pricing. To convince the public to pay higher tariffs, TNB must unbundle its accounts in order to bring about more transparency and show to the public that it can achieve the targets it sets itself, and that the reforms will be a success.

Also in order to convince the public, the government will have to cease sustaining the independent power producers (IPPs) with generous power purchase agreements (PPAs), but instead to allow them to compete through an open bidding process that will ultimately benefit consumers. We also need to review our energy efficiency programmes so that firms and households are encouraged or compelled to adopt energy efficiency measures. In this regard, there is a duplication of responsibility between the Energy Commission (EC) and SEDA, although by legislation, greater responsibility is placed upon the EC, and it should be given greater powers to advance energy efficiency in the Peninsula.

Dr Soontorn Boonyatikarn, Director, Faculty of Architecture, Chulalongkorn University, shared some of his thoughts on designs for sustainable development and natural capitalism. He argued that, going back in history, we had an era when staple crops such as rice were the fuel for the primary source of energy, i.e. human and animal muscle. Since then we transformed into another energy era that carries on till today where the primary fuel is fossil fuels and the primary source of power is machines and electronics. Whereas the first energy era was minimally-polluting and sustainable (yet it did not last), the second energy era is highly-polluting and unsustainable.

Therefore, Dr Soontorn proposes that we transform into a new energy era under the paradigm of 'natural capitalism'. Under this paradigm, the primary fuels are supplied by nature (renewable energy or RE) in the form of wind, solar energy, water, biogas and biomass; and the primary sources of power are natural processes such as micro-biological processes, atomic processes, gravity and electromagnetism, evaporation and radiation.

RE can fully provide for our electricity needs by utilizing biomass and biogas to meet base demand, and solar and wind to meet peak demand. The innovations that are required are those to turn wastes into fuels, and those to harness solar and wind energy into performing useful work. These innovations have then to be incorporated into the design of buildings. The feasibility of such a building design has been proven by Dr Soontorn in the form of the award-winning Millennium Home (Figure 14), which consumes only 15% of the electricity of a comparable house of conventional design.

Figure 14: The Millennium Home

Source: Soontorn Boonyatikarn

An improvement over the Millennium Home is the Bio-Solar Home (Figure 15) which is energy self-sufficient. It is able to be thus despite the limited sunny periods of Thailand by orienting its 62.5 squre meters of roof southwards and cutting its energy requirements to one-fifteenth that of a comparable house.

Planting the right kinds of trees at the right places, combined with the pooling of processed waste water around the house can reduce the air temperature outside the walls by 7 degrees Celsius, i.e. from 39 to 32 degrees Celsius. This means the house's cooling system needs only to bring the outside air temperature down by 7 degrees Celsius to achieve a comfortable temperature of 25 degrees Celsius inside (as opposed to 14 degrees without the correct planting of trees and water pooling).

The garden, and openings to the house are carefully positioned to maximize the potential for natural lighting and natural ventilation of the house. Specially enginered glass is used in this house to cut out ultraviolet and infrared rays, while allowing the visible light spectrum through. It is also water self-sufficient, even through the dry season by promoting

Figure 15: The Bio-Solar Home

Source: Soontorn Boonyatikarn

condensation on the roofs as night-time temperatures drop. The condensed water is then collected, filtered and stored, to add to condensation collected from air-conditioning units and rainwater.

By converting waste produced in this house into biogass and fertilizer, and by processing waste water for cooling ponds and cropwater, this house is also able to eliminate water pollution. The production and utilization of biogas (as cooking and transport fuels) is especially important as decomposing waste produces methane that has 22 times the greenhouse effect of carbon dioxide.

