



# 2017

## A YEAR IN REVIEW

### REMARKS FROM CEO, CHARANJIT SINGH GILL

Season's greetings!

It has been an exciting and productive year for SB and the wider Malaysian Electricity Supply Industry. I would like to begin by expressing my gratitude to the entire SB team for their hard work, diligence and perseverance. The effort and commitment shown by SB staff have instilled me with the utmost confidence that SB will continue to overcome any issues that arise through the operational changes within the industry, and ensure Peninsular Malaysia has a secure and reliable electricity industry long into the future.

Beginning with the launch of our new corporate identity earlier this year, SB continues to stride further in enhancing its transparency and accountability through the development of its own 10-year business plan, migration of email address and the signing of SLA with TNB ICT. Other key achievements to note are the full operationalization of NEDA, enhancement of SB's load forecast methodology, review of the Generation Reliability Standard and successful execution of power purchase agreements for Pengerang Power Sdn. Bhd. and Southern Power Generation Sdn. Bhd. At the international level, SB

was instrumental in realising the Laos-Thailand-Malaysia Power Integration Project. The creation of SB's newsletter, WattsUp, early this year was also an effective medium to update the industry on the ongoing developments in SB and MESI.

Month of October also saw the official launching of the SB website by KeTTHA and ST at the International Greentech and Echo Products Exhibition and

Although it is a marginal 2MW increase from the previous year, it characteristically shows that our country's demand is becoming increasingly sensitive to weather. The side effects of Typhoon Lan which caused a heat wave in certain parts of Peninsular during this particular week drove electricity demand to levels seen during last year's El Nino – particularly due to air conditioning load used to combat the heat.

**“On the system side, Peninsular Malaysia recently recorded a new peak demand of 17,990MW on 23 October 2017.”**

Conference Malaysia (IGEM 2017) held in Kuala Lumpur. The launch marked a significant achievement by SB in demonstrating transparency, independence and non-discriminatory conduct in its operations. The website provides the public with market operation information such as the historical and forecasted demand, as well as the weekly and monthly generation outlook.

On the system side, Peninsular Malaysia recently recorded a new peak demand of 17,990MW on 23 October 2017.

As we conclude 2017 and look forward to an exciting year ahead, on behalf of everyone in SB, we thank you all for your continuous support. We wrap up our final WattsUp issue of the year by featuring the SB family in the front cover, as a dedication to their passion, energy and enthusiasm.

Wishing you all a safe and happy holiday. 🎉

*Charanjit Singh Gill*  
**Chief Executive Officer  
Single Buyer**

### WATT'S INSIDE

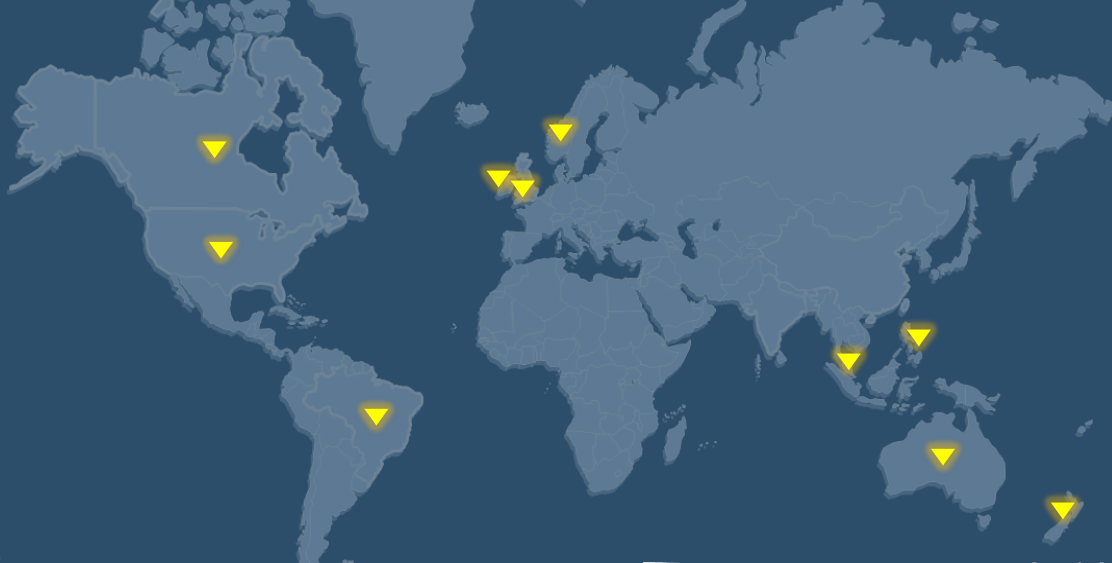
- P2** Industry & Governance—IBR & Tariff
- P3** NEDA Updates & SB Website Launch

- P4** From Photons to Electrons—Solar PV Performance
- P6** Watt's Happening
- P8** Meet the People Behind SB—Akmarhayu
- P9** SB-ian Corner
- P10** Long Term System Planning Workshop & The Life and Times of the Prophet
- P11** ST's Executive Attachment Programme in SB
- P12** Electric Power Transmission



Scan for online version

# IBR INCENTIVE BASED REGULATION



A regulatory framework to connect goals, targets and measures utility performance. Sometimes called as **Performance Based Regulation** or **PBR**.

