

**TNB**  
**GENCC**

A subsidiary of Tenaga Nasional

**TNB POWER GENERATION SDN BHD**  
**SUSTAINABILITY SUKUK FRAMEWORK**



**JULY 2024**

# Progressing Towards a Sustainable Future

**TNB Power Generation Sdn Bhd** is dedicated to **empowering progress and make positive impact** as an organisation to ensure that we are constantly aligning our business **direction and effort towards the UN's Sustainable Development Goals (UN SDGs)**

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# BACKGROUND

# 1 BACKGROUND

## 1.1 HISTORY OF TNB POWER GENERATION SDN BHD

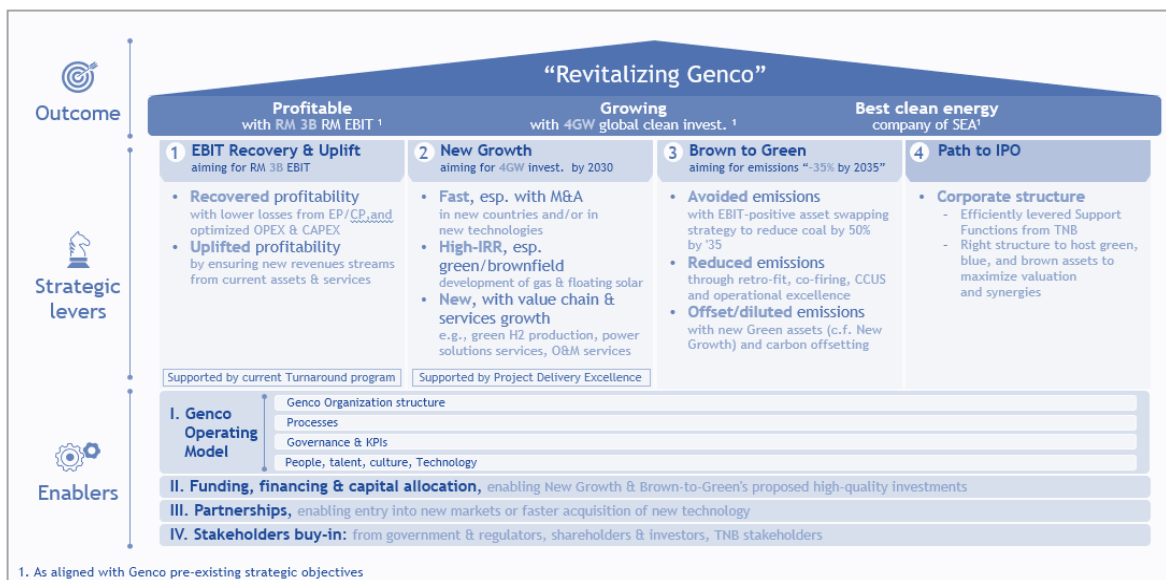
Tenaga Nasional Berhad (“TNB”) as the largest electricity utility provider in Malaysia and the leading utility company in Asia with an international presence in United Kingdom, Kuwait, Turkey, Saudi Arabia, Pakistan, India and Indonesia. TNB is proactively getting ready for the immense changes in the global energy industry to cope with global energy demands and transition to a zero-carbon economy by 2050. As a significant and wholly-owned subsidiary of TNB, TNB Power Generation Sdn Bhd (“TPGSB”, also known as “TNB Genco” or the “Company”) plays an important role in supporting TNB’s power generation role to provide secure, stable, reliable and sustainable power in contributing to the long-term energy needs of the country with end-to-end capabilities ranging from project development, construction and operation and maintenance of the plant.

TPGSB’s principal activities are the ownership, management and operation of domestic power plants, renewable energy (“RE”) generation business, power plant operation and maintenance (“O&M”) business as well as dry bulk terminal operations business. TPGSB also develops energy projects such as thermal, solar and hydro power plants.

TPGSB is committed to drive further **Performance, Growth and Sustainability** to support TNB’s aspiration in transitioning to a Net Zero utility company by 2050.

## 1.2 BUSINESS STRATEGY & PORTFOLIO

TPGSB’s strategic plan is driven by its 5-year business plan that anchors on the Reimaging TNB strategic plan framework. TPGSB through ‘Revitalizing Genco’ program encompasses four (4) Strategic Plays to propel the organization towards growth and foster sustainability, as illustrated below:



# **SUSTAINABILITY JOURNEY AT TPGSB**

## 2 SUSTAINABILITY JOURNEY AT TNB POWER GENERATION SDN BHD

### 2.1 SUSTAINABILITY AT TNB

TNB on 26 August 2021 announced its sustainability pathway with an aspiration to achieve net zero emission by 2050, a move towards decarbonisation and RE.

