



FUTURE OUTLOOK OF ENGINEERING PRACTICES IN OIL & GAS AND ENERGY

Presented by:

Dato' Nor Azman bin Mufti
(Managing Director, TNB)

FUTURE OUTLOOK OF ENGINEERING PRACTICES IN ENERGY SECTOR



- BEM CONVENTION
- October 26, 2022
- Kuala Lumpur, MALAYSIA

CONTEXT



Segment 1:

Global Trending in Energy Transition

TNB Leading the Nation Energy Transition



Segment 2:

Future Engineer – What's Required?



GLOBAL TRENDING IN ENERGY TRANSITION





Global change in the energy industry is inevitable and power utilities must continue to evolve to win in this new landscape – 4Ds



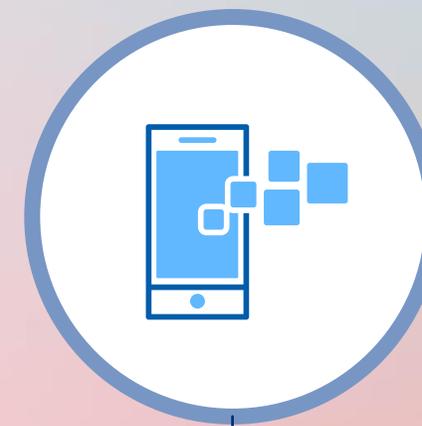
Increased **deregulation** to drive competition



Rising importance of **de-carbonisation** and renewables

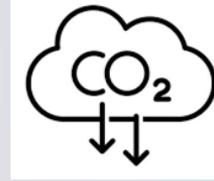


Increased **decentralization** and customer participation



Faster rate of **digital disruption**

Global Future Outlook in Energy Sector



Gas and steam turbines OEMs adapt to decarbonization i.e. green fuel (co-firing & hydrogen), carbon capture-utilization-storage (CCUS), battery energy storage system (BESS) and small medium reactor (SMR);



GT-Hydrogen Ready

GT Hydrogen Blended Fuel Firing Carbon Capture and Sequestration (CCS)

GE's 7HA.03 at 430 MW is capable of up to a 50% blend of hydrogen



GT-Hydrogen Ready

GT Hydrogen blending capability with natural gas with DLE

(dry low emissions) technology between 30% and 75% by volume



Battery Energy Storage

Innergex RE Project-Emerald- 425 megawatt-hours (MWh) in the Atacama desert of Northern Chile.

Green Hydrogen

JV with Magnum Development, and Haddington -Advanced Clean Energy Storage Project, Utah, USA

- 220 MW of electrolyzers to produce up to 100 metric tonnes per day of green hydrogen
- stored in two massive salt caverns each capable of storing 150 GWh of energy.
- 840 MW hydrogen-capable CCGT



Carbon Capture Technology

Petranova Carbon Capture Project, Texas, USA.

- capture 4776 tonnes/day from WA Parish Coal Plant
- CO2 utilised for enhanced oil recover (EOR) – West Ranch Oil Field



Bio-Mass/Ammonia

Development on low carbon fuels / co-firing i.e. ammonia, biomass, hydrogen

JEP Co-firing study using bio-mass and ammonia (Phase 1- feasibility study completed)

Genco-Petronas-IHI JV

Ammonia Co-firing Pilot test at TNBR testing facility (up to 60% of ammonia)

KEV co-firing using bio-mass (EFBP)



Small Medium Reactor

Also known as Small Modular Reactor
 Small ≤ 300MWe
 Medium ≥ 300 to 700MWe
 In Developing Stage

TNB LEADING THE NATION ENERGY TRANSITION



4 STRATEGI TNB DALAM MENERAJUI PERALIHAN TENAGA (ENERGY TRANSITION) & MEMANGKIN EKONOMI HIJAU (GREEN ECONOMY):



Mempercepat **program**
penyahkarbonan bagi
meningkatkan **nilai**
perusahaan
(*Enterprise Value*)
terutamanya bagi Gecco



