

COMMUNICATING TO LARGE POWER CUSTOMERS

TENAGALINK

KDN : PP8515/01/2013(031995)

**El-Niño's
Bill Spike Effect**

Read the WHYs
on page 10

Towards a Brighter Future

**Driving Sustainable and
Efficient Energy**

We
value your
feedback!

SURVEY INSIDE

Complete it, scan it &
email it back to us!



Volume 1 | 2016



YOU KNOW YOU'VE DONE A GOOD JOB, WHEN EVERYONE TAKES YOU FOR GRANTED.

Air-conditioned homes, cookers, washers, dryers, toasters, tvs, fridges and the brilliant electric light; what an endless list of utter comfort and convenience modern life is, much of it made possible, we hasten to add, courtesy of a tireless little worker we call electricity

Moving out of the home into the worlds of commerce, enterprise and industry, the story is the same; electricity has helped us, one and all, build a thoroughly modern nation. Think about that the next time you reach out to flip on a switch; you might just appreciate how lucky we all are just a little more.

We welcome your **FEEDBACK**,
COMMENTS and/or **SUGGESTIONS** to
help us **IMPROVE** our **SERVICES**.

Please email your responses to dist_news@tnb.com.my
or log on to www.tnb.com.my/customer-care.html.



Look at any facet of human endeavour of recent times and you will discover the underlying effort to preserve and nurture our environment, after it became apparent that the exploits of mankind have been leaving an unwanted mark on nature.


We have been taught from a young age to reduce, reuse and recycle. The transportation industry is slowly inching away from fossil fuels in favour of cleaner modes of propulsion. Even buildings are designed and constructed to have as small a carbon footprint as possible.

As the producers of electricity, utilities around the world have been looking at reducing the impact they have on flora and fauna, and Tenaga Nasional Berhad (TNB) is no different. While keeping an eye on nature to ensure we do no harm, we find that the answers to generate electricity sustainably lie within it.

Solar, wind, hydro – these are the common, unlimited sources of natural energy that can be harnessed to create electricity without detrimental effects to the environment. In line with the government's drive to introduce efficiency in energy management, TNB has embarked on several initiatives to encourage the use of these clean energies in electricity generation.

TNB Green Energy Policy is disseminated via its energy-related divisions, including the Sustainable Energy Development Section. Among their roles are curating the renewable energy efforts – such as the Net Energy Metering (NEM) and the Large Scale Solar (LSS) schemes – as well as promoting the efficient consumption of electricity at the end-user level.

TNB has also initiated efforts to ingrain energy efficiency by modernising technologies. For instance, its recently launched Manjung 4 coal-fired power plant is among the most efficient of its kind in the region, thanks to its cutting-edge equipment. At the other end of the spectrum, TNB is among the first in the region to install smart meters for all its customers – a five-year plan that has been set into motion.

These are just a few of the undertakings administered by TNB to do its part in creating a planet that is clean and green while meeting and exceeding the growing electricity needs of the country. It is a responsibility we proudly shoulder, not just for us today, but to also ensure that our children will have a better and brighter future. 

Datuk Ir. Baharin Din
Vice President (Distribution)
Tenaga Nasional Berhad



Better Environment
Brighter Future

TNB NEW CUSTOMER BILLING SYSTEM

Self-service portal empowers customers

(monthly bill, bill payment, electricity supply application, closing of account, landlord/tenant monitoring)



Real-time transaction



Real-time updates for payment

via third-party collection agencies



Improved customer experience



Credit rating to customers



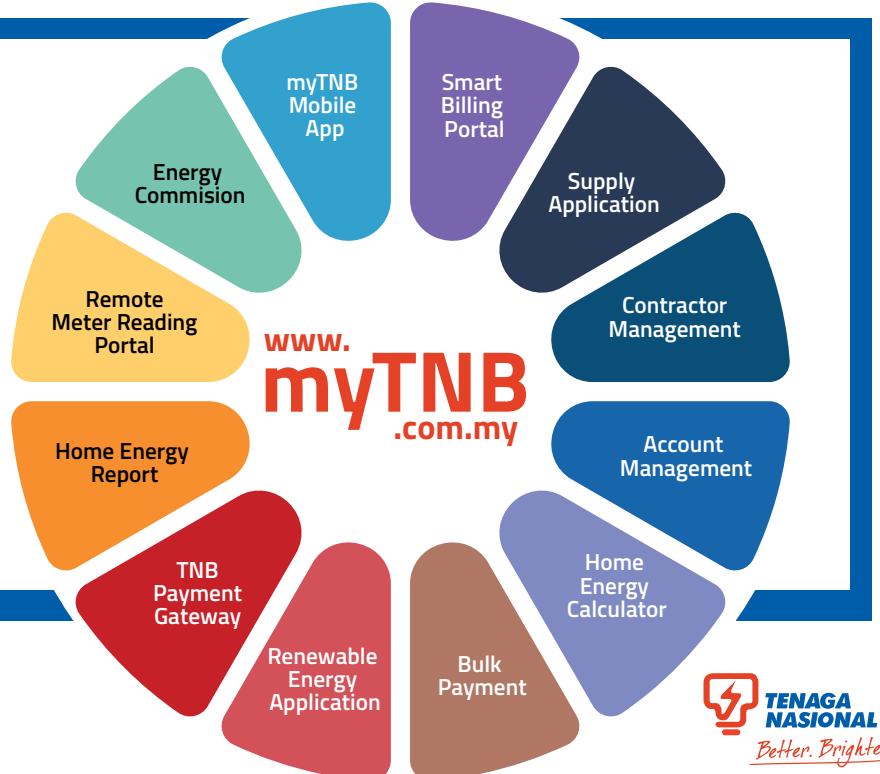
Deployment to
8.5 million
customers



Implemented at
Kedai Tenaga
scalable to cater for business expansion

myTNB Portal Features:

Self-service portal integrates existing web services for greater convenience



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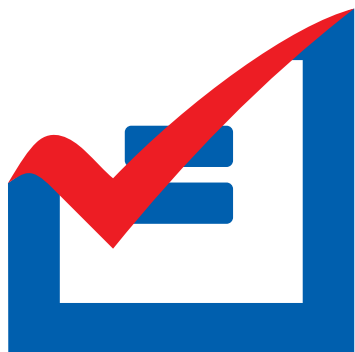
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Dear TENAGALINK readers,

As part of our continuous effort to improve TENAGALINK, we are conducting a survey to gain information about the magazine and its readers. The survey should only take a few minutes of your time. Thank you for helping make TENAGALINK a better publication.

1. How informative do you find the TENAGALINK magazine?

- ☐ Very uninformative
☐ Uninformative
☐ Neutral
☐ Informative
☐ Very informative

2. Do you find the articles in our magazine insightful and thought-provoking?

- ☐ Yes
☐ No

3. Do you think the magazine should cover more topics other than electricity and business-related topics?

- ☐ Yes
☐ No

4. What other types of articles would you like to see more of in TENAGALINK? (check all that apply)

- ☐ Tips
☐ Technical "know how"
☐ Case studies
☐ Products and services
☐ Others: _____

5. What other topics related to TNB Distribution would you like to see covered in TENAGALINK?

6. Do you read the advertising/special messages in TENAGALINK?

- ☐ Yes
☐ No

7. Which version of TENAGALINK do you prefer to read?

- ☐ Print
☐ Online

8. Do you know that you can read TENAGALINK on TNB's official website www.tnb.com.my?

- ☐ Yes
☐ No

9. Who else in your company reads TENAGALINK?

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☐ Others: _____

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(1 being Unsatisfied and 10 Satisfied)

1	2	3	4	5	6	7	8	9	10
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Important Note: This is a "green survey" initiative. Complete the survey, tear it, scan it and email it back to us @ dist_news@tnb.com.my with your details as follows for a chance to get a **5000mAh power bank**. Limited to 50 completed survey only while stock last.

- Your company's name:
- Your post at the company:
- Your name:
- Your IC:
- Your office telephone number:
- Your mobile telephone number:


TNB VENTURES INTO TURKEY

TNB has completed its US\$255 million (RM1.03 billion) unconditional acquisition of 289.49 million (RM1.17 billion) (30%) shares in Turkish power company, GAMA Enerji AS. The Turkish utility is a subsidiary of GAMA Holding AS, which provides and invests in power, mechanical, electrical, instrumentation, construction and erection services in the Middle East, the Russian Federation, Eurasia, Southeast Asia, North Africa and Ireland.

One of GAMA Holding AS energy projects in Turkey is the Kirikkale Refinery, created to meet the petroleum demands of the Ankara and neighbouring provinces.