This aspiration is underpinned by a commitment to reduce 35% of its emission intensity as well as 50% of its coal generation capacity by 2035. In line with this, TNB has announced that it will no longer invest further in any greenfield coal plants with the last being the Jimah East Power (“JEP”) plant which was commissioned in 2019 and existing coal plants will be phased out upon expiry of the relevant power purchase agreements (“PPA”). Additionally, TNB remains committed to the Government’s green agenda and Malaysia’s commitment to reduce Greenhouse Gas (“GHG”) emission intensity of gross domestic product (“GDP”) by 45% by 2030, relative to the 2005 baseline.

As the need for greater climate action becomes more pressing, TNB is progressively transitioning towards cleaner energy with the adoption of efficient technologies, and expansion of RE assets domestically and internationally.

### 2.2 TPGSB’S SUSTAINABILITY COMMITMENT TO SUPPORT TNB GROUP’S SUSTAINABILITY AGENDA

As a significant and wholly owned subsidiary of TNB, TPGSB will play an important role in supporting TNB’s sustainability aspirations and commitment in mitigating climate change by adopting greener, cleaner and more efficient power generation technology, which includes amongst others:

- Owner and operator of three (3) main hydroelectric schemes in Peninsular Malaysia with a total installed capacity of 1.9GW, inclusive of five (5) mini hydro plants in Cameron Highlands. Two (2) hydroelectric power plants, namely SJ Hulu Terengganu and SJ Ulu Jelai hydroelectric power plants are currently pending transfer from TNB. Transfer of these two (2) hydroelectric power plants to TPGSB will add on to a total of 637MW installed capacity of clean energy into the Company’s green portfolio. The Company will further grow its hydroelectric assets portfolio with a new 300MW Nenggiri hydroelectric power plant project that currently under construction which expected to be in operation in 2027. Hydro power plants are a flexible energy resource which can supply and store electricity to meet real-time energy demands. They play a vital role in stabilizing the grid by addressing peak demand and maintaining optimal voltage and frequency levels across the national grid.
- In ensuring cheaper tariff for consumers, coal power plants are still required to be operated as a cheaper source of generating electricity. However, in transitioning to a sustainable operation and business, TPGSB is adopting/ utilising ultra-supercritical technology which consumes less fuel per MWh electricity produced. Ultra-supercritical plants generate 40% more electricity energy per metric ton of coal burned in comparison to conventional or older coal technology, which further contribute to lower GHG emissions. This technology is adopted in its current coal power plants, namely the Manjung 4, Manjung 5 and JEP.

- Utilising H-Class Gas Turbines in a single-shaft configuration mode, which helps to achieve greater efficiency at approximately 60% and contribute to lower GHG emissions. Both Southern Power Generation and Prai Power Station currently operate using this technology.
- In addition to the above, TPGSB is also exploring new energy business ventures, where it intends to forge partnership with other adjacent industry sectors (i.e. oil & gas) to pilot several industrial-scale projects that help accelerate the production of new energy sources (e.g. green hydrogen, ammonia etc.) at scale and being economically viable.

In line with its sustainability commitment, TPGSB is actively embarking on efforts to improve overall energy efficiency of its existing generating plants, under the “**Asset Turnaround Program**”. One of the focus areas is in terms of operation, where the main objective is to eliminate and reduce losses due to plant degradation and defective equipment, especially in brown assets. Among the key initiatives include technical upgrades in plant facilities, improving the overall production processes, reducing the amount of energy consumed by the facilities (i.e. optimising auxiliary power consumption) and pursuing operational excellence initiatives (i.e. business turnaround, innovative digitalisation technologies and automation). Being energy efficient will enable the Company to generate more power by consuming less fuel and help to reduce the environmental impact.

From a social perspective, TPGSB is also committed to play its part in creating a sustainable society for its internal and external stakeholders. Emphasis is placed in the provision of quality training and career development for its employees encompassing general skills to meet job scopes and demands as well as leadership courses. The Company will also provide new opportunities to local residents and businesses in terms of job creation and contract opportunities.

