

COMMUNICATING TO LARGE POWER CUSTOMERS

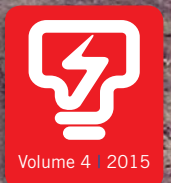
# TENAGALINK

KDN : PP8515/01/2013(031995)

## After the Storm

Improved Safety Measures in Hand,  
TNB Stands Ready for Future Floods

**SAFETY FIRST**







# 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.

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**A**t TNB, safety is a journey, and when connecting Pulau Besar to the national grid, comprehensive dialogue with the community and feasibility studies including hydrological studies of the terrain ensured that we were going ahead both in line with the community's needs, and with safety foremost in our minds. As engineering work began (foundations for the towers which carried the electric cables out to the island were driven 20 metres into the seabed), TNB also worked closely with the fishing community to ensure the work posed no threat to shipping. Today, with a safe and reliable power supply, the island has a growing tourism industry.

With safety being the theme of this issue, we also highlight TNB's efforts to mitigate the effects of floods in the future with lessons learned from the devastation of the deluge in 2014/2015. Working with the various divisions within TNB as well as with the affected communities, we proposed and implemented a number of measures, including 14 initiatives that encompass communication, service delivery and staff welfare. The most crucial lesson is that ensuring safety requires that we are innovatively proactive with preventive actions.

At TNB, safety policies and practices are ingrained in every employee at every level. We also designed an Emergency Response Plan, which initially catered to only system-related disturbances but now applies to non-system related issues as well, such as floods and fires. The idea is to take control of situations before any accident occurs to enhance the safety of the community, our employees and machinery.

For our employees, our neighbours, our partners, and our customers – whether they are domestic customers or Large Power Customers – TNB's commitment is the same as it has always been: to provide our nation with power that is reliable, affordable, clean, and most importantly, safe. 

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



# SAFETY IS KEY

A safe environment does not happen by accident.



Be safe at work • Stay safe at home



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## TREE-PLANTING EXERCISE

*Better environment, brighter future* is the new tagline for Tenaga Nasional Berhad (TNB), as the utility company aims to plant up to 13,000 trees at 13 locations in Peninsular Malaysia this year, including recreational parks and public places.

This initiative is in line with TNB's commitment to environmental protection and conservation, as well as broader national interests in urban forestation.

TNB's Senior General Manager (Corporate Affairs and Communication) Datuk Mohd Aminuddin Mohd Amin said that the initiative, under the *Tree for a Tree* programme, involved the planting of 1,000 trees at a cost of RM100,000 to RM120,000 for each of the selected locations.

"This initiative was started in Kuantan, Pahang in August last year. Melaka is the second location, while the next is Kangar, Perlis, followed by the other selected



locations," he said after a tree-planting at Dataran 1Malaysia, Melaka.

Officiating the event was Melaka Housing, Local Government and Environment Committee Chairman Datuk Ismail Othman, with Science, Technology and Innovation Deputy Minister Datuk Dr Abu Bakar Mohamad Diah, and Klebang Assemblyman Datuk Lim Ban Hong attending. 📺

## MULTI-CURRENCY MEDIUM-TERM NOTE PROGRAMME



Tenaga Nasional Berhad (TNB) announced that it is in the initial stages of establishing a long-term multicurrency medium-term note (MTN) programme to raise funds for future growth.

The company said in a statement, "This is part of TNB's on-going process of exploring funding options it might require in the future in line with its strategic objectives, and to sustain growth and shareholder value creation."

Last November, it sold the country's third-biggest *sukuk* (Islamic bond) worth RM8.93billion, to part-finance the construction of a 2,000MW coal-fired power plant.

Any potential *sukuk* issued in future will largely depend on the successful completion of prospective transactions, TNB said in response to media reports suggesting it plans to issue US\$3 billion worth of *sukuk* globally to fund investments. 📺




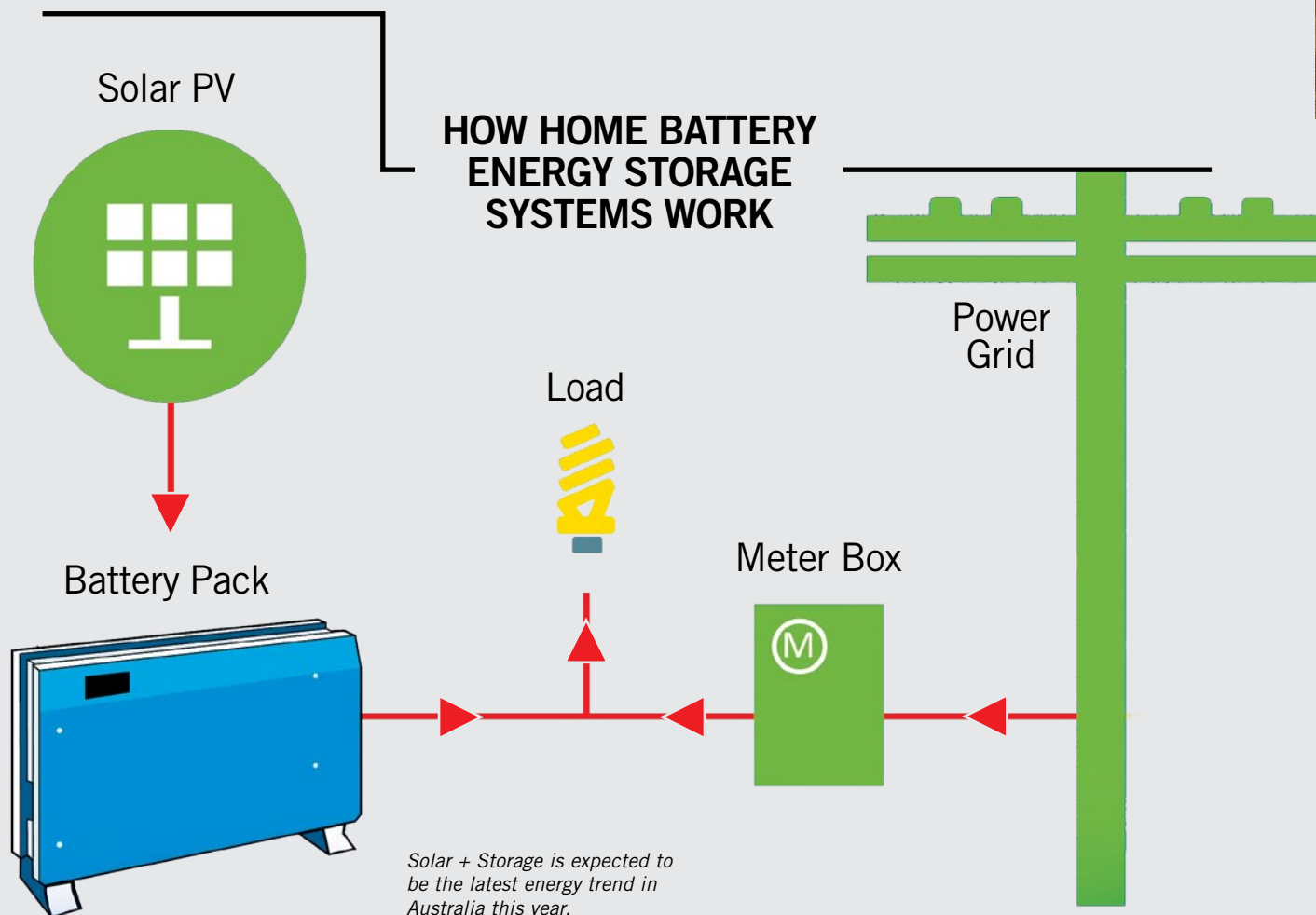
## THE YEAR OF BATTERY-STORAGE SYSTEMS

Australia's Clean Energy Council predicts an upcoming trend of battery-storage energy systems, as the array of electricity options grows rapidly for households and businesses.

According to a new report published by the Renewable Energy Agency (REA) and consultancy KPMG, costs have fallen so rapidly for battery storage capacity that within two years, the technology will be cheap enough for households with rooftop solar systems.

The Climate Council (also based in Australia) reports that half of all households are likely to adopt solar systems with battery storage. A separate report prepared internally by energy retailer AGL suggests overall prices for customers will fall in the next few years as consumption habits change.

"The main barrier has been that batteries have been fairly high-cost, but that cost is really coming down," says Darren Gladman, Policy Manager at the Clean Energy Council. "People are expecting that in the next year or two, batteries will become a quite affordable option for households and businesses." 




## PR1MA & TNB IN PROPERTY TIE-UP

Perbadanan PR1MA Malaysia has signed a conclusive contract with Tenaga Nasional Bhd (TNB) to develop two blocks of apartments on 3.33ha land owned by TNB in Kajang.



PR1MA Chief Executive Officer Datuk Abdul Mutalib Alias told Bernama that under the development plan, which was expected to be completed by end-2019, one block would be given to TNB for its employees and the other would be sold by PR1MA.

“TNB is the first government-linked company (GLC) that has stepped forward to work collaboratively with us in providing PR1MA homes for TNB employees as well as to those who are eligible. We are looking forward to more collaborations with other GLCs, property developers as well as the government and its agencies that possess land in good locations to develop more PR1MA homes,” he told Bernama at the agreement signing ceremony. 

*Committed to planning, developing, constructing and maintaining high-quality housing with lifestyle concepts for middle-income households in key urban centers, PR1MA has teamed up with TNB to collaborate on housing for TNB employees and members of the public.*

## UTM-CAMBRIDGE ENERGY RESEARCH


Universiti Teknologi Malaysia and the University of Cambridge are collaborating on an effort to find alternative energy sources. The collaboration focuses on producing gas from recycled waste materials. The outcome of this research would be to find out which gases have the highest heating value, making them viable as a renewable heating source.

UTM's Mechanical Engineering Faculty Senior Director Professor Dr Mohammad Nazri Mohd Ja'afar describes the gases as an alternative energy that is renewable, sustainable and also green. “In many ways, it is better than diesel or petrol as an energy source,” he said.

A memorandum of agreement (MoA) was signed between UTM and the University of Cambridge in December 2015 between Professor Dr Ahmad Fauzi Ismail, Deputy Vice-Chancellor (Research and Innovation) and Professor Simone Hochgreb, Head of Cambridge's Rolls Royce University Technology Centre in Combustion Research.



*Prof Ahmad Fauzi Ismail (left) exchanging MoA documents with Prof Simone after the signing ceremony between UTM and University of Cambridge held at the Banquet Hall, Sultan Ibrahim Chancellery Building, UTM Johor Bahru.*

This is the second time that both universities are collaborating on a research programme. In 2008, UTM and the University of Cambridge undertook a study on the potential of biofuels. 