Figure 16: The DNA Resort and Spa, Khao Yai, Thailand

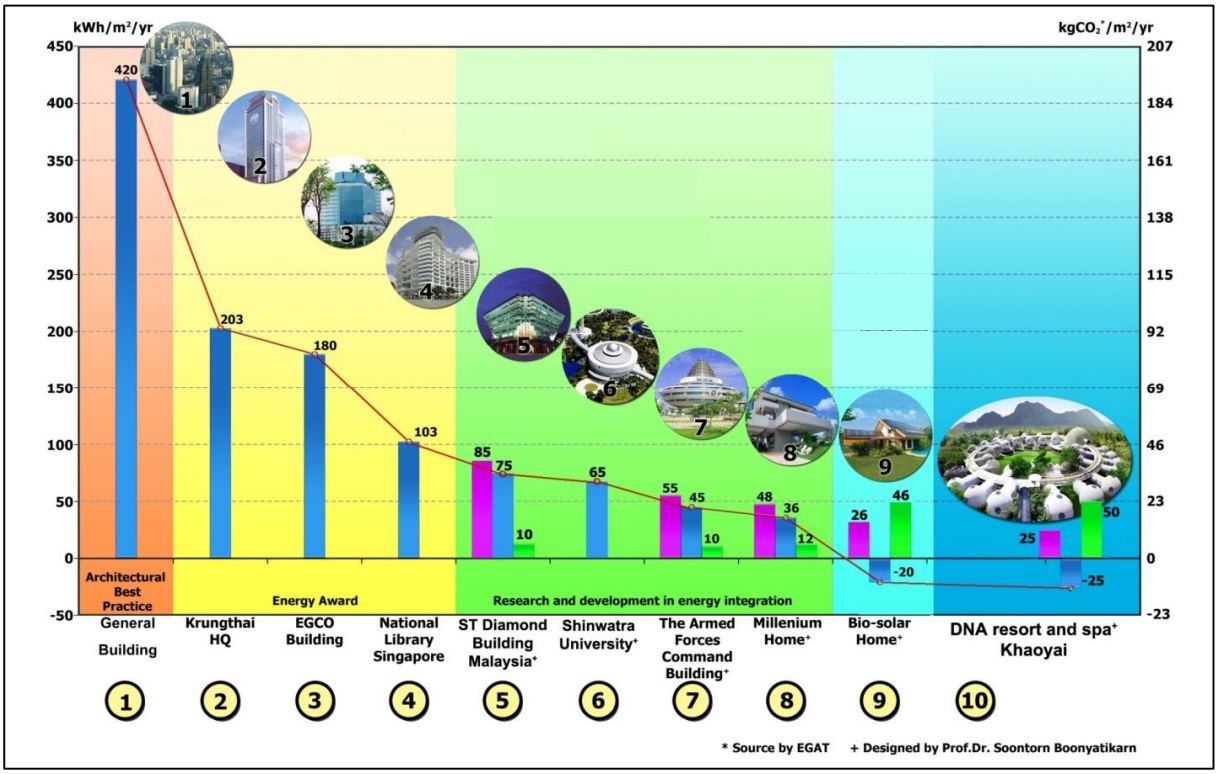
Source: Soontorn Boonyatikarn

With the installation of electricity storage, a house such as the Bio-Solar Home would be able to become an energy-producing home, selling excess solar energy to the grid. Dr Soontorn has pushed the limits of energy efficient buildings into a new paradigm territory (of Natural Capitalism) with his DNA (Design with Natural Assets) Resort and Spa in Khao Yai, Thailand (Figure 16), which he claims is 100% sustainable.

The DNA Resort and Spa was followed by the building of the Thai Government Center in Bangkok. This building requires only one-tenth of the air-conditioning of conventionally designed buildings, thus saving 2.1 billion Baht. In addition, associated investment in electricity sub-stations is lower by 105 million Baht (35 MW instead of 65 MW), and the energy bill is lower by 275 million Baht per year (from 350 million Baht per year).

Dr Soontorn's energy efficient design was also incorporated into the Energy Commission's Diamond Building in Putrajaya. This building is one of the foremost examples of its type in the region. According to the scale given in Figure 17, the Diamond Building (labelled 5) ranks 6th in the region or 3rd if only office buildings are included. Nonetheless, future designs must push the limits further into new paradigm territory, i.e. the designing of energy producing buildings such as the Bio-Solar Home and the DNA Resort and Spa.