From governance perspective, TPGSB will continue to strengthen efforts on occupational health and safety by ensuring a safe and secure work environment for its employees, contractors, and other related parties. TPGSB is committed to support TNB’s aspiration to achieve zero fatalities at the workplace and maintaining Lost Time Injury Frequency Rate of less than 1.0. TPGSB also endeavours to maintain close collaboration with relevant authorities and stakeholders.



TPGSB's Sustainability Sukuk Framework is aligned with TPGSB Sustainability Framework's pillars and goals described below:



As a wholly owned subsidiary of TNB, TPGSB carries the same commitment as TNB to become a socially and environmentally responsible organization, whereby its sustainability pillars are the cornerstone of TPGSB's progress.

# **SUSTAINABILITY SUKUK FRAMEWORK**

### 3 SUSTAINABILITY SUKUK FRAMEWORK

TPGSB's Sustainability Sukuk Framework (the "**Framework**") is established to set out clear and transparent guidelines and principles for the issuances of Sustainability Sukuk Wakalah from TPGSB's Sukuk Wakalah Programme of RM10.0 billion in nominal value ("**Sukuk Wakalah Programme**").

Issuance of the Sustainability Sukuk Wakalah will be in compliance with any one or more of the following guidelines or frameworks, as amended from time to time:

- (i) the Sustainable and Responsible Investment ("**SRI**") Sukuk provisions under the Securities Commission Malaysia ("**SC**")'s Guidelines on Unlisted Capital Market Products under the Lodge and Launch Framework issued on 9 March 2015, as amended from time to time ("**LOLA Guidelines**");
- (ii) the ASEAN Green Bond Standards issued by the ASEAN Capital Markets Forum ("**ACMF**");
- (iii) the ASEAN Social Bond Standards issued by the ACMF;
- (iv) the ASEAN Sustainability Bond Standards issued by the ACMF;
- (v) the Green Bond Principles issued by the International Capital Market Association ("**ICMA**");
- (vi) the Social Bond Principles issued by the ICMA;
- (vii) the Sustainability Bond Guidelines issued by the ICMA; and/or
- (viii) such other related guidelines or principles or frameworks or standards, whether or not having the force of law, in relation to sustainability/social/green bonds issued from time to time.

(collectively, the "**Sustainability Guidelines/Framework**").

The Framework takes into account the following four pillars and is aligned with the Sustainability Guidelines/Framework:

- 1) Use of Proceeds
- 2) Process for Project Evaluation and Selection
- 3) Management of Proceeds
- 4) Reporting (Allocation and Impact)

### 3.1 USE OF PROCEEDS

An amount equal to the net proceeds from the issuance of Sustainability Sukuk Wakalah under the Sukuk Wakalah Programme shall be utilised by TPGSB to finance, in whole or in part and/or refinance loans obtained to finance investments in accordance with the Eligible Project as defined below.

In relation to the Eligible Project (as defined below) identified under this Framework, TPGSB commits to continuously comply with the relevant environmental, social and governance standards or such other recognised best practices relating to the Eligible Project.

#### i. Eligible Types of Investments

- Eligible Projects may include value of fixed assets investments and other related and supporting expenditure, capital expenditures (“CAPEX”) and operational expenditures (“OPEX”) of physical assets meeting the eligibility criteria outlined below
- Research and Development (“R&D”) expenditures related to the Eligible Project categories account as OPEX

#### ii. Financing and Refinancing

- New financing is defined as allocated amounts to Eligible Projects financed within or after the year of the issuance of the Sustainability Sukuk Wakalah and refinancing is defined as allocated amounts to Eligible Projects financed prior to the year of the issuance of the Sustainability Sukuk Wakalah

#### iii. Look-back Period<sup>1</sup>

- Asset values and CAPEX will qualify for refinancing without specific look-back period, while OPEX qualify with a maximum 36 months look-back period prior to the issuance date of the Sustainability Sukuk Wakalah


#### iv. Exclusions

- The net proceeds will not be allocated to ineligible projects as set out in the relevant Sustainability Guidelines/Framework (e.g. fossil fuel generations projects, activities that pose a negative social impact related to alcohol, gambling tobacco and weaponry)

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<sup>1</sup> “Look-back period” refers to a maximum period in the past that an Issuer will look back to identify assets/earlier disbursements to such Eligible Projects that will be included in the allocation and impact reporting.