Implemented in various jurisdictions such as Australia, UK, US and the Philippines.



“**Carrot and Stick**” approach enables the regulated entity to receive incentive or penalty based on operational performance.

IBR is one of the most common regulatory framework for utilities (electricity, gas, water) where there is a monopoly.



In Peninsular Malaysia’s context, IBR is a mechanism for the electricity tariff determination, focusing more on efficiency gains and a structured process in tariff evaluation.



## IBR IN NUMBERS

**3**  
years

One cycle of IBR, referred to as Regulatory Period (“RP”)

**2014**

Interim RP

**2015  
to  
2017**

**RP1**

**38.53**  
sen/kWh

**RP1**  
Average  
Electricity  
Tariff



Domestic

**31.66**  
sen/kWh



Commercial

**47.92**  
sen/kWh



Industrial

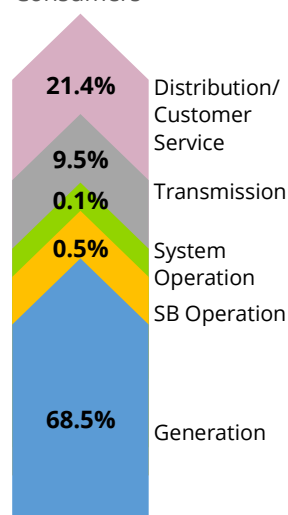
**36.15**  
sen/kWh

**5**

**Major Tariff  
Components**



Electricity  
Consumers



Sources:

<http://www.st.gov.my/index.php/ms/download-page/category/107-briefing-session-on-electricity-tariff-in-peninsular-malaysia-19-december-2013.html?download=427:briefing-session-on-electricity-tariff-in-peninsular-malaysia-19-december-2013>.













# SMP SYSTEM MARGINAL PRICE

## What is System Marginal Price?

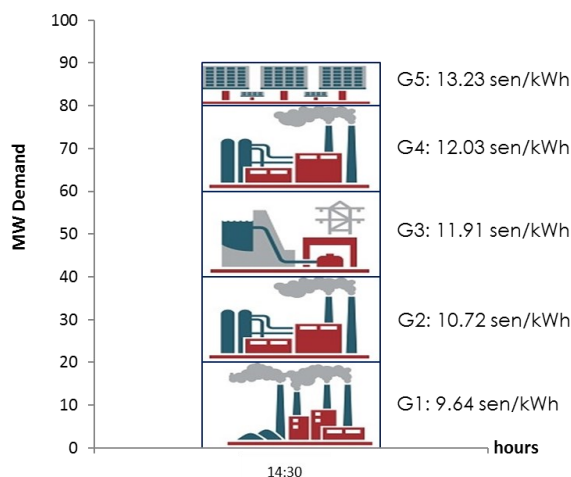
In NEDA, the System Marginal Price (SMP) is defined as the energy price of the most expensive marginal generator scheduled/ dispatched to meet the demand in the half-hour period.

SMP is the price paid to the Price Takers for the energy exported to the transmission/ distribution grid. ⚡

## Criteria of a Marginal Generator

- |   |  |   |  |
|---|--|---|--|
|  A centrally dispatched generating facility |  Not a hydro plant  |  Not a testing unit  |  Not ramping up at Maximum Ramp Up Rate                       |
|  Running under normal industry conditions   |  Not a renewable plant  |  Not subject to gas curtailment                                    |  Not Ramping down at Maximum Ramp Down Rate                   |
|  Running on primary fuel                    |  Not a constrained generator due to transmission or fuel constraint |  Not a must run plant whether on active power or ancillary service |  Not generating at maximum stable load or minimum stable load |

## Setting the SMP: An Example



- ⇒ Highest energy cost at 14:30 hour is 13.23sen/kWh from G5
- ⇒ However, G5 is a solar generator, therefore G5 cannot set the SMP
- ⇒ The next highest generator is 12.03sen/kWh from G4
- ⇒ G4 meets all the conditions to set the SMP, hence the SMP for 14:30 hour is 12.03sen/kWh

## SB WEBSITE LAUNCH

12 October 2017

The SB website was launched by KeTTHA and ST at the International Greentech and Echo Products Exhibition and Conference Malaysia (IGEM) held in Kuala Lumpur on 12 October 2017.