The purchase of the shares worth US\$243 million (RM979 million) from GAMA Holding, International Finance Corp and IFC Global Infrastructure Fund was first announced by TNB in December 2015. An amended agreement was signed in March 2016 owing to the parties agreeing to retain additional assets as a project of GAMA Enerji. The deal allows TNB to form a separate partnership with GAMA Holding to offer operations and maintenance (O&M) facilities services in Turkey and the neighbouring region, and take advantage of opportunities in the O&M sector, leveraging GAMA Holding's regional leadership in engineering, procurement and construction services.

Currently, GAMA Enerji owns and operates a large and well-balanced portfolio of thermal, wind and hydro assets in Turkey, and also developed and operates a large water conveyance project in Jordan. TNB also indicated that its equity investment in GAMA Enerji will create access to power generation assets in Turkey and a platform to pursue infrastructure projects in the surrounding region. These would include asset acquisition, greenfield projects, portfolio optimisation and entry into the supply market. 

TNB SEALS RM2.3b COAL DEAL


TNB Fuel Services Sdn Bhd has signed five long-term affreightment contracts valued at US\$537 million (RM2.11 billion) to ship coal from Indonesia to Malaysia.

TNB said in a statement that the contracts – 10 years for secondhand vessels and 15 years for newbuilding vessels – were inked with PNSL Bhd, Malaysian Bulk Carriers Bhd, Duta Marine Sdn Bhd and Prima Shipping Sdn Bhd. Two of the consecutive voyage charter (CVC) contracts are with PNSL Bhd, worth US\$99 million (RM388.4 million) and US\$95.4 million (RM374.3 million), to transport a total of 3 million tonnes per annum (Mtpa) for a 10-year period.

The single biggest contract was given to Malaysian Bulk Carriers Bhd, valued at US\$143.1 million (RM561.4 million), to carry 1.5 Mtpa for a 15-year period. The CVC deal with Duta Marine is to ship 1.5 Mtpa over 10 years for US\$100.5 million (RM394.3 million). Prima Shipping, meanwhile, will deliver 1.5 Mtpa for US\$99 million (RM388.4 million) for a 10-year period.



The long-term affreightment contracts secured by TNB Fuel Services Sdn Bhd will ensure a reliable coal supply in the coming years.

“The awarding of the long-term contracts of affreightment (COA) reflects TNB Fuel's commitment to promoting and nurturing the growth of Malaysian-owned shipping companies, which eventually will allow them to own and/or operate Malaysian-flagged vessels,” TNB told *The Star Online*. 


NEW PPA WITH POWERTEK



Powertek's 434MW power plant in Telok Gong, Melaka will provide electricity to TNB for three years and ten months after the PPA's signing.

TNB has signed a new power purchase agreement (PPA) with Powertek, a wholly owned subsidiary of 1Malaysia Development Bhd (1MDB) for an extension of three years and ten months following a conditional letter of award by the Energy Commission to Powertek in August 2015.

"This new PPA governs the rights and obligations of both parties throughout the term of the extension and on the sale and purchase of all capacity and electrical energy generated by Powertek from its 434MW open-cycle power plant located at Telok Gong, Melaka," TNB told The Star Online. Three of the units in the Powertek Facility commenced operations on 1 March 2016 and another one on 15 March 2016.


TNB and Powertek had executed an original PPA in December 1993 for the sale and purchase of all the capacity and the electrical energy generated by the Powertek facility, but it expired on 13 January 2016. The utility giant said the signing of the PPA would not have any effect on the issued and paid-up share capital and the substantial shareholders' shareholdings of TNB, and would have a "neutral impact on the earnings of TNB" over the term of the extension. 

REBATE FOR ENERGY SAVINGS

Tenaga Nasional Bhd (TNB) recently announced that RM758.03 million had been allocated as rebate to consumers with a monthly electricity consumption of more than 300kWh. The utility giant said this Imbalance Cost Pass-Through (ICPT) rebate was made possible due to lower liquefied natural gas (LNG) and coal prices, higher performance of coal power plants and a reduction in the use of LNG for electricity generation.

The government also announced an ICPT rebate of 1.52 sen/kWh beginning from July 2016 until Dec 31, 2016. TNB said the rebate also took into account additional gas cost following the government's subsidy rationalisation plan and decision to further increase the piped gas price from the current RM18.20/mmBTU to RM19.70/mmBTU. The ICPT

is a mechanism approved by the government and implemented by the Energy Commission since 1 January 2014, as part of a wider regulatory reform called the Incentive Based Regulation (IBR).

IBR is a form of economics regulation which is widely adopted worldwide. The regulation was introduced by the Energy Commission (EC) in 2012 to ensure a sustainable electricity supply industry through transparent and fair returns whilst promoting maximum efficiency. 

The ICPT mechanism allows TNB to reflect changes in fuel and generation costs in consumers' electricity tariff every six months.



THE GREEN ENERGY DRIVE

Expanding on Sustainable Energy

As the national utility provider, the core operations of Tenaga Nasional Berhad (TNB) are intrinsically entwined with energy consumption, production and distribution – making it a company with strong links to sustainable, green and renewable energy. **TENAGALINK** speaks to two instrumental members of its Sustainable Energy Development Section (SEDS), who demonstrate that these words are taken very seriously at the company. **Ir Kartina Hasim, Manager of Green Technology, and Dr Amissa Shaidi Arifin, Senior Engineer of Project Development**, shed light on the efforts taken by TNB Distribution to stay on the green path.





ON THE NATIONAL SCALE

Before we get into the details of TNB'S prudent energy management, let us first look at the steps and initiatives taken by the government to encourage the sustainable mind-set on the country. Perhaps the most pivotal are the *National Energy Policy and the Renewable Energy Act (2011)*. The *National Energy Policy* was drawn up with the idea of enhancing the utilisation of indigenous renewable energy resources, in order to contribute towards national electricity supply security and sustainable socio-economic development.

Nestled within the *Renewable Energy Act (2011)*, meanwhile, are provisions for the establishment and implementation of a special tariff system aimed at nurturing the growth of renewable energy for the purpose of electricity generation. With its many proponents, the Act catalysed the development of sustainable energy.

The biggest change brought forth by the Act is the introduction of the Feed-In Tariff Scheme (FiT) in the same year as the Act itself. Under this scheme, which is overseen by the Sustainable Energy Development Authority (SEDA), TNB's customers can generate electricity from renewable energy sources, such as photovoltaic panels on their property, in order to harness solar energy. The energy collected is converted into electricity, and then sold back to TNB.



“We want to ensure that our customers are more aware of the need for, and benefits of, energy efficiency as well as promote measures to conserve energy.”

– Ir Kartina Hasim,
Manager of Green Technology

A FITTING ARRANGEMENT

Not a single portion of this electricity is used to power the building; rather, the electrons generated are meant for sale to TNB in their entirety. “Therefore, there would be two meters on the premises – one to read the electricity sold to the customer by TNB and another to measure the opposite,” Ir Kartina says.

“Developers who express interest in being part of the scheme need to get into a contract with TNB by signing a Renewable Energy Power Purchase Agreement (REPPA), which grants them approval to produce and sell the electricity to TNB,” she adds. If they are

successful in their application, they become Feed-in Tariff Approval Holders (FiAH). The quota of applicants is set by SEDA.

The REPPA is signed for a number of years, according to the type of renewable energy. "The duration of the contract for biomass and biogas resources is 16 years, while for small hydropower and solar photovoltaic, it is 21 years," Dr Amissa explains. The agreed-upon FiT rates apply for the length of the contract.

"We are involved from the get-go of this process, beginning at

application stage, signing of REPPA, testing and commissioning of the renewable energy project, and then processing payments to the FiAH," Ir Kartina says.

CONNECTION SUPPORT

"Renewable energy developers who wish to be connected to the grid are reviewed technically," Dr Amissa adds. "If their generation capacity exceeds 12 kW, they have to undergo a technical feasibility study."

The type of study depends on the output. "A connection confirmation check is required for those

producing between 12 and 180 kW, and those producing between 180 and 425 kW are subject to an advanced connection confirmation check." Anything higher than this range would involve a power system study, although a cap of 30 MW is placed for connections to the grid.

"The connection confirmation check is done to verify that the connection point to the grid is stable. The power system study is a detailed technical study to determine the optimal connection point. The voltage rise and generation levels as well as other factors are given heavy consideration. It is done

THE EFFECT OF EL-NIÑO ON BILLS

How Increasing Temperatures Lead to Increasing Tempers



While a sunny climate might be a boon for solar energy harvesting efforts, weather that is too hot will put a dent on comfortable living; the El Niño phenomenon resulted in ambient temperatures that were beyond tolerance. It prompted customers to increase their air-conditioning usage, causing a surge in electricity demand and generation.