## 3.1.1 ELIGIBLE PROJECTS

Eligible Project	Eligibility Criteria	Alignment with UN SDGs
<p><b>Renewable Energy</b></p> <p><b>Sustainability Benefits:</b> <i>Climate change mitigation</i></p>	<p>Construction, development, acquisition, installation, maintenance, and/or operation of <b>new projects</b> including but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Renewable energy projects/assets including: <ul style="list-style-type: none"> <li>○ <b>Solar</b> (onshore e.g., solar roofs and solar farm and offshore e.g., floating solar, concentrated solar pant (“<b>CSP</b>”)<sup>2</sup></li> <li>○ <b>Hydropower</b><sup>3</sup> satisfying any one of the following criteria: <ul style="list-style-type: none"> <li>▪ (1) Run-of-river without artificial reservoir or low storage capacity;</li> <li>▪ (2) Power density &gt;5 W/m<sup>2</sup>;</li> <li>▪ (3) Lifecycle GHG emissions from the generation of electricity by the entire facility &lt;100 gCO<sub>2</sub>e/kWh.</li> </ul> </li> <li>○ <b>Biomass energy</b> from waste feedstock including forestry and agriculture residues such as wood chips, sawdust straw, cane trash, palm kernel shells or palm oil mill effluent from Roundtable on Sustainable Biomaterials (“<b>RSB</b>”) or Roundtable on Sustainable Palm Oil (“<b>RSPO</b>”)-certified palm oil operations, wastewater and sewage sludge, and sustainably sourced used cooking oil</li> <li>○ <b>Waste-to-energy</b> from incineration of mixed residual waste, in particular, Municipal Solid Waste where majority of recyclables are segregated before energy conversion</li> <li>○ <b>Nenggiri Hydroelectric Power Plant Project</b><sup>4</sup> (“<b>Project Nenggiri</b>”) as detailed out in <a href="#">Section 4.1</a> and <a href="#">Section 4.2</a>.</li> </ul> </li> <li>▪ Energy storage technologies/ equipment connected to renewables or grid infrastructure including: <ul style="list-style-type: none"> <li>○ Pumped storage hydropower</li> <li>○ Battery and Energy Storage System (“<b>BESS</b>”) Facilities</li> </ul> </li> </ul>	

<sup>2</sup> CSP with more than 85% generated from the facility is derived from solar energy resources.

<sup>3</sup> All hydropower projects to have an environmental and social impact assessment conducted by a credible third-party with no significant risk, controversies or expected negative impact identified.

<sup>4</sup> Project Nenggiri satisfies the criteria of having lifecycle GHG emissions from the generation of electricity by the entire facility <100 gCO<sub>2</sub>e/kWh.

	<p>Construction, development, acquisition, installation, maintenance, and/or operation of <b>existing hydropower<sup>5</sup> generation works</b> including but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Rehabilitating large electric and mechanical components</li> <li>▪ Refurbishing electrical facilities and control systems</li> <li>▪ Upgrading existing facilities to enhance generation efficiency</li> <li>▪ Environmental refurbishment of generation facilities e.g., protection of biodiversity</li> <li>▪ <b>Life Extension Program of Sungai Perak Hydroelectric Scheme Project (“Project HLEP”)</b> as detailed out in <a href="#">Section 4.3</a> and <a href="#">Section 4.4</a>.</li> </ul>	
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### 3.2 PROCESS FOR PROJECT EVALUATION AND SELECTION

TPGSB has established processes to ensure that projects are properly identified and assessed in compliance with this Framework. The Framework has been approved by the Board of Directors of TPGSB (the “**Board**”). The Board will continue to provide the oversight required in relation to implementation of the Eligible Project identified under the Framework to ensure that the projects benefits are aligned with TPGSB’s Sustainability Goals and is in accordance to the Framework.

TPGSB’s Executive Committee (“**GEXCOM**”) chaired by the Managing Director together with other head of departments as committee members is responsible for:

- Oversee the Framework implementation and allocation process;
- Review the allocation to the project to ensure it meets the Eligibility Criteria set forth in the Framework;
- Monitor the key performance indicators of the approved Eligible Project, safety and risk management as well as provide direction and advice on issues related to governance, initiatives and best practices in order to ensure that mitigation actions are properly planned and executed;
- Validate the relevant reports, including Allocation and Impact Reports for annual reporting

To ensure strong governance in addressing the relevant environmental and social risks associated with the Eligible Project, the GEXCOM is guided by the TNB Risk Assessment Process that provides a structured approach to identify, analyse, evaluate and treat risks.

Progress of Eligible Project will be reported to GEXCOM on a regular basis.