Figure 17: Ranking of Energy Efficient Buildings by Energy Consumption (kWh/m^2/year) and Carbon Dioxide Emissions (kg CO_2/m^2/year)



Source: Soontorn Boonyatikarn

Mr Asfazaam Kasbani, Assistant Resident Representative (Energy and Environment), United Nations Development Programme (UNDP) served as the final panelist for Session 4. He highlighted the fact that some 2,000 professionals had been educated in energy audit and management by the conclusion of the Malaysian Industrial Energy Efficiency Improvement Project in 2006, in which the UNDP played a leading role. The UNDP had also been involved in other capacity-building projects related to energy, such as co-generation and biomass generation and building-integrated photovoltaic.

Overall, however, Malaysia has not been particularly successful in improving energy efficiency in the last fifteen years, with very few examples of the capacity-building projects and other studies being put into practice. The few exceptions include the Ministry of Energy, Green Technology and Water's (KeTTHA) Low-Energy Office building in Putrajaya, GreenTech Corporation's Green Energy Office building in Bangi, and the Energy Commission's Diamond Building.

Internationally, there exist markets for energy efficiency. The International Energy Agency estimated that some USD200 billion was invested in energy efficiency improvement, globally, in 2011, which is almost equal to the investment in renewable energy. However, the amount invested is still very much lower than the subsidies on fossil fuels. To illustrate the impact of energy efficiency improvement, we can take the example of Western Europe which began investing in energy efficiency following the Oil Crisis of 1971 — cumulatively, they have managed to save about 65% of their fuel consumption today.

World Bank data indicates that Malaysia's energy intensity (GDP per unit of energy) has increased 6% since 2005. On the contrary, Thailand's energy intensity has decreased 4% over the same period, while Singapore's has decreased 10%. Malaysia can learn much on energy efficiency from Singapore, Japan and Korea.

We have to act on energy efficiency now rather than focusing on economic development with little regard for sustainability, as such a course would be very difficult to alter or reverse, the longer it carries on. In this regard, we must act upon the two major drivers, which are policy and energy prices. The government can be aided in this effort by improving transparency in the way energy prices are calculated.

Synopsis of Discussions

Discussions on Energy Market Outlook and Regional Experience in Sectorial Reform

Generation efficiency

Improvement in electricity production efficiency can be an important instrument in the restructuring of the sector. Coal power plants are now able to reach a high level of efficiency through co-generation, converting 70% to 80% of fuel input into electricity and cooling, compared to the existing 30% to 40% rate of conversion of fuel input into electricity. However, the regulatory reforms are clearly not supportive of this improvement.

Consumption efficiency

It is undeniable that most of the subsidy accumulates to the higher income consumers who are not deserving of it. Unfortunately, the 'subsidy mentality' is quite entrenched among consumers. Nonetheless, the Malaysian government has firmly decided upon gradually reducing subsidies of all forms. A tariff redesign that penalizes high-voltage consumers was adopted in 2008 but it was so poorly received by the public that the tariff was amended. With such low tariffs as today, consumers have been largely unresponsive to the government's campaigns on energy efficiency and energy conservation. As such, it is necessary to decouple the subsidy from economic pricing, to introduce more transparency, to create a safety net for the lower-income groups and to reward efficient consumers, perhaps through rebates.

Utilization of budgetary savings

MyPower has submitted to the government some recommendations as to where it could channel the savings generated through gas subsidy reform but the government may have to consider attending to more pressing budgetary requirements.

Security of supply

As Malaysia increases its coal-fired generation and as most of the coal is imported from Indonesia — which itself is increasing its coal-fired generation — security of coal supply becomes an increasingly pressing concern. One way to address this is to improve generation efficiency and so limit import demand growth. Another way is follow the lead of other major Asian coal importers i.e. China and India, and buy coal mines abroad.

Discussions on Increasing Competition in Malaysia's Electricity Sector

Regulation versus free market

It is somewhat ironic that in order to liberalize a market we demand the establishment of a comprehensive regulatory structure. In this case, the regulator even has to set performance indicators for TNB while the tariff must be approved by the government. Setting up and running a regulatory structure is not cheap and the only way we can avoid having it is by not engaging in a sectorial reform in the first place. However, it appears that the cost of reforming and liberalizing the electricity sector is calculated to be less than the cost of an inefficient near-monopoly; and the cost of regulating a liberalized sector is expected to be less than the cost of a market out of control.