Memperluas
fokus pasaran
bagi perambahan
**Tenaga Boleh
Baharu (TBB)**



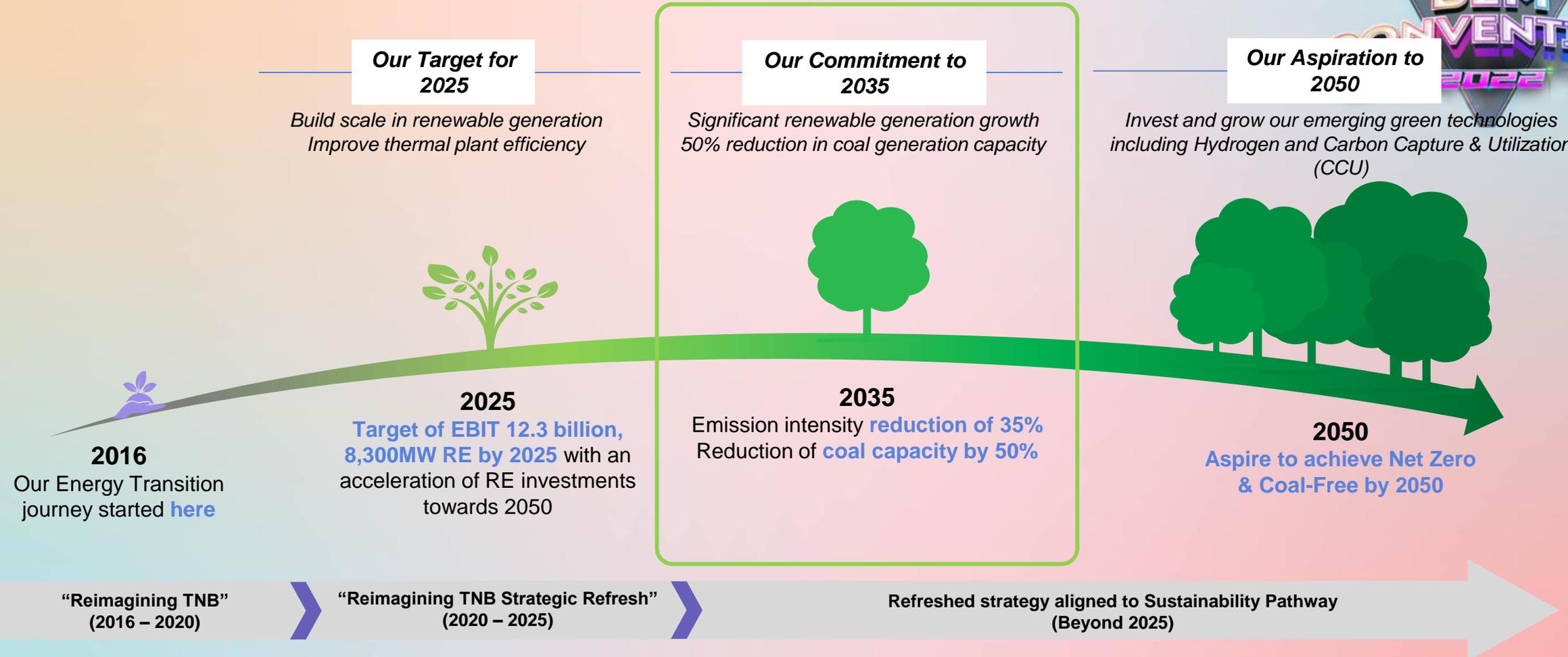
Pelaburan bagi
**Grid Masa
Hadapan**



Pembangunan dalam
**Industri
Kenderaan &
Pengecas
Elektrik**



TNB Sustainability Pathway 2050 (SP 2050)



TNB's fast-track energy transition plan ensures sustainable business growth while meeting our ESG commitments

GenCo

GenCo aims to capture estimated RM40 bil revenue from domestic market by 2050

Fast track decarbonisation

- 1 Coal plants early retirement
- 2 Repowering plants with cleaner fuel and green tech
- 3 Strategic

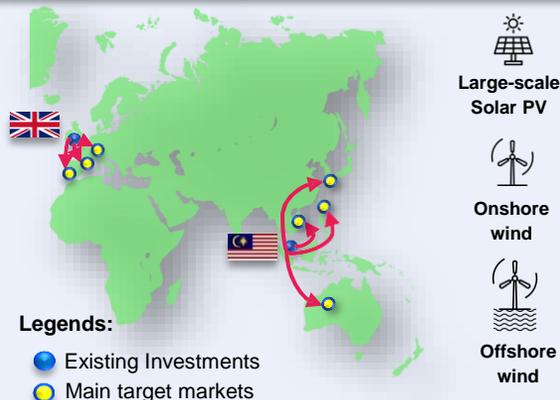
Explore opportunities in ASEAN



- Increase enterprise value and sustainability position of GenCo
- Possibility of an IPO of GenCo

NED

~USD7 bil equity investment by 2050



- Large-scale Solar PV
- Onshore wind
- Offshore wind

FOCUS MARKETS



14.3GW by 2050
 (Average portfolio return of 7% – 9%)

Grid

Regulated asset base (RAB) for Grid + DN to grow to ~RM100 bil by 2050

- Spurring growth of Renewable Energy Distributed Energy Resources (DER) and Value Resources (VRE) and
- Propelling growth of transportation and industrial customers electrification
- Reducing carbon footprint and preserving the forestry & natural environment

Regional Interconnection

To strengthen security of supply and open investment opportunities



Potential Earnings by 2050: ~RM7 bil

EV

We will invest RM90 mil to support BEV ecosystem over the span of 3 years with the following key strategic moves:

- 1 Build charging infrastructure
- 2 Reskill & upskill workforce
- 3 Lead by example through TNB Fleet electrification
- 4 Sponsor EV-related studies
- 5 Foster coalition among EV sector players

2030 EV Market Potential

18,000 charging points
 500,000 BEV on the road
 4,432 k tons CO₂ emission reduction

2.318 TWh annual electricity sales
 RM 1,258 mil annual revenue

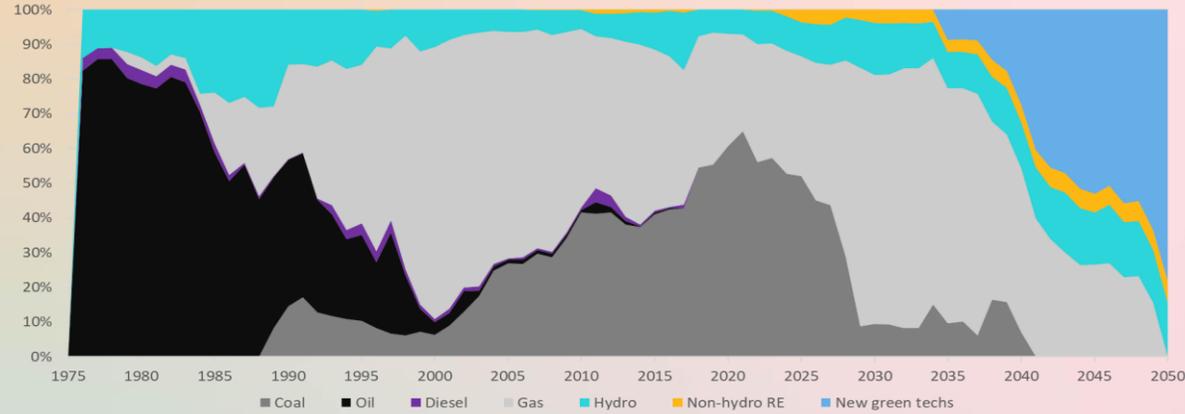


We start with GenCo as the biggest lever with major shifts to RE and new green technologies towards the future...

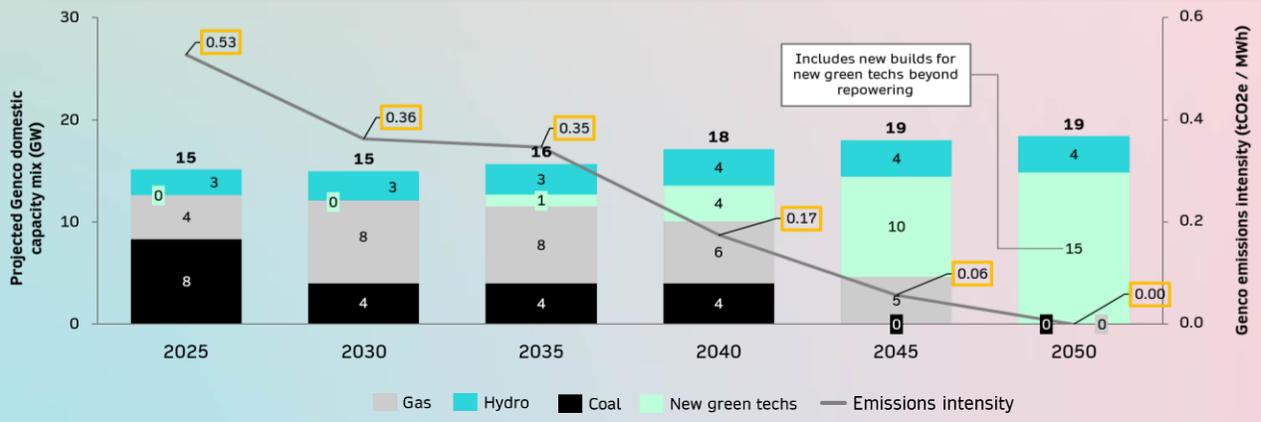
TNB's decarbonisation roadmap to achieve net zero emission by 2050 and be coal-free by early 2040s, ahead of initial milestone