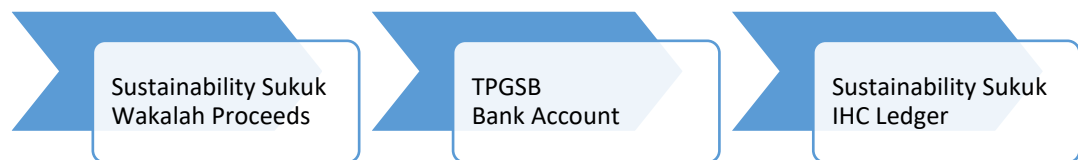
<sup>5</sup> Existing hydropower generation will respect a power density threshold above 5 W/m<sup>2</sup> and/or be run-of-river without artificial reservoir or low storage capacity.

### 3.3 MANAGEMENT OF PROCEEDS

The proceeds of the Sustainability Sukuk Wakalah are being deposited into TPGSB's bank account, managed by TPGSB's treasury team. TPGSB has established a dedicated In-House Cash banking and settlement process ("IHC") to monitor the proceeds and utilisation of the Sustainability Sukuk Wakalah via a dedicated IHC general ledger under TPGSB. The IHC general ledger separates the Sustainability Sukuk Wakalah proceeds from other source of funds within TPGSB.

The disbursement tracking will be visible via the Eligible Project's and/or TPGSB's accounting system i.e. Enterprise Resource Management System which is centrally governed by TNB's Information, Communication and Technology division. The accounting system tracks the expenses via a dedicated cost center which will be assigned to the respective Eligible Projects. The Sustainability Sukuk Wakalah proceeds disbursement (inflow) and/or any expenses/settlement (outflow) related to the Eligible Projects shall be tagged to the cost center assigned. The final output of the Sustainability Sukuk Wakalah utilisation will be under the financial statements of the respective Eligible Projects and/or cost centre under TPGSB.

As and when required, the proceeds will be disbursed to the Eligible Projects, in line with TPGSB's Limits of Authority. The flow of proceeds is demonstrated in the diagram below:



*Diagram: Fund-flow of the Sustainability Sukuk Wakalah proceeds*

Any unutilised proceeds shall be invested with TNB which will be Shariah-compliant. TNB will invest the proceeds (on behalf of TPGSB) into amongst others, Shariah-compliant marketable instruments/ fixed deposits in the interim, pending utilisation in accordance with TNB's liquidity/investment policy.

### 3.4 REPORTING (ALLOCATION AND IMPACT)

TPGSB is committed to managing corporate sustainability and relevant reporting commitments relating to the Eligible Projects as required under the Sustainability Guidelines/Framework. To enable investors to follow the development progress and monitoring of the environmental compliance/social impact, TPGSB will publish a Sustainability Sukuk Report which will be publicly available at [www.tnbgenco.com.my](http://www.tnbgenco.com.my) annually for so long as all the Sustainability Sukuk Wakalah remains outstanding.

The reporting is split into two parts (i) the Allocation Reporting and (ii) the Impact Reporting, whereby each part will disclose information including, but not limited to:




#### Allocation Reporting

The amount of proceeds allocated to the Eligible Projects including broad description of the Eligible Project and amount allocated to such Eligible Project; and

The remaining balance, if any, of unallocated proceeds at the end of the reporting period and where it is placed/ invested pending utilisation.

#### Impact Reporting

We will report on the relevant areas of environment and social impact of the Eligible Projects. On a best effort basis and subject to data availability, the impact reporting may include, but not limited to, impact or key performance indicators as outlined in the table below. Any assumptions made in relation to the units used or the relevant benchmark emissions will be clearly stated in the reporting:

UN SDG Goals	Eligible Category	Impact Indicators or Key Performance Indicators
	Renewable Energy	<ul style="list-style-type: none"> <li>▪ Renewable energy capacity installed (in MW)</li> <li>▪ Annual renewable energy generation (in TWh)</li> <li>▪ Expected avoided CO<sub>2</sub> emissions in tons of CO<sub>2</sub> per year</li> </ul>
	Economic Growth	<ul style="list-style-type: none"> <li>▪ Percentage of contract value awarded to domestic contractors</li> </ul>
	Climate Change Adaptation	<ul style="list-style-type: none"> <li>▪ Annual CO<sub>2</sub> emission reduction/ avoidance (in tonnes of CO<sub>2</sub>)</li> </ul>

Additional indicators and/or detailed information related to the impact indicators as mentioned above may be reported at the discretion of TPGSB's management.