We also need to ensure that a liberalized sector will have sufficient operational reserves at all times. Even more importantly, given the high demand growth rate in Peninsular Malaysia, it would be foolhardy to not ensure that sufficient and timely investments in capacity additions and other infrastructures are made. This is a problem frequently encountered in liberalized electricity sectors around the world; but the case of Singapore may be instructive where the regulator will monitor the need for capacity additions and, if the utilities do not do this on their own, the regulator will initiate a competitive bidding exercise for a vesting contract lasting about five years.

Effectiveness of sectorial reforms to-date

As to the question of what we have achieved with the sectorial reforms to date, the answer is that we do not know because there is no parallel experiment where we do not go through the reforms. Nonetheless, except for the over-generosity of the early PPAs, we do not appear to have lost anything through the reforms and in all probability we have gained something through them on the net.

The value of subsidy

We cannot liberalize the electricity sector without dealing with the issue of subsidy. However, we do not truly know what the subsidy level is — that it is the difference between the market price and the actual domestic sales price is purely notional as the market price is only clear once the product is sold. We have estimated the cost of subsidy but we have not quantified the benefits of the subsidy.

Managing coal price

In order to manage the coal price, we may want to consider these possible actions: one is to establish a second domestic coal importer — whether public or private is another issue — in order to compete with the sole existing importer that is a subsidiary of TNB. Second, is to allow utilities to buy coal themselves. The latter, however, will be more problematic as rating agencies see this arrangement as riskier to the utilities.

The environmental impact of the utilization of coal

As to the issue of the increasing use of coal and its environmental impact, the utilities take the logical view that as long as the externalities associated with the use of coal and other fuels are properly reflected in the regulations, taxes and penalties, then they should be free to choose whichever fuel they see fit. It is not possible, under the current sectorial structure, to prevent utilities from using coal unless it is decided at the higher levels of government to actively discourage the use of coal and to institute policies to that effect.

Certainty of reforms

Reforms in Malaysia tend to be stop-start affairs and this particular reform — being incremental and over a long period of time — is susceptible to political intervention and objections from the industry as well as the public. This sort of uncertainty is bad for investment, whether from industry or from the public, especially as we need to increase energy efficiency on the supply and on the demand sides.

Discussions on the Need for Electricity Tariff Review and Its Impact

Market pricing

Fuel cost pass-through is something that the Peninsula's electricity sector had had since 1949 up to 1994, when it was abandoned for reasons that are more political than economic or financial. Therefore, electricity consumers should not be apprehensive of market-pricing. However, consumers need certainty as to whether or not market-pricing will be adopted; as such, what is most important for the government is to follow through with its plan for reforms and not to abandon or defer those plans for political reasons, as it had done previously.

Fair pricing

Reforms in the electricity sector will have to address other issues such as leakages and corruption within the sector. These issues are particularly apparent in the first generation power purchase agreements (PPAs) that give double-digit returns to independent power producers (IPPs). However, fair-price discovery has been much improved through the second generation PPAs and competitive bidding exercises. Furthermore, the quality of TNB's power supply has been much improved over the last 10 years; tremendous improvement was also seen over the preceding 10 years.

Transparency

TNB need not be broken-up into independent entities in order to bring about transparency and efficiency. It is sufficient for its accounts to be unbundled — something that was supposed to be undertaken in 1991. However, since the Energy Commission (EC) stopped publishing generation cost statistics in 2010, it is not possible for the public to find

out what the generation and supply costs of TNB and IPPs are. Neither is it possible for the public to learn what the costs associated with gas and LNG supply are. Although the Incentive-Based Regulation (IBR) is designed to enhance transparency and efficiency, EC recommendation on tariffs is still subject to the political interests of the government; similarly what information EC can release to the public is also subject to the approval of the government. It does not help public interest that any and every issue, changing electricity meters for example, can be and often is, politicized. Nonetheless, MyPower has recommended to the government in all its studies for such information to be made public and also for more public engagement exercises to be conducted in order to clarify the mechanics of tariff setting and the composition of electricity bills.

Impact of tariff increase

A study conducted by the Economic Planning Unit shows that a 15% increase in tariff will result in a 0.43% increase in the CPI and a 0.35% decrease in GDP. [The study referred to here may be the T21 modelling exercise; the impact of CPI and GDP stated here may be the immediate impact and not the net effect over the long-run, which may be more positive for the economy and inflation].

