SINGLE BUYER
WATT UP
Electrifying The Future

SINGLE BUYER
Newsletter

Issue 4
Oct 2017

REMARKS FROM CHIEF EXECUTIVE OFFICER CHARANJIT SINGH GILL

It has been a busy and exciting last two months for all of us in SB. The submission of the Incentive Based Regulation (IBR) for Regulatory Period 2 (RP2) including the SB Generation Costs and SB OPEX/CAPEX was a major exercise involving numerous discussions and clarifications with ST. SB's plans and major activities to be implemented in RP2 provided the framework for SB moving forward.

In other activities, in early September, SB organised a two-day System Planning and Operation workshop in Penang. This was the second series of workshop which aims to familiarise market participants and stakeholders on SB's functions, operations as well as NEDA mechanism. The workshop was also intended to be a platform for engaging and obtaining the buy-in of prospective players wanting to enter into NEDA.

The month of September ended with the commissioning of Manjung 5 on 28 September 2017. The 1,000MW coal plant utilises the ultra-supercritical technology, which is the current gold standard for coal-fired plants in the world. With this new addition, the total installed capacity for Peninsular Malaysia is now close to 24,000MW.

On the broader national energy perspective, SB is currently spearheading a study on an environmentally-friendly energy mix for Peninsular Malaysia's power sector. This study, commissioned by the Government, seeks to explore the potential options in achieving the country's commitment to reduce carbon footprint whilst ensuring the security and reliability of electricity.

"The 1,000MW coal plant utilises the ultra-supercritical technology, which is the current gold standard for coal-fired plants in the world. With this new addition, the total installed capacity for Peninsular Malaysia is now close to 24,000MW."

One of the key deliverables is the assessment impact on power sector generation expansion towards achieving Malaysia's commitment to reduce Green House Gas (GHG) emission and intensity of GDP by 45% by 2030.

The Government's GHG reduction target is further supported by the signing of the Energy Purchase and Wheeling Agreement between the governments of Malaysia, Thailand and Laos during the 35th ASEAN Ministers on Energy Meeting (AMEM-35) in Manila on 27 September 2017. The multilateral cross-border power trade of up to 100MW will enhance the power sector expansion plan while at the same time strengthen regional energy security.

The Government's focus on energy development is now mainly placed on diversifying energy sources and investment in new technology, in order to meet Peninsular Malaysia's growing demand in a sustainable manner. With this in mind, SB is committed to continuously undertake advisory roles to explore the feasibility and framework in facilitating the entrance of new technologies such as energy storage systems.

I look forward to keeping you up to date with many important and exciting initiatives underway at SB. As we approach the festival of light, I take this opportunity to wish all of our Hindu friends a Happy Deepavali. May this celebration brings unity and prosperity to all.

Charanjit Singh Gill
Chief Executive Officer
Single Buyer

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Scan for online version

INDUSTRY REGULATORY FRAMEWORK

The Stakeholders

Stakeholders in the energy industry include government agencies and energy regulatory bodies. Their function is to establish rules and regulation, formulate policies and strategies for the interest of the consumers.

KeTTHA KEMENTERIAN TENAGA, TEKNOLOGI HIJAU DAN AIR

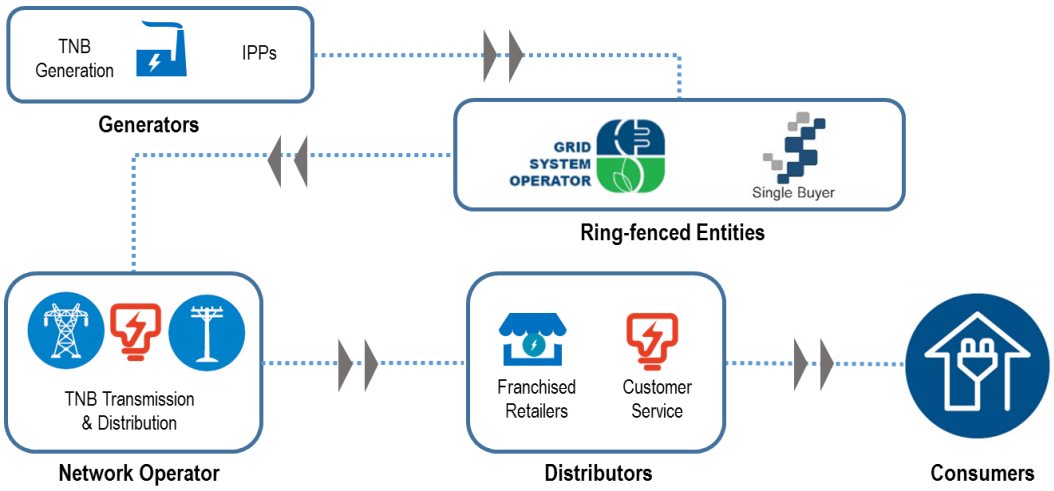
Suruhanjaya Tenaga

EPU ECONOMIC PLANNING UNIT PRIME MINISTER'S DEPARTMENT, MALAYSIA

Licensees

Licensees are industry players which are given licences to operate by ST and are subjected to ST's regulatory oversight. These include Tenaga Nasional Berhad, independent power producers, independent power distributors, etc.