GenCo aims to capture estimated RM40 bil of domestic market by 2050

TNB generation mix (%)



GenCo moves will contribute to reaching our 2035 intensity target and net zero by 2050



GenCo's next moves to fast track decarbonization

- 1 Early retirement of coal plants**
Explore the viability of retiring Kapar Energy Ventures (KEV) to a year ahead of its PPA expiration, subject to agreement of existing shareholders & approvals from relevant authorities and regulators
- 2 Repowering plants with cleaner fuel and green tech**
Following KEV early retirement, we will begin our repowering plan with KEV (1400MW) and Paka (1400MW). GenCo repowering strategy will include optionality. Paka is planned to be hydrogen-ready by 2029
- 3 Accelerate green tech adoption via strategic technology partnership**
In addition to green tech, strategic partner can provide capital and new capabilities



Through these deliberate steps to increase its enterprise value and sustainability position, we are also staying open to the possibility of an Initial Public Offering (IPO) of GenCo, should the opportunity come up

GenCo aims to explore hydro and gas opportunities in ASEAN

Gas

Vietnam Thailand Indonesia

Target: +4 gas projects

Hydro

Laos Indonesia

Target: +7 new hydro projects

~800
MW

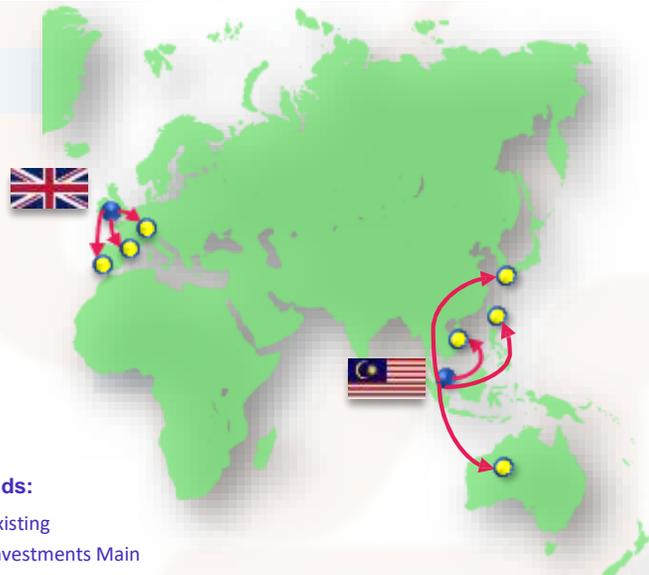
Target share of capacity of the new international plants by 2050

TNB's New Energy Division (NED) will continue to expand our renewable energy portfolio on both domestic and international grounds as we build capability and gain access to technology and market knowledge



Asset development and business expansion

Geographical Expansion



Legends:
 ● Existing
 ● Investments Main target markets

FOCUS MARKETS

CURRENT

UK

SEA

TH

NEW FOCUS MARKETS

EU

ES

APAC

IN

FR

Life Cycle

- Move upstream into asset development for IRR enhancement

Capital Strategy

- Recycle capital to optimise capital allocation, contributing to EBIT uplift
- Tapping global capital market for RE investments

Technology Focus

Large-scale Solar PV

Onshore wind

Offshore wind

Target growth of installed RE capacity



The Grid is a critical infrastructure to enable Malaysia's energy transition. TNB will continue to invest to strengthen the grid and network infrastructure of the future, balancing grid security, sustainability and affordability



Spurring growth of Variable Renewable Energy (VRE) through improved grid flexibility & regional interconnection



Propelling growth of transportation and industrial customers electrification via enhanced grid capacity & connectivity



Reducing grid's own carbon footprint and preserving the forestry & natural environment

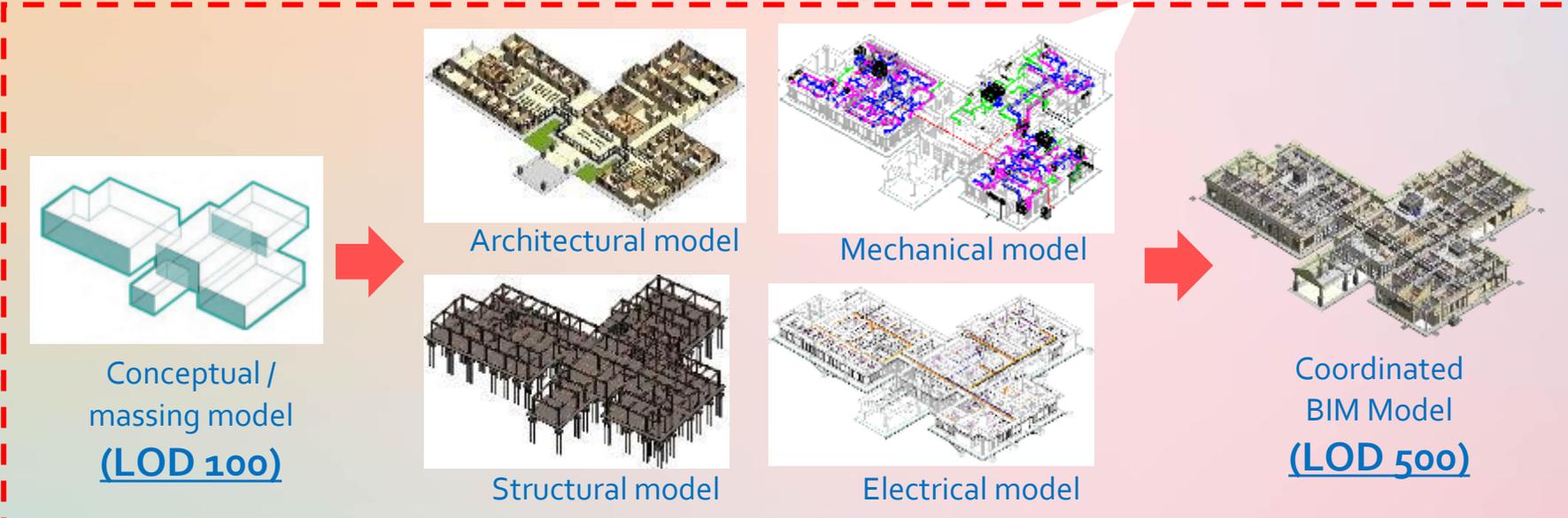
○ Enabling decarbonization ○ Decarbonizing grid