Alternative method of tariff-setting

The current tariff structure is based on calculation of the average tariff with a subsequent cross-subsidization of low-voltage consumers by higher-voltage consumers. Although a tariff based on fixed- and volumetric charges are more reflective of the cost of supplying electricity at different voltage levels — and MyPower has studied its feasibility — it is deemed that the Malaysian public is not ready to switch to such a tariff structure, on top of a transition to market-pricing and IBR.

Discussions on Transition and Adaptation

The environmental dimension of the reform

The problem is framed as an economic issue rather than a sustainability issue. This has led to a neglect of the environmental dimension of energy security. In addition to affordability, accessibility and availability, Malaysia should broaden its energy security dimensions to include energy efficiency and sustainability .

The bias towards industry in energy efficiency policy design

Government energy efficiency initiatives have been largely targeted at helping industries rather than households. Industries can benefit from double tax deductions if they invest in solar panels, but households are not eligible for any tax benefits from the same investment. Furthermore, industries are allocated the bulk of quotas for feed-in-tariffs, whereas households face problems benefitting from that scheme because TNB is geared to be a seller of electricity and not a buyer. There is a lot of money to be made in the electricity sector and, since the introduction of feed-in-tariffs, in renewable energy and

the bulk of it accrues to the rich. However, there is not a lot of money to be made from energy efficiency, so it is not as 'sexy' and is not emphasized.

Energy efficiency improvement among households

With tariffs at the current low levels, there is no incentive for the public to consider the inefficiencies and sustainability of the system, and no motivation for the public to take the lead in improving the efficiency of their energy consumption. Current average electricity tariff is 33.54 sen/kWh. Without any subsidy, this would increase by about 50% to 50.31 sen/kWh. This would still be lower than the average tariff in Singapore or the Philippines, but it would very likely spur consumers to reduce their wastage of electricity. At the same time, not many people are able to build or renovate their houses to become energy efficient/neutral/producing as Dr Soontorn's, so the lower income population will continue to pay more and more for electricity. The net effect is that we are neglecting the social equity aspect of energy security.

A tool that would help households improve their energy efficiency is the smart meter which shows electricity charges in real-time. Adoption of this tool in Singapore has resulted in immediate 3-4% decline in electricity consumption as consumers cut unnecessary use of electrical appliances.

The Way Forward

Shahnaz Sharifuddin

There are two parts to the reforms proposed for Peninsular Malaysia's electricity sector (and discussed in the Forum). The first part is aimed at improving competition in the sector. This involves two main thrusts: one is an unbundling of the accounts of the government-linked, vertically-integrated TNB, which dominates the sector. This is expected to level the playing field at the generation level, thus boosting competition between utilities at this level. This will follow the institution of competitive bidding process for electricity generation which has seen five successful exercises to-date. Competitive bidding will eventually replace existing power purchase agreements (PPAs) that are established by negotiation and that have been criticized as being over-generous to the IPPs.

The second thrust involves improving the efficiency of TNB through the Incentive-Based Regulation (IBR). This involves establishing performance targets for TNB as it is unbundled, with rewards and penalties for achieving or missing those targets.

The second part of the reform is aimed at bringing electricity tariffs to reflect market prices for fuel inputs. This involves a gradual removal of gas subsidies by increasing the selling price to utilities. The proposed increment is USD1 per million British thermal units (MBtu) every six months beginning in 2014. It is this part of the reform that is controversial among the public and it leads to further questions on the workings of the sector.

The case for tariff revision is compelling: gas supply for power production is heavily subsidized (to one-third of its export price), but domestic gas resources are depleting and the Peninsula has to import liquefied natural gas (LNG) at market prices to meet demand. As demand for electricity grows, so does the cost of subsidizing gas.

At this point, there is a contention on the cost of subsidizing gas: how do we calculate its cost if the subsidy is only implicit? The generally accepted method is to compare the actual selling price with the price that could be obtained by selling in the open market — in this case, it is LNG exports to Japan[6]. Using this method, it is calculated that gas subsidy can total to between USD38 and 52 billion between now and 2030 (in real terms)[7]. That is a very substantial amount, 60 percent of which will be lost through generation and transmission processes, and wasted through inefficient consumption.