Who's who in supplying electricity to your doorstep



Generators.....	Generates electricity at PPA/SLA tariffs or rates as per NEDA Guidelines.
Single Buyer.....	Manages PPA/SLAs by scheduling energy and processing payments to the Generators.
System Operator.....	Operates grid system, i.e. the high voltage (132kV, 275kV & 500kV) transmission network.
Network Operators.....	Maintains the high voltage (132kV, 275kV & 500kV) transmission network.
Distributors.....	Operates, maintains, manages electricity supplies at the low voltage distribution network. This includes franchise retailers, i.e. suppliers other than TNB Distribution.
Consumers.....	End-consumers include domestic, commercial, industrial and other minor sectors.

Each entity above plays a key function in supplying electricity to end consumers. Under the IBR mechanism, electricity tariff is determined by identifying the entity and cost in providing its services. In RP1, this includes SB Generation Tariff, SB Operation Tariff, System Operation Tariff, Transmission Tariff and Customer Services Tariff.

Source:
1. www.kettha.gov.my
2. www.st.gov.my
3. www.singlebuyer.com.my

Want to know what's IBR and what's in the electricity tariff?

Watch out for this column in our next issue!

NEDA UPDATES

NEDA Engagement Sessions With Industry Players

SB is continuously taking proactive steps in engaging with the industry players ranging from the existing generators, co-generators and power plant manufacturers. Besides promoting NEDA, the one-to-one engagement is aimed to gain insights into the concerns and issues of each company that hinders participation in NEDA. This initiative has proven to be more effective in understanding issues unique to a particular company.

Between January to September 2017, SB has conducted several engagement sessions with various organisations. These sessions have tremendously facilitated the registration process currently undertaken by these generators.

SB also recently welcomed delegates from Siemens Malaysia who expressed their interest to assist in promoting NEDA, particularly in creating awareness among the power generators. SB believes that the engagement with manufacturers is a practical way to promote NEDA and also to utilise their expertise to reach out to more potential participants especially among the power generators.

The System Planning and Operation Workshop recently conducted in Penang has also provided an excellent platform for engaging and obtaining the buy in of prospective players wanting to enter into the NEDA market mechanism. SB is committed to intensify its promotional efforts to encourage greater NEDA participation.

https://mpi.singlebuyer.com.my

COAL TECHNICAL VISIT to Down Under

SB and delegates from KeTTHA, ST and TNB were recently invited to join a technical visit to a coal mine and terminal in Australia, held from 14-18 August 2017 and organised by TNB Fuel Services Sdn Bhd. The Secretary General of KeTTHA, YBhg. Dato' Seri Ir. Dr. Zaini bin Ujang was also part of the entourage. SB was represented by Puan Akmarhayu Abd Rahim, the General Manager of Contract & Resource Management.

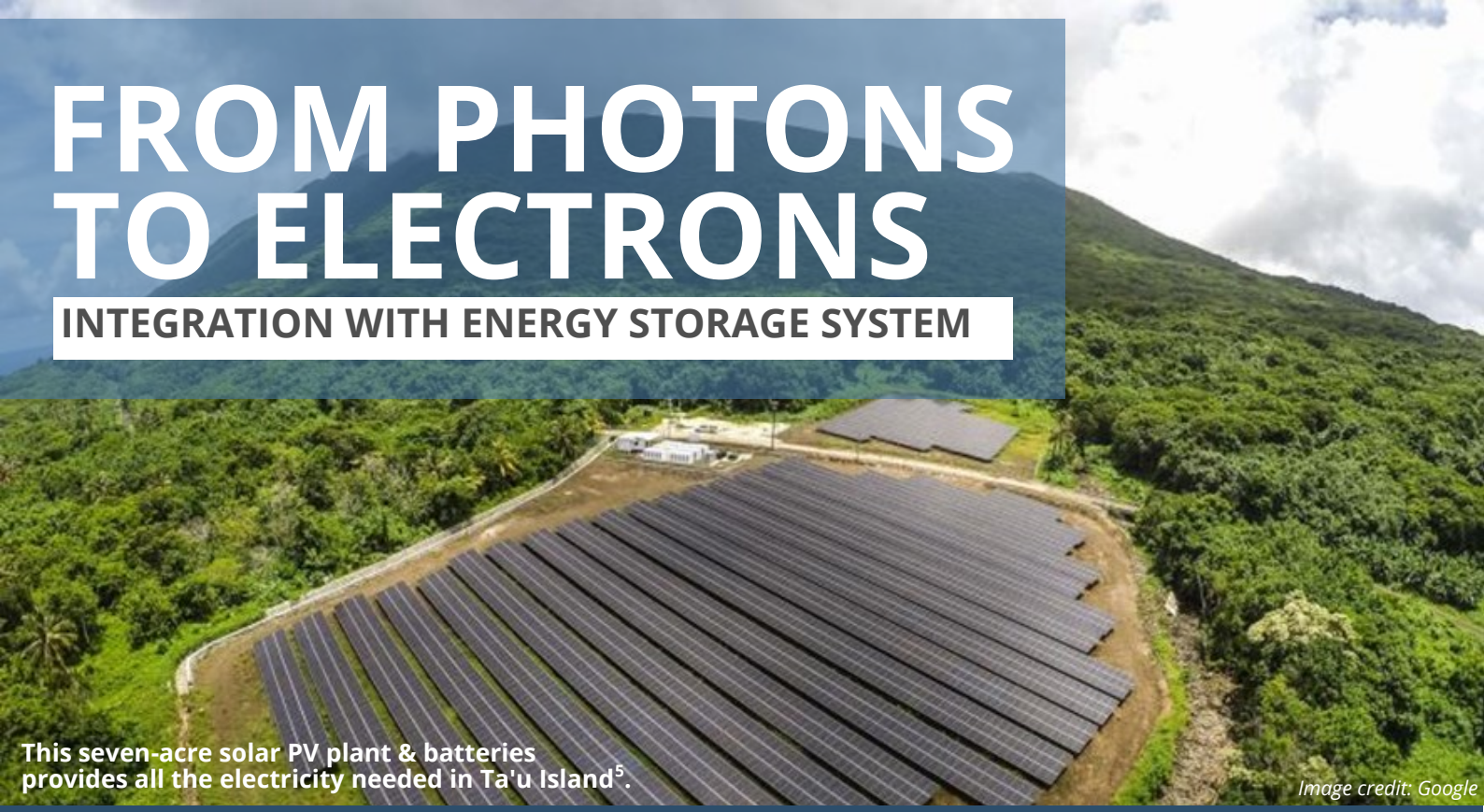
The objectives of this visit are to explore on the coal mining management, coal operation and coal delivery to Malaysia, to obtain latest development of coal industry and to explore and understand coal issues.