- ... **Increasing share of grid-connected VRE especially solar in the grid and Distributed Energy Resources (DER)** will threaten system stability and introduces operational complexity
 - Target to achieve a score of **85% on the Smart Grid Index by 2025**
 - **Analytics, automation and digitalization** to deliver operational efficiencies Potentially **45% of LSS** in national capacity mix by 2050
- ... **Increasing EV penetration, electrification of industrial customers and will increase peak load seen by the grid**
 - **50% growth in grid peak load by 2050 compared to 2022 level**
- ... **Expansion of grid infrastructure** may lead to increased deforestation as well as potential emission and pollutant release
 - **Continuously conserving & preserving forest** from grid development activities
 - Adopt **green technologies** for grid asset

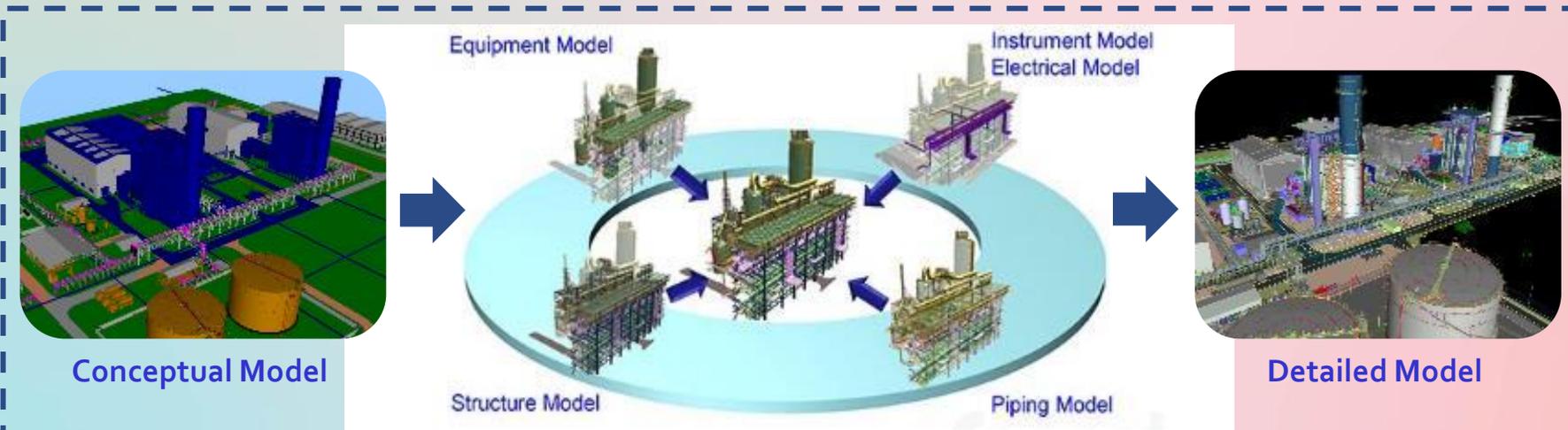
Collaboration in Building Information Modelling (BIM)



3D model + information data sharing in single collaborated BIM model



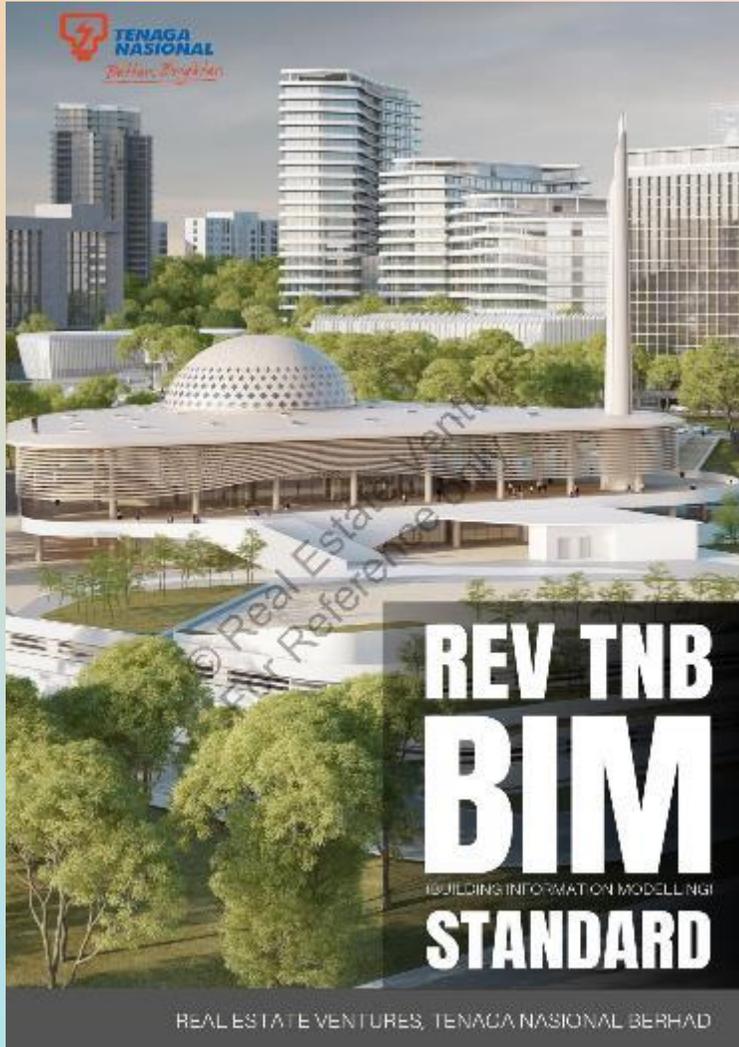
- Better visualization in 3D
- Clash detection to reduce conflict & reworks
- Efficient scheduling & cost estimating



- Information data can be embedded into the model
- Drawings can be generated from single BIM model
- Efficient Facility Management of built asset

BIM in TNB

Two main pillars of implementation; "Collaboration" & "Future-Proof"



- Started utilized BIM for Balai Islam HQ project & later produced **BIM Standard**.
- the benefits of BIM in **enhance productivity & efficiency**.
- BIM is essential to allow project teams to verify designs & construction methodology in **virtual environment which minimize construction changes**.
- **BIM is crucial in enhancing skills & capability** of REVD teams to align to modern construction standard.
- **TNB is committed** to continuing the development of BIM & **support the Malaysian Govt's mandate** of BIM compliance under CITP.