The website will be an important platform to disseminate information regarding Single Buyer's operations. The website also provides the public and industry players with market operation information such as the historical and forecasted demand, as well as the weekly and monthly generation outlook.

The publication of these information, which are updated on a real-time basis, is an important milestone for SB in demonstrating transparency, independence and non-discriminatory conduct in its operations. More information will be included in the website over time, which will improve data visibility and reporting for the market players. ⚡

For more information visit: [www.singlebuyer.com.my](http://www.singlebuyer.com.my)





# From PHOTONS to ELECTRONS

## PERFORMANCE OF SOLAR PV PLANT

*In the previous edition, we have explored on the intermittency of solar PV plant and how Ta'u Island can rely solely on solar PV and batteries for three full days of electricity supply without sunshine. However, similar to any type of generation technology, the performance of solar PV plant may vary after installation, dependent on actual site condition.*



### High solar PV modules temperature does not mean better performance!

In fact, the temperature of solar PV module has an inverse correlation to the performance of solar PV plants, as shown in Figure 1. The plot also shows that thin film solar PV cells (manufactured by First Solar) is more efficient than standard multicrystalline technology as the module temperature goes beyond the Standard Test Condition (STC) temperature (25°C).

Nevertheless, in general, the efficiency of solar PV plants decreases as the module temperature increases. The increase in temperature results in greater atom vibrations in the p-n junction cell, subsequently impede charge carrier movement and hence decreases cell efficiency<sup>1</sup>. Coincidentally, the design of the solar PV plants has taken into account three mechanisms of heat transfer i.e. conduction, convection and radiation as illustrated in Figure 2.

<sup>1</sup><http://large.stanford.edu/courses/2013/ph240/alshakhs2/>

<sup>2</sup><http://www.aguacalientesolarproject.com/en/Technologies-and-Capabilities/PV-Modules/First-Solar-Series-4-Modules>

<sup>3</sup><http://www.pveducation.org/pvcdrom/modules/heat-loss-in-pv-modules>

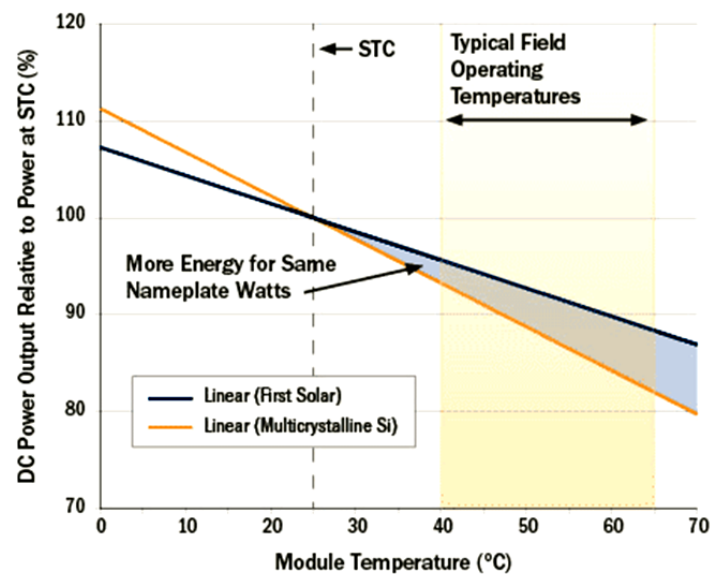


Figure 1: Solar PV output vs module temperature<sup>2</sup>

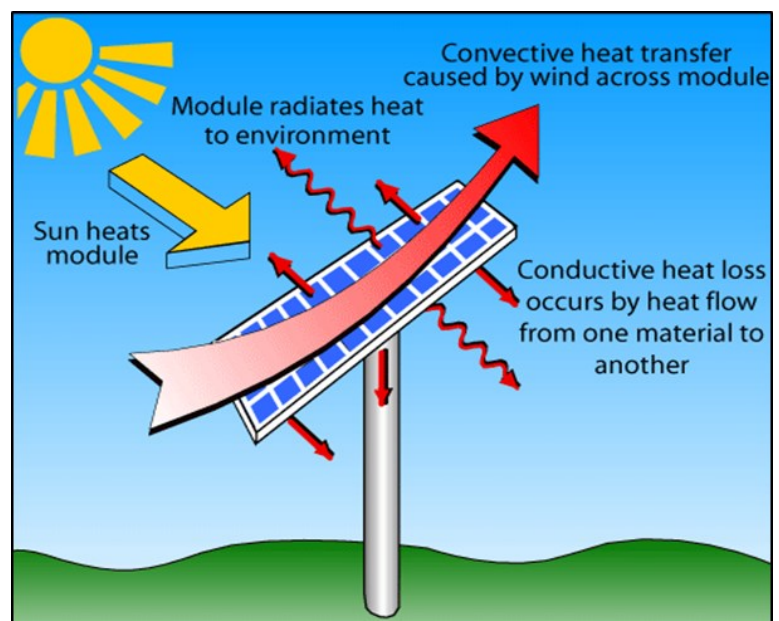


Figure 2: Heat Loss Features of Solar PV<sup>3</sup>

## Irradiance is the key for solar PV performance!

What is irradiance?