Australia was selected for the visit as it is one of the largest coal exporters with potential reserves of up to 110 years[1]. The delegates visited the Moolarben Coal Mine Complex and Newcastle Coal Infrastructure Group Terminal, owned by Yancoal Australia Ltd. The company is the sixth largest coal supplier in Australia and the ninth largest in the world based on the available coal reserves.

[1] Economic Demonstrated Resources (December 2015)

FROM PHOTONS TO ELECTRONS

INTEGRATION WITH ENERGY STORAGE SYSTEM



This seven-acre solar PV plant & batteries provides all the electricity needed in Ta'u Island[5].

Image credit: Google

In the previous series, we have elaborated on various types of solar cells and the most common are monocrystalline, polycrystalline and thin film technology. Among the three, the price and efficiency is highest with monocrystalline technology followed by polycrystalline and thin film.

Undeniably, due to the intermittency of power produced by Solar PV plant, no one can rely solely from solar PV plant without the integration with grid network or other types of hybrid configurations such as battery energy storage system or diesel generator.

intermittent *(adjective)*

(1) occurring irregularly; not continuous or steady
(2) stopping or ceasing for a time

The intermittency of solar PV plant can be seen in Figure 1 and Figure 2, depicting data from the live data monitoring and recording of the Green Energy Research Centre (GERC), which was established under the Faculty of Electrical Engineering, Universiti Teknologi MARA, Shah Alam, Malaysia. The data captured is from their single-phase grid connected PV power system using Yingli YL235P-29b Polycrystalline modules with a peak capacity of 5.4kW[1].

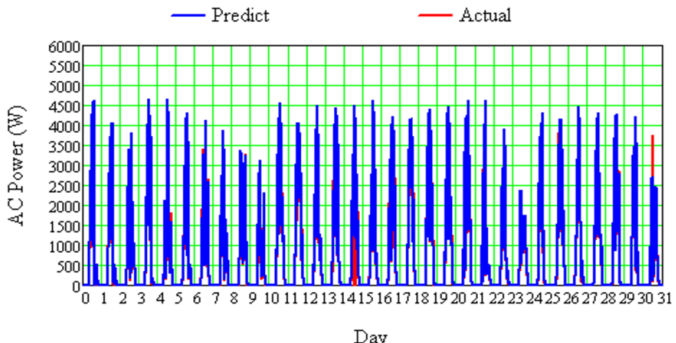


Figure 1: AC Power Output for Month of May2017[1]

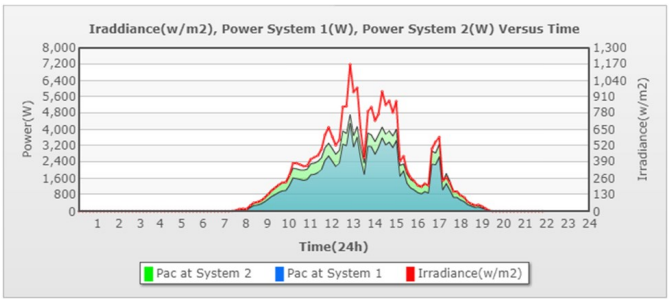


Figure 2: One day (26.09.2017) solar irradiance profile & power output[2]

Cloudy with a chance of sunshine?

Solar PV output will generally vary throughout the day depending mainly on the irradiance and weather. As discussed in the previous series, the irradiance, which refers to the intensity of sunlight shining on the solar PV cells, will determine the rate of electrons flowing through the conductors to produce electricity.

Cloud cover over the sky will greatly reduce the irradiance and thus lessen the output from the solar PV system. Prediction of cloud coverage and weather are crucial for solar PV generation forecast. Thanks to sophisticated tools and software, forecasts of these factors have greatly improved, which enables more accurate estimation of solar PV generation.

With better solar prediction and proper planning of other generation resources, the impact of solar PV generation intermittency can be greatly reduced.

[1]http://gerc.uitm.edu.my/gerc/GCPV_yingli/2017%20May.html
[2]http://gerc.uitm.edu.my/gerc/gerc.php?site=livedata

Integration of solar PV systems with batteries and/or diesel generator set have existed more than a decade ago!