As the mercury rose past ever higher figures, Malaysians started to look desperately for cooling reprieve. Yes, Malaysia is a tropical country on the equator that is bathed generously in the sun's rays, but when sweat glands had to work overtime to bring the body temperature down because of the additional effects of El Niño, it soon became more than an inconvenience and unbearable. Hands starts reaching for the compact remote, and thumbs stabbing the 'lower temperature' button. The sweating ceases, but something else starts to work overtime; air conditioners running for hours on end.

with the help of a software,” Dr Amissa clarifies.

To date, 5,676 renewable energy projects have been commissioned for the FiT scheme, which amounts to a total capacity of 309.56 MW. “This figure was achieved in the four years since we adopted the FiT scheme from Germany,” Dr Amissa states. “This is a massive increase compared to the total of 60 MW attained in the ten-year period between 2001 and 2010!”

– continued on page 15



“Via our involvement in renewable energy and energy efficiency efforts, SEDS supports TNB green energy policies as well as development of national sustainable energy and energy efficiency initiatives.”

– Dr Amissa Shaidi Arifin,
Senior Engineer of Project
Development

This, of course, led to a trend that became apparent when the national electricity consumption figures were analysed. The highest demand (peak demand) of electricity in Peninsular Malaysia posted a reading of 17,788MW on 20 April 2016, a sizeable increase of 37.82% when compared to the 12,906 MW reading on 1 January 2016.

The hot and dry weather, which persisted for weeks saw air conditioners running more often and for longer periods than usual. The power-hungry cooling appliances were also placed in maximum settings – at the coolest temperatures and highest blower speeds – which meant that it wolfed down the wattage even more ravenously.

Older, less efficient air-conditioners, as well as fans and other equipment which are not properly maintained can also lead to increased electricity consumption, which inevitably results in unsightly numbers appearing on the customer’s electricity bill.

A case study done in Selangor showed the usage of three air conditioning units increase from five hours a day in December 2015 to eight hours a day in April 2016. As a result, electricity consumption ballooned by 40%, rising from 428 kWh to 598 kWh. This increase almost doubled the customer’s average electricity bill amount, as it climbed from RM125.52 to RM231.69.

Another primary cooling appliance also experienced heavier usage during the hot spell. Refrigerators are power hungry machines – running all day and consuming a substantial measure of electricity (a 2-door, 190 litre unit has an average usage of 1,236kW a year, which amounts to RM384).

To reduce the dent these machines leave on the electricity bill, TNB has put up advisory material on its website and Facebook. For air-conditioners, this includes purchasing more energy-efficient air conditioning units, setting the optimal temperature (24 degrees Celsius is recommended), limiting the number of hours the unit is turned on, increasing the temperature setting and combining the cooling effects of the air conditioner with a fan, and setting the air conditioner in ‘dry’ mode instead of ‘cool’ mode.

When it comes to refrigerators, it is also important to ensure that a unit has been bestowed with an efficient energy rating before purchasing, as well as to choose the right size and type of refrigerator to suit household needs. The temperature of each compartment should be set according to its contents (-18 degrees Celsius for the freezer and 5 degrees Celsius for the refrigerator are recommended).

EYEING ENERGY EFFICIENCY

The sustainable efforts helmed by TNB are not just limited to renewable energy, as a considerable chunk of their work champions the case for efficient expenditure of energy. This encompassed energy efficiency awareness, initiative and reward programmes, as well as adding provisions for energy calculation and audits to help energy prudence. The following are several examples of TNB's endeavours on the energy efficiency front.

Home Energy Calculator

This nifty calculator can be accessed at hec.tnb.com.my, and customers can utilise it to estimate how much household electricity they are using. Variables such as house design, room count and appliances type can be configured for a more streamlined estimation.



Home Energy Report (HER)

With this service, TNB helps customers to keep an eye on their electricity consumption by showcasing usage patterns, comparisons with similar homes and advice and tips to cut down on unnecessary usage.

A suite of services for selected domestic customers

**What will
these customers
get?**

1. ▶ Report mailed to their house
2. ▶ Usage trend and ranks
3. ▶ Personalised Energy Efficiency (EE) tips
4. ▶ eHER
5. ▶ Web Portal tips and tools

Energy Efficiency Buildings (Pilot Project)

Via this programme, TNB focuses on bringing its own buildings up to speed in terms of efficiency. This is accomplished via retrofitting works to reduce energy wastage, which include installing more efficient lighting, solar photovoltaic panels and the Centralised Energy Monitoring System (CEEMOS). In the example here, Wisma TNB at Jalan Timur has successfully slashed 5% off its monthly bills as a result of the programme.



Average bill/month (pre-retrofit):

RM240,000

Average saving/month:

RM12,000

Savings:

5%

**RM
144,000
Savings/year**

Power Factor Correction

In an effort to encourage its large power consumers to maintain a high power factor (an index used to measure the efficient use of electricity), TNB has offered to share the cost to install equipment that improve this index at their customer's property. This conditional offer is subject to a cost limit, as well as other criteria listed below.

Subsidy by TNB

(50-50 Cost Sharing):

Up to OPC - RM2,500/customer

Up to LPC - RM25,000/customer

Overall project cost:

RM2 million

CRITERIA

Commercial & Industrial Customers

Power Factor less than 0.85

Paying Power Factor Surcharge

Good Paymaster

Doesn't have any power factor correction equipment installed at the premise yet

260 Customers from Kuala Lumpur, Selangor, Melaka & Penang

A DEDICATED TEAM

The Sustainable Energy Development Section (SEDS) is TNB's in-house green energy department created to support the TNB Green Energy Policy and development of national sustainable energy and energy efficiency initiatives.

SEDS is essentially a one-stop centre for all queries regarding renewable energy in TNB, coordinating with other like-minded departments and entities such as the Regulatory Economics & Planning (REAP) department, the Asset Management Department (AMD), the Single Buyer department, TNB Research, and TNB Energy Services, on all matters that are pertinent to renewable energy.

It is also tasked with managing the implementation of the FiT endeavour. In this regard, its involvement spans all aspects of the scheme – from the application stage, signing of the RE Power Purchase

Agreement (REPPA), testing and commissioning of the renewable energy projects which are approved by SEDA, processing the payments to the FiAH and processing the recovery money from SEDA.

Promoting energy efficiency initiatives for sustainable living through EE awareness programmes is another SEDS effort. This includes implementing EE demonstration projects and performing studies in other green technology areas, such as electric vehicles and energy storage.

As the NEM and LSS programmes gain momentum, SEDS will oversee them in similar fashion to the FiT scheme. This entails managing the application process for technical studies, processing the payment to the LSS developers and NEM consumers, and coordinating the terms and conditions for these projects.



Steered by Sansubari Che Mud, Senior Manager (Renewable Energy & Green Technology) (front row, centre) Dr Amissa Shaidi Arifin Senior Engineer of Project Development (front row, fourth from right) and Ir Kartina Hasim, Manager of Green Technology (front row, third from right), the SEDS team helps to pave the way for a brighter, cleaner tomorrow with their efforts to curtail energy wastage.



“Working hand-in-hand with other TNB departments, SEDS acts as a consultant to work out the feasibility of a particular sustainable energy project.”

– Sansubari Che Mud,
General Manager (Sustainable Energy Development)

– continued from page 11

The payment pool reserved for the FIAH is called the Renewable Energy Fund, and it is generated by charging TNB customers who consume more than 300 kW (approximately RM77) of electricity a month a token amount of 1.6% of their total bill.

“The collected amount is forwarded to SEDA to be deposited into the fund. We then upfront payment to the developers who sell electricity generated from RE plant, before being reimbursed by SEDA from the fund. While the payment pathway may be confusing, what matters is that at the end of the day, the fund is being used to nurture the expansion of renewable energy.”


NEW SCHEMES ON THE BLOCK

According to SEDA, the quota for solar energy under the FiT scheme has reached its limit, and it will no longer be offered to domestic consumers after 2017. “Therefore, the government has introduced new schemes in the forms of Net Energy Metering (NEM) and Large Scale Solar (LSS) as a replacement,” says Dr Amissa.