According to Oxford Dictionary:

[mass noun]

1 **Physics**  
The flux of radiant energy per unit area (normal to the direction of flow of radiant energy through a medium).

+ Example sentences   - Synonyms

**radiance**, light, brightness, luminosity, shine, gleam, glimmer, incandescence, phosphorescence, luminescence

[View synonyms](#)

2 **literary** The fact of shining brightly.

- Synonyms

**light**, shining, brightness, brilliance, luminosity, radiation, beams, rays, illumination, blaze, glow, luminousness, gleam, lustre, glitter, sparkle, flash, dazzle, shimmer, glare

Figure 3: Definition of irradiance<sup>4</sup>

In solar PV context, irradiance is the density of energy obtainable in an area, measured as Watt per area ( $\text{W/m}^2$ ) which directly defines the amount of energy produced by solar PV. In STC or during factory testing, the amount of irradiance assumed is  $1000 \text{ W/m}^2$  for the corresponding advertised efficiency value of the solar PV. Figure 4 illustrates the ranges of irradiance attainable depending on weather condition of the day.

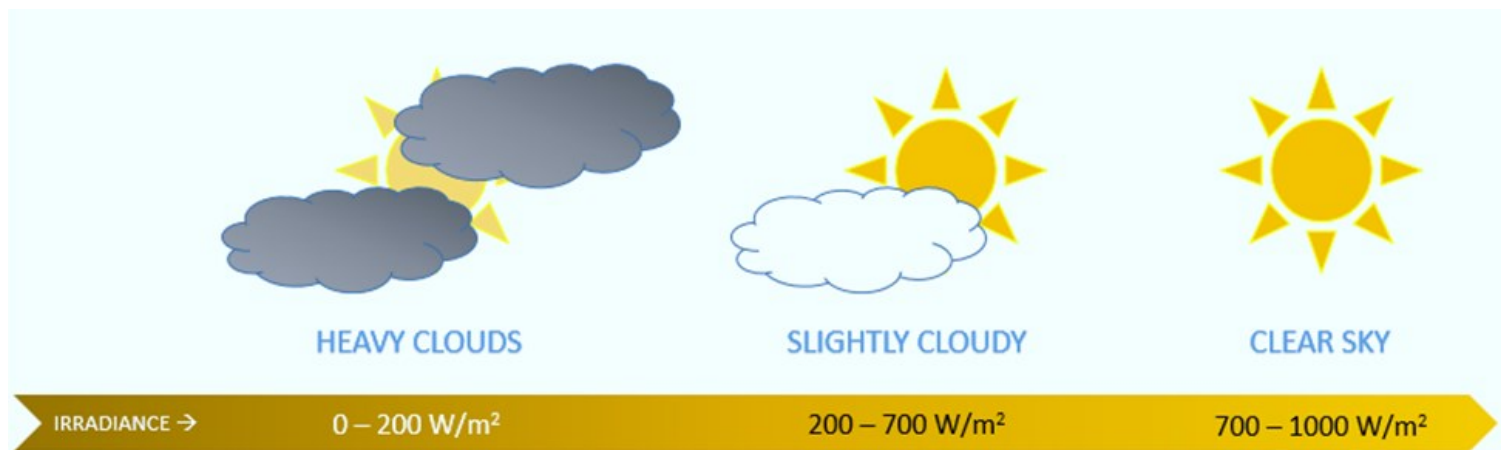


Figure 4: Approximate Irradiance Level vs Weather Condition

Since the sky is not always clear, solar PV plant operators/owners should capitalise every opportunity to maximise the output of their solar PV plants. Through appropriate design and proper maintenance schedule, the operation of solar PV plants can be optimised through minimisation of potential losses such as electrical losses (e.g. cabling, inverter and transformer), shading, dust and water accumulation.

### Performance Ratio (PR) to measure Solar PV performance.

The PR measures how effectively the plant converts sunlight collected by the PV panels into AC energy

delivered to the off-taker relative to what would be expected from the panel nameplate rating. This metric quantifies the overall effect of losses due to inverter inefficiency, wiring, cell mismatch, elevated PV module temperature, reflection from the module front surface, soiling, system down-time, shading, and component failures. Since the design parameters are quoted as STC, it is important for the off-takers to assess the PR once the solar PV plants are assembled and ready for operation. The formula to calculate PR is simply to divide the actual output of the solar PV with the expected (calculated) output based on the prevailing irradiance values. PR values for new systems typically range from 0.6 to 0.9 and impossible to reach 1 (100%)<sup>5</sup>.