This is still a solution all over the world in electrifying some rural communities that are too remote and have no access to the grid network. These rural communities are considered as electrical islands with micro-grids connecting houses and businesses clustered closely together. Such micro-grids can potentially be powered by any technology, and for small villages in areas with rich sunlight, solar PV and more often solar PV/diesel generator hybrid systems are typically the most practical solutions.

In many places, installing off-grid solar PV can be more cost-effective than solely relying on diesel generator. Although the up-front cost of installing solar PV systems is higher than diesel generators, the cost over time is lower. Furthermore, purchasing fuels such as kerosene can often mean lengthy shopping trips and long waits to replenish supplies, and even then, there can be issues with availability. Solar PV systems also do not create air pollution like diesel generators, nor do they carry the fire risk of kerosene lamps[3] .

Ta'u Island's electricity generation shift from 100% diesel to 100% solar.

Ta'u, one of the outer islands in American Samoa, was transformed totally on November 2016 from an island relying on diesel fuel to produce electricity to depending solely on solar PV and battery energy storage system.

The USD8million project, funded by American Samoan and US authorities (including the Department of Interior), includes 5,328 solar panels, generating 1.4 megawatts of electricity and six-megawatt hours of battery storage from 60 Tesla Powerpacks. It took just a year to implement, providing power to the Ta'u micro-grid and energy independence for the nearly 600 residents of the island.

The battery system also allows the residents to use stored solar energy at night and allow Ta'u to stay powered for up to three days without any sunlight; the capacity of the batteries can be recharged fully in seven hours. As well as providing energy, the project will allow the island to significantly save on energy costs and offset the use of more than 109,500 gallons of diesel per year, not to mention the amount of fuel it takes for shipping[4].

The future of solar PV/battery systems is radiant!

As prices of solar PV panels and batteries reduce, more projects similar to Ta'u Island's will take off. Many off-grid communities which are still relying on diesel will consider adopting solar PV with batteries for their electricity supply. When prices drop further and able to compete with the tariff offered by power utilities through the grid supply, we might even see individual homeowners implementing such concept of living off-grid relying solely on solar PV and battery energy storage system.

Companies such as Solar Energy USA have begun offering services to design and provide custom emergency solar power systems, sometimes referred to as "off-grid solar with battery backup" to power critical or essential household needs which includes refrigeration, electric or induction cook top, interior lighting, exterior security lighting, and a cell phone charger. Additional non-essential loads that can be tied to the battery bank can also be designed based on customer needs. The main components needed for such system are as shown in Figure 3.

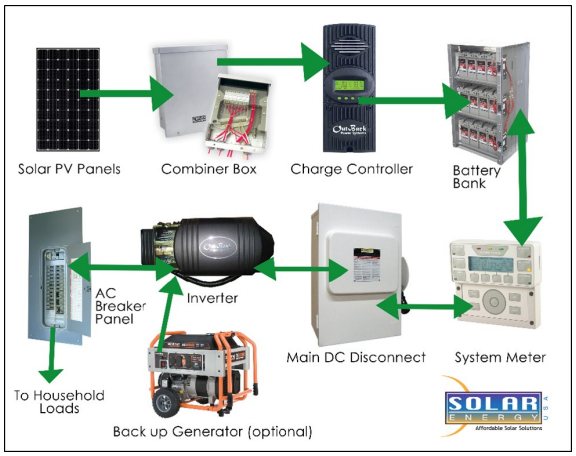


Figure 3: Main components of residential solar PV and battery integrated systems

[3]https://www.solarserver.com/solar-magazine/solar-report/solar-report/electricity-for-the-rest-of-the-world-opportunities-in-off-grid-solar-power.html
[4]http://www.wired.co.uk/article/island-tau-solar-energy-solarcity
[5]http://news.nationalgeographic.com/2017/02/tau-american-samoa-solar-power-microgrid-tesla-solarcity/#/solar-energ-samoa-2-GOPR8043.jpg
[6]http://solarenergy-usa.com/solar-info/solar-with-battery-backup-emergency-power-systems/

SB organised a 2-day workshop in Melaka to deliberate the outcome of the Environmentally-friendly Energy Mix study. The participants are from the Economic Planning Unit (EPU), Kementerian Tenaga, Teknologi Hijau dan Air (KeTTHA), Kementerian Sumber Asli dan Alam Sekitar (NRE), Suruhanjaya Tenaga (ST), Tenaga Nasional Berhad (TNB) and Sabah Electricity Sdn Bhd (SESB).

Workshop on the 'Environmentally-Friendly Energy Mix Study' **3-4 AUG**

Visit to Lekir Bulk Terminal and Manjung 4 & 5 coal yard **9 AUG**

A group of SB officers visited the Lekir Bulk Terminal (LBT), which is the receiving point for imported coal used in Manjung coal plants. Located in Seri Manjung with a natural depth of 20 metres, LBT deep water seaport is currently South-East Asia's largest dry bulk unloading facility. The terminal is capable of berthing an entire range of Panamax and Capemax vessels up to 165,000 DWT. The officers also visited Manjung 4 & 5 coal yard to view the current coal stock level.

SB's second Risk Assessment Workshop amongst the top and middle management of SB was held in Bangsar. The workshop aims to identify and discuss strategic and operational risks for SB as a ring-fenced entity.