# ONE YEAR LATER

TNB Fulfills Its Commitment to Guaranteeing the Nation's Electricity Infrastructure





# Moments in the Wake of the Flood

## TNB Employee Photographs the Stirring Sights



Redzuan Mohamed Salleh

You have probably already glanced at the front cover of this issue of *TenagaLink*, but take a minute to flip it over and study the picture. Allow your eyes to absorb the poignant details which depict the aftermath of a disastrous flood.

A wooden building, once someone's home, teeters precariously over the edge of a road; its soil-encrusted walls indicating how high the floodwater rose. Tyre tracks run deep in the road, turned into a muddy trail by the deluge. Adding their footprints to the tread marks are three boys, stoically soldiering on amidst the devastation that has befallen their village.

It is a striking photograph that tells the story of one of the worst floods in Malaysia's history. The man who pressed the shutter button is Redzuan Mohamed Salleh, a TT10 Grade technician attached to Tenaga Nasional Berhad (TNB) Perak. In early January 2015, he participated in a flood relief expedition helmed by TNB Perak's *Rakan Niaga Strategik* (Strategic Business Partners).

The convoy of 36 vehicles started their eastward journey on New Year's Day 2015, shortly after the inundation began to recede. After crossing the Kelantan border, the initial glimpses of demolition greeted them along the Gua Musang to Kuala Krai route. At approximately 11 o'clock in the morning of January 4, the windshield of Redzuan's car framed a despondent scene, compelling him to whip out his smartphone and capture the view. It is the picture that you just pored over on the cover.

The village in the photograph is Kampung Kemubu, situated in Dabong, Kelantan. Redzuan and his party were struck dumb by

the scale of the destruction. "The first thought that came to mind was 'This is how Banda Aceh in Indonesia must have looked like after the 2004 tsunami'. It was that bad," Redzuan recounts.

He describes the despairing scenes. "There was a lady who asked only for a prayer shawl and a copy of the Quran; food had become a secondary concern of hers. There were mothers who had just given birth in squalid conditions, putting on a brave face despite the circumstances. Schoolchildren were fighting over new school shoes as classes were days away. Countless families had to endure the cold at night because there were not enough blankets."

This heartfelt state of affairs moved Redzuan and his fellow volunteers deeply, and they did their best to render assistance. "We were glad that we made the trip to these flood-ravaged areas and helped out as much as we did, as we could see how much it meant for the victims," he reveals.

The cover photo is not the only picture the high-voltage overhead cable technician snapped during his expedition to Kelantan. The images surrounding these sentences are also his, snapshots taken on different occasions and at various locations along the journey. They say a picture is worth a thousand words, and in this case, each one relates its own powerful tale.







**S**easonal storms and flooding are annual end-of-the-year occurrences on Peninsular Malaysia's east coast. However, the downpour from December 2014 to January 2015 was the heaviest in more than 50 years. For Tenaga Nasional Berhad (TNB), the floods cost around RM130 million. Having learnt the lessons from that deluge, TNB's Asset Maintenance and Delivery Division has allocated RM50 million to prepare for future floods. **TENAGALINK** finds out more.

During the events of the 2014 floods, TNB had to ensure the safety of the damaged distribution and transmission wires, restore supply so that emergency services can function properly. The severity made the task even more difficult. It was said that the floods were the worst faced in 50 years, with 67% of Kelantan underwater.

### GENERATION GAPS

Each of the three main divisions of TNB faced different challenges. TNB Generation Senior General

Manager Roslan Abd Rahman revealed that for his division, one of the main concerns was to ensure safe and reliable plant operations.

As Roslan explained, "Throughout our history of operations, we never experienced anything like it. As a matter of fact, one of our hydro units was completely submerged in water, and we had to shut them down to protect the public from possible danger. Apart from damage to generation equipment, the spillways of several downstream dams were not spared."

**Above:** TNB's Generation team reviewing operation procedures during the 2014-2015 East Coast floods.

“We are working with the Meteorological Department to get the latest weather forecasts, so we are better prepared for any potential floods.”

– Roslan Abd Rahman,  
TNB Generation Senior General Manager



Mitigating the effects of the floods required several bodies to work together. “We had to coordinate efforts with the police, the fire brigade, the National Security Council, and the District Office to ensure that people had the time to prepare and to evacuate if necessary,” Roslan explained.

Revealing more about how the team ensured safe and reliable plant operations, Roslan said, “We had to keep an eye on the water level of the dams, and determine whether the water could be released

through the dams’ gates. We also had to ensure that the plants were operating, otherwise the water would have been wasted.”

Roslan also noted that there was a misperception that the water released from the Kenyir 2 Dam in Terengganu contributed to the floods. This, he said, was physically impossible as the water would have had to flow upstream to reach Kelantan. In fact, rather than contributing to floods, dams help mitigate them. For example, floodwaters in Terengganu have

been under control since the completion of the Kenyir Dam.

## TRANSMISSION WOES

For TNB Transmission, Senior General Manager of Asset Maintenance Ir Husaini Husin explained that although the plants and substations were designed with



**Left:** Residents in flood-hit areas register for emergency lights with members of TNB's Generation Division.



flood mitigation measures in mind, they had not expected the rain to exceed the records of the past 50 years.

He revealed that soil erosion also placed several substations and transmission towers at risk of landslides.

The Transmission team also faced the challenge of maintaining connectivity between the west and east coasts of Peninsular Malaysia, while by-passing the five submerged substations.

This was to ensure that there would be no loss of power. Explaining this process, Ir Husaini said, “We treated these five substations as part of the transmission line, and isolated their transformers and alternating and direct current supply, using the busbars to transmit power instead.”

Several transmission lines were also dangerously close to the rising waters. “This meant that there was insufficient ground clearance between the lowest overhead transmission line and the flooded rivers, which would have been a major electrical hazard,” Ir Husaini explained.

To mitigate this, the Transmission team rerouted the transmission lines between Tanah Merah and Kuala Krai as well as between Tanah Merah and Kandis. This meant having to sacrifice one line to maintain connectivity.

## DISTRIBUTION CHALLENGES

Safety was also a major objective for the Distribution Division, as was the need to restore electricity supply as quickly as possible, particularly to places such as hospitals and other relief sites. Senior General Manager Dato’ Abd Aziz explained that TNB managed to settle the first issue by carrying out checks as well as liaising with the media to tell people in flood-hit areas not to turn on their switches until they had checked with

registered contractors if it was safe to do so.

He explained, “Around 1,900 substations in Kelantan were affected by the floods, including five 132 kV substations, which were completely submerged from 24th December to 28th December. More than 67% of supply in Kelantan was disconnected, along with 13% in Pahang, 6% in Terengganu and 1% in Perak.”

Supply was gradually restored in flood-affected areas, with states such as Pahang and Terengganu having their electricity restored within days of the flood waters receding. Kelantan however was more challenging because of the heavy infrastructure damage incurred. Even then, most parts of the state were reconnected within

**Right:** TNB Transmission Division workers repairing a damaged transmission tower. One of the measures taken to mitigate the effects of another flood is to raise the height of 20 towers by 7.5 metres.

**Next page (top):** Transmission Division members study plans to install flood protection measures such as floodgates at substations.

**Next page (bottom):** TNB vehicles were used to spread news and awareness about electricity safety during the floods.





a week after the flood waters receded. Dato' Abd Aziz also said that this process required close cooperation between the Distribution and Transmission divisions.

## PREPARING FOR THE FUTURE

The floods cost TNB approximately RM100 million and spurred efforts to ensure that future deluges would not cause such problems. A post-mortem of TNB's actions and responses was held, where the teams discussed how to manage and prepare for repeat incidences. Although TNB's response during the crisis was commendable, the post-mortem enabled it to review certain aspects and improve on them.



“During the floods, TNB personnel and resources from the rest of Malaysia were sent to provide assistance to their counterparts in the affected areas. This raised morale considerably and sped up recovery.”

– Ir Husaini Husin,  
TNB Transmission  
Senior General Manager







“By using Geographic Information System (GIS) technology, we are identifying substations that are at risk of flood damage, so we can secure them.”

– Dato' Abd Aziz Abd Majid,  
TNB Distribution Senior General Manager

“We are carrying out research on how to optimise our existing substations as well as when planning for new substations,” Dato' Abd Aziz explained. By using Geographic Information System (GIS) technology, TNB is identifying substations that are at risk of flood damage, so that it can secure them.

Ir Husaini explained that this has been done by installing protective measures around the substations. These include bankments made of earth and concrete as well as channels to divert rainwater around the five substations that were submerged during the floods.

In addition, the entryways to the substations were elevated and floodgates were installed. This substation mitigation plan was carried out in Kelantan, Pahang and Terengganu, with all improvements completed by the end of 2015.

Another measure taken was to raise the heights of 20 transmission towers by 7.5 metres. Towers in Laloh, Kuala Krai, which were leaning owing to the strong floods, had to be replaced while six new

towers were built on higher ground in Kusial, Tanah Merah.

Speaking for the Generation Division, Roslan Abd Rahman explained that the generation planning for hydropower stations

will be reviewed on a more frequent basis. In addition, TNB is also working with the Meteorological Department and academic institutions such as Universiti Tenaga Nasional (UNITEN) to get the latest weather forecasts. “This



*Dato' Abd Aziz Abd Majid and members of the Distribution team showing off the generators that were used to provide emergency electricity supply.*

enables us to determine which areas will be affected, so we can take the necessary precautions,” he said.

In order to address the loss of the electrical supply during floods, TNB Energy Services has proposed several solutions. One is to fix solar PV cells on relief centres so that they can generate electricity without being connected to the grid. The other is to have a mobile solar hybrid system, where a generator is placed on a vehicle and is powered by solar, wind and diesel power.

## REACHING OUT

Dato' Abd Aziz also revealed that 14 initiatives encompassing strategies,


communication, innovation, service delivery and staff welfare have been established. The most important thing, he said, is to be proactive rather than reactive. For example, essential non-perishable goods were bought and stored so that people will have access to such items in the event of emergencies.

Effective communication has also been identified as being essential during an emergency situation. Looking back at the coverage of TNB during the floods, it was shown that 75% of sentiments on social media was negative, and most of it was centred on power cuts. Therefore, the decision is to start communicating with the public as soon as the monsoon season starts.

In order to achieve this, outreach has been enhanced with TNB boosting its working relationship with the media, state governments and local council. This enables them to reach out better to the people and educate them on the do's and don'ts with regards to electricity during floods.

There was also a flood drill held in Kelantan in October 2015, which involved the Generation, Transmission and Distribution divisions as well as ICT and corporate and media. “This helped us improve our Standard Operating Procedures, so we can better manage critical situations and restore supply as fast and as safely as possible,” Dato' Abd Aziz explained.