<sup>4</sup><https://en.oxforddictionaries.com/definition/irradiance>

<sup>5</sup><https://www.nrel.gov/docs/fy13osti/57991.pdf>



# WATT'S HAPPENING

OCTOBER  
NOVEMBER 2017



## 6 SEPTEMBER 2017 | PORT DICKSON VISIT TO REDSCAPE SDN BHD

ST, SB, TNB Fuel and CIDB visited Redscape Sdn. Bhd., the one and only factory in Malaysia which utilises bottom ash (one of the main residues of a coal plant) to manufacture bricks.

This visit is to identify ways of enhancing, promoting and sustaining the utilisation of bottom ash, by exploring a wider range of bottom ash applications without compromising the environment, health and safety.



## 12 OCTOBER 2017 | KUALA LUMPUR MEETING ON POWER SYSTEM STUDY (PSS) WITH NUR

A meeting between NUR, NUR's appointed consultant, SB and TNB Grid Planning was held to kick-off the Power System Study (PSS) process. The PSS is one of the pre-requisites to register for NEDA.



## 24 OCTOBER 2017 | KUALA LUMPUR MEETING WITH MALAKOFF CORPORATION BERHAD ON NEDA

An engagement session with Malakoff was conducted to identify Malakoff's issues and concerns on the NEDA mechanism. SB was represented by Nor Ziha from NEDA Unit.



## 31 OCTOBER 2017 | LAOS TECHNICAL TASKFORCE MEETING FOR LAO PDR-THAILAND- MALAYSIA POWER INTEGRATION PROJECT (LTM-PIP)

A technical taskforce meeting for LTM-PIP was held in Laos to handover the signed copy of Energy Purchase and Wheeling Agreement (EPWA) to EDL and EGAT, discuss operational issues prior to effective date of EPWA of 1 January 2018 and finalise the Interconnection Operations Manual for LTM-PIP.

SB was represented by Akmarhayu Rahim, General Manager (Contract & Resource Management) and Aeni Haryati Hashim, Senior Manager (Industry Development). The meeting was also attended by GSO, TNB, EDL and EGAT.



## MEETING AT SG PERAK HYDRO POWER STATION 31 OCTOBER-1 NOVEMBER 2017 | PERAK

A meeting was held at Sg Perak Hydro Power Station between ST, TNB and SB to discuss the way forward for Sg Perak Hydro post its SLA expiration date in 2022. TNB is in the midst of preparing the Life Extension Programme (LEP) for Sg Perak Hydro which includes modernisation, uprating and rehabilitation of related plants.





### 1-2 NOVEMBER 2017 | BANGKOK PAPER PRESENTATION AT THE INTERNATIONAL ENERGY POLICY & PROGRAMME EVALUATION CONFERENCE (IEPPEC)

Syazwani Aman of Load Forecast Unit (SB) together with Dr Ahmad Faruqi of The Brattle Group (US) co-presented a paper entitled 'A Hybrid Model for Forecasting Electricity Sales: A Case Study for Peninsular Malaysia' at the IEPPEC.

The conference, attended by international energy experts, policy makers and program evaluators, discusses the roles of EE and RE in meeting carbon reduction targets, adoption of new technologies as well as new developments in econometric modelling, dynamic pricing and forecasting.



### 6 NOVEMBER 2017 | BANGSAR NEDA ENGAGEMENT SESSION WITH ST

A meeting to update ST on NEDA registration status was held in SB's office. SB also highlighted on the issues that SB is currently facing during the implementation of NEDA. Currently there are two Price Takers in the registration process.



### 14 NOVEMBER 2017 | SUBANG JAYA MEETING WITH TEKNOLOGI TENAGA PERLIS CONSORTIUM SDN BHD (TTPC)

An engagement session with TTPC was conducted to identify TTPC's issues and concerns on the NEDA mechanism. The meeting was chaired by TTPC's Chief Executive Officer, Mr. Chan Poh Loong. SB was represented by Market Operation and Assessment and Legal Unit.



### 28 NOVEMBER 2017 | BANGI CORPORATE SOCIAL RESPONSIBILITY (CSR) INITIATIVES

SB recently assisted a single mother of 5 children ranging from 3 to 12 years old as part of its CSR initiatives. Volunteers from SB helped to improve the condition of the house they are living in by painting the rooms and fixing the curtains. While the work was carried out, the children were treated to lunch.





## GENERAL MANAGER CONTRACT & RESOURCE MANAGEMENT AKMARHAYU ABD RAHIM

In this section, we talk to our colleague Akmarhayu Abd Rahim, General Manager of Contract & Resource Management about her background and roles in SB.



**WattsUp:** Thank you for agreeing to share your story with us. We hope it is not too late to congratulate you on your promotion. Can you tell us briefly on your background?