The Second SB Risk Assessment Workshop **10-11 AUG**

Technical Visit to Tuanku Jaafar Power Station **17 AUG**

Two SB officers participated in a technical visit to Tuanku Jaafar Power Station (TJPS), Negeri Sembilan, organised by the Malaysia Nuclear Power Corporation (MNPC). The purpose of this visit is to provide a deeper understanding on the operations of TJPS as a combined cycle gas-fired facility as well as other different types of thermal power plant technologies.

Visit to Petronas CUF Kertih and CUF Gebeng **24-25 AUG**

Seven SB officers together with two representatives from Grid System Operator (GSO) went to the Centralised Utility Facility (CUF) in Kertih and Gebeng for a technical visit and meeting. The meeting was intended to share the current status of SB's One Stop Settlement Centre (OSSC) system.

SB sent two representatives to a technical training with Taiwan Power Company. The two-week training was held at Dalin Simulation Training Centre, Taichung Power Plant and Taipower Research Institute. The objective of the training is to provide participants with an in-depth knowledge of coal generation. Participants had the opportunity to learn on the low quality coal burning techniques applied at Taichung Power Plant. Participants were also given a demonstration and hands-on training on the coal combustion software. Other organisations who participated in the training are KeTTHA, ST, TNB Janamanjung, KEV and TNB power plants.

Technical Training with Taiwan Power Company **21 AUG-1 SEP**

Visit to National Load Despatch Centre **5 SEP**

SB organised a technical visit to the National Load Dispatch Centre (NLDC), Bangsar to educate new SB officers on GSO operations. Participants of the visit were given a briefing on the daily system operation, control room operation and the applications of Supervisory, Control, and Data Acquisition (SCADA) and Energy Management System (EMS). The visit ended with an interesting demonstration on dispatch simulation using the dispatcher training simulator.

The signing ceremony of the Energy Purchase and Wheeling Agreement between the Government of Malaysia, Thailand and Laos during the 35th ASEAN Ministers on Energy Meeting (AMEM-35) in Manila held on 27 September 2017 was attended by two SB representatives. Signing of the agreement marks the beginning of a multilateral cross-border power trade of up to 100MW between Lao PDR and Malaysia through Thailand.

Signing of the Energy Purchase and Wheeling Agreement of Lao PDR-Thailand-Malaysia Power Integration Project **27 SEP**

MEET THE PEOPLE BEHIND **SB**

PERSONAL ASSISTANT TO THE CEO OF SINGLE BUYER

LATIFAH MD SALLEH

In this edition, we speak to our lovely colleague Latifah Md Salleh, Personal Assistant to the CEO of Single Buyer, Charanjit Singh Gill about her work experience in SB and personal experience.

WattsUp: Thank you for agreeing to share your stories with us. Can you tell us a brief background of yourself?

Latifah: I was born in Kulim, Kedah. I joined Lembaga Letrik Negara in 1977 as a typist cum operator in the district of Nibong Tebal, Pulau Pinang. I married my husband in 1978, and after marriage, I migrated to Kuala Lumpur. I was promoted to a secretary at System Planning Department in 1978.

WattsUp: How long have you been the Personal Assistant (PA) to Charanjit? How has the experience been?

Latifah: I believe it has been nearly 10 years. I was assigned as PA to Charanjit in 2008 when he was the Chief Engineer at System Planning and Development Department. I have known him since he was a young executive. Charanjit is humble, sporting, generous and strict at times. We get along really well. I even envisioned that he would be my boss someday when he was a senior engineer in our previous office. As someone who enjoys Hindustani movies, I was excited to discover that Charanjit is a talented singer when he sang a Hindustani song during a hi-tea event (laughs).

WattsUp: What made you decide to join SB? What do you like about working at SB?

Latifah: I followed Charanjit to join SB as he is a good boss. I also feel SB has a good working environment and I am comfortable with my job scope. I have good colleagues here and there is teamwork amongst us. It is important to have good colleagues.

WattsUp: PAs have important roles to play in an organisation. What do you think are the qualities that every PA should possess?

Latifah: Firstly, you must understand the boss. You must always be aware of his needs and his whereabouts. Secondly, you must be resourceful and be able to give all efforts in your job. Thirdly, you must be attentive. Next, you must be disciplined, punctual and be at work earlier before your boss arrives. Besides that, you must always be present at your workplace to ensure that you are available in any occasion. Lastly and most importantly, you must ensure that all correspondences must be dispatched urgently without any delay.

WattsUp: We see that you are an avid traveller. Can you share with us your memorable travelling experience?

Latifah: I love and enjoy travelling. I enjoy experiencing new places, cultures and attractions. I first started travelling in 1995 to Scotland with my children. My most memorable travelling moment was last April in Morocco as we went travelling with all my family members including my husband. Words cannot describe how wonderful the experience was. I cannot decide which country is my top destination but my top 3 favourite countries would be Switzerland, the Netherlands and the United Kingdom. My destination wish list is definitely India to see the Taj Mahal.

WattsUp: How do you stay energetic and healthy?

Latifah: I drink fresh apple juice every morning and it has become a daily routine. I avoid sugary drinks and consume less meat and fattening food. I prefer eating fish, vegetables and fruits. I believe to stay healthy; it is all about your food intake. I also ensure that I drink plenty of plain water and avoid iced drinks. You must stay happy and always find ways to overcome any challenges.

WattsUp: Any final advice?

Latifah: If I may quote in Malay — "*Kerja bersungguh-sungguh, berhibur juga bersungguh-sungguh, hargailah diri kita dengan berbudi pada diri sendiri dengan melancong*".