If we are able to calculate the cost of subsidy, we have yet to estimate the benefit of the subsidy. Limiting our consideration to economics, we may gain some idea as to how beneficial the subsidy is through projections. The T21 modelling exercise undertaken by the Economic Planning Unit shows that beyond an initial adjustment period, subsidy removal will result in faster economic growth[8]. This conforms to conventional economic thinking that subsidies are generally beneficial in the early stages of development when cheap energy is required to kick-start economic activity. Beyond that, subsidies tend to produce

distortions on markets and can act as a drag to growth, such that removing them will improve economic performance.

Representatives from industry and civil society at the Forum generally accept the fact that the gas subsidy is unsustainable but remain concerned over the affordability of electricity. What tariffs would be without subsidy has not been ascertained. However, a very rough approximation to this i.e. if subsidy was totally removed today, all other things remaining the same, average electricity tariff would probably be about 52 sen/kWh or 52% higher[9].

In order to restrain tariff increases, the gas subsidy will be removed only gradually and the sectorial fuel mix will shift from gas to coal, which is 60% cheaper than gas at market prices. The lowest price for electricity will be sought through competitive bidding for electricity generation and an unbundling of TNB accounts, so that transmitters, retailers and consumers can buy at lowest cost. In addition, tariff cross-subsidization to maintain a lifeline band assures the affordability of electricity for low-income households[10].

The issue of affordability is closely related to the issue of consumption efficiency. Statistics show that Malaysians consume more energy per household and per unit of GDP than comparable countries[11]. This suggests that we can cut some energy use without sacrificing comfort or productivity. Deeper cuts without unduly affecting living standards or productivity can only be achieved through investment in higher efficiency buildings and machineries. In order for this to happen, however, tariffs must increase.

The bulk of energy efficiency improvement must come from higher income households and firms. High-income households and large firms can be expected to achieve this on their own, and Dr Soontorn has shown how this is possible through his zero-energy and energy-producing homes and office buildings[12]. Middle-income households and small and medium enterprises (SMEs), however, will probably require government assistance to invest in energy efficiency. The urgency of this requirement is apparent when it is taken into account that these consumers are also greatly affected by fuel subsidy reduction and the introduction of the goods and services tax.

There was a general agreement at the Forum that certainty is critical to public acceptance. Consumers must be certain that the proposed reforms will be followed through. The previous attempt to remove gas subsidy in 2011 — halted after one increment — left many investors in energy efficiency unable to benefit from their investment. Also with regard to investment in energy efficiency, the failure to follow through with the previous reform has built up a certain inertia among a public that is accustomed to the subsidization of energy and the politicization of tariffs. As such, it is necessary to establish certainty as to the implementation of the proposed reforms in order to generate the correct response from consumers.

Transparency is also a demand put forward strongly in the Forum. It stems largely from discontent over the over-generosity of the first generation power purchase agreements. Consumers want to know how and for what they are being charged. This

requires itemized billing and publication of comprehensive statistics, including items such as fuel supply costs, utilities' generation costs, utilities' selling price, transmission and distribution costs, as well as leakages and service quality. The Energy Commission (EC) has commendably improved its publication of statistics; however, greater clarity is required as to how tariffs are arrived at.

In a liberalized market, the regulator must ensure that consumers are protected from the vagaries of the free market and that they see the benefits of market liberalization. The recent experience of the UK suggests that these are not assured: UK electricity prices increased 11.1% in 2012 while wholesale prices went up by only 1.7%, and a House of Commons committee is currently hearing evidence into market manipulation by the 6 big power suppliers. As there is no perfect regulatory model, it is necessary to have sufficient transparency to reveal flaws and failures within the system in order that remedial measures may be undertaken.

In the perspective of energy security, three further issues must be addressed. These are generation efficiency, carbon dioxide emissions (CO_2) and supply stability, and they are very much tied to the increasing use of coal for electricity generation. Coal is the most CO_2 intensive of the major fuels and increase in CO_2 emissions from electricity generation must be restrained with higher efficiency power plants or offset with reforestation projects.