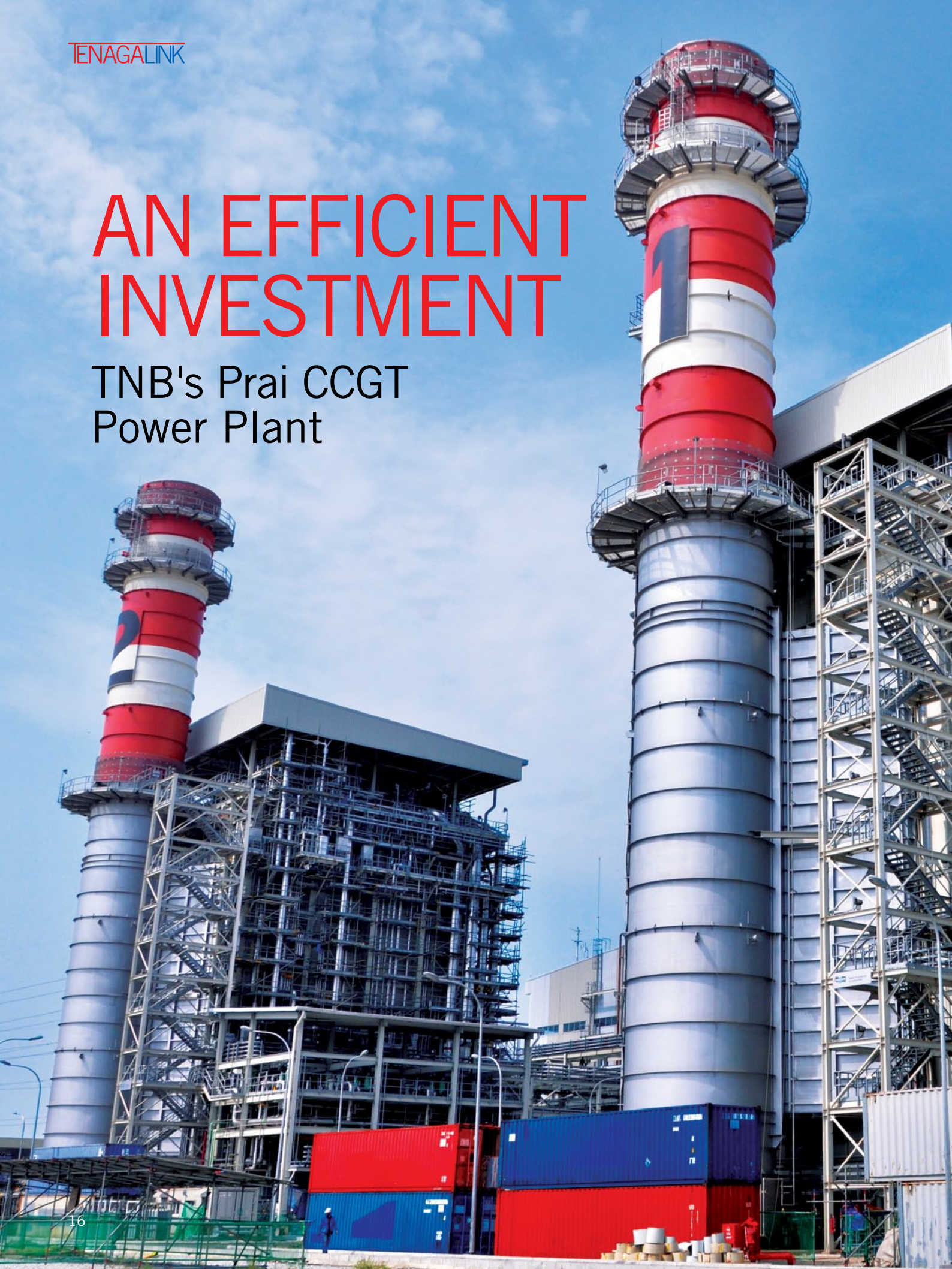


**The rainfall in 2015 was not as bad as in 2014, owing to the El Niño effect. However, thanks to the measures taken by TNB, the team was and still is prepared in case of drastic changes in the weather pattern. The lessons that TNB learned has enabled it to improve and streamline its emergency response plan. While we hope that a similar situation will not occur again, we are confident that if it should, then the TNB team will be more than prepared.** 




# AN EFFICIENT INVESTMENT

TNB's Prai CCGT  
Power Plant







**W**hen the steam power plant that stood at Seberang Prai first started operating, Malaysia was focused on playing the host nation of the 1998 Commonwealth Games. The plant relied on marine fuel oil (MFO) to produce 360MW of power via three turbines. As urbanisation gradually overtook the surrounding area in the years following the turn of the millennium, something had to be done to address the growing demand for electricity that was on the verge of surpassing the plant's capacity. After some deliberation, TNB stepped up to answer this pressing need with a brand new power plant – one that makes use of the engineering sophistication of a combined cycle gas turbine (CCGT) set up to minimise energy wastage in the electricity-generating process.

### THE RIGHT CHOICES

From a field of 18 international bidders, TNB was awarded the tender by the Energy Commission of Malaysia to build and operate a power plant with a capacity of between 1,000 and 1,400MW. Their design called for over 1GW to be generated by two gas turbines in a CCGT configuration.

“For this project, TNB engaged Samsung Construction & Trading (Samsung C&T) to handle the engineering, procurement and

construction aspects. They serve as the packager, searching for the most suitable type of turbine and boiler,” says Project Director Daud Adnan, adding that Samsung C&T had a commendable track record of building CCGT power plants, with projects in Singapore and the United Arab Emirates.

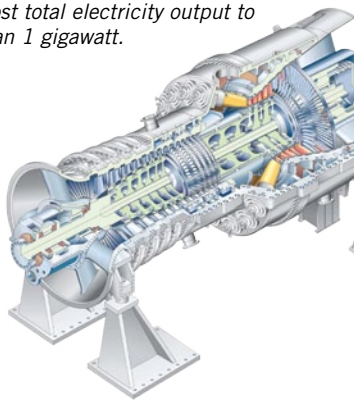
The original equipment manufacturers (OEM) included Siemens, which supplied the two H-Class gas turbines for the new plant. Prior to this transaction, the German conglomerate had delivered 20 other similar class

*The new CCGT power plant in Prai has a power output of more than 1,000MW, a substantial boost to TNB's generation capacity.*



**Right:** Fibreglass pipes, each over three metres in diameter, transport seawater which is cycled within the plant to help cool the condensers.

**Below:** The Prai CCGT Power Plant makes use of not just one, but two Siemens SGT5-8000H turbines, which help boost total electricity output to more than 1 gigawatt.



gas turbines to projects all over the globe. With a combined cycle rated power and efficiency of 570MW and over 60% respectively, the SGT5-8000H turbine was ideal for the task.

A comprehensive delivery package was shipped out of the Siemens factory to Malaysia. As the power plant is a CCGT design, the generating equipment consisted of two single-shaft power trains, each comprising an SGT5-8000H turbine, an SGen-3000W water-cooled generator and an SST-5000 triple-pressure steam turbine and auxiliary systems.

### A CONSUMMATE POWERHOUSE

Each power train develops a considerable 535MW of power, which by itself is close to 50% more powerful than the total output of the previous plant. This means that the Prai CCGT power plant has a combined output of 1,071MW.

When it comes to conventional power plants that have been

designed to yield high power outputs, a substantial degree of energy wastage typically comes with the territory. However, this is not the case with CCGT plants, particularly this one, as Daud Adnan reveals. "At just under 60%, it is currently the most efficient CCGT plant in the world." In comparison, the Gelugor Power Station, an older CCGT plant, only posts an efficiency level of 48%.

The CCGT design has other benefits in the efficiency department. It can be built in a shorter timeframe, with construction periods falling within the region of 24 to 36 months. "This is opposed to coal-fired or hydroelectric plants for instance, which may take up to five years to build. On top of that, the plant takes up a smaller area of land."

The power plant strengthens the electrical grid system in the northern region and, to a lesser extent, the national grid network. Locally, Daud Adnan sees further ways the plant contributes to its surroundings. "The Prai Plant enhances the industrial development of the area, particularly in Penang and Kulim, as well as boosts the socio-economic

status of the local community, as it generated job opportunities during its construction, and now too when it is operational."

### IN COMPETENT HANDS

Getting everything in order once construction work commenced on-site was a challenge, but TNB's management took it in their stride. "We engaged a team of engineers from the owner's engineer (OE), to whom our staff reports, performing tasks such as site supervision and commissioning," Daud Adnan explains. The OE team consists of seven people, and the TNB's team, 40.

"This arrangement is similar to other projects such as Ulu Jelai and Hulu Terengganu, where TNB's staff follows the lead of the OE," Daud Adnan adds. According to him, this ensures that the transfer of technology and expertise transpired without a hitch.

Additionally, the team's responsibility included conducting thorough site inspections. "This way, we could be certain that quality and safety standards were

maintained. At the same time, we could have a handle on the project's objectives and goals, especially scheduling and cost," Daud Adnan states.

The team had to overcome a number of issues that cropped up during construction, such as oil-tainted soil that was discovered during excavation works on the site. This unforeseen development left a dent in the schedule as the polluted soil had to be exhaustively removed and trucked out of the site for safe disposal. The gravity of the situation quickly became apparent as the team realised that the environmental solutions company Kualiti Alam's waste management site was situated a whopping 420km away in Negeri Sembilan.

Other concerns that also threatened to derail the project's construction timeline included magnetic dust contamination on one of the generators, and accidents that occurred on the job site. Although these incidences caused delays, the team worked hard to tackle each case to mitigate downtime. Through these efforts, the project was on track for its February 2016 Commercial Operation Date (COD).

## ENVIRONMENT, THE PRIORITY

The efficiency gains the CCGT plant nets is good news for Mother Nature. Instead of being released into the atmosphere, the hot exhaust from the burnt gas is channelled back to the steam turbine and used to heat the water past boiling point, the heat also taking the place of energy generated from burning fuel. "This design allows us to control the emissions output, ergo less pollutants are released into the environment," Daud Adnan says.

He elaborates, "Our system is linked to the Department



## CARING FOR THE COMMUNITY TNB Penang Hosts a Get-Together

A get-together event presented an excellent opportunity for TNB to appease the concerns of fishermen, who were worried about the effect the new power plant may have on their livelihood, due to its proximity to their fishing spots. TNB's Vice President of Energy Ventures Dato' Haji Nor Azman Mufti took to the dais and welcomed them with a speech.

"This project is an effort by TNB to fortify the national grid, an important step in ensuring the security of our electricity supply," he said, before adding that "TNB is a company that places utmost importance in looking into the complaints and problems that is faced by the community around our project sites. This event is a token of our appreciation for the support given to us by you, and we look forward to solving any dissatisfaction brought upon by our projects with fruitful discussions."