Inline with TNB's direction and future plans, future engineers need to be equipped with the right skills and knowledge. At UNITEN we ensure the Energy Theme is spread throughout our curriculum programme



IR 4.0 and beyond	Renewable Energy	Energy Economics	Artificial Intelligence and Analytics
Cybersecurity	Develop Leadership qualities (ULEAD)	Develop Self Inner Strength (SHIELD)	Green Tech in Power Generation
Smart Grid and Grid of the Future	Energy Centric Theme in all Academic Programmes	Energy Computing	Energy Business

Basic Knowledge and Research goes hand in hand to ensure UNITEN always is at the forefront of Energy related knowledge

5 Research Institutes



Institute of Power Engineering (IPE)

- Transmission and distribution technologies
- Power generation



Institute of Sustainable Energy (ISE)

- Solar energy
- Wind technology
- Energy based on biofuel



Institute of Energy Policy & Research (IEPR_e)

- Energy economy
- Regulatory policy
- Social transformation



Institute of Energy Infrastructure (IEI)

- Geospatial intelligence
- Energy water security
- Disaster risk reduction



Institute of Informatics & Computing in Energy (IICE)

- Data analytics
- Visual informatics
- Energy security

National Energy Centre

Future Postgraduate Programme

Master of Energy Management by Coursework & Project

Master in Dam Safety Management & Engineering

Master of Electric Transportation System

Future Short Courses

Training Courses In Renewable Energy



*Proposed to begin in October 2022

Operation and Maintenance of Anaerobic Digester (Level 2 & 3) In collaboration with SEDA

Energy & Society Course

Sustainable Energy Management for Business Course



**TENAGA
NASIONAL**

Better. Brighter.

FUTURE
ENGINEER:
WHAT'S
REQUIRED???



Elements Essential by Future Engineers



Technical And Non-Technical Know How

- Decarbonisation
 - ✓ Renewable & Sustainable Energy
 - ✓ Green Technology (CCUS, Hydrogen Fuel, SMR)

- Industrial Revolution 4.0
 - ✓ Digitalization (IoT)
 - ✓ Machine-Learning
 - ✓ Artificial Intelligence (AI)

Attitude

- ✓ Adaptive & Agile
- ✓ Collaborative
- ✓ Forward thinking
- ✓ Mindfulness
- ✓ Integrity



Disclaimer

All information contained herein are solely for the purpose of this presentation only and cannot be used or referred to by any party for other purposes without prior written consent from TNB. Information contained herein is the property of TNB and it is protected and confidential information. TNB has exclusive copyright over the information and you are prohibited from disseminating, distributing, copying, reproducing, using and/or disclosing this information.



THANK YOU



Committed to Engineering Excellence

BOARD OF ENGINEERS MALAYSIA

Tingkat 17, Blok F, Ibu Pejabat JKR

Jalan Sultan Salahuddin, 50580 Kuala Lumpur

<http://www.bem.org.my>

bemconvention2022@bem.org.my or event@bem.org.my

Tel: 03-26912090



Back Up Slide



Clean Coal Technology Achievement

TNB Jimah Plant Wins ASEAN Energy Award For Clean Coal Technology

By Editor - October 10, 2021



Trailblazing in the energy producing sector by using new and innovative technology and inline with keeping carbon emission at minimal, Tenaga Nasional Berhad and its power station's are reinventing the way power is generated.

Its this progressive thinking that has enabled the utility giant to receive recognition on a regional level, recently the Jimah East Power came up triumphant in the ASEAN Energy Awards 2021 by winning the Clean Coal Technology Utilisation for Large Power Generation category, a testament to the company's will.

Held in Brunei, the award recognises best practices of cleaner and sustainable coal use and the transition towards a more sustainable and lower carbon emission. JEP won the top prize in the category ahead of PT Indonesia Power PLTU Jateng 2 Adipala Omu, Indonesia, in second and Mae Moh Power Plant, Thailand, in third.

Award

CCT Utilisation for Power Generation

Large Sub-category



ASEAN ENERGY AWARDS 2021

Winner

SJTM Sharing of Best Practices in Clean Coal Use and Technology Innovations, Jimah East Power Sdn. Bhd., Malaysia.

Tenaga Nasional Berhad : JEP TRIUMPHANT AT ASEAN ENERGY AWARDS 2021

10/09/2021 | 11:12pm EDT



PRESS RELEASE

S.A. 2021/10/123 (HQ)

JEP TRIUMPHANT AT ASEAN ENERGY AWARDS 2021

- TNB'S USC power station is recognised for applying the best practices in clean coal usage

Tenaga Nasional Berhad's (TNB) power station, Jimah East Power (JEP) was triumphant in the ASEAN Energy Awards 2021 organised by the ASEAN Centre of Energy by winning the Clean Coal Technology Utilisation for Large Power Generation category.

The awards ceremony was held virtually in conjunction with the ASEAN Energy Business Forum and 39th ASEAN Ministers on Energy Meeting (AMEM) which was held from 14-16 September 2021 in Brunei.

JEP Triumphant at ASEAN Energy Awards 2021

10/10/2021

Tenaga Nasional Berhad's (TNB) power station, Jimah East Power (JEP) was triumphant in the ASEAN Energy Awards 2021 organised by the ASEAN Centre of Energy by winning the Clean Coal Technology Utilisation for Large Power Generation category.

The awards ceremony was held virtually in conjunction with the ASEAN Energy Business Forum and 39th ASEAN Ministers on Energy Meeting (AMEM) which was held from 14-16 September 2021 in Brunei.

The award recognises best practices of cleaner and sustainable coal use and the transition towards a more sustainable and lower carbon emission. JEP won the top prize in the category ahead of PT Indonesia Power PLTU Jateng 2 Adipala Omu, Indonesia, in second and Mae Moh Power Plant, Thailand, in third.



Better. Brighter.

POWER POINTS

Winning Attributes

- ✓ Track 4A is equipped with the first commercial GE 9HA.02 gas turbines—one of the world's largest and most efficient power-generating models.
- ✓ The landmark \$1.1 billion project showcases an array of first-of-its-kind equipment and technology.
- ✓ The project team reportedly completed a total of 10 million man-hours of work with zero lost-time injuries.
- ✓ Malaysia's Energy Commission awarded a fast-track project tender for Track 4A to help Peninsular Malaysia overcome regular power disruptions.
- ✓ The project team overcame significant obstacles to commission Track 4A during the global COVID-19 pandemic.