**Akmar:** I was born in Johor Bharu. As my father was in the army, I went to several primary schools across the country due to his job transfers. I went to Maktab Rendah Sains MARA for my secondary education and pursued my tertiary education at Universiti Teknologi Malaysia (UTM). I graduated with a Bachelor of Electrical Engineering in 1996. I am married with a 19-year-old son and two daughters aged 16 and 10.

**WattsUp:** Can you tell us how you are assigned to SB?

**Akmar:** When I joined TNB in April

1997, I was first assigned to the Business Management Unit under the Transmission Division. The unit was responsible for the management, operation and billing settlement of the first generation Power Purchase Agreements (PPAs). These functions continue to reside within SB following the electricity industry restructuring exercise in 2012. I joined Single Buyer as a Senior Manager in Fuel Management Unit. Therefore, technically speaking, I have been involved in managing the commercial aspects of the PPA since day one.

**WattsUp:** What do you love the most about working in SB?

**Akmar:** As SB aspires to be the country's leading think tank for the electricity industry, working in SB provides a myriad of learning opportunities such as engagement with stakeholders, technical studies and advisory works for the industry, and involvement in the regulatory reform initiatives.

**WattsUp:** What are the roles of your team at SB?

**Akmar:** My unit is responsible to facilitate the security of electricity supply and ensure efficient contract management and operation of the PPAs, service level agreements (SLAs), interconnection agreements and fuel agreements. Contract & Resource Management is divided into 3 sections – New Energy, Contract Performance, and Fuel Management. New Energy is responsible for a new capacity tendering, evaluation of project proposals and negotiation of PPAs prior to commercial operations, whilst adhering to Single Buyer Rules, Codes of

Conduct, and the Malaysian Grid Code (MGC). Upon commercial operations, Contract Performance will operationalise the PPAs and SLAs as well as monitor the performance of the generators in accordance with the relevant agreements and the MGC. Finally, Fuel Management will operationalise the fuel contracts and manage the security of fuel supply security of the power sector.

**WattsUp:** Tell us a bit of what you enjoy doing in your leisure time?

**Akmar:** I love cooking especially the food that my family enjoys the most i.e. laksa johor and roti jala. The secret to good cooking is to cook with love and of course my mum's recipes (laughs). Besides cooking, I enjoy reading and my favourite pick are motivational and parenting books. I have a few favourite books which include Little Gold Book of Yes! Attitude by Jeffrey Gitomer and Catch the Coaching Moment by Zainal Abidin Rahman.

**WattsUp:** Any words of wisdom you would like to share with our readers?

**Akmar:** Always love what you do and I would like to quote Jeffrey Gitomer - *"the love of what you do, combined with your belief in what you do, will not determine your success. It will determine how hard you will work and how dedicated you will be to achieving it. Success just shows up from there".*







Say... kar-dee-o-PUL-muh-nair-ee rih-suh-sih-TAY-shun

In short, it is called "CPR" and it means...

**C**ardio = Heart

**P**ulmonary = Lungs

**R**esuscitation = to bring back to life

**CPR** can help a person who has stopped breathing AND whose heart may have stopped beating to stay alive. It consists of the use of chest compressions and artificial ventilation to maintain circulatory flow and oxygenation during cardiac arrest.

**Equipment:** CPR can be performed anywhere without the need for specialised equipment. However, universal precautions such as wearing gloves and mask should be taken.

**Think CPR, Think A — B — C**

CPR comprises of 3 steps and to be performed in the order of:

**A** — Airway

**B** — Breathing

**C** — Chest compressions

**What happens when you call 911?**

Firstly, the operator will confirm which agency you require, your location and state you are in.

Ask for an ambulance.

A trained Ambulance Communications Officer will dispatch paramedics having asked you the following questions:

- ⇒ The location of the incident
- ⇒ The call back phone number
- ⇒ Details of the incident
- ⇒ If the casualty is conscious/unconscious
- ⇒ The casualty's exact injury or illness

## 1 Check response

Can you hear me?  
Open your eyes.  
What's your name?  
Squeeze my hand.



## 2 Establish an airway

Support the jaw and tilt the head. If you see fluid or foreign objects, turn the patient onto their side and clear.



## 3 Check for breathing

Look at the chest.  
Listen for air escaping.  
Feel for air escaping and chest rising.



## 4

If no breathing, give two rescue breaths.



## 5 If still no sign of life

Give 30 compressions on the center of the chest and two rescue breaths. Do this at least 5 times in 2 minutes.



## 6

If the person shows sign of life, then place the person on their side.



## 7 Continue until help arrived.

If available, implement a defibrillator as soon as possible.