Chairman of Persatuan Nelayan Kawasan (Fishermen Association for the Area of) Hujung Batu, Alias Osman, then took over the microphone, bringing up an earlier TNB event in which the company awarded ex-gratia payments to fishermen who claimed to have been affected by the project. "On behalf of the fishermen, I would like to say that we are happy with the way TNB handled this situation, conducting the negotiations with great care and respect. I hope that the recipients appreciate this gesture by the company and extend their support for the Prai Power Plant project."

of Environment (DOE), which analyses the Environmental Impact Assessment (EIA). We also monitor relevant environmental parameters based on our own Environmental Planning and Management (EPM)."

The plant takes its supply of water from the sea. 3.2 metre diameter fibreglass pipes, snaking their way

out of the bowels of the plant, extend out into the ocean and dip out of view below the surface several metres off-shore, poised to suck in the water to cool the condensers and release it once the cycle is completed. To prevent sea life from unwittingly finding their way into the system, screens have been installed at the mouths of the pipes.





“In normal plants, fuel is used to fire the boilers in order to turn water into superheated steam in the steam turbine, but in CCGT plants like this one, the exhaust from the gas turbine is utilised instead, saving energy.”

– Daud Adnan,  
Prai CCGT Power Plant Project Manager

“During test runs, we obtained the seawater at its ambient temperature of 32°C. When we discharged the water back into the ocean, we found that the temperature difference is +7°C, which means that the end temperature was 39°C – below the recommended 40°C,” Daud Adnan says, before noting that independent consultants would verify this finding and forward it to the DOE.

The COD saw the firing up of the plant, upon which all systems were examined to ensure that they were in the pink of health and performing as they should. Soon thereafter, cheers and applause echoed around the plant on March 9, 2016 as the official ‘Taking over Ceremony’ took place. Samsung C&T handed over operations to TNB Northern Energy Berhad. The keys to the RM2.5 billion plant were then passed to TNB Prai, which will manage its day-to-day running.

**TenagaLink caught up with TNB’s Vice President in Energy Ventures Dato’ Haji Nor Azman Mufti and asked him to shed a bit of light on the Prai Project and the plans of TNB’s Energy Ventures.**

#### **What is the significance of the Prai CCGT Power Plant Project?**

The development of this plant is to accommodate for the rise of electricity load growth in the next five years. Our installed capacity will increase in tandem with the development of the country, and this is part of the plan by TNB and the government to increase the generation capacity, and maintain the reserve margin at an acceptable level. It also ensures the security of supply to Penang Island and the area surrounding the plant.



#### **How does this plant fit into the long-term plan of Energy Ventures (EV)?**

99% of the revenue stream for TNB comes from sales of electricity. The EV is one of the pillars of TNB’s Energy Division and was established to identify revenue stream from non-regulated sources, which may come from subsidiaries that provide services to customers, or from power generation such as this plant in Prai. We also have several other power projects in Malaysia, and are pursuing opportunities outside the country – in Sri Lanka, Indonesia, Turkey and India. This will enhance TNB’s non-regulated revenue generation.

**The Prai CCGT Power Plant heralds a new age of efficient power generation for the country. While producing more than adequate power to meet current and future demand, the proficient energy utilisation in the generation process translates to not only big savings in operation costs, but also goes a long way in reducing any negative impacts on the environment – a great achievement by any measurement. 🇲🇾**

# IS IT SAFE?

For our employees,  
our neighbours,  
our partners –  
whether they are  
domestic customers  
or Large Power  
customers, at TNB,  
safety matters.  
It is our priority.



# KEEPING HARM AT BAY

## TNB's Priority on Safety

**S**afety is the paramount concern in many organisations, especially if they have employees who operate in work environments where potential risks and dangers are part and parcel of the job. For a utility company like Tenaga Nasional Berhad (TNB), safety hazards come in many forms – electrocution from an exposed wire at a switching station, burns from a flashover at a power plant boiler, or even bites from a dog at a customer's home while reading the electricity meter. **TENAGALINK** talks to Wan Nazmy Bin Wan Mahmood, Senior General Manager (Asset Management) at TNB's Distribution Division to learn more about the safety practices and policies ingrained at TNB.



*TNB's Emergency Response Team is made up of various personnel with different responsibilities who are always on standby to handle dangerous situations. The medics, for instance, help provide first aid to the injured before ambulances arrive.*

“By injecting a healthy dose of safety at every stage of a project or task – from its planning, construction, operation, maintenance and finally disposal – safety is heard, seen and felt here at TNB.”

*Wan Nazmy Wan Mahmood,  
Senior General Manager (Asset Management)  
at TNB's Distribution Division*



## FOCUS ON SAFETY

One of TNB's main visions is to be a Domestic Dominant Regional Champion (DDRC). It is at the top of its game locally, and now aims to be a regional utility player. “In order to do that, TNB must possess certain pertinent attributes, including reliability, efficiency and safety,” Wan Nazmy says.

“Safety is very important to us as an organisation, where it is ingrained within all levels of employment,” he adds. The fundamental concern when it comes to safety is the well-being of employees. A slight, momentary lapse in safety is enough for disastrous consequences – loss of limbs, or even life, being the most feared.

There are also other losses to consider. Equipment and machinery can be damaged when safe practices are ignored, and they would need repair or replacement. Additionally, there is loss of productivity. “Whenever a stop-work order is issued due to a safety concern, we incur losses as a result of the downtime,” Wan Nazmy explains.

## SEEN, HEARD AND FELT

According to Wan Nazmy, TNB's approach to safety is for it to be

present in all situations. “We must ensure that safety is embedded within our corporate culture, so it becomes second nature to everyone here.” He says that there are two important factors to tackle when it comes to driving safety in the organisation – safe behaviour and safe conditions.

“Safe behaviour focuses on the employees, specifically the way they think, work and act in relation to safety. Simply said, it is how seriously they take the matter. Safe conditions refer to the level of safety resident in the equipment in terms of their specification and installation.”

TNB has launched Tenaga Safe, a programme containing 19 strategic initiatives to be practiced across all levels in the organisation in order to meet these two factors. The initiatives cover the ‘3E’ philosophies – education, engineering and enforcement.

An example of these initiatives would be the Safety Quality Enforcement (SQE) system. “Line managers

can perform safety audits on their subordinates, peers and even superiors. If a minor non-compliance issue is found, a yellow card is given to the offender. A major non-compliance issue warrants a red card, as do three consecutive yellow cards. This would result in a stop-work order being issued, and the offender being referred for internal administrative action.”

## EVOLUTION OVER TIME

Although the risks faced by employees, especially at workplaces such as substations, have remained similar over the years, the safety equipment and practices used by TNB have changed to offer better protection. Wan Nazmy uses a type of Personal Protective Equipment (PPE) as an example.

*Personal Protective Equipment (PPE) offers a layer of safety to employees, especially those who work in high-risk areas.*





# THE EMERGENCY RESPONSE PLAN

The Emergency Response Plan (ERP) covers a wide variety of dangerous situations that might be faced by the employees of TNB at the workplace. These include floods, fires, explosions, landslides, earthquakes, civil unrest, bomb threats, storms and typhoons. Although there is an Emergency Response Team to handle these circumstances, it is important that everyone on the floor familiarises themselves with the safety steps to take should the worst happens. Therefore, it is advisable that they pore over the ERP to be better prepared against the possible dangers. TENAGALINK examines the ERP's recommendations to deal with three of the more common emergency concerns – floods, fires and blackouts.

## FLOODS

### If the water level is low:

- Save office equipment if possible, record the rise of water level and ensure there is no chemical leak.
- Close all electrical line passages.
- Go to a safe area that is higher than the water level.
- Wait for instructions from the authorities or rescuers.
- Do not attempt to enter the workplace or building, unless allowed by rescue officials.

### If the water level is high:

- Try to exit your workplace as practiced during emergency drills.
- Follow the instructions from the authorities for further action.

### After the flood:

- There are still risks even after the flood water recedes, so listen to the radio or get information before your next move. Follow the instructions from the authorities if available.
- Do not attempt to enter the building if flood water surrounds it.
- Watch out for electrical hazards.

## FIRES

### If you notice smoke or flames:

- Locate and trigger the fire alarm.
- Determine if the fire can be put out by a fire extinguisher.
- Exit the area as quickly as possible. DO NOT use the elevator.
- Dial 994/999 and relate the situation to the operator.

### If you hear the fire alarm:

- Leave through the nearest exit, and ensure that fire doors on the way are shut.
- Help those who require assistance.
- Call the emergency office hotline.
- Inform firemen or safety officers if there is anyone trapped in the building.
- Converge at the designated fire assembly point outside and keep away from the building.

### If you have to go through the fire:

- Crawl towards the door and exit.
- Ensure that you are as low to the floor as possible to avoid the smoke.
- Hold your breath as long as you can.
- Breathe slowly through your nose and use a shirt or a piece of cloth to filter out the smoke.

Wan Nazmy in his briefing to the Energy Commission at site



## BLACKOUTS

- Always remain calm.
- Follow the instructions from the Safety Department.
- If the need to evacuate the building arises, help those who require assistance or contact the emergency lines for help.
- Ensure that air is able to enter the area for ventilation.
- Do not use candles for light, especially near flammable materials, to avoid a fire accidentally breaking out.
- Unplug computers and other electrical and electronic appliances.
- DO NOT use the elevator.
- Follow the exit lights as they turn on when auxiliary power is in use.
- Exit in a safe manner.

### If there are people trapped in the elevator:

- Inform the person or people inside that you are going to get help, and tell them to remain calm.
- Contact the emergency line and relay the information.
- Stay in the area until the police and building officers arrive.


## EMERGENCY RESPONSE PLAN

“Decades ago, workers who operated near switchgear wore normal clothing, which provided little to no protection in case a flashover occurs. That soon changed when we made it mandatory for them to put on fire retardant suits that offered improved safety. Today, they don arc flash suits, which gives even better protection.”

Machinery has come a long way too. “On some potentially hazardous machines, we now have remote switching to eliminate the need of a worker switching in front of a machine, thus removing the risk of injury should the machine malfunction. In another example, using gas-insulated switchgear negates the need to rack circuit breaker trucks in and out to isolate circuits, again removing the need of the worker exposing himself to unnecessary risks.”

The Emergency Response Plan (ERP) was initially designed for system-related disturbances, such as a major trip at a large power plant which results in the loss of several thousand megawatts. The ERP would then be initiated, with the setting up of an operation room, managing of the media and notification of restoration.