Winning POWER's highest honor is Track 4A, Southern Power Generation's 1.4-GW natural gas-fired power plant in southern Malaysia that is equipped with the first commercial **GE 9HA.02** gas turbines—one of the world's largest and most efficient power-generating models. Though jolted by the pandemic, an international team brought this first-of-a-kind plant online through innovative continuity efforts. The project is today a showcase of advanced technology integration and a meaningful model for balancing climate awareness, energy affordability, and reliability in power-hungry Southeast Asia.



Media Excerpts on TNB Energy Transition



The Star, Malaysia

Powering ahead to a greener world

Future proofing of TNB business through Sustainability Pathway 2050

Powering ahead to a greener world

Future proofing of TNB business through Sustainability Pathway 2050

Powering ahead to a greener world

Future proofing of TNB business through Sustainability Pathway 2050

7. THE EDGE CEO MORNING BRIEF

TNB commits RM20 bil capex annually to hasten transition into responsible energy until 2050

KUALA LUMPUR (Aug 17): Tenaga Nasional Bhd (TNB) on Wednesday (Aug 17) announced it will invest around RM20 billion per year over the next 28 years as capital expenditure (capex) for initiatives to fast-track TNB's Energy Transition Plan aimed at reducing its emissions intensity to net zero by 2050.

"The investment will pave the way for TNB's journey towards its net zero aspiration and will open opportunities in more than doubling its EBIT (earnings before interest and tax),

"This Responsible Energy Transition journey will bring positive business growth to the group, even as we accelerate our efforts to decarbonise," said TNB president and chief executive officer Datuk Baharin Din in a statement via the group's Bursa Malaysia listing.

Baharin said the company will grow its regulated asset base to RM100 billion by 2050 as TNB continues to invest in the "Grid of the Future".

Earlier this month, TNB announced initiatives to accelerate its sustainability agenda, which was initially announced in August last year, and shared the progress on its energy transition plan.

"We will pursue regional interconnection that will allow for a wider reallocation of renewable energy resources that



NEED's strategy is to increase investments in large-scale solar as well as on-shore and offshore wind with a focus on existing markets in Malaysia and the UK, and new markets in Spain, Ireland, France, Thailand, Philippines, Vietnam, Australia, Taiwan and Korea, said the utilities giant in the statement.

Baharin added that TNB's focus is on developing the EV ecosystem as part of efforts to bring consumers along the energy transition journey.

"We are committing to invest RM90 million over the next three years in order to spur the adoption of EVs, reaching 500,000 cars by 2030 that will contribute RM1.25 billion in annual electricity revenue," he said.

Meanwhile, TA Securities in a note on Wednesday said the research house is mostly positive on all the ambitious environmental initiatives by TNB, with the firm expecting investors to likely favour these measures in view of current sustainable trends that boost ESG ratings for companies.

"However, we believe that the long-term execution of these strategies remains fluid given that it is still early days at this juncture."

"In particular, the comprehensive decarbonisation and energy transition strat-

KUALA LUMPUR (Dec 14): Sime Darby Bhd's automotive unit Sime Darby Motors (SDM) Malaysia plans to work together with Tenaga Nasional Bhd (TNB) for two years to explore initiatives to accelerate the adoption of electric vehicles (EVs), including ensuring a network of highly efficient EV charging infrastructure is in place to support this growth.

The two parties also aim to look into other energy-efficient and renewable energy initiatives to optimise the cost of EV charging infrastructure and to reduce carbon emissions. They signed a memorandum of understanding for this collaboration on Tuesday, according to a joint statement from them.

"We have very clear EV ambitions at Sime Darby Bhd and TNB plays a crucial role in ensuring that our goal is within reach here in Malaysia. Partners such as TNB play important roles as enablers in helping us achieve our target of a more energy-efficient product portfolio by 2025 and becoming a leader for EV in Asia Pacific," said Sime Darby group

Sime Darby to collaborate with TNB to accelerate electric vehicle adoption

TNB president and chief executive officer Datuk Baharin Din said TNB's interest to accelerate e-mobility stems from the group's ambition to create a conducive EV environment that encourages a higher EV adoption rate among the public, which will support the low carbon mobility footprint agenda for Malaysia.

He said through the collaboration, SDM, Malaysia and Sime Darby as a whole could rely on TNB's expertise in

ties to fast-track its sustainability agenda. These involve its wholly owned TNB Power Generation Sdn Bhd (TNB Genco), TNB's new energy division (NEED), and electric vehicles (EVs) under its project management office.

On TNB Genco, he noted that the acceleration of TNB's decarbonisation

ties to fast-track its sustainability agenda. These involve its wholly owned TNB Power Generation Sdn Bhd (TNB Genco), TNB's new energy division (NEED), and electric vehicles (EVs) under its project management office.

On TNB Genco, he noted that the acceleration of TNB's decarbonisation

12. BERITA HARIAN

Bandar Pintar Sandbox bakal dibina di UNITEN

Tenaga Nasional Bhd (TNB) merancang bekerjasama dengan beberapa syarikat hartanah untuk memajukan tanah seluas 240 hektar di Universiti Tenaga Nasional (UNITEN). Kajian mengenai Bandar Pintar Sandbox.

Cadangan pembangunan bandar pintar itu adalah sebagai komitmen inisiatif alam sekitar, sosial dan tadbir urus (ESG) syarikat utiliti nasional yang dilaksanakan pada Hari Pelabur TNB kelmarin.

Penganalisis HLIB Research, Daniel Wong yang mengahiri Hari Pelabur TNB itu berkata, bandar pintar itu akan meng-

hadapan di Malaysia," katanya dalam satu nota penyelidikan.

Hari Pelabur TNB 'Sifar Bersih 2050' mengemukakan komitmen ESG syarikat utiliti itu ke arah mengurangkan 35 peratus pelepasan karbon menjelang 2035 dan mencapai pelepasan sifar bersih menjelang 2050.

TNB seperti Allo dan GSpurs. Malah, beliau berkata, terdapat juga lot komersial yang ditawarkan untuk dijual di bandar pintar berkenaan.

"Bandar pintar itu antara lain akan mengayai sistem pengurusan tenaga rumah dan sistem tenaga kenderaan elektrik (EV).

"Ia akan dibangunkan dalam masa tiga hingga lima tahun. TNB masih berunding dengan rakan kongsi berpotensi bagi projek itu," katanya.