New ultra-super-critical power plants are 36% more efficient than existing coal-fired power plants and emit 40% less CO_2. They can improve Malaysia's energy security with respect to generation efficiency, and limit, if not avoid, deterioration with respect to CO_2 emissions. However, their deployment will be limited by the lock-in of existing infrastructure.

As increasing levels of Malaysia's fuel requirement is met through imports, there arises a need for strategies to ensure stability of import prices. For LNG, this is commonly done through securing long-term supply contracts and the acquisition of resources overseas. For coal, the same strategies should be supplemented with a strategic stockpile that will help utilities go through periods of high prices.

Fuel mix diversity is another strategy to ensure supply stability — going by the Approved Development Plan, this is set to deteriorate with increasing reliance on coal, but improve significantly with the interconnection with Sarawak's hydroelectric power plants[13]. Increasing the deployment of renewable energy and the adoption of nuclear power are measures that can further diversify the fuel mix and ensure supply stability.

Although cutting the government budget is often cited as a reason to rationalize subsidies, the subsidy on gas is implicit. That is, no money is paid out to keep its price low. Rather, revenues are forgone by selling at lower prices. This means that reducing gas subsidies will not lower expenditures, but it will raise revenues. How these extra revenues will be spent determines whether or not the reforms create a net positive effect, particularly in the perspective of energy security, and is therefore critical to public acceptance of the reforms.

If the gas subsidy is removed as proposed, its price will reach market levels by 2017. The savings between now and 2030 can amount to between USD33 and 45 billion (in real terms)[14]. The extra revenues accruing to the government via the gas producer, PETRONAS, is not calculated. However, a very rough approximation serving to indicate its magnitude would be USD1.6 to 2.2 billion between now and 2030, or an average of between USD96 and 132 million per year (in real terms)[15].

There are at least three areas that should be funded with the extra revenues in order for the reforms to create a net positive impact. One is to assist households and businesses invest in energy efficiency in order that electricity consumption is reduced without a loss to living standards or productivity.

The second is to fund reforestation and forest conservation in order to offset the increase in CO_2 emissions arising from the switch from gas to coal for power generation.

Third, there should be investment in the transport sector in order to reduce petrol consumption, thereby bringing about a reduction in CO_2 emissions as well as explicit subsidy on that fuel.

Lastly, a portion of the extra revenues should be devoted towards creating a strategic coal stockpile that would lend towards maintaining price stability for electricity.

To conclude, there is sound reasoning to revise electricity tariffs and reform the electricity sector. The cost of gas subsidy is increasing as domestic gas production is depleting, and there is a high degree of inefficiency within the system that must be addressed. Rejecting the proposed reforms will lead Peninsular Malaysia down the direction of Indonesia where politicization of tariffs are stalling the necessary sectorial reforms, despite the heavy and increasing cost of subsidy, declining local supplies of energy, infrastructural inadequacy and relatively poor service quality.

On the other hand, acceptance of the reforms should put Peninsular Malaysia in the trajectory towards Thailand which has achieved, or is very close to achieving, most of the objectives that we seek through our reforms — unbundling of accounts, generation capacity addition through competitive bidding, 3rd party access to the gas network and electricity grid, fuel cost pass-through and transparency through itemized billing.

In order to gain public acceptance of the reforms, there must certainty as to implementation, transparency as to how and for what consumers are being charged, and correct spending of the extra revenues generated from subsidy removal. Four areas should be funded with those revenues in order to create a net positive impact — assistance to households and businesses to improve their energy efficiency, reforestation and forest conservation to offset CO_2 emissions from coal power, reduction of petroleum consumption in the transport sector and establishment of a strategic coal stockpile to ensure supply stability. While these measures create the right environment, consumers will have to be proactive and improve their energy efficiency in order to realize a better energy future for Peninsular Malaysia.

Endnotes

1. Based on the IEEJ-ACE projection, average thermal efficiency assumptions are increased from 40% to 49% and 34% to 38% for gas and coal, respectively, in 2020.