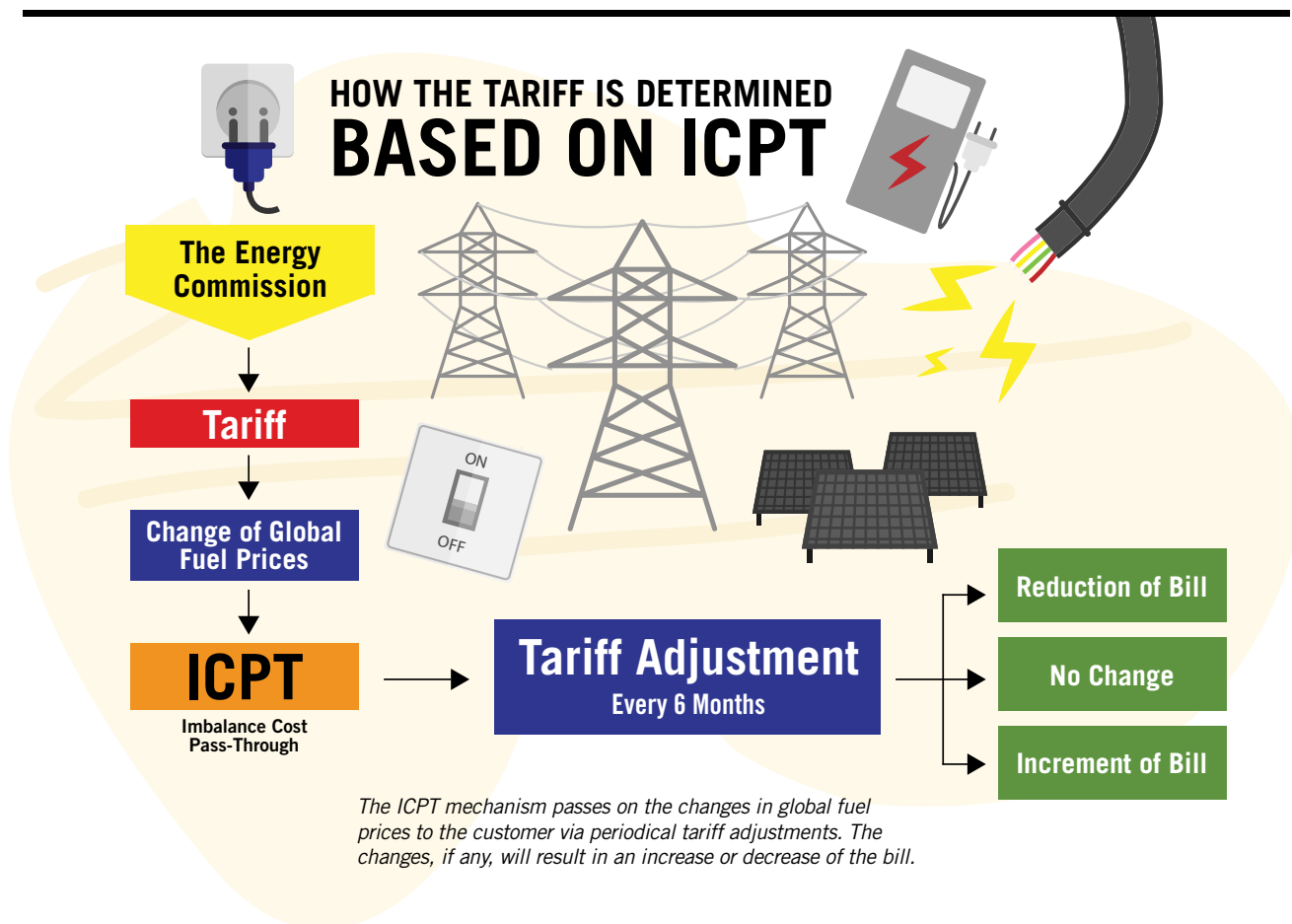
“We realised that the plan could be used for non-system-related incidences as well, such as natural disasters – including floods,” Wan Nazmy reveals. “ERP helps reduce the risk of danger to our employees, and the community as well. The difference here is, the plan is often initiated before the incident, rather than after it, as with system-related disturbances.” In other words, the ERP allows for the situation to be controlled before any accident occurs.

The emphasis on safety has made TNB achieve a commendable track record in that regard. Case in point, its Distribution Division posted an Accident Frequency Rate (AFR) – which measures the number of occupational accidents for every one million man hours – of just 0.42, placing it among the best of its peers around the world. TNB’s aim to lower that figure to 0.36 by the end of 2016 is an indication that this is one organisation where safety is not kept simmering on the back burner. 



# ICPT

## Striking a Balance



**T**he Imbalance Cost Pass-Through (ICPT) has been a hot topic even before its official introduction. It allows TNB to pass on the variations in fuel costs – a substantial factor to electricity generation cost – to its customers via a set rate every six months. For example, if the fuel price goes down, there will be a rebate that results in a lower overall bill amount. However, many are still in the dark when it comes to understanding the role and significance of ICPT. **TENAGALINK** speaks to Ir Joon Ibrahim, TNB General Manager for Economics Regulations, to shed light on this mechanism.

### THE OLD MECHANISM

Previously, the electricity tariff was determined provisionally. TNB had to submit its proposal to the government for its approval, and tariff reviews were on ad-hoc basis. There was a review in 1996 and 1997. Following that, there was a long period before the subsequent review, which took place in 2006. Further reviews happened in 2008, 2009, 2011, and the most recent one was in 2014.

When there was any fuel adjustment, the tariff rate itself was revised. Ir Joon provides an example. "When the fuel prices significantly increased in 2008, we revised the tariff rate to increase by 24% to reflect the fuel price variation. In 2009, when fuel prices went down slightly, we revised the tariffs downwards by 3.7%."

### A COMPONENT OF IBR

ICPT is part of a wider regulatory framework called the Incentive-Based Regulation (IBR), which was implemented by Suruhanjaya Tenaga (ST) in January 2014. The IBR is a form of economic regulation, which ensures a sustainable electricity supply industry through transparent and fair returns. The IBR allows TNB's operation to run more efficiently, and ensures that its customers are charged competitively priced electricity tariff.

The IBR review interval is three years, with the first regulatory period starting from 2015 until 2017. According to Ir Joon, this fixed mechanism is welcomed with open arms by large power customers as they can foresee and manage their costs. "They know that this is the base tariff for these three years, and a new base tariff will only be effective from 2018."



*Ir Joon Ibrahim, TNB General Manager for Economics Regulations*

"In the IBR framework, the electricity tariff is made up of two components. One is the fixed cost which comprises operational and capital expenditures including staff cost, repair and maintenance, etc. The second portion is generation-related cost, which includes the fuel needed to generate electricity. The ICPT reflects the changes in generation cost," Ir Joon says. The cost changes caused by fluctuations in fuel and generation costs are then incorporated in the electricity tariff. These changes could be a decrease or an increase.

The country's energy regulator, Suruhanjaya Tenaga (ST) determines

the calculation and methodology of the ICPT on a six-monthly basis, and it is subject to the government's approval. For example, when the base tariff was determined in 2014, coal was set at US\$87.5 per tonne. With the ICPT in place, the actual coal cost is reviewed every six months against the base cost (reference price) and any variation is passed through to the customers.

Ir Joon explains, "Currently, the coal price has dropped to about US\$60 per tonne, resulting in savings in terms of fuel cost. Hence, with the approval of the government, we are able to pass on some of the savings to the customers in the form of rebates." There have been three ICPT rebates implementations so far.

### ICPT ON THE BILL

The ICPT is a charge that is applicable for every kWh of electricity consumed by the customer. Therefore, it is a variable component in the electricity bill, and charged based on monthly electricity usage. The calculation is by multiplying the kWh usage a month by the ICPT rate, which is in sen/kWh. Based on this, the ICPT charge will be subtracted from or added to the current bill amount.

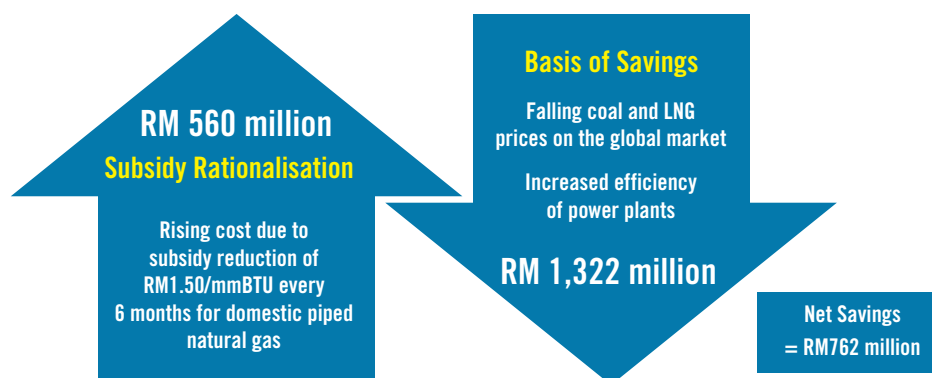
"All TNB customers are affected by this mechanism, except for

## ICPT SAVINGS

Imbalance Cost Pass-Through

Total rebate of

**=1.52** sen/kWh



**Base fuel prices that are used to determine base electricity tariffs**

*A total rebate of 1.52sen/kWh will be reflected in bills from January 1 to June 30, 2016. This rebate is the result of net savings achieved by TNB in electricity generation costs.*



## Sample Bill (Industry)

### Electricity Bill And Tax Invoice

**ABC BERHAD**  
NO 1 TAMAN PERDANA LESTARI  
JLN BULAT 6/8 SIMPANG 4  
BUKIT BAHAGIA  
40150 PETALING JAYA SELANGOR

**Total Amount Payable : RM 587.65**

Outstanding :RM 0.00 Thank You  
Current Charges :RM 587.65  
Rounding Amount :RM 0.00  
Total Bill :RM 587.65 Pay Before 01.05.2016

#### Previous Bill and Payment

Previous Bill RM 1,883.40 Last Payment RM 1,883.40  
(01.03.2016) (10.03.2016)

#### Current Charges

Details		GST Non-Applicable	GST Applicable	Total
Usage kWh	kWh	0.00	1,130.00	1,130.00
Usage kWh	RM	0.00	560.37	560.37
ICPT (RM 0.0152-)	RM	-	17.18	17.18
<b>Current charges</b>	<b>RM</b>	<b>0.00</b>	<b>543.19</b>	<b>543.19</b>
6% GST (6% x RM 543.19)	RM		32.59	32.59
RE Fund (1.6%)	RM		8.97	8.97
Late Payment Surcharge	RM		2.90	2.90

#### Current Charges

**RM 587.65**

(For Further details please turnover to page 2)



151000191005032760719000000058765

**ABC BERHAD**  
NO 1 TAMAN PERDANA LESTARI  
JLN BULAT 6/8 SIMPANG 4  
BUKIT BAHAGIA  
40150 PETALING JAYA SELANGOR



Aras 16, Wisma TNB, No. 19, Jalan Timur, 46200, Petaling Jaya, Selangor.  
GST Registration Number 001107427328

Page 1 of 2

Account Holder  
Information

Total Bill Amount

Separation of bill amount for  
GST and ICPT calculation

Calculation of  
GST and FIT



Account No. : 15100019100503  
Deposit : RM 5,000.00  
Contract No. : 00150685  
Tariff code : B-021-Commercial

Bill Date : 01.04.2016  
Billing Period : 01.03.2016 - 01.04.2016 (31 days)  
Tax Invoice No. : 27607190



For more information on bill and previous payment please visit  
<https://e-services.tnb.com.my/eservices>

For enquiries, please contact TNB office :

**TNB Shah Alam**  
- PSN DAMAI SEK 11  
40100 SHAH ALAM SELANGOR  
Tel: 03-55102020  
Fax: 03-55103643

Fuel Cost Subsidy by  
Federal Government  
RM 90.17  
(for information only)

The first 300kWh is zero-rated for domestic customers

RE Fund - Renewable Energy Fund  
ICPT - Imbalance Cost Pass Through

domestic users who consume 300 kWh (RM77) or less a month, as they fall under the government's social safety net tariff band," Ir Joon reveals. The ICPT rate is the same for the customers who are affected by the mechanism. However, these customers will see different amounts of ICPT charges on their bills, as the calculations are based on monthly usage.