“The NEM scheme is introduced to replace the FiT scheme, where the electricity produced is used to power the building – self-consumption, and any excess electricity is then sold to the grid at a rate that is different from FiT,” she continues. “There will be only a single meter used – a bi-directional one. Customers benefit in terms of a reduction in their electricity bill, as a portion or all of the electricity they use at home is generated by them,”

The capacity is fixed at 500 MW for the 5-year period between 2016 and 2020. “This is distributed at the rate of 100 MW a year, of which 90 MW is reserved for Peninsular Malaysia and 10 MW for Sabah,” Dr Amissa mentions. The ratio is set at 20 MW for domestic consumers, and 35 MW each for industrial and commercial ones.

LSS involves solar photovoltaic plants that lie in the range of 1 to 50 MW, and Dr Amissa says the connection to the grid is dependent on the capacity. “If the output is below 30 MW, it is connected to the distribution grid. Anything beyond this capacity requires a connection to the transmission grid.” The annual quota is 250 MW for Peninsular Malaysia and 50 MW for Sabah, for the years leading up to 2020, which is a total of 1000 MW.

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HAND IN HAND

For a Greener Tomorrow

Sustainable Energy Development Authority (SEDA) Malaysia is the government body that has been tasked with implementing and administering the feed-in tariff (FiT) mechanism, which allows customers to produce electricity from renewable energy sources on their property to be sold back to the utility. SEDA is also instrumental in promoting sustainable energy measures in the effort to attain national energy security and energy autonomy. Therefore, naturally, SEDA and TNB have goals which are in tandem in the pursuit of sustainable production and utilisation of energy. **TENAGALINK** has a chat with **Catherine Ridu, Chief Executive Officer of SEDA**, to have an understanding of its achievements and its future plans.



SEDA was established on 1 September 2011 upon the passing of the *SEDA Bill 2010* by the Malaysian Parliament, and it has shouldered its responsibilities impeccably since. It was born of the need for a dedicated agency to lead the nation's sustainable energy charge.

"Subsequently, it was agreed that an authority for sustainable energy be established as a statutory body under the Ministry of Energy, Green Technology and Water (KeTTHA). SEDA is expected to be the body overseeing the growth of renewable energy, ensuring that the renewable energy policy targets are met and also be held

accountable of the success of renewable energy development in the country," Catherine says.

EFFECTIVE ADMINISTRATOR

Three months after the formation of SEDA, the FiT scheme was implemented – and by the end of June 2016, SEDA had approved a total of 9,570 FiT applications from customers. These applications amount to a hefty cumulative capacity of 1,308.55MW.

"In the same period, a total of 6,201 FiT applications with a total capacity of 364.02MW have achieved commercial operation. In this respect, within a period of

four-and-a-half years, the FiT scheme has achieved over six-fold growth in renewable energy operational capacity compared to the small renewable energy power programme (SREP) which spanned from 2001 to 2010," Catherine reveals.

According to Catherine, the FiT scheme has yielded substantial energy, environment and economic benefits. "It has created a shift from brown to green economy, which has resulted in job creation, investments in green projects, and improvement in the environment with less carbon emission."

SEDA's engineers conduct regular scheduled inspections to ensure all is in order at the electricity generation setup installed at customers' premises under renewable energy schemes.

Cumulative Approved FiT Applications (end of June 2016)

Renewable Resources	No. Application	% of Total Applications	Capacity (MW)	% of Total Capacity
1 Biogas	96	1.00%	170.96	13.06%
2 Biomass	38	0.40%	358.79	27.42%
3 Small Hydro	44	0.46%	349.29	26.69%
4 Geothermal	1	0.01%	37.00	2.83%
5 Solar PV	9,391	98.13%	393	30.00%
<i>Individuals</i>	8,513	88.96%	78.63	6.01%
<i>Community</i>	299	3.12%	6.71	0.51%
<i>Non-individuals</i>	579	6.05%	307.17	23.47%
Total	9,570	100.00%	1,308.55	100.00%

Cumulative FiT Applications Achieving Commercial Operation (end of June 2016)

Renewable Resources	No. Application	% of Total Applications	Capacity (MW)	% of Total Capacity
1 Biogas	12	0.19%	21.36	5.87%
2 Biomass	6	0.10%	68.40	18.79%
3 Small Hydro	5	0.08%	18.30	5.03%
4 Solar PV	6,178	99.63%	255.96	70.32%
<i>Individuals</i>	5,664	91.34%	52.82	14.51%
<i>Community</i>	160	2.58%	2.86	0.79%
<i>Non-individuals</i>	354	5.71%	200.29	55.02%
Total	6,201	100.00%	364.02	100.00%

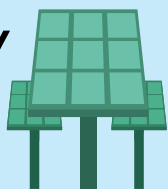
OTHER FOCUS

SEDA is also looking into developing competency in renewable energy technology, particularly solar. The list of solar photovoltaic (PV) trainings offered includes a grid-connected PV systems design course, grid-connected PV for non-engineers, a continuous development programme (CDP) for qualified persons, grid-connected PV for wiremen and chargemen, and solar PV installer and maintenance courses.

Additionally, SEDA places priority in the promotion of energy demand management (EDM) activities, such as the implementation of the government's Performance Management And Delivery Unit (PEMANDU) Entry Point Project (EPP)-9 Sustainable Achieved via Energy Efficiency (SAVE) programme, Low Carbon Building Facilitation Program for Local Authorities, State Governments & Government Agencies and Low Carbon ICT Programme.

"The EDM team within SEDA is also currently involved in the implementation of the Energy Audit

IN HARMONY WITH TNB



SEDA Malaysia has been working closely with TNB since the development of the National Renewable Energy Policy and Action Plan (NREPAP), which paved the way to implementation of the FiT and NEM schemes.

"Globally, most utilities are concerned about the threat of renewable energy to the survival of their core business. However, TNB is an exception, and they have been undivided in their support of the renewable energy agenda," Catherine says.

"TNB is an exemplary utility, having several notable renewable energy demonstration projects and smart grid initiatives. While some conventional utilities in Europe have suffered the ill-fated utility death spiral, TNB has positioned itself in readiness for the megatrend in energy transition."

"SEDA appreciates the cooperation of TNB and their roles in collecting the 1.6% additional charge imposed on electricity bills for above 300kWh per month in peninsular Malaysia towards the RE Fund, and for disbursing the FiT payments to the FiT projects each month. To this end, SEDA hopes TNB will continue its roles and be a model for utilities in other ASEAN countries to emulate." The RE Fund (KWTBB) is established under the *RE Act 2011* to fund the payment of FiT projects and administrative fees for Distribution Licensees and SEDA.

Impact Indicators of the FiT (projected up to 2019)

	Number of Jobs Created	RE Generation (MWh)	Installed Capacity (MW)	FiTCD Capacity (MW)	CO2 Reduction (tonnes)	Total Investment (RM)
Biogas (palm oil waste, agro based & farming)	3,686.77	1,033,489	147.47	21.36	743,215	1,184,528,988
Biomass (palm oil waste, agro based & farming)	7,394.76	1,480,567	246.49	68.40	988,319	1,606,061,908
Mini Hydro	4,487.10	1,860,685	299.14	18.30	1,336,719	2,778,024,182
Solar PV	9,136.93	502,900	365.48	255.96	361,309	3,631,403,821
Geothermal	555.00	236,520	37.00	-	129,140	-
Total	25,261	5,114,161	1,095.58	364.02	3,558,701	9,200,018,898

Conditional Grant for Commercial Buildings, a programme outlined under the 11th Malaysia Plan,” says Catherine. This effort focuses on understanding how and where energy is being used throughout a building, in order to identify the energy savings potential.


LOOKING AHEAD

With net energy metering (NEM) as an extension outside the FiT mechanism for solar PV, SEDA is preparing to be the mandated implementing agency. NEM allows building owners to install a solar PV system and consume electricity generated from the solar PV system in situ, with any excess electricity generated from the solar PV system exported back to the grid.

“Under the Budget 2016, the Prime Minister of Malaysia announced that SEDA shall be the implementing agency for NEM, commencing 2016 with an annual quota of 100 MW. This announcement is most apt as the solar PV quota will be exhausted post-2017 under FiT. The introduction of NEM will sustain solar PV industry and enable us to capitalise on the sizeable PV manufacturing base in the country,” Catherine remarks.

An example of a FiT scheme that has been approved by SEDA, the biogas facility at the Bukit Tagar Sanitary Landfill harnesses methane gas discharge to generate electricity, which is then sold back to TNB.



SEDA has also embarked on the development of a Sustainable Energy Transition Roadmap 2050 in association with the Ministry of Energy, Green Technology and Water (KeTTHA). “This roadmap will chart the path for Malaysia to augment sustainable energy contributions in the energy mix, and wean the country off its over-reliance on fossil fuel.” 