## At A Glance



Check for danger



Call for help



If no sign of life, give CPR

"An investment in knowledge pays the best interest "

# LONG TERM SYSTEM PLANNING WORKSHOP

24-25 October 2017



SB organized a Long Term System Planning Workshop on 24-25 October 2017 in Putrajaya. The primary objective of the workshop is to provide a platform for planners and stakeholders to discuss and deliberate on issues and challenges encountered in planning activities. The workshop also aimed to:

- ▶ streamline roles, functions and responsibilities of the various parties in carrying out the planning activities;
- ▶ enhance coordination between generation and transmission planning;
- ▶ review the annual planning cycle to affect the changes required due to the shift of TNB's financial year from September-August to January-December;
- ▶ share the new initiatives undertaken by various parties for the betterment of long term planning processes.

The 2-day workshop was attended by 45 participants from KeTTHA, ST, Grid Planning, Distribution Planning, GSO and SB.

This workshop is intended to be held as an annual event to ensure continuous improvement in the long term planning for the industry.



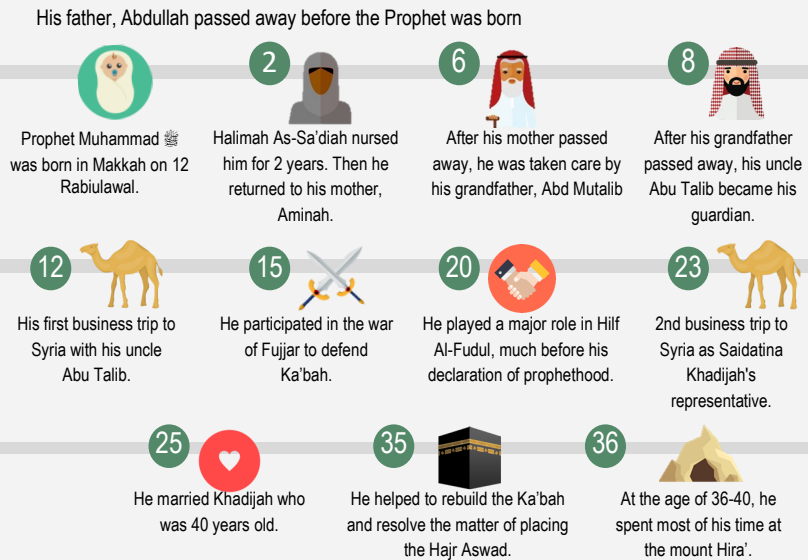
In conjunction with Maulidur Rasul, let's take a moment to reflect on the life and times of  
**Prophet Muhammad PBUH (ﷺ)**

Surah Al-Anbiya [21:107] And We have not sent you, [O Muhammad], except as a mercy to the worlds.

**DID  
YOU  
KNOW?**

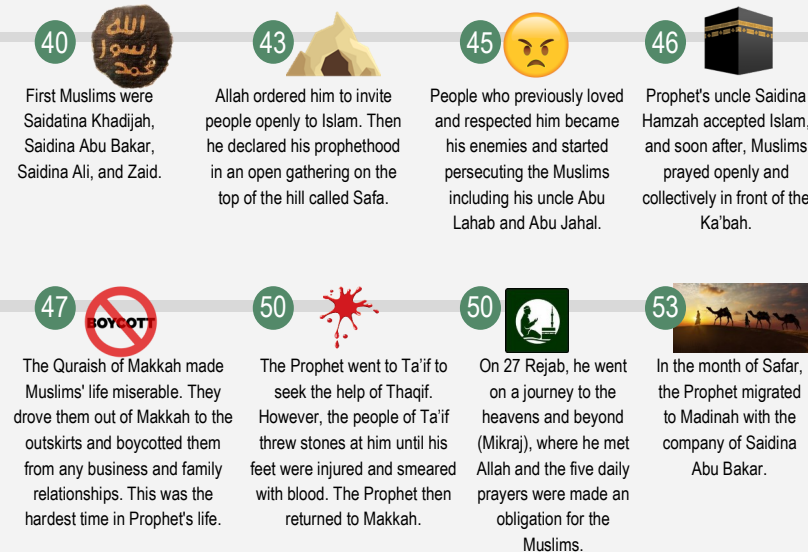
## The Prophetic Signs

# Indicates the age of the Prophet



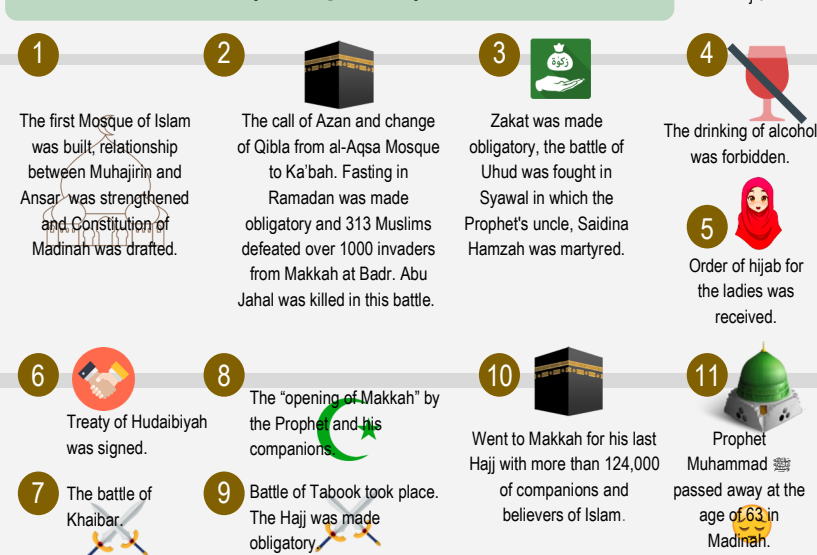
## Prophethood - Migration from Makkah to Madinah