TNB's large power customers (LPCs) receive two charges – capacity charge and energy charge. The first is a kilowatt charge or a maximum demand charge, and the latter is a kWh charge. "Capacity charge is not affected by ICPT, but the energy charge is. This is because ICPT is only meant for variable cost."

### THE EFFECT SO FAR

In the period between July 2015 and December 2015, TNB managed to save RM1,322.03 million in fuel and generation costs, thanks mainly to a reduction in the use of liquefied natural gas (LNG) for electricity generation. The emphasis was instead placed on coal as the fuel for electricity generation, as well as lower coal price as compared to the benchmark price, and the high performance of coal power plants.

On the other side of the coin, TNB incurred RM560 million in additional generation cost as the government decided to increase the piped gas price from the original RM15.20/MMBtu (1 MMBtu = 1 million British Thermal Units) set in the base tariff to RM 18.20/MMBtu. Despite this extra cost, the overall net savings amounted to RM762.03 million, which forms



“Before, tariff changes were performed on an ad hoc basis. Now with the IBR and ICPT in place, it is a more institutionalised undertaking, with tariff reviews occurring at fixed time intervals.”

– Abu Bakar Ismail,  
General Manager (Commercial Management)

the ICPT rebate. This will be translated to a 1.52 sen/kWh rebate in bills for the period starting January 1 until June 30, 2016.

### AWARENESS IS KEY

TNB goes the extra mile to ensure that its customers understand what the ICPT mechanism is and how it affects them. “We are reaching out to customers through the media, our website, and on-the-ground engagement. When we first introduced ICPT, we spoke to associations such as the Federation of Malaysian Manufacturers and the Real Estate and Housing Developers Association (REHDA).”

“We have also engaged with our large power customers, and government agencies such as the Malaysian Investment Development Authority (MIDA). Additionally, we made sure that our TNB Careline team has been well-trained when it comes to enlightening our customers about ICPT.”

Since its implementation, the ICPT mechanism has been received well. The timing of the ICPT rebate in 2015 was advantageous to TNB’s customers. A rebate of 2.25 sen per kWh was announced in March, a month before the government introduced GST. “As GST is about 6% and the ICPT rebate about 5%, our customers did not see the immediate impact of GST on their bills.”

## Understanding Fuel Costs and ICPT

The ICPT mechanism does not explicitly match global oil prices, and Ir Joon explains the reason behind this. “Everyone is aware that the world market price for oil is currently on a downtrend. It is less than US\$30 per barrel. But we must understand that in our generation sector, the main fuel sources are coal and piped gas, not oil. Even though the oil price is down, it does not necessarily mean that our fuel costs would also go down.”

The weakening ringgit has also found its way into the picture. “Coal is an imported fuel, so it is traded in US dollars. If we look at the currency exchange rate, the ringgit has depreciated to around RM4 to US\$1. This means that there has been some reduction in the savings from coal.”

On top of these, the government has embarked on subsidy rationalisation for gas. “Previously, the price of piped gas was subsidised to a point substantially below the market price. Now, however, the government has decided that the price of piped gas will be increased by RM1.50 per MMBtu every six months until it matches the market price.” This adds to the electricity generation cost.

“As you can see, there may be a reduction in fuel prices but the impact has been partially negated. On the bright side, we have been very efficient when it comes to the operation of the system via the Single Buyer Department. The Single Buyer Rules commit them to operate the system on a least-cost optimum basis, indirectly contributing to the net savings to be passed through to the customers.”



**Even in the early stages of its introduction, ICPT has proven to be a fair system to reflect the unstable cost of fuels in the electricity tariff. The framework incorporates the varying cost of electricity generation brought about by fluctuating market prices of gas and coal, and ensures that the customers of TNB pay the right price for their electricity usage. 🔒**



# INDAH WATER KONSORTIUM

## Powering a Wastewater Plant



*Above: The Bandar Tun Razak Sewage Treatment Plant is among the close to 7,000 STPs that IWK runs throughout the country. This plant was recently upgraded to cater for a population equivalent, or PE (a local area population-based measurement to estimate the wastewater volumetric flow rate) of 170,000.*

**M**alaysia has a dedicated national sewerage company in the form of Indah Water Konsortium (IWK), which, as its tagline says, has been “serving your needs quietly and surely for the past 20 years.” Running a wastewater management company is a monumental undertaking, requiring a sizeable inventory of equipment that operate almost continuously to rid the water of contaminants. To handle the steady supply of wastewater, these machines require a steady supply of electricity, and that is where Tenaga Nasional Berhad (TNB) steps in. **TENAGALINK** speaks to IWK's Chief Operating Officer Ir Hj Mohamed Haniffa Hj Abdul Hamid to find out how important electricity is to IWK's operation.

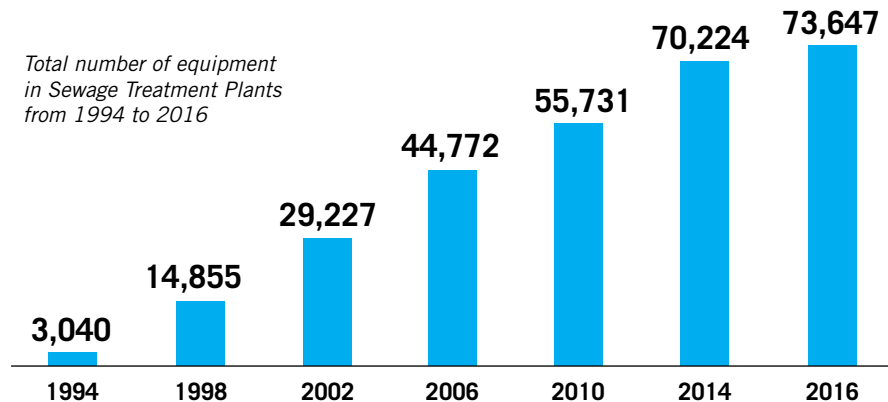
“Over the years, TNB has rendered good service to IWK, providing a stable supply of electricity to sewage treatment plants, as disruptions encountered have been very negligible.”

– Ir Hj Mohamed Haniffa  
Hj Abdul Hamid,  
IWK's Chief Operating Officer



### Total Equipment at IWK STPs

Total number of equipment  
in Sewage Treatment Plants  
from 1994 to 2016



Sources: Indah Water Konsortium

### UP TO TASK

In order to properly fulfil its responsibility of developing and maintaining a modern and efficient sewerage system for all Malaysians, IWK has invested heavily on large scale sewerage infrastructure which includes a large list of machineries. “IWK operates more than 6,700 sewage treatment plants (STPs) in Malaysia,” Ir Hj Mohamed Haniffa says. “We have a total of 73,647 equipment operating at our STPs as of 31 March 2016.”

Some of the common equipment used in STPs include mixers, scrappers, mechanical screens, conveyors, and sludge processing equipment. The more critical hardware in these plants are sewage pumps, aerators and air blowers.

The equipment wattage requirement ranges from 0.37kW to 400kW, and typical large equipment in STPs consume higher than 100kW. According to Ir Hj Mohamed Haniffa, the electricity usage to power these machinery is substantial.

“On average, we use 1.6 million kWh, or RM650,000 worth of electricity per day to operate the more than 6,700 STPs with their 73,647 equipment nationwide.”

### HEALTHY SUPPLY

The STPs under IWK's umbrella are highly dependent on an efficient and stable supply of electricity. “Disruption to our power supply will affect the operation of our critical equipment, cause imbalances in the treatment processes within STPs





*At IWK's laboratories, technicians ensure that harmful contaminants are removed from the wastewater and safely disposed of, leaving only clean water at the end of the treatment process.*

and lead to major non-compliances or overflow of untreated sewage into environment," Ir Hj Mohamed Haniffa states.

Fortunately, TNB has stepped up to the plate and ensured that these STPs are constantly fed with electricity. Additionally, it has also helped to iron out minor niggles that crop up from time to time, working closely with IWK in doing so.

Ir Hj Mohamed Haniffa elaborates, "In ensuring smooth operation of the STPs, IWK has been consulting with TNB Branch Managers nationwide to resolve day-to-day issues such as reinstatement of TNB meters, power failures, provision of standby generator sets, power factors, surges and others. Generally, TNB has assisted us in resolving problems related to electricity supply over the years."

"TNB has always ensured availability of alternative power supply during their maintenance works at our STPs nationwide. They have also ensured our power supply interruptions are resolved within 30 mins to 4 hours for most cases nationwide," he adds.

It goes without saying that IWK needs to ensure that the sewage

treatment processes are operating around the clock to handle the wastewater that is being continuously pumped in. In addition, we have 'Early Warning System' (EWS) at strategic plants to restore to other practical temporary solutions in the absence of power supply.

To prepare for such an outcome, IWK has a fail-safe method. "The STPs are equipped with a 'Standby or Mobile Generator System' to cater for any temporary power failure occurrences. The system will kick in when there is no electricity supply."

### ENERGY SAVINGS

As the plants run continuously and constantly, IWK does not have the option of balancing peak and non-peak electricity usage. Therefore, the company is looking into several energy savings initiatives to ensure that operation cost – and electricity consumption – is optimised.

Ir Hj Mohamed Haniffa lists them out. "The first initiative is Process Optimisation, where we operate STPs within its optimal capacity based on hydraulic capacity and process capabilities. Secondly, we study Equipment Improvement, in which we use high efficient equipment such as turbo blowers, efficient motors, pumps and others at the STPs."