# **INFORMATION ON ELIGIBLE PROJECTS**

## 4 INFORMATION ON ELIGIBLE PROJECTS

### 4.1 NENGGIRI HYDROELECTRIC POWER PLANT PROJECT

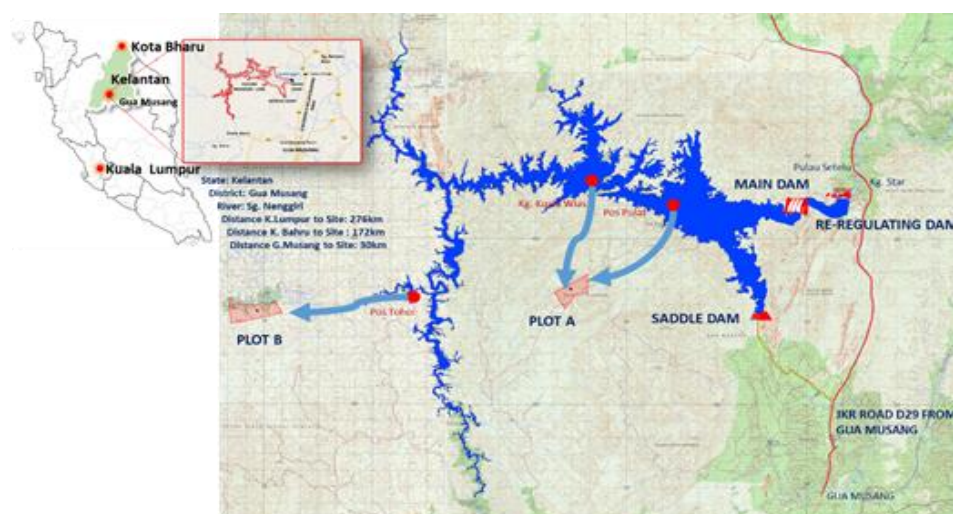
TPGSB has incorporated a wholly-owned subsidiary, TNBPG Hydro Nenggiri Sdn Bhd (“**Project Co**”), to undertake Nenggiri Hydroelectric power plant project (“**Project Nenggiri**” or the “**Project**”). Project Nenggiri, an impoundment hydroelectric power plant, is located in the district of Gua Musang, Kelantan and is within Sg. Nenggiri catchment which is approximately 30km from Gua Musang town.

The Project consists of three dams i.e. Main Dam, Saddle Dam and Re-regulating Dam. The Main Dam will inundate an area approximately 5,384ha while the Re-regulating Dam will require inundation of a 97ha area. The Project is anticipated to operate via a similar type of Power Purchase Agreement like other existing TNB’s hydroelectric power plants. The Project’s key technical information is shown in the table below.

No.	Description	Value		
		Main Dam	Saddle Dam	Re-regulating Dam
1.	Number of Dams	3		
2.	Dam Type	RCC	RCC & Embankment (Composite)	Concrete Gravity
3.	Dam Height (m)	88.1	56	29
4.	Plant Nett Capacity (MW)	300 (150 x 2 unit)	-	-
5.	Average Annual Energy (GWh/yr)	599.5	-	-

*Note: RCC: Roller Compacted Concrete, MW: Megawatt, GWh/yr: Gigawatt-hour per year*





The location of Project Nenggiri is shown below.



The main construction work packages of Project Nenggiri will be parceled out into three (3) main lots, i.e. the Civil Works (Lot 1), Electrical & Mechanical Works (Lot 2) and Resettlement & Plantation (Lot 3) where the total project cost is estimated to be at RM5.0 billion. These construction works are estimated to take five (5) years to complete with Scheduled Commercial Operation Date (“SCOD”) expected on 1 June 2027.

The Sustainability Sukuk Wakalah proceeds will be channeled by TPGSB to the Project Co through the provision of shareholders’ loans and/or advances and/or through subscription of any equity instruments as may be agreed between the parties. The total project cost is estimated to be at RM5.0 billion with construction of period of 5 years.




TPGSB has identified Project Nenggiri as the Eligible Project pursuant to the Framework which supports the six (6) United Nations Sustainability Development Goals (“UN SDGs”) identified by TNB, which are shown in the table below. Project Nenggiri is an important asset development project for TPGSB as it will be TPGSB’s large-scale hydro show case to demonstrate its commitment in contributing to TNB Group’s sustainability goals. Project Nenggiri is expected to have multifold roles in delivering environmental and socioeconomic benefits including providing a cleaner source of additional power supply to the national grid, electricity supply to rural areas, flood mitigation, provision of clean water supply, social infrastructure and local job opportunities for the people of Kelantan.