WISMA TNB

Housing a Peaceful Piece

A flick of the switch is all it takes to have a surge of electricity current rushing to fixtures and appliances, allowing them to operate as their designers intended. Sitting in a room made bright by lights and cool by air conditioners, it is all too easy to forget that the flow of electrons powering them has made a seamless journey through various equipment. While this hardware has been around since electrical grids appeared and spread decades ago, it has evolved with the times as new technology emerges and modernises it. But what happened to the obsolete gear of yesteryear? Condemned for the trash heap, most likely, and wasting away.

However, the men and women at Wisma TNB Taiping decided that upon rendering years of service, these electrical apparatus deserved better. After salvaging several integral items that were the current technology back in the day, the personnel granted them a life of retirement as interesting museum pieces on display on the Wisma TNB premises. **TENAGALINK** experiences a blast from the past as it explores and marvels at these intriguing exhibitions.

PRESERVING HISTORY

TNB's outpost in Taiping is a clean, modern-looking building that sits just off Jalan Istana Larut, sporting a well-manicured lawn of calming foliage. Nicknamed 'The Heritage Town,' the quiet, idyllic municipality in the state of Perak is a place

where time moves so slowly it seems to stand still.

Time and heritage are two aspects that Wisma TNB Taiping is well-versed in, only their time is not just slowed or stopped, it is reversed. This is because the structure harbours on its grounds something

no other Wisma TNB in the country has – a museum dedicated to the electrical wonders of the past.

"The museum has been around for several years," Mohd Rohaizan bin Shamsudin, Area Manager of TNB Distribution (Taiping) says. "It is something that we are proud of, as it reminds us of our achievements in the past and what we are capable of in the future. We will ensure that it remains open for years to come."

"We have on display items that are relics from the past, back before TNB was established," he added. "These heirlooms first saw the light of day during the time of *Lembaga Letrik Negara (LLN)* decades ago."

There are two portions to the museum layout – an internal one featuring smaller items, and an external one that showcases larger items. The indoor section of the museum is called the *Galeri Dato Ir Aishah*, named in recognition of her tenure as the Vice President of TNB Distribution.

The outdoor section is simply called *History Corner*, and the plaque standing before it informs curious bystanders that it was launched by Dato' Zainol Fadzi bin Hj Paharuddin, the Chairman of the Committee on Arts, Culture, Youth and Sports of Perak on 25th Syawal 1433 Hijrah, or the 11th of September 2012.

TAIPING

of TNB's History

FULL OF FASCINATION

Although neither is especially large, both segments of the museum are comprehensively stocked with obsolete wonders rescued from destruction. Free from space constraints, the *History Corner* is populated with objects which are liberally dimensioned.

The museum caretaker, Ahmad Kamal bin Hashim, gives us a guided tour. "This is my favourite item here," he says, gesturing at a piece of machinery clad in cast iron and sprouting levers. "It is an old-school transformer that is complete with the accompanying switchgear."

Aside from the history it soaked up over the years, he tells us that its significance is augmented by another special event. "This machine was used in the launching ceremony of the very Wisma TNB on whose grounds it stands. The late Sultan of Perak, Almarhum Sultan Azlan Muhibbuddin Shah, officiated at the opening of the building by manipulating the switches, which triggered the pageantry for the launch gimmick. Subsequently, the transformer was placed on this spot."

A plaque on the machine reveals just how old the machine is. It reads 1955, making the transformer even older than Malaysia. Ahmad

"We will ensure that the museum remains open for years to come to perpetuate the historical significance of the items in it, some of which are well over 50 years old today."

– Mohd Rohaizan bin Shamsudin,
Area Manager of TNB Distribution
(Taiping)



"We have students coming here to learn about the development of electricity in the country, and about the history of the land too."

– Ahmad Kamal bin Hashim,
Museum Caretaker,
Wisma TNB Taiping



Kamal points to another plaque that is riveted to the machine's side – which reads *Golden Frontier (Orion Paper)* – and says that the transformer once occupied space in a paper mill.

He then directs our attention to the electrical poles that rise up a

dozen feet into the air, made of wood that has seen its fair share of weathering. "They are fashioned out of mangrove wood, and were hewn into shape in the 1940s!" The first train tracks were laid at that time – in 1943 – from Taiping to Port Well, and the wood of choice for the pillars was mangrove. It was



Top left and right: The gazebo and walkway outside Wisma TNB Taiping was made with recycled TNB poles as part of REUSE, REDUCE and RECYCLE initiative to contribute to a sustainable environment.

Below left: The History Corner features electrical contrivances, equipment and other interesting Lembaga Letrik Negara collectibles that hark back to the olden days.

Below right: Their substantial age proudly on display, the items within the glass cases each tell an interesting tale of the past.

the easiest wood to procure at the time, and the state has no shortage of mangrove trees.

With an interesting story behind every item on display, a mere browse around the fenced compound becomes an excellent history lesson.

RICH IN HERITAGE

Continuing the tour inside the building, Ahmad Kamal takes us to the gallery where more antique pieces await. The collection consists of items more petite than the ones found outside, but they are no less adept at arousing the curiosity of onlookers.

Take the set of iron ladles and pot that look like they came out of an ancient kitchen, for instance – they are not something the average person would associate with electricity. But Ahmad Kamal assures us that they are. “These were the tools used to connect two wires together,” he explains. “Tin was melted over a fire in the pot, and then – in a fashion similar to soldering – utilised to fuse the ends of two wires to each other.”

With the advent of modern technology bringing far greater ease into the methods of joining wires and cables together, this particular technique



would have been lost to the past, unknown to the population of today – if not for the tool display at Wisma TNB Taiping.

There are other artefacts from the days of old as well, such as warning and information signage that are recognisable from the lettering and backing to be from another era. On the table are electric meters with analogue rotating counters, the white-on-black numbers a sight

only familiar to those who grew up in the 1980s, or earlier.

The other pieces exhibited there – including but not limited to switches, connectors, capacitors, coils, and gadgets to measure voltage, amperage and wattage – wear a similar coat of age, the patina hiding metal that was new a lifetime ago, the stain of wood no longer sparkling as its lustre is dulled by the years.

This appearance, although a far cry from being faultless, enhances the appeal of these articles manifold. Commanding awe, these fragments from the past compel observers to rewind time to the period when the conveyance of electricity relied heavily on them, and provide a sampling of the ingenious solutions engineers of the time conjured up to energise the development of electricity.

Evoking a range of feelings from nostalgia to admiration, the displays devoted to the history of the nation's electricity at Wisma TNB Taiping offer an exclusive window to the past. It is a befitting view held by the workforce there that these creations of yore are valuables, and their commitment to the cause of keeping these antiquities intact is a laudable one, and one that is hoped to persist for generations to come. 🏠



NATURE-FRIENDLY TECHNOLOGY

Manjung 4 Joins the Ranks at TNB Janamanjung

Manjung 4 (centre) stands tall at TNB Janamanjung, heralding a new dawn in coal-fired power plants with its impressive list of cutting-edge technologies.

The Sultan Azlan Shah Power Station of TNB Janamanjung is a coal-fired power station that has been a reliable workhorse for Tenaga Nasional Berhad (TNB) since it began operations with three 700MW plants, named Manjung 1, 2 and 3. Work commenced in 2011 to build a fourth sibling for these three – Manjung 4. It adds 1,000MW to the Janamanjung power station's combined capacity, pushing the total to 3,100MW. The new plant contributes in more ways than one – it produces more power, uses less fuel, releases less waste and offers employment to the local community.

FOUR YEARS IN THE MAKING

TNB Janamanjung is a wholly-owned subsidiary of TNB, and was established in 1996 to build and operate a coal-fired power station in Manjung, Perak. The station stands on a 325-hectare man-made island on the outskirts of Seri Manjung, some 80 kilometres southwest of state capital Ipoh and just south of the twin tourist hotspots of Lumut and Pangkor Island. The foundations for the three 700MW power plants, also known as Generating Facility 1 (GF1), were laid in 1999. The plants were operational in 2003.

As demand for electricity grew nationwide, plans for a larger capacity plant – Generating Facility 2 – were drawn up to compliment GF1. On 31 March 2011, French power generation specialist Alstom and CMC Machipex, a local subsidiary of CMC China, embarked on the Manjung 4 project. The RM6 billion venture was completed four years later in 2015, and pushed Janamanjung's combined output capacity to 3,100MW – more than 20% of the country's electricity. This makes TNB Janamanjung the largest producer of electricity in the country.