Prophet Muhammad ﷺ received his first revelation from Allah through Jibril on 17 Ramadhan in the form of 5 verses from Surah Al-Alaq.



## Life in Madinah - the passing of Prophet Muhammad ﷺ

# Indicates the year of Hijrah





# ST's EXECUTIVE ATTACHMENT PROGRAMME IN SB

Conducted since 2015, ST's Executive Attachment programme is aimed to give exposure to ST personnel on the electricity supply aspects under the regulatory purview of ST. The first session took place between March and May 2015 with 21 participants, while the recent session in August – October 2017 consisted of 22 participants. Each session is divided into 4 groups of 5-6 personnel, whereby each group will attend a series of presentations by the various units in SB.



We asked one of the participants, Ili Najihah binti Mohd Fuad, on her attachment experience.



## What is your work background in ST?

I have been working with ST for two years. Since then until now, I've been with the Industry Development Unit. One of my job scopes is to develop new initiatives to promote competition in the power sector such as NEDA.

## How do you find the attachment experience?

During the attachment, I learnt the technical and commercial aspects of SB's operations in depth. I found this to be very beneficial particularly since my unit is currently involved in the governance reform study of SB and GSO.

## Any suggestions to improve the attachment experience?

I would like to suggest SB to include more

real case demonstrations, for instance a dummy example of the day-ahead scheduling.

## Any advice for future participants?

Ask more questions and be as interactive as possible during the attachment.

## Do you think it is also a good idea for SB to have a similar programme at ST?

Yes, why not? SB has been collaborating with ST in so many occasions and each unit in SB plays an important part in ST's regulatory scope. From this programme, ST has the opportunity to view things from SB's perspective. Likewise SB has the chance to learn about the industry from the regulatory point of view.

## MARKET WATCH January 2018



## LTM-PIP Commercial Operation

## COMING SOON IN 2018

SB is currently enhancing its website to improve its design and contents to meet the needs of our stakeholders.

Major enhancements include improved data publication, interactive data visualisation and easier navigation.

## SB Website New Look!



[www.singlebuyer.com.my](http://www.singlebuyer.com.my)

## WORDS OF WISDOM

The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn.

- Alvin Toffler -

## YOUR FEEDBACK MATTERS

We welcome any comments or suggestions to improve our newsletter. If you have any feedback or content that you would like us to include in the upcoming editions of WattsUp, please email us at [sbet@singlebuyer.com.my](mailto:sbet@singlebuyer.com.my)



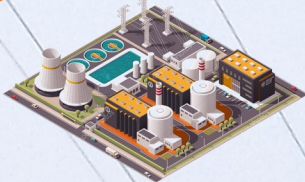
# ELECTRIC POWER TRANSMISSION

Transmitting Power from Generation Sources to Customers



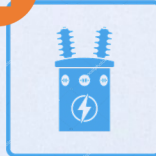
Have you ever wondered how electricity reaches your home?

## 1 Electricity Generation



Electricity is generated by power plants which are usually located near the source of energy (e.g. hydro, coal, gas pipelines) and typically far from the load centres.

2



## Step-up transformer

is located in substations near to power plants and it increases generator output voltage to transmission system voltage, i.e. either 132kV, 275kV or 500kV.

3

## Transmission Network



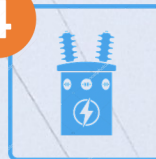
The transmission network (also known as the National Grid) consists of high voltage power lines (500kV, 275kV, and 132kV), which is managed and operated by the Grid Division of TNB (the Grid Owner). The network transports power from power plants to load centres (substations) or directly to large power consumers (e.g. factories).

5






**Distribution Network**  
delivers power to customers.

4



**Step-down transformer** is located in substations near to load centres and it brings down the voltage to distribution system voltage e.g. 33kV, 11kV, 6.6kV.

## Peninsular Malaysia's Transmission System Highlights

	 132kV	 275kV	 500kV
No. of substations	336	83	7
Length of transmission network (km)	11,313	9,449	783
	862	68	0

Source: TNB Annual Report 2016

• Overhead Lines

• Underground Cables