2. Million British thermal units.

3. Based on the IEA projection for Japan's LNG import price, less USD1 per MBtu for shipping from Bintulu.

4. Imputation is based on the difference between the export price and the domestic sales price.

5. This study, undertaken by Dr Khalid Abdul Hamid and Dr Zakaria Abdul Rashid of Malaysian Institute of Economic Research (MIER), is still on-going. Results discussed in the forum are only preliminary.

6. Malaysian industries argue that domestic gas should not be priced at the rate of the LNG export price as supplying gas by pipeline is lower in cost. There is merit to the argument; however, for the purpose of calculating opportunity cost, LNG export price is taken as the market price.

7. This is based on the assumption that domestic gas supplied at the subsidized price of RM13.70 per MBtu remains constant in volume at 1,000 million standard cubic feet per day. See Figure 5.

8. The exercise projects that, with the gradual removal of the gas subsidy to achieve market pricing by 2015, GDP growth to 2020 will be 0.3% lower compared to the scenario where gas subsidy is retained, but will be 0.1% higher from then on.

9. If the coal price passed-through into tariff was to be revised also (from USD85 per tonne to USD107.90 per tonne) tariffs would increase to probably about 54 sen/ kWh, or 60% higher.

10. Taken as synonymous with low-voltage residential consumers.

11. Of 22 countries whose gross domestic product per capita (GDP per capita, measured at purchasing power parity in 2005 USD) lie within 25% of Malaysia's, only three have electricity consumption per capita and/or per GDP greater than Malaysia's. They are: Bulgaria, Kazakhstan and the Russian Federation. Source: IEA Key World Energy Statistics 2013.

12. See page 23.

13. The Herfindahl-Hirschman Index (HHI) is currently 0.46; it will deteriorate to 0.52 with the switch to coal, but then improve to 0.44 with the Sarawak interconnection. See Figure 1.

14. Calculations are based on the same assumption applied to calculations of the cost of subsidy (see Figure 5).

15. Conservatively assuming that profits work out to 10% of revenues (i.e. subsidy savings), and dividends accruing to the government work out to 50% of profits. Excludes taxes and other incomes.

Appendix

Role Players

Session 1 Energy Market Outlook and Regional Experience in Sectorial Reform

Moderator	Datuk Loo Took Gee Secretary General Ministry of Energy, Green Technology and Water
Speaker	Mr Shahnaz Sharifuddin Analyst Institute of Strategic and International Studies (ISIS) Malaysia
Panelist 1	Dr Maxensius Tri Sambodo Economic Research Centre Indonesian Institute of Sciences (LIPI)
Panelist 2	Dr Pallapa Ruangrong Commissioner Energy Regulatory Commission (Thailand)
Panelist 3	Prof Dr Darryl Jarvis Associate Dean, Faculty of Liberal Arts and Social Sciences, and Head, Department of Asian and Policy Studies The Hong Kong Institute of Education

Session 2 Increasing Competition in Malaysia's Electricity Sector

Moderator	Dr Rozali Ali Distinguished Fellow ISIS Malaysia
Speaker	Datuk Shahrol Azral Director Performance Management and Delivery Unit (PEMANDU)
Panelist 1	Dato' Zulkifli Ibrahim Managing Director Jimah Energy Ventures Sdn Bhd
Panelist 2	Datuk Ahmad Fauzi Hassan Chief Executive Officer Energy Commission

Session 3 **The Need for Electricity Tariff Review and Its Impact**

Moderator	Mr Mustafa Kamil Mohd Janor Managing Editor *New Straits Times (Business Times)*
Speaker	Ir Azhar Omar Senior Director Energy Commission
Panelist 1	Mr Ramamuthie Varathan Vice Chairman Federation of Malaysian Manufacturers
Panelist 2	Dr Khalid Abdul Hamid Head of Division (Econometrics) Ministry of Finance

Session 4 **Transition and Adaptation**

Moderator	Dato' Abdul Razak Abdul Majid Chief Executive Officer MyPower Corporation
Speaker 1	Tan Sri Dr Fong Chan Onn former Chairman Sustainable Energy Development Authority
Speaker 2	Prof Dr Soontorn Boonyatikarn Director, Faculty of Architecture Chulalongkorn University, Thailand
Discussant	Mr Asfazaam Kasbani Assistant Resident Representative (Energy and Environment) United Nations Development Programme

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