MATCHING POWER AND EFFICIENCY

Manjung 4 does not only have a larger capacity than its older brothers, but it is also more efficient, requiring a lesser amount of coal to operate pound-for-pound. It is the most efficient coal-fired plant in Southeast Asia at an almost 40% efficiency level, thanks to the latest ultra-supercritical combustion technology it employs. In comparison, the Manjung 1, 2 and 3 plants run at only 36% efficiency.

VIEWS

Datuk Shamsul Ahmad
Managing Director, TNB Janamanjung



When the plans for TNB Janamanjung were being mooted, the government was looking at diversifying generation fuels. We were depending heavily on gas at the time, so we decided to opt for coal, because it is a cheaper and plentiful fuel source. There is a large coal reserve around the world, and one of the principal sources is in Kalimantan, about a week's journey by ship.

The power station is strategically located to receive coals. The man-made island, formed using reclaimed soil to cover what was once a swampy area, is complemented by the Lekir Bulk Terminal. The design of the terminal's jetty is perfect – its draft is deep enough for larger ships to be berthed without waiting for high tide, and it is protected from rough waters by Pangkor Island.

Manjung 4 represents a step forward in coal-fired technology. The clean coal technology we employ complies with not just the local requirements, but also World Bank standards as well, as we have pledged to take care of the environment. We have even conducted dust dispersion studies to gauge our contribution of dust to the surrounding area, which turned out to be only 5%, well under road dust levels.

The station also has excellent safety standards, and it has been awarded the OHSAS 18000 certification by SIRIM. We apply the safety excellence management systems developed by TNB. Currently, we are also employing behaviour-based safety, which encourages employees to report even the most trivial of incidences (even a cut on the finger) rather than brushing them off. The reports are then investigated and analysed, and the resulting data used to instil countermeasures to prevent reoccurrence. In terms of accident statistics, we are doing a lot better than comparable stations in other countries such as the UK. My tagline is "Be safe, stay safe" and I impress that upon all the staff.

It has been an amazing journey for us here at the station, watching it evolve over the years to become a benchmark coal-fired power station in terms of its safety records, work processes and the way it is managed. We regularly receive visitors from other power companies based in the Southeast Asian region and beyond, including Hong Kong, Taiwan, Japan and Saudi Arabia, who come here to take notes on how we run the station. It validates the effort we have put into turning TNB Janamanjung into the successful power station it is today.

Below: A row of monitoring equipment at the Manjung 4 control room, which provides personnel with comprehensive information on the essential components of the power plant.



The plant also employs state of the art filtering systems, which allow it to use lower quality coal as fuel without compromising by way of higher emission levels. As Manjung 4 uses an advanced pulsed jet fabric filter, particulate matter that leaves the plant does not exceed 50mg/Nm³.

At 200mg/Nm³, Nitrous Oxide (Nox) and Sulphur Oxide (SOx) levels are less than half the 500mg/Nm³ set by the Department of Environment (DOE). Dedicated filtering and

emission-control systems including flue gas desulphurisation and low Nox burner help to ensure that this requirement is met.

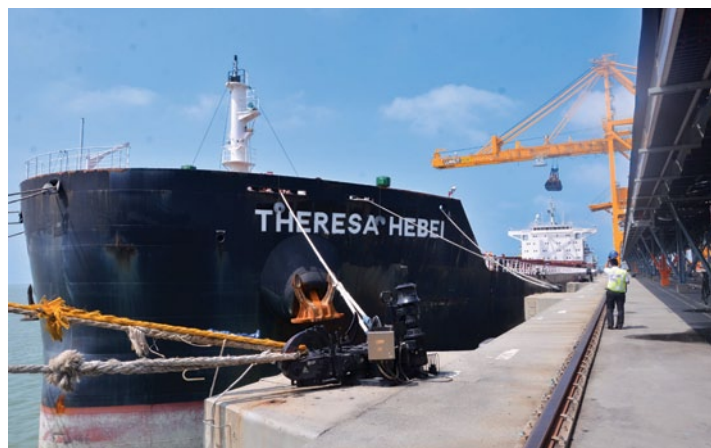
A CROWDED TROPHY CABINET

While TNB Janamanjung power station has racked up several accolades during its years of operation, Manjung 4 has also netted a few of its own. Asian Power, a magazine has bestowed upon Manjung 4 the Gold Award for Coal Power Project of the

Year, recognising the plant's many achievements.

The International Project Management Association (IPMA) has also included Manjung 4 on its awardee list, declaring it the Silver Winner in the Award Category in Project Excellence for Mega-sized Projects.

Power Magazine, an international publication, recognised the plant as the most efficient coal-fired power plant in Southeast Asia, stating that the "Manjung 4 Power Plant can burn



Top: With a dedicated jetty to receive its coal supply, TNB Janamanjung's fuel stockpile is never inadequate.

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REPLANTING THE FUTURE

Sustainable Environment

This year's Janamanjung Fellowship Ride 2016 (JMFR'16) is the 9th annual ritual themed 'Better Environment, Brighter Future'. The event—which took place between 7:00am and 2:30pm and was flagged off by Datuk Zainuddin Ibrahim, TNB Generation Vice President—saw 1,452 enthusiastic bicyclists ride around the 130km course in the Sultan Azlan Shah Power Station.

To emphasise TNB's commitment to environmental sustainability and conservation, an additional activity—a mangrove planting programme—was added as a symbol of the plant to give back to the community. With the theme '1 Rider, 1 Plant', participants at the event planted around 1,000 mangrove trees. The mangrove plants were purchased using the participation fees as well as some contribution by TNB Janamanjung.



Datuk Zainuddin Ibrahim, TNB's Vice President of Generation (4th from left) accompanied by other participants flagged off the mangrove planting programme at Stesen Janakuasa Sultan Azlan Shah, Manjung as part of the opening of the Manjung 4 power plant and TNB's environmental sustainability initiative.

THE LEGACY ENDURES

Sultan of Perak Launches Manjung 4



It was a day of pomp and circumstance at TNB Janamanjung as the royal couple descended on the man-made island to officiate its latest power plant.

Almost 10 years ago in 2007, the Sultan Azlan Shah Power Station was launched by the sultan of Perak, whom it was named after. On February 2, 2016, His Majesty's son, Sultan Nazrin Muizzuddin Shah (pictured inset) graced the power station's grounds with royal presence again to launch Manjung 4.

The launch event was also attended by several dignitaries, including the Perak Chief Minister Dato Seri Dr Zambry Kadir, the Minister of Energy, Green Technology and Water (KeTTHA) Datuk Seri Panglima Dr Maximus Johnity Ongkili, the Chairman of TNB Tan Sri Leo Moggie, and President and Chief Executive Officer of TNB Datuk Seri Ir Azman. Representatives from several companies and establishments including those from other power companies, such as General Electric, were also present.

As the event kicked off, Tan Sri Leo Moggie and Datuk Seri Panglima Dr Maximus Johnity Ongkili both took to the podium to deliver their sentiments on the Manjung 4.

"The use of the ultra super-critical technology not only ensures that the electricity is produced in a safe and environmentally-friendly way, but makes Manjung 4 the most efficient coal-fired power plant in the Southeast Asian region at the moment," Ongkili said in his speech.

According to Moggie, Manjung 4 satisfies all current environmental regulations

with its clean coal technology. "The cost of generation at Manjung 4 is also among the lowest in Malaysia. Aside from being efficient and competitive, it is in line with TNB's commitment to provide an excellent and high quality service via the construction of new infrastructure," he added.

A cinematic video montage on Manjung 4 then held the attention of attendees for six minutes. It revealed details and specifications of the new power plant, and showcased the harmonious relationship between the Sultan Azlan Shah Power Station and the local community.

Sultan Nazrin Muizzuddin Shah later officiated the launch by signing on the ceremonial plaque. Shortly thereafter, His Majesty was taken for a tour around the power station along with his wife, Tuanku Zara Salim, as well as the other dignitaries. The event then concluded with a lunch.

ENRICHING THE NEIGHBOURHOOD

Surau Al-Khairiah Kampung Permatang

For 67-year-old **Yunus bin Abdul Talib**, committee member at the surau in idyllic Kampung Permatang, TNB's Janamanjung plant has proven to be a boon for the village. As TNB has sought to recruit employees who live near the plant, numerous employment opportunities have arisen and many villagers have taken up the job offers. Development has also increased in the area, and property values have gone up as a result.