TNB masih berunding dengan rakan kongsi berpotensi jayakan Bandar Pintar Sandbox di UNITEN.

TNB seperti Allo dan GSpurs. Malah, beliau berkata, terdapat juga lot komersial yang ditawarkan untuk dijual di bandar pintar berkenaan.

"Bandar pintar itu antara lain akan mengayai sistem pengurusan tenaga rumah dan sistem tenaga kenderaan elektrik (EV).

"Ia akan dibangunkan dalam masa tiga hingga lima tahun. TNB masih berunding dengan rakan kongsi berpotensi bagi projek itu," katanya.

1. KOSMO

TNB labur RM20 bilion untuk peralihan tenaga

PERALIHAN tenaga - Tenaga Nasional Berhad (TNB) akan melabur kira-kira RM20 bilion setahun dalam tempoh 28 tahun akan datang sebagai perbelanjaan modal dalam inisiatif mempercepatkan peralihan tenaga yang berorientasikan teknologi. Kajian mengenai Bandar Pintar Sandbox.

Cadangan pembangunan bandar pintar itu adalah sebagai komitmen inisiatif alam sekitar, sosial dan tadbir urus (ESG) syarikat utiliti nasional yang dilaksanakan pada Hari Pelabur TNB kelmarin.

Penganalisis HLIB Research, Daniel Wong yang mengahiri Hari Pelabur TNB itu berkata, bandar pintar itu akan meng-

hadapan di Malaysia," katanya dalam satu nota penyelidikan.

Hari Pelabur TNB 'Sifar Bersih 2050' mengemukakan komitmen ESG syarikat utiliti itu ke arah mengurangkan 35 peratus pelepasan karbon menjelang 2035 dan mencapai pelepasan sifar bersih menjelang 2050.

TNB seperti Allo dan GSpurs. Malah, beliau berkata, terdapat juga lot komersial yang ditawarkan untuk dijual di bandar pintar berkenaan.

"Bandar pintar itu antara lain akan mengayai sistem pengurusan tenaga rumah dan sistem tenaga kenderaan elektrik (EV).

"Ia akan dibangunkan dalam masa tiga hingga lima tahun. TNB masih berunding dengan rakan kongsi berpotensi bagi projek itu," katanya.



Power Generation Sdn Bhd, (TNB Genco) dan New Energy Division (NEED) TNB serta dalam membangunkan bandar pintar. Kajian mengenai Bandar Pintar Sandbox.

Cadangan pembangunan bandar pintar itu adalah sebagai komitmen inisiatif alam sekitar, sosial dan tadbir urus (ESG) syarikat utiliti nasional yang dilaksanakan pada Hari Pelabur TNB kelmarin.

Penganalisis HLIB Research, Daniel Wong yang mengahiri Hari Pelabur TNB itu berkata, bandar pintar itu akan meng-

TNB, Petronas, IHI conduct ammonia co-combustion test

KUALA LUMPUR: Tenaga Nasional Bhd's (TNB) wholly owned subsidiaries TNB Research Sdn Bhd (TNBR) and TNB Power Generation Sdn Bhd (TNBPG), together with IHI Power System Malaysia Sdn Bhd and Petronas Hydrogen Sdn Bhd, have conducted an ammonia co-combustion test as part of a joint initiative to decarbonise the country's power sector.

TNB said the experiment, conducted at TNBR's test rig facility in Kajang, Selangor, was successful with carbon dioxide (CO2) and sulfur dioxide (SO2) emissions "reduced in accordance with the co-firing rate, with no generic ammonia detected at the exit of the furnace during the experiment."

It said the result seemed to be in favour of the experiment's objective towards decarbonisation, "which would be a great opportunity for TNB to move forward in having pilot plants upon obtaining approval from the authorities."

"The main objective of the experiment is to determine the impact of co-firing ammonia as carbon-free fuel together with coal in a coal-fired power generation system," TNB said in a statement yesterday. "The experiment was conducted using three types of commonly used coal in Malaysian coal-fired power plants."

TNB said the ammonia ratio was increased gradually from 0 per cent to up to 60 per cent for

power generation. The test rig facility in Kajang, Selangor, was successful with carbon dioxide (CO2) and sulfur dioxide (SO2) emissions "reduced in accordance with the co-firing rate, with no generic ammonia detected at the exit of the furnace during the experiment."

It said the result seemed to be in favour of the experiment's objective towards decarbonisation, "which would be a great opportunity for TNB to move forward in having pilot plants upon obtaining approval from the authorities."

"The main objective of the experiment is to determine the impact of co-firing ammonia as carbon-free fuel together with coal in a coal-fired power generation system," TNB said in a statement yesterday. "The experiment was conducted using three types of commonly used coal in Malaysian coal-fired power plants."

TNB said the ammonia ratio was increased gradually from 0 per cent to up to 60 per cent for

TNB and Petronas MOU in Decarbonization Effort



KUALA LUMPUR, 19 August 2022 – PETRONAS and Tenaga Nasional Berhad (TNB) have signed a Memorandum of Understanding (MoU) to strengthen collaboration in driving innovative solutions towards decarbonisation in support of Malaysia's aspirations to be a carbon-neutral nation by 2050.





Promoting Electric Vehicle (EV) Adoption

TNB in EV drive

BY MUHAMMAD YUSRY
 newsdesk@thesundaily.com

PROMOTING LAYA: Tenaga Nasional Berhad (TNB) is aggressively pursuing avenues to grow the market for electric vehicles (EV) in Malaysia and is having talks with Proton and Perodua, among others, to resolve existing pain points.

Malaysia's EV market was valued at RM61.5 million in 2020, with total revenue expected to grow at 12.46% annually to reach RM140 million in 2027, according to a Maximise Market Research report.

Last month, Prime Minister Datuk Seri Ismail Sabri Yaakob suggested Perodua collaborate with TNB to provide an affordable electric vehicle charge rate to encourage more uptake of energy efficient vehicles.

In an exclusive interview with theSun, a TNB spokesperson said the Deloitte Global Automotive Consumer Study 2021 on consumer concerns about owning EV highlighted that 35% of respondents in Malaysia complained about the shortage of EV charging infrastructure.

Another 21% quoted the high prices of EV, 18% expressed safety concerns, 12% complained about the short driving range and 11% said it took too long to charge.

Based on the study, TNB said it is taking up a leading role through strategic partnerships with other players in the EV sector, including DHL Express, Sime Darby Motors, BMW Group Malaysia, Malaysia Automotive, Robotics and IoT Institute, Socar Mobility Malaysia, Ipoh City Council and SP Seda Berhad to address those concerns.