Sustainability Pillars	Roles of Project Nenggiri	Relevant UN SDGs
<b>Economy</b>	<ul style="list-style-type: none"> <li>Support GDP growth, in particular, significantly increasing the GDP share for the State of Kelantan.</li> <li>Improve sustainable revenue of TPGSB and ultimately to TNB and will benefit the government and the nation as a whole.</li> </ul>	
<b>Environment</b>	<ul style="list-style-type: none"> <li>Adopt an energy efficient and lower emission design and technology as well as increase share of cleaner and more efficient energy compared to other types of power plant such as those powered by gas turbines. Based on TPGSB’s assessment, the projected GHG emissions from Project Nenggiri is 72.7 gCO<sub>2</sub>e/kWh vis a vis a gas-fired power plant, which emission is estimated at 490 gCO<sub>2</sub>e/kWh (as quoted by the International Hydropower Association (“IHA”). The projected GHG emissions for Project Nenggiri is within the internationally recommended benchmark of less than 100 gCO<sub>2</sub>e/kWh for hydro plants that are eligible for sustainable financing. The projected GHG emission from Project Nenggiri was calculated using the G-res tool which has been developed and validated by the IHA before it can be used for commercial purposes or publicly disclosed.</li> <li>Improve the diversification of generation fuel mix where Project Nenggiri will increase Peninsular Malaysia’s hydropower plant capacity by 1.1% in 2027 (overall</li> </ul>	  

hydropower capacity is 9.8% in 2021 and expected to increase to 10.9% in 2027 after the commercial operation of Project Nenggiri), while Project HLEP, with a capacity of 650.75 MW, will help TPGSB maintain its current level of renewable energy generation.

- Provide fast start-up and capable of increasing Peninsular Malaysia transmission grid system stability by providing ancillary services to support the high voltage transmission grid, such as fast frequency response, black start, voltage support and reactive power.
- Support TPGSB to provide climate change/disaster control adaptation as the hydroelectric dam can also function as flood mitigation mechanism.
- Provide clean water source and sustainable water management to the locals given that Nenggiri Dam is capable of keeping a huge volume of water, stored in the reservoir and then released in a regulated manner downstream with almost consistent volume throughout the year.
- In addition to the above requirements, the following assessments were conducted to ensure that the Project is in compliance with the required environmental related regulations and also Hydropower Sustainability Standard as follows:

Date of Approval	Approval of Assessment
<b>Mar 2016</b>	Potential Mineral Source Study approved by Department of Mineral & Geoscience
<b>Jan 2018</b>	Wildlife Management Plan (“ <b>WMP</b> ”) approved by Wildlife Department
<b>Apr 2018</b>	Environmental Impact Assessment (“ <b>EIA</b> ”) approved by Department of Environment (“ <b>DOE</b> ”)
<b>May 2019</b>	Environmental Management Plan (“ <b>EMP</b> ”) approved by Kelantan's DOE

<p><b>Social</b></p>	<ul style="list-style-type: none"> <li>Stimulate local economy, provide new jobs to locals especially to the Orang Asli and generate business opportunities starting from the execution of the Project. Post completion of the Project, it is envisaged that the co-benefit will include the potential creation of sustainable eco-tourism business within the surrounding area of the Project to benefit the locals.</li> <li>Provide the Orang Asli at the resettlement area quality housing and modern infrastructures and facilities such as clean water supply, electricity, sewage treatment system, access road, clinic, multi-purpose hall, school and other amenities.</li> <li>Conservation of cultural heritage by undertaking archeological rescue and excavation program prior to the reservoir impoundment. Artefacts, eco-facts and other outcomes from the program will be displayed in a gallery to be built.</li> <li>In addition to the above requirement, the following assessments were conducted to ensure that the Project is in compliance with the applicable regulations and also Hydropower Sustainability Standard:</li> </ul> <table border="1" data-bbox="542 1010 1208 1541"> <thead> <tr> <th data-bbox="542 1010 699 1108">Date of Approval</th> <th data-bbox="699 1010 1208 1108">Approval of Assessment</th> </tr> </thead> <tbody> <tr> <td data-bbox="542 1108 699 1245">Dec 2018</td> <td data-bbox="699 1108 1208 1245">Heritage Impact Assessment (“HIA”) approved by Department of National Heritage</td> </tr> <tr> <td data-bbox="542 1245 699 1381">Apr 2019</td> <td data-bbox="699 1245 1208 1381">Social Impact Assessment (“SIA”) approved by PLANMalaysia/ Department of Town and Country Planning</td> </tr> <tr> <td data-bbox="542 1381 699 1541">Sep 2019</td> <td data-bbox="699 1381 1208 1541">Kelantan State Government through JKMPPP certified the Pelan Pertapakan Penempatan Orang Asli on Lot PT 7784 and Lot PT 7785</td> </tr> </tbody> </table>	Date of Approval	Approval of Assessment	Dec 2018	Heritage Impact Assessment (“HIA”) approved by Department of National Heritage	Apr 2019	Social Impact Assessment (“SIA”) approved by PLANMalaysia/ Department of Town and Country Planning	Sep 2019	Kelantan State Government through JKMPPP certified the Pelan Pertapakan Penempatan Orang Asli on Lot PT 7784 and Lot PT 7785	 
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Sep 2019	Kelantan State Government through JKMPPP certified the Pelan Pertapakan Penempatan Orang Asli on Lot PT 7784 and Lot PT 7785									
<p><b>Governance</b></p>	<ul style="list-style-type: none"> <li>The Project has strengthened the relationship of TPGSB and TNB with relevant authorities and stakeholders.</li> <li>Focus on governance was paramount to ensure all relevant authorities and stakeholders (listed below) were involved for the planning, approvals and execution of the Project.</li> </ul>									