Kampung Permatang

The development brought about by the plant has also resulted in an increased number of tourists. **Ahmad Radzuan Mohd Hayat** had been a fisherman for seven years before he made a slight switch in careers. He became a fishing tour guide, taking customers to the best fishing spots out at sea – in the waters off Pulau Sembilan, Pulau Jarak and Pulau Tukun Perak among others. He now makes more than he did as a fisherman. **Md Dah bin Hasan**, a teacher at Sekolah Kebangsaan Simpang Empat Sitiawan says that he has seen many of his former students take up positions in the plant, and hopes that more locals explore the employment opportunities available there.



Continued from page 26

a wide variety of coals from many locations to survive in a volatile regional coal market despite lack of indigenous coal resources.”

MANJUNG 4 U

‘Manjung 4 U’ is the tagline TNB Janamanjung has adopted for Manjung 4, and for good reason. Aside from its role as a power producer, TNB is well-

known for its corporate social responsibility (CSR) efforts, and TNB Janamanjung is no less philanthropic when it comes to keeping an eye on the needs of the surrounding populace. Its CSR is centred on the theme ‘Powering Communities, Powering Education and Powering Environment’.

This theme helps to spread the scope of assistance across many channels.

Via TNB's Baiti Jannati initiative, poor families with dilapidated homes will have their houses repaired and rebuilt. Education aid is given in the form of school facility upgrades, school supply donations to children and study programmes. Mangrove tree replanting programmes and a memorandum of understanding with the DOE to carry out further nurturing exercises make up the green aspect of the theme.



Hasil Laut Jamilah

Jamilah Baharuddin started off with a small stall at Lumut Waterfront several years ago, but her business has now expanded to four shops and two homestays across the district. Her name is the first thing you will hear if you ask locals about seafood-based products. Her shop at Jalan Titi Panjang has everything from dried shrimp and anchovies to fish crackers and souvenir fridge magnets. According to Acting Manager **Wan Mohd Nor bin Abdul Rahman**, the growth of the enterprise is as fuelled by electricity as it is good business acumen, because the shop makes use of decorative lights and fans to attract an ever-increasing number of customers, as well as using machines to package their products. With the new Janamanjung 4 station strengthening the grid, he is confident that the reliable supply of electricity will help the business become more prosperous.

Starfish Underwater Services

Starfish Underwater Services (SUS) is a home-grown outfit specialising in underwater pipe maintenance with a branch near Kampung Permatang. In line with TNB Janamanjung's recruitment policy of employing locals to work at the plant, SUS was approached by management at the plant when the plant's intake pipes, which are submerged at sea, needed cleaning. It now performs regular maintenance work at the plant on contract

Perhaps its most famous communal engagement is its sponsorship of the Janamanjung Fellowship Ride (JMFR), an annual cycling event that has been organised since 2008. It draws over 1,300 cyclists from Malaysia, the UK, the US, Japan, Singapore, Indonesia and the Philippines, and has become a tourist attraction of its own. JMFR's contribution to the economy of the state regularly touches RM1 million.

60% of the close to 1,000 staff that TNB Janamanjung employs are from the state of Perak. Even more interesting is that 60% of that 600-odd people are from Manjung itself, proof that the power station is helping to contribute to the community in ways aside from just powering up their homes. Locals can also attest to the fact that TNB Janamanjung has helped to spur economic development in the surrounding area, as tourists and those who work at the station will also agree. 📍

FROM TORRENT TO CURRENT

The Perting Mini Hydro Project



Hidden deep in the thick jungle of Bentong, Pahang is a building no one expects to stumble upon amidst the foliage. Slate grey, windowless (save for some slatted vents on the wall) and fashioned from corrugated steel, its appearance is unapologetically utilitarian, a stark contrast to the verdant treeline encircling it. This industrial park refugee seems to be out of place, that is until you walk closer to it and get a clue of why it is there – the roar that can only be created by a large amount of fast-moving water. It is a hydro power plant. **TENAGALINK** steps into the depths of the structure and takes a look at how river water is turned into electricity at the Perting Mini Hydro Project.

THAT NATURAL RUSH

Unlike conventional hydro power plants which rely on a dam constructed at a body of water such as a river or lake, mini hydro power plants do not stop the natural flow of the river's water current. Instead, these power plants tap into the river several hundred metres upstream, channelling the water into a pipe and directing the rush of water to the power plant.

Since the inlet point of this pipe system is situated at a location much higher than the plant itself, potential energy – or a pressure head – is created by the difference in elevation. It is this pressure that is introduced to the turbine units, turning the blades and generating electricity in the process.

The spent water is then reintroduced into the river via a large drainage



Above right: This 2MW generator was installed at the plant in 2015, stretching its total capacity to 6MW.

Right: The generators utilise a twin jet impulse design, which requires two pipes (seen here in black) on either side of each unit to introduce high pressure water at the top and bottom of the turbines (hidden within the yellow box).





A comprehensive set of gauges and displays help personnel monitor and control the electricity production at the plant.

Sungai Perting forms a line of water that ultimately empties into the Sungai Pahang, the longest river in Peninsular Malaysia.

One of its more famous natural features is the Chamang waterfall, a holiday hotspot thanks to its picturesque layout. The spray of water crashing into the rocks below has appeared as the backdrop of countless tourist pictures.

Just a-hundred-odd metres upstream, hidden from the view of frolicking holidaymakers beyond the crest of the fall, lies one of the river's more famous man-made features – the Amcorp Perting Mini Hydro Power Plant.

It is Amcorp Porperties Berhad's maiden foray into renewable energy production. Construction for the plant commenced in 2006 and took three years to finish, and it was officially commissioned on 31 December 2009. The capacity for the plant at the time was 4MW, generated by two 2MW turbines fed entirely by water taken from Sungai Perting.

The plant operated without trouble, earning it recognition locally and regionally – first netting the *ASEAN Energy Award* in 2012, and then *The Association of Consulting Engineers Malaysia's Silver Award of Merit* in 2013.

It ran without issues during the following years, thanks to a steady supply of water from generous

system originating from beneath the plant.

This minimally intrusive method of harnessing the power of the natural water system ensures that the negative impact to environment is

reduced drastically, especially when compared to a normal hydro dam.

TAPPING SUNGAI PERTING

Snaking through the virgin woodland of the Bukit Tinggi Forest Reserve,

rainfall. This spurred the decision to increase the plant's capacity by 50% to 6MW in the middle of 2014, following the addition of a third 2MW turbine unit. Works for this installation concluded by the following year.

PROVIDING CLEAN ELECTRICITY

The newly uprated plant was then conferred a feed-in tariff commercial operation date (FiTCD) status from the Sustainable Energy Development Authority (SEDA) of Malaysia, which took effect from 27 April 2015.

This paved the way for TNB to sign a 21-year Renewable Energy Power Purchase Agreement (REPPA) with Amcorp, a deal that is valued at the ballpark of RM8.8 million per annum, for electricity that is produced with zero carbon emissions.



THE PLANT EQUIPMENT

Mohammad Thoha Md Rahim, the on-site engineer, takes us around the plant to acquaint us with the equipment. There are three turbine units, sitting side-by-side; each unit has its own set of inlet and outlet pipes through which the water travels, spinning the turbine blades before being dumped onto the drainage system below.

The ends of the inlet pipes that are not connected to the turbines disappear through the floor. According to Mohammad Thoha, they are connected to a larger pipe at the side of the building, and he takes us there. "This is the penstock, or the main pipe that originates from our river water intake point upstream," he says. "It is 1,400mm in diameter, and roughly 4km long. It runs underground for most of that length, save for three points where the pipe breaks the surface. The total head, meanwhile, is 70 metres high."

There are six air valves along the line, he adds, to release the air and

reduce the pressure in the system, and lessen the likelihood of a vacuum forming in the line. "This is important as, if there is a transformer switching or a trip in the power by TNB, we have to immediately shut down our operation. This in turn will cause the water to come to a dead stop in the pipe."

"Thanks to the mechanical float system of the air valves in the pipe, the pressure within the pipe is regulated, and the pipe system is always primed, despite us suddenly stemming the flow."

Returning to the turbine generators, he points out that the inlet pipes by the sides of each unit, which deliver water at the average velocity of 1.6 cubic metres a second, are bifurcated. "This fork in the pipe system is due to the design of the turbines we use. They are twin-jet impulse turbines, so we have two nozzle points – one above the other – that spray water at the blades at two points."

The torrent of water spins the turbines to a rotational speed of 750

"Our generation capacity is dependant on the quantity of rain that falls within the catchment area of the river. A higher amount of precipitation will increase the volume of river water, allowing us to produce more electricity."

*Mohammad Thoha Md Rahim,
On-site Engineer*



Traversing across the river, the weir helps to direct water into the intake plant (right).

rotations per minute (rpm). “This may sound low, but it is akin to the dynamo wheel attached to a bicycle tyre. It is more a question of power than outright rotational speed to get the turbine turning,” Mohammad Thoha says.