"We also strive to attain Energy Management: ISO50001 (Energy Management) certification for selected plants and implement Nationwide Energy Audit and Monitoring System (EnMS) initiatives for STPs. The target is to roll-out ISO50001 certification to all plants nationwide," he continues.

"Next, we are exploring Renewable Energy options by embarking on the generation of electricity using biogas engine, from the methane gas generated in Anaerobic Digesters at STP. Lastly, Continual Improvement Plans are put in place to optimise operations and save energy usage at the unit operational levels."

**Proper wastewater management is a crucial need for everyone, and thankfully, IWK has proven to be more than capable for the job. With TNB as a reliable provider of electricity at its side, IWK is set to continue serving the country with high levels of efficiency. 🇲🇾**

# It's Better to be Safe Than Sorry

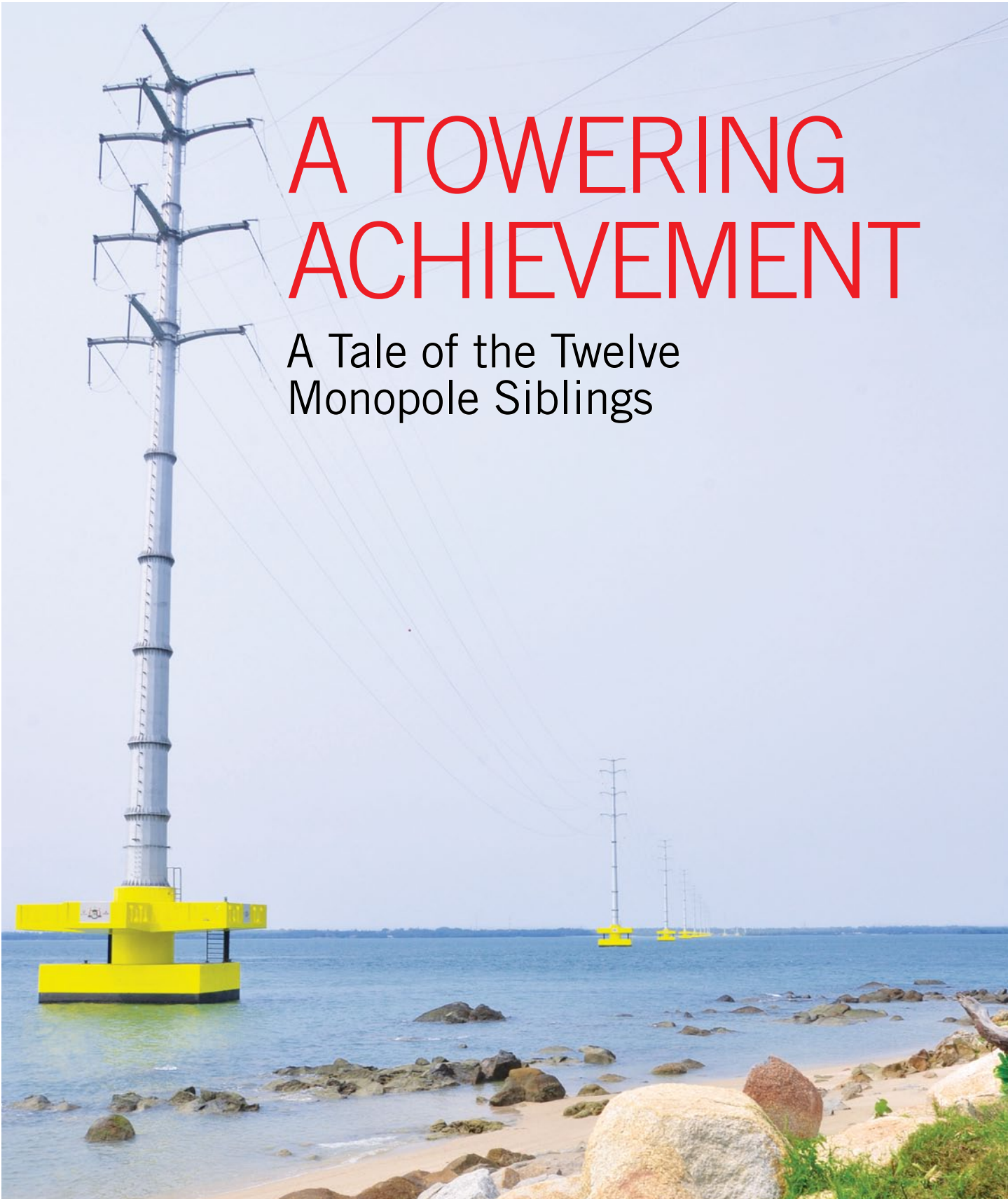
Eliminate Risks and  
Leave Nothing to Chance





# A TOWERING ACHIEVEMENT

A Tale of the Twelve  
Monopole Siblings



*Standing like formidable sentries, the dozen towers make for a talking point among beholders not just for their role in supplying electricity to Pulau Besar, but also for their captivating appearance.*

**T**he skipper steers the boat with well-practiced ease through the choppy waves towards Pulau Besar. This idyllic island sits off the coast of Melaka, and its white sandy beaches circle an interior dotted with development. It is only accessible by sea, and those who regularly make the bumpy journey out from Pantai Siring on the mainland have long since stopped gazing out at the view, but everyone noticed as twelve brightly coloured towers started to appear one-by-one along the 4.2km route. Far from the grumbled complaints that usually accompany offshore windfarms and other coastal developments, the monopoles have been welcomed by locals as they play a very important role – they have finally connected the island’s homes, school and businesses to TNB’s mainland grid.

For several decades prior, Pulau Besar’s only source of electricity came from generators. This sparked many discussions about supplying the island with grid-sourced power, but the project that ultimately took off was the result of a joint venture between TNB and the government of Melaka. TNB Melaka General Manager Datuk Baderul Sham Saad talks to Tenaga Link about the project.

**Q: Could you briefly describe the project?**

This project was the brainchild of the former Chief Minister of Melaka, Tan Sri Mohd Ali Rustam. Initially, the island’s individual households and developers used their own generators for electricity, and discussions to have a 24-hour supply to Pulau Besar only began in earnest 10 years ago.

There were three initial proposals by TNB when it came to the means of supply: using large-scale generators, using submarine cables, or using towers across the sea. After factoring in the feasibility and cost, we decided to go with the tower option, as it was a third of the price of laying submarine cables, while still having the ability to provide high-capacity power.



“The project involved both the Distribution and Transmission divisions of TNB. The cabling work was handled by the former, while the erection of the towers was overseen by the latter.”

– Datuk Baderul Sham Saad,  
TNB Melaka General Manager

At first, the plan was to use lattice towers, but the monopole design was chosen instead for aesthetic purposes. With their clean, interesting design, they are more pleasing to look at than traditional lattice towers, and therefore more tourist-friendly. It is a sight to behold at night when these towers are lit up. It is the first project of its kind not only in Malaysia, but the ASEAN region as well.

The final cost came to about RM36 million with the supply set at 11kV, although the cable is rated up to 132kV. TNB collaborated with the Melaka State Development Corporation (PKNM) for the project, and local contractor Malaysian Resources Corp Bhd (MRCB) was tasked with the technical aspects of the project. Work commenced soon in early February 2014.



*There are several places of interest on the island, including a museum, and even more attractions in the pipeline such as an Islamic theme park that would benefit greatly from the new stable and sufficient supply of electricity.*

### Q: How was the work carried out?

A similar over-sea electricity supply project in Thailand was used as the benchmark, although that one used a lattice tower design. Planning wise, applications had to be made via various channels and authorities, including the Marine Department, Department of Irrigation and Drainage, and Department of Fisheries.

We had to conduct hydrological studies to ensure the suitability of the ocean floor terrain, as well as perform piling works 20 metres deep. The towers were erected using a new method involving platforms. I am happy to announce that only local contractors were engaged in the work, and the project was completed six months ahead of schedule, finishing in February 2015.

We also kept an eye on the well-being of the local community, focusing on the nature of interaction between the project and them. We opened up communication channels with the locals and discussed issues that were raised, such as cable-laying paths and how the towers might affect fishermen.



### Q: What benefits does the project bring to the area?

As the Melaka state government plans to woo investors into the state, PKNM decided to turn the project into a tourism product. Not only would the attractive design be a drawing point, but the reliable electricity supply will help catalyse Pulau Besar's potential of becoming a tourist island.

Currently, there is a museum, a resort with a golf course, and an Islamic school on Pulau Besar that pull the tourists in, and numbers would be greatly boosted by a stable supply of electricity. Additionally, a promising Islamic Civilisation Theme Park is being planned for the island, targeted at Muslim tourists from both inside and outside Malaysia.

**Projects that connect islands to the mainland power grid are not unheard of within TNB, and this Pulau Besar effort follows many others that have been done before. What is unprecedented however, is the use of the monopoles to achieve that connection. These stately towers draw the eye, breaking the monotony of the otherwise plain ocean view with their striking design and colour – a landmark that stretches for kilometres, and a paradigm for future projects in the country. 🇲🇾**



**Above:** The teachers and students of Sekolah Menengah Agama dan Tahfiz Pulau Besar are all smiles as they are no longer at the mercy of an unstable electrical supply.

# GRID IS GOOD

## Enhancing Lives in Pulau Besar

**T**ranquil beaches and fascinating forests have made Pulau Besar a favourite for holiday-makers seeking a break that is off the beaten path. Located 4.2km off the coast of Melaka, the island is also home to a small but thriving community. For years, the inhabitants of Pulau Besar have lived, studied and worked there without the benefit of steady electricity supply. Instead, they had to depend on highly unreliable individual generators. Today they have grid connectivity thanks to TNB and its drive to bring electrification to outlying communities.

This has been made possible thanks to the installation of 12 monopole towers from Pantai Siring to Pulau Besar. *TenagaLink* visited Pulau Besar to find out more about this project (read more in *A Towering Achievement* on pg 32). Costing RM36 million, the towers not only

help transmit electricity to the island but are also used as navigational guides for planes and ships on the Straits of Malacca.

A joint initiative by TNB and the Melaka State Development Corporation, the monopoles are

delivering 24-hour power to Pulau Besar. Electricity demand there is currently 3MW and is expected to reach 6MW by 2020.

Much of this increase is expected to be driven by tourism activity as the state government aims to enhance





“I used to have a small generator to power my shop, and each day it cost me RM20 in fuel. I come here from Thursdays to Sundays, and each trip costs me RM80. So I am very happy to receive electricity supply from TNB because it is helping me save.”

– Khatijah Abu Bakar,  
Sundry Shop Owner

“This pioneer project has become an attraction for both locals and tourists, and has become a benchmark for other states that have similar islands. It provides significant investor opportunities for the area. It is my hope that the island and its surrounding areas become developed.”