"With 1,014 units of EV on Malaysian roads as of May this year, and the number expected to increase thanks to government incentives, we are working with industry players to resolve the poor charging infrastructure in the country, among others," TNB said.

It added that there are currently 707 charging stations in Malaysia, and the government is targeting to have 50,000 battery electric vehicles by 2025, supported by 10,000 public charging stations.

The downside is that EV in Malaysia are sold at over RM150,000, which is far above mass market affordability.

This is despite Budget 2022 providing for zero import duty for completely built up units until 2023, completely knocked down units until 2025, and 0% sales and service tax (which ended in June).

EV buyers benefit from a RM2,500 income tax rebate for home charging installation and road tax waiver until 2025.

But no incentives have been announced for the charging point operators.

TNB said: "In playing a key role to develop the EV ecosystem in Malaysia, TNB welcomes any partnership with EV manufacturers or importers that encourage its higher adoption."

"TNB continues to engage with the government and other stakeholders regarding policies and regulations that will encourage and accelerate the growth of EV adoption."

Turn to page 3

TNB to set up fast EV charging stations at Plus' R&R and federal roads

By Zuzaimi Abckalab - August 2, 2022 @ 3:03pm

TNAG Nasional Bhd (TNB) is collaborating with PLUS Malaysia Bhd for carbon emissions reductions by providing electric vehicle (EV) charging stations on PLUS highways, among others.

Both parties have agreed to work together through three sustainability initiatives — developing EV charging station network, installation of efficiency monitoring system energy and installation of photovoltaic solar systems — at selected Rest and Service Areas (RSAs).

Through the collaboration, a network of EV charging stations will be installed at the selected RSA along the PLUS highway alignment, while the energy efficiency monitoring system and photovoltaic solar systems will be installed on the roof of Ayer Keroh R&R building (northbound) and Tapah R&R (northbound) with total capacity over 300 kWp (followed next year).

TNB will provide a reliable and stable electricity supply to the ecosystem. EV charging mutually agreed upon by both parties. TNB also offers solutions to PLUS that can optimise electricity costs and support green measures and sustainable energy in reducing carbon emissions." TNB president and CEO Datuk Baharin Din said in a statement yesterday.

He explained all these initiatives under the memorandum of understanding (MoU) would reduce carbon emissions as well as support green energy use in addition to optimising the use of electricity in business operations to further increase commitment on environmental, social and governance (ESG).

"A joint venture with various organisations such as PLUS further strengthen investor confidence about our commitment to ESG and provide potential strategic measures for business expansion beyond kWh," he added.

The exchange of this strategic cooperation document through MoU between Baharin and PLUS MD Datuk Aman Ismail was held at the Kuala Convention Centre last Friday, witnessed by Prime Minister Datuk Seri Ismail Sabri Yaakob, the Minister of Pinnang, Tanjong Datuk Seri Zaidi Tangku Abdul Azar and Senior Minister and Minister of International Trade and Industry Datuk Seri Mohamed Azmin Ali.

Also present was Khazanah Nasional Bhd MD Datuk Anirul Faisal Wan Zabri, TNB chief distribution network officer Wan Nany Wan Mahmood, chief grid

TNB estimates that there will be some 3,300 charging points set up by it and other EV players to serve 33,350 pure EVs by 2025, generating RM80 million electricity revenue annually.

TNB, PLUS collaboration to boost EV usage and reduce carbon emissions

A network of EV charging stations will be installed at the selected R&R along PLUS highway

Tenaga Nasional Bhd (TNB) is collaborating with PLUS Malaysia Bhd for carbon emissions reductions by providing electric vehicle (EV) charging stations on PLUS highways, among others.

Both parties have agreed to work together through three sustainability initiatives — developing EV charging station network, installation of efficiency monitoring system energy and installation of photovoltaic solar systems — at selected Rest and Service Areas (RSAs).

Through the collaboration, a network of EV charging stations will be installed at the selected RSA along the PLUS highway alignment, while the energy efficiency monitoring system and photovoltaic solar systems will be installed on the roof of Ayer Keroh R&R building (northbound) and Tapah R&R (northbound) with total capacity over 300 kWp (followed next year).

TNB will provide a reliable and stable electricity supply to the ecosystem. EV charging mutually agreed upon by both parties. TNB also offers solutions to PLUS that can optimise electricity costs and support green measures and sustainable energy in reducing carbon emissions." TNB president and CEO Datuk Baharin Din said in a statement yesterday.

He explained all these initiatives under the memorandum of understanding (MoU) would reduce carbon emissions as well as support green energy use in addition to optimising the use of electricity in business operations to further increase commitment on environmental, social and governance (ESG).

"A joint venture with various organisations such as PLUS further strengthen investor confidence about our commitment to ESG and provide potential strategic measures for business expansion beyond kWh," he added.

The exchange of this strategic cooperation document through MoU between Baharin and PLUS MD Datuk Aman Ismail was held at the Kuala Convention Centre last Friday, witnessed by Prime Minister Datuk Seri Ismail Sabri Yaakob, the Minister of Pinnang, Tanjong Datuk Seri Zaidi Tangku Abdul Azar and Senior Minister and Minister of International Trade and Industry Datuk Seri Mohamed Azmin Ali.

Also present was Khazanah Nasional Bhd MD Datuk Anirul Faisal Wan Zabri, TNB chief distribution network officer Wan Nany Wan Mahmood, chief grid

operation stability. In addition to ensuring good governance and being committed to the needs of society, environmental management is also one of the main pillars driving the development of PLUS to become a Smart Highway of the Future," he said.

Azman said this move is also in line with other green initiatives implemented by PLUS including the use of green technology in its premises, using pavement which is recycled to pave roads in R&R areas, and using materials that are more environmentally friendly in the handling of its highway operations.

"This MoU is also one of our measures to reduce the negative impact on the environment as our day-to-day operations," he said.

PLUS also welcomes this collaboration with TNB and described it as one of the company's efforts in supporting ESG.

The infrastructure network facility of the EV charging station is expected to not only attract new users of EVs, but also transport operators, particularly multinational companies that want to switch from using engine vehicles internal combustion (Internal Combustion Engine) to electric-based vehicles.

Since June 2021, TNB has been actively collaborating to promote widespread usage of electric vehicles in the country.

Apart from PLUS, its strategic partners so far include DHL Express, Sime Darby Motors, BMW Group Malaysia, Malaysia Automotive, Robotics and IoT Institute, Socar Mobility Malaysia and Ipoh City Council. — TMK