Latifah while holidaying in Keukenhof, the Netherlands

INTERNSHIP EXPERIENCE IN **SB**

SITI FATIMAH ZAINI

Brief background on yourself

I was born and raised in Johor Bahru but moved to Bandar Baru Bangi around 4 years ago. I graduated last year with a Bachelor's Degree in Economics and Political Science from the University of Michigan, USA. Right after graduation, I decided to pursue my master's degree in Economics at Universiti Malaya and I am expected to graduate this coming December. My research interests include development and energy economics particularly the electricity markets in developing countries. In terms of hobby, I do rock climbing and read whenever time permits.

What made you decide to have your internship in SB?

Initially, I intended to do research on the electricity market reform in Malaysia as part of my 18-months program at Universiti Malaya. Since Single Buyer Department plays a major role in Malaysia's electricity sector, I found this position as an excellent opportunity to be part of the team that is working to ensure the security of supply. However, I changed my topic for some technical reasons but since the new topic still revolves around the energy sector, I figured that this opportunity would not only enhance my understanding of the sector.

What do you like about your internship in SB?

I like the fact that I knew very little about SB and the electricity industry prior to joining SB. I was on a steep learning curve, leaving me either stuck to my laptop googling about what I don't understand or knocking on people's "doors" to sate my curiosity. But this internship was more than just an exercise of satisfying my curiosity, it also allowed me to apply my economics training in the assignments given particularly those related to long-term load forecast. But my favorite part is the people that I had the opportunity to work with. They are enthusiastic, driven and eager to learn- all of which are the qualities that I think crucial for an organization that is evolving like SB.

Challenges met during internship

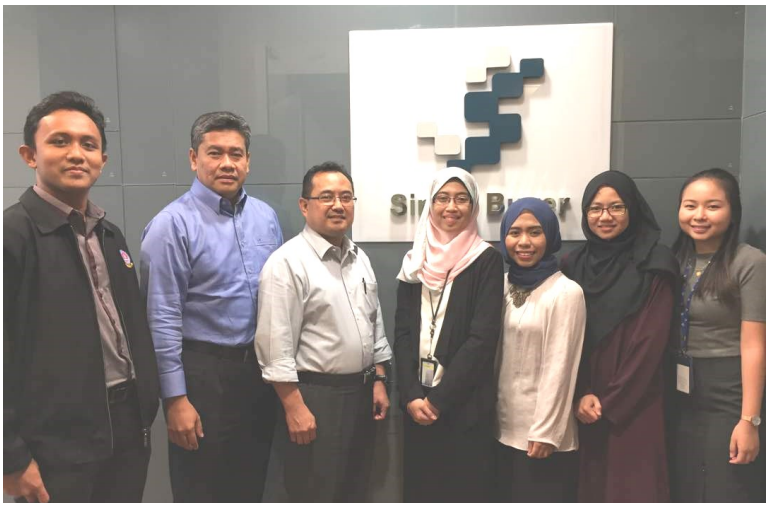
The challenges I faced arose mostly due to my limited knowledge on the electricity sector. Even though I had done some readings both for my research and my preparation for the internship, it was more on the economics side of things whereas in SB, a good understanding of the technical part is also imperative. I initially struggled to understand the terms used, the mechanisms at play, the players involved and what not. But I think now I can understand what the forecasters and schedulers talk about during meetings!

Most memorable experience

I have a long list! The workshop on Ontario's market that had me really excited (and dizzy) about the industry, the docket meeting every morning and how I went from understanding nothing to understanding something, the people's faces when they first tasted my breakfast (greek yogurt, green apple, granola and honey), the scribbling on the walls and tables, the weekly ayam goreng kunyit session and more importantly, the people. Everyone is so warm and generous, I could not have asked for anything better.

Advice for future interns

My advice would be to be constantly curious and at the same time, independent. Internship programs would be more beneficial if we know what we don't know so we could channel our energy towards answering those questions. Ask around and never be afraid of looking stupid for asking questions (and Google is always there).



Want to know how to be a Google Power User?
Watch out for this topic in our next issue!

Workshop on
SYSTEM PLANNING & OPERATION

On 5-6 September 2017, SB organised a workshop on System Planning and Operation in Penang. The annual workshop was initiated based on the findings of the SB Compliance Audit in 2016 by Ernst & Young and ESB International.

This is the second workshop organized by SB to continuously update and share with industry players on the current system planning and operation methodology as well as NEDA updates. The previous workshop, held in October 2016 in Melaka, focused on Short Term Generation Planning and New Enhanced Dispatch Arrangement (NEDA).

A total of 68 representatives from various stakeholders of KeTTHA, ST, EPU, Generators, and GSO attended the workshop.

The Chief Operation Officer of SB, En Abdul Malik Mohd Jaafar, in his opening remarks updated the participants on SB's ring-fencing requirements, compliance and governance. He also briefed on SB's expanding roles and functions based on the new structure. This was followed by presentations by the young talents of SB on key SB functions.

The second day was dedicated to the invited speakers from GSO. One of the key messages is on the imminent challenges faced by GSO in managing system constraints due to difficulties in implementing critical transmission projects and increasing presence of disruptive technologies in the future grid system such as solar and battery storage.

The workshop provided a good platform for engagement between various industry players. Feedback gathered from the participants pertaining to the planning and operation of the system particularly on the NEDA implementation are imperative for SB to improve its business efficiency.