– Datuk Zaidi Atan,  
Serkam Assemblyman



“Previously, we had to make do with the often unreliable diesel generator for power. When the generator broke down, over a hundred students and staff had to congregate at the canteen to find shelter from the stifling heat. Now that is a thing of the past thanks to TNB.”

– Muhammad Shahril Dolah,  
Senior Assistant of Sekolah Menengah Agama  
and Tahfiz Pulau Besar



Pulau Besar’s attractiveness to visitors. This in turn will help draw investors to the state. One of the main projects is the establishment of an Islamic Civilisation Theme Park, which Chief Minister Datuk Seri Idris Haron hopes will attract a significant number of Muslim tourists.

### THE JOY OF CONNECTIVITY

The lives of Pulau Besar’s inhabitants and traders have also changed for the better with the provision of steady electricity supply. One such person is Khatija Abu Bakar, who lives on the mainland but operates a sundry shop on the island.

Speaking about the difficulties of running a business without regular electricity supply, she said, “I used to have a small generator to power

my shop, and each day it cost me RM20 in fuel. I come here from Thursdays to Sundays, and each trip costs me RM80. So I am very happy to receive electricity supply from TNB because it is helping me save.”


Khatija also recalled that if she wanted to cool food items, she had to buy ice cubes from the mainland and take them to the island. She no longer has to do that as she can now use a fridge in her shop without having to worry about paying for extra fuel.

The successful connection of Pulau Besar to the grid has also enhanced the environment of the island’s only school, much to the joy of administrators, teachers and students. According to Muhammad Shahril Dolah, the Senior Assistant of Sekolah Menengah

Agama dan Tahfiz Pulau Besar, the only source of power in the past was a diesel generator.

“It was often unreliable,” he told *TenagaLink*. “When breakdowns occurred, a hundred students and staff had to gather at the canteen in order to find reprieve from the heat. Also, it took a long time for the generator to be repaired because the technician had to come from the mainland. Today, these problems are all in the past thanks to TNB.”

This means that students are able to learn in an ambience that is more conducive to study. In addition, regular power supply also enables teachers to make use of electrical and electronic educational aids to teach.

**Pulau Besar’s electrification is just one of many such projects that TNB has carried out throughout Malaysia. By bringing power to the people, it is helping to lift standards of living and create opportunities for growth. This ties in with the national initiative to become a developed nation, and demonstrates TNB’s commitment to the country and its people. **





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# TNB STATE OFFICES

## Wilayah Persekutuan

### Kuala Lumpur

Pengurus Besar Negeri  
Bahagian Pembahagian  
Tenaga Nasional Berhad  
Aras 11, Wisma TNB  
Peti Surat 11050  
50990 Kuala Lumpur  
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Fax : 03 – 6250 6500

## Selangor Darul Ehsan

Pengurus Besar Negeri  
Bahagian Pembahagian  
Tenaga Nasional Berhad  
Wisma TNB Subang Jaya  
Jln USJ 10/1A, USJ 10  
47620 Subang Jaya  
Tel : 03 – 8022 9400  
Fax : 03 – 8022 9554

## Johor Darul Takzim

Pengurus Besar Negeri  
Bahagian Pembahagian  
Tenaga Nasional Berhad  
Aras 14, Wisma TNB  
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80100 Johor Bahru  
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Fax : 07 – 223 1425

## Kedah Darul Aman

Pengurus Besar Negeri  
Bahagian Pembahagian  
Tenaga Nasional Berhad  
Aras 8, Wisma TNB  
887 Jalan Sultan Badlishah  
05990 Alor Setar  
Tel : 04 – 774 5600  
Fax : 04 – 732 4185

## Melaka

Pengurus Besar Negeri  
Bahagian Pembahagian  
Tenaga Nasional Berhad  
Aras M, Jln Banda Kaba  
75990 Melaka  
Tel : 06 – 282 8544  
Fax : 06 – 282 6460

## Wilayah Persekutuan Putrajaya/Cyberjaya

Pengurus Besar Negeri  
Bahagian Pembahagian  
Tenaga Nasional Berhad  
Blok 4802-0-7, Jalan Perdana  
CBD Perdana, 63000 Cyberjaya  
Tel : 03 – 8886 6888  
Fax : 03 – 8886 6933

## Kelantan Darul Naim

Pengurus Besar Negeri  
Bahagian Pembahagian  
Tenaga Nasional Berhad  
Aras 5, Wisma TNB  
Jln Tok Hakim  
15000 Kota Bharu  
Tel : 09 – 745 1100  
Fax : 09 – 747 3611

## Pulau Pinang

Pengurus Besar Negeri  
Bahagian Pembahagian  
Tenaga Nasional Berhad  
Aras 17, Wisma TNB  
30 Jalan Anson  
10400 Pulau Pinang  
Tel : 04 – 222 4000  
Fax : 04 – 227 3110

## Perlis Indera Kayangan

Pengurus Besar Negeri  
Bahagian Pembahagian  
Tenaga Nasional Berhad  
Wisma TNB, Bulatan Jubli Emas  
01000 Kangar  
Tel : 04 – 976 0021  
Fax : 04 – 976 1921

## Pahang Darul Makmur

Pengurus Besar Negeri  
Bahagian Pembahagian  
Tenaga Nasional Berhad  
Aras 13, Wisma TNB  
Lot 14, Seksyen 19  
Jln Gambut, 25000 Kuantan  
Tel : 09 – 515 5555  
Fax : 09 – 515 5656

## Perak Darul Ridzuan

Pengurus Besar Negeri  
Bahagian Pembahagian  
Tenaga Nasional Berhad  
Aras 2, Wisma TNB  
Jalan Lahat, 30200 Ipoh  
Tel : 05 – 208 8000  
Fax : 05 – 254 5199

## Negeri Sembilan Darul Khusus

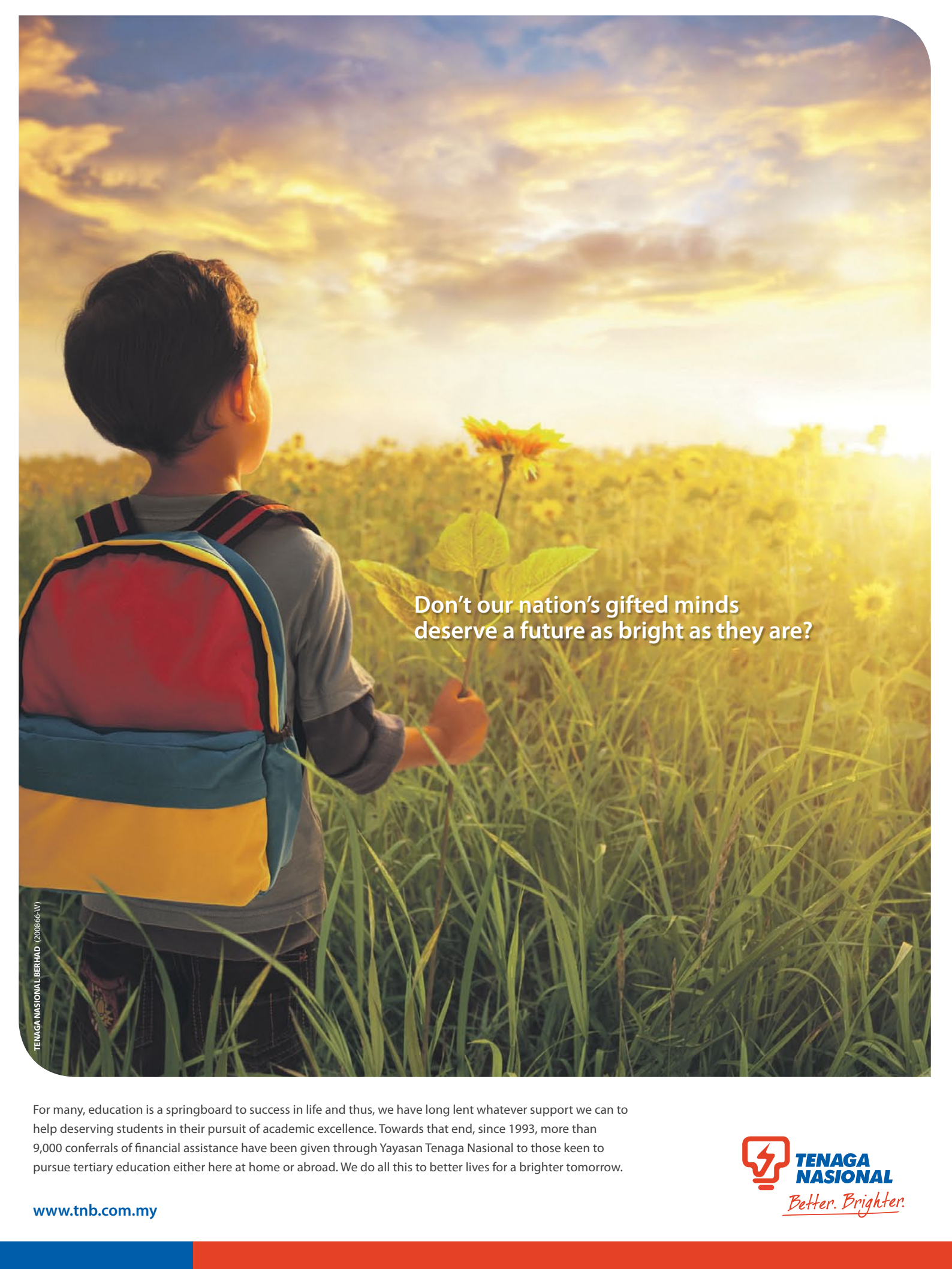
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Jalan Dato Bandar Tunggal  
70990 Seremban  
Tel : 06 – 768 3400  
Fax : 06 – 764 4271

## Terengganu Darul Iman

Pengurus Besar Negeri  
Bahagian Pembahagian  
Tenaga Nasional Berhad  
Jln Cherong Lanjut  
20673 Kuala Terengganu  
Tel : 09 – 622 3022  
Fax : 09 – 624 3896





A young boy with dark hair, seen from the back, stands in a field of tall grass and sunflowers. He is wearing a grey long-sleeved shirt and a backpack with red, blue, and yellow sections. He holds a single sunflower in his right hand. The background is a vast field of sunflowers under a dramatic sky with golden light and scattered clouds, suggesting a sunset or sunrise.

Don't our nation's gifted minds  
deserve a future as bright as they are?

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For many, education is a springboard to success in life and thus, we have long lent whatever support we can to help deserving students in their pursuit of academic excellence. Towards that end, since 1993, more than 9,000 conferrals of financial assistance have been given through Yayasan Tenaga Nasional to those keen to pursue tertiary education either here at home or abroad. We do all this to better lives for a brighter tomorrow.

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