“Once the equilibrium speed is achieved, we synchronise this with the plant’s systems and proceed to export the electrical energy. The transformers step up the 690V

generated by each turbine generator to 11kV.”

The synchronisation occurs in the plant’s control room, which oversees the entire process from generation to the exportation to the grid. Banks of instrumentation, informing the personnel on the current outputs and turbine performance, all help the procedure transpire smoothly.

THE INTAKE POINT

Piling into the back of a four-wheel-drive, we then headed out to the intake plant further up the river. Although the distance is only about

2km as the crow flies, the trail is a 4km unpaved stretch littered with massive potholes and rocks that would defeat a normal car.

It is a 20-minute bumpy ride through the jungle before we catch sight of an unassuming structure by the river. We are greeted by Shaiful Reazal Romli, the project manager. “What we have here is the intake point for the power source of our mini hydro power plant,” he starts. “It is a side intake type, and it is divided into three sections.”

He indicates at a large concrete wall that spans the width of the river.



“Unlike a dam whose job is to retain water, excess flow simply cascades over the top of the weir. Therefore, the water level within the intake plant is maintained at that depth, which is about four metres.”

Shaiful Reazal Romli, Project Manager

“That is the weir, which helps to direct the flow of the water into the power intake point here. There is a screen in front of this inlet point to prevent debris such as driftwood, leaves and such from progressing further into our intake system.”

The screen however, is insufficient to filter out sand. The bulk of that job is carried out by the third section of the intake point – the de-sanding machine. “The water that flows into the machine has its speed regulated such that the sand floating within it simply descends to the bottom due to gravity.”

The sand particles that escape this filtration are smaller than 0.2 microns, a negligible size as far as the machinery welfare is concerned,

Shaiful adds. The filter is cleaned out on a regular basis by flushing it out with water. “Everything is manually done here in terms of maintenance; the gates are lifted by the pulley system, and the sand is pushed out by the gravitational flow of water.”


“The only automated gates here are the emergency gates, which are pump-operated. If there is a break somewhere in the penstock pipe,

sensors will pick up the drop in pressure, which will in turn trigger the lowering of the gate,” Shaiful explains. “This will stop water from entering the pipe.”

To communicate with the team at the power plant below, the intake plant team uses a radio system. There is also a fibre optic line buried underground between the two structures, to relay information between them.

The spent water from the turbines is redirected into river, and eventually cascades down the face of the Chamang Waterfall without raising a single eyebrow among bathers – a mark of how environmentally-unintrusive the hydro plant is.



With another two decades of the REPPA agreement with TNB left to go, the Perting Mini Hydro Power Plant is set to provide clean, carbon-footprint-free electricity for the use of the local community in Bentong and beyond for a while yet. Its success has laid the groundwork for other similar projects to be started in the country, utilising Malaysia’s rivers and tropical downpours to great effect, helping to increase the portion of electricity generated from clean sources. 





GARDENIA

The Home of Malaysia's Favourite Bread

The brand Gardenia is associated with qualities such as good taste, freshness, trust and reliability. In a highly competitive market, these are the values that help it stand out and stay ahead. Nonetheless, being a major supplier of bread to Malaysian consumers means that Gardenia factories are required to operate constantly to meet demand, thus reliable electricity power supply is important to Gardenia's round-the-clock operations. **TENAGALINK** interviews Desmond Teh Kum Choy, General Manager of Manufacturing, Engineering and Projects, to uncover the power consumption patterns of Gardenia's factories and how they strive to always stay on top of their game.

Gardenia Bakeries (KL) Sdn Bhd rolled the first loaf of bread off its line in 1986. Within four short years, it became the bread market leader with an astounding 99% brand recall rate and 80% top-of-mind recall. Gardenia's range of products grew and evolved through the years, becoming better and better with each step. Leveraging on its brand strength, Gardenia now produces a variety of baked products to satisfy consumers'

demands, from bread to cakes, buns, rolls and more.

In order to fulfil the responsibility of delivering the best quality products to the people of Malaysia, Gardenia has always strived to improve the processes in its daily operations. With five factories situated in Malaysia, the company strives to meet the consumer's demand for variety by staying abreast with industry innovations

Gardenia's factories operate around the clock in order to meet constant demand for their myriad of bread products, meaning that both Gardenia and TNB need to be in constant communication and corporation to ensure uninterrupted production.



“We always strive for perfection to keep the production lines running 24/7 at all our five facilities. TNB's reliability is certainly a crucial contributing factor to achieve that goal.”

– Desmond Teh Kum Choy,
General Manager of Manufacturing,
Engineering and Projects, Gardenia

and baking technologies as well as committing to new product development. Easy access to the product plus a sound marketing strategy has contributed to their success of becoming a household name in Malaysia.

POWER DEPENDENCY

Gardenia produces a quantity of almost 2.2 million products daily to meet consumer demand. “All five of our factories rely on an 18,550KVA installed capacity of transformers to operate all the machines, which costs the company an approximate RM1.67 million in electricity bills monthly,” Desmond said.

Their factories also operate around the clock in order to meet constant

demand for their products; as a result, using highly automated machinery means that they depend greatly on an efficient and stable power supply to ensure smooth production. For Gardenia, maintaining a positive relationship and cooperation with TNB is an imperative factor to the manufacturing of their products.

RELIABLE COOPERATION

Operating factories on a large scale is no easy task for the top bread manufacturer of Malaysia, and having alternative power plans is a must when faced with any interruption. To tackle this, Gardenia drew up their contingency back-up plans with stand-by generator sets to overcome this issue without affecting their overall operations.

Gardenia has taken effective steps such as installing a transient voltage surge suppressor at their machine control panels to protect their electronic equipment, and installing Uninterrupted Power Supply units (UPS) as a contingency plan in the event of a power outage.

Constant cooperation with TNB has also helped them minimise power quality issues, as Desmond stated that incidences related to power are almost rare at their factories. To demonstrate the level of cooperation between Gardenia and TNB, Desmond cited an incident of power failure at their factory Bukit Kemuning, Klang, that happened years ago.

“We had power quality issues that affected our production when

we first started our operations approximately a decade ago. With effective communication and constant engagement with the TNB team of engineers at Klang, the root cause of the power dip was eventually sorted out. The staff there had demonstrated their professionalism in discharging their duties, and I appreciate the excellent service rendered."

Desmond did add that even though the issue took almost a year to solve due to the complexity of the problem, TNB was constantly updating them on the matter.

Since then, Gardenia has not been faced with such an ordeal, but Desmond says Gardenia continues to work closely with TNB to prevent such incidences. "We draw up multiple solutions, depending on potential problems, to ensure

smooth operations within our factories," he said, adding that TNB is ever ready to assist.

SAFETY IS KEY

Safety measures are of utmost priority in all of Gardenia's factories in order to prevent accidents. The staff is required to undergo ample training, and to follow safety procedures meticulously before, during and after production. A

safety committee has also been appointed in all of their factories, to tackle safety issues from electrical, mechanical, civil and structural viewpoints. "We strive to achieve a clean sheet and to tick all the boxes. Any procedure carried out in Gardenia is always begun with checking safety standards, and we pride ourselves in being able to maintain an excellent rating for the past decade," Desmond mentioned.

Maintaining a positive relationship is what Gardenia and TNB both place priority on, as ensuring a smooth flow of production is imperative for the bread manufacturer of the nation. TNB on the other hand, values their customer's loyalty by continuously monitoring their needs and delivering high quality products and services. Preparing alternative strategies in handling power crises for their top consumers is also how the top energy supplier to the nation retains their reputation.

With a total of 5 main factories in Malaysia, Gardenia and TNB have worked together to draw up multiple plans to counter potential problems that may arise and disrupt the Gardenia's power supply.



SAFETY IS KEY

A safe environment does not happen by accident.



Be safe at work • Stay safe at home

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TENAGA NASIONAL BERHAD (000866-W)

Listen
and
you won't
know
we're here.

Down below, the natural sounds of the forest can be heard echoing across the land. All is as it has long been, as it should be, despite the fact that construction of the Puah and Tembat hydroelectric dams began in 2010. We have gone to great lengths to ensure the everyday lives of bats, birds, gaurs, tigers, tapirs, elephants and rhinoceroses were disturbed as little as possible. Selective clearing of the forest and the creation of special corridors that allow the 'natives' to roam and forage freely has helped us make significant progress; as a business, and a responsible, eco-friendly neighbour.

Solar • Biogas • Biomass • Hydro • Clean Coal