SB would like to convey our sincere appreciation to the participants and speakers for making the event a success. SB looks forward to welcoming and meeting participants at the next event in 2018.

WORKSHOP SPEAKERS

DAY 1

Opening Remarks & Current SB Updates
Chief Operation Officer, Abdul Malik b. Jaafar

Session 1: Energy Mix Forecasting
Mohd Fakhruddin b. Suparin

Session 2: NEDA Updates for PPA/SLA Generators
Nazaitul Idya bt. Hamzah

Session 3: Despatch Instruction According to PPA
Ahmad Zulhilmi b. Omar

DAY 2

Session 4: Management of Grid System Constraints
Head of GSO, Gurcharan Singh

Session 5: Generator Outage Management
Norhasbi b. Abdul Wahab

Closing Remarks
Chief Operation Officer, Abu Bakar b. Ahmad

SB-IANS CORNER

"Mooting Coach"

Danial Nizam is an alumnus of Universiti Teknologi MARA (UiTM) and a former mooter competitor in 2009 and 2010. He is an active mooting competition supporter and was invited to judge at various national and international mooting competitions, including the recent International Maritime Law Arbitration Moot 2017 held in Singapore.

In this issue, he shares his experience as a coach for the UiTM team in the 12th LAWASIA International Moot Competition.

As a coach for the UiTM mooting team, my main task was to oversee the preparation of UiTM team for the national and international rounds. Mooting preparation includes finalisation of legal arguments for both written and oral submissions, research on points of law, and managing weekly training session.

The UiTM team emerged as the champion in the National Rounds of the LAWASIA Moot Competition 2017 on 30 July 2017 held in Kuala Lumpur. Following the win, UiTM team represented Malaysia at the International Rounds of the 12th LAWASIA International Moot Competition 2017 from 18 to 21 September 2017 in Tokyo, Japan.

UiTM team topped the general and quarterfinal rounds in Tokyo. After 5 months of preparation and 10 rounds of mooting over the period of 3 days, the team emerged as First Runner Up against Singapore Management University at the global final, with the final score of 3:2 and secured the best mooter award.

From left: Assoc. Prof. Dr. Irwin U.J. Ooi, Fathan Alfian, Nur Fatin Hafiza Hasham, Amiza Murad, Aomi Nakamura, Danial.

This special column is dedicated to the UiTM team for their outstanding performance at the global final of the International Rounds. Congratulations and *Malaysia Boleh*!

DID YOU KNOW?

"Mooting" is one of the compulsory subjects offered in any legal education. Mooting allows law students to gain experience of advocacy at the academic and vocational stages of legal education. LAWASIA Moot Competition is one of the leading mooting competitions in the world.

LAWASIA is an international organisation of lawyers' associations, individual lawyers, judges, legal academics, and others that focus on the interests and concerns of the legal profession in the Asia Pacific region.

MARKET WATCH

Pengerang 400MW Commercial Operation

October 2017

UPCOMING EVENTS

Long Term Planning Workshop

24-25 October 2017

WORDS OF WISDOM

Don't count the days. Make the days count.

- Muhammad Ali - *Boxer*

YOUR FEEDBACK MATTERS

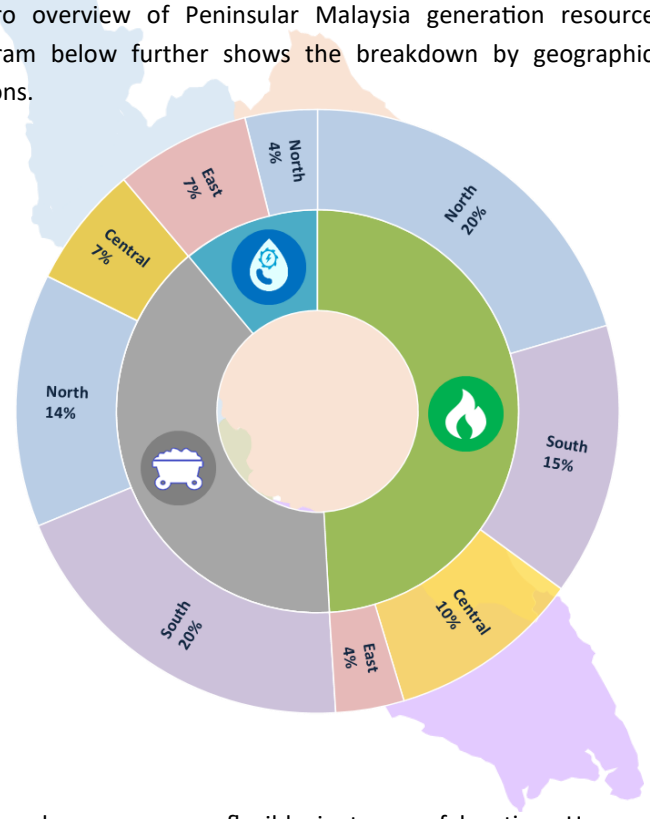
We welcome any comments or suggestions to improve our newsletter. If you have any feedback or content that you would like us to include in the upcoming editions of WattsUp, please email us at sbet@singlebuyer.com.my

PENINSULAR MALAYSIA

SCHEDULING OF GENERATION RESOURCES

REGIONAL GENERATION RESOURCES

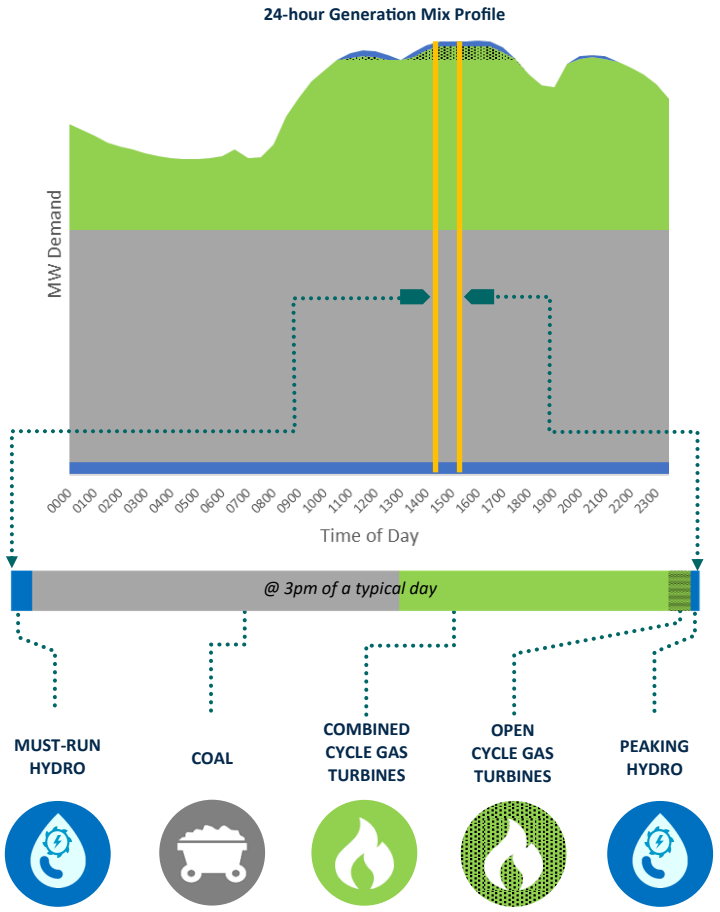
As a continuation from the previous issue where we illustrated the macro overview of Peninsular Malaysia generation resources, diagram below further shows the breakdown by geographical regions.



Coal and gas are more flexible in terms of location. However hydro is location-dependent and in the case of Peninsular Malaysia, it is pre-dominantly located in the eastern region, i.e. Kelantan, Terengganu and Pahang to leverage on the natural reservoirs and high elevation areas.

GENERATION MIX IN A TYPICAL DAY

Generation resources vary between different times of the day. Cheaper generations are maximized and expensive ones are used only when required, i.e. during peak times.

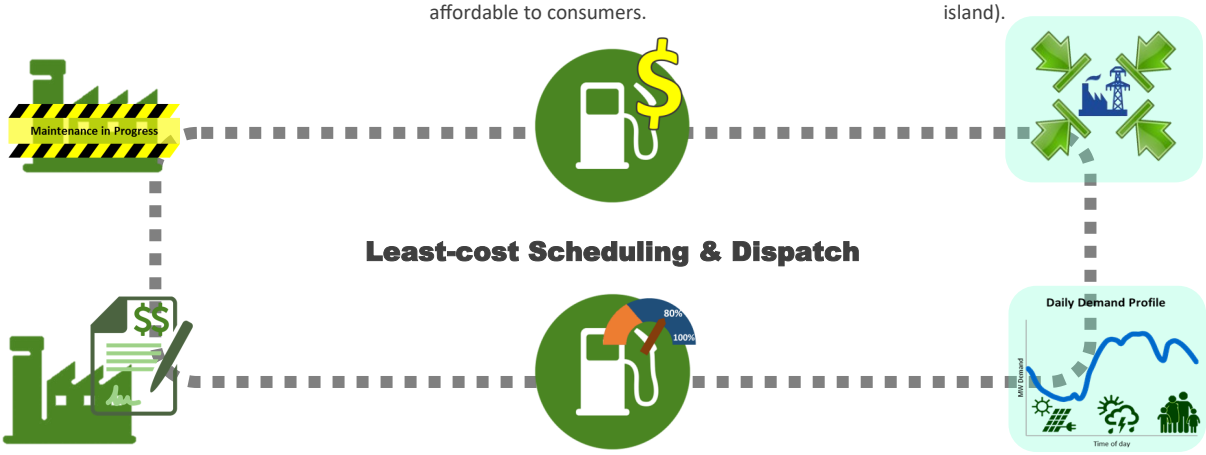


"Least Cost" = Balancing minimum cost and security of supply

Generators Availability may be lower from the installed capacity when there are planned outages, forced outages and temporary reduction in capacity.

Fuel Prices. Fuel cost contributes 60-70% of electricity cost. Generation from expensive fuel sources will be minimized to keep the cost of supply affordable to consumers.

System Constraints include inter-area power transfer limit and "must-run" generators due to riparian requirements (hydro) and grid system security (Penang island).



Generators Contractual Parameters which include technical (minimum and maximum capacity, ramp rates, etc.) and commercial rates (heat rates, variable operating rates, etc.)

Fuel Availability. Historically, the most common constraint on availability happens to gas when there is a shutdown or maintenance of gas facilities (offshore platform, processing plant, etc.). For hydro, this relates to water availability.

System Demand is very crucial to determine the units to be scheduled. Demand is heavily dependent on weather, people behaviour and more recently, renewable energy penetration.