Type of Authorities/ Stakeholders	Authorities/ Stakeholders
<b>Malaysia Government</b>	<ul style="list-style-type: none"> <li>• Suruhanjaya Tenaga</li> <li>• Kementerian Kewangan Malaysia</li> <li>• Kementerian Tenaga, Sains, Teknologi, Alam Sekitar &amp; Perubahan Iklim (MESTECC)</li> <li>• Kementerian Hal Ehwal Ekonomi (MEA)</li> <li>• Kementerian Air, Tanah Dan Sumber Asli (KATS)</li> <li>• Kementerian Pembangunan Luar Bandar (KPLB)</li> <li>• Jabatan Kemajuan Orang Asli Persekutuan (JAKOA)</li> <li>• Kementerian Pelancongan Seni Dan Budaya (MOTAC)</li> <li>• Jabatan Perdana Menteri</li> <li>• Kementerian Pendidikan Malaysia</li> <li>• Jabatan Perancangan Bandar &amp; Desa (PLANMalaysia)</li> </ul>
<b>Kelantan State Government</b>	<ul style="list-style-type: none"> <li>• Unit Perancangan Ekonomi Negeri (UPEN)</li> <li>• Pejabat Pengarah Tanah Dan Galian (PTG)</li> <li>• Jabatan Alam Sekitar Negeri (JAS)</li> <li>• Majlis Daerah Gua Musang (MDGM)</li> <li>• Jabatan Pengairan Dan Saliran (JPS)</li> <li>• Jabatan Kemajuan Orang Asli Negeri (JAKOA)</li> <li>• Jabatan Perhutanan Negeri</li> <li>• Jabatan Mineral Dan Geosains Negeri (JMG)</li> </ul>
<b>Local Resident</b>	<ul style="list-style-type: none"> <li>• Orang Asli</li> <li>• Local Villagers</li> <li>• Private Land Owners</li> </ul>
<b>Others</b>	<ul style="list-style-type: none"> <li>• NGOs (under planning – MNS and WWF).</li> </ul>

## **4.2 BENEFITS OF PROJECT NENGGIRI**

### **4.2.1 ELECTRICITY GENERATION**

The function of the Main Dam is to retain water from the catchment area for use in electricity generation. Water stored in the Main Reservoir will be channeled to hydro turbines located in the generation station building. The waterpower will rotate the hydraulic turbine connected to the generator to generate electricity and then channel it to the national grid. Water that has passed through the hydro turbine will be discharged into the Re-regulating Pond which is dammed by the Re-regulating Dam. The main function of the Re-regulating Dam is to control the rate of water flow back to Sg. Nenggiri so as not to disrupt the economic activities of the residents downstream.

### **4.2.2 FLOOD MITIGATION**

Early in the monsoon season, the Project Co will lower the water level in the Main Reservoir to provide plenty of rainwater space during the monsoon period. This is a "standard operation" at TNB hydro stations such as the Sungai Perak Hydro Scheme and Kenyir Hydro Scheme. Frequent flooding downstream can be reduced by the presence of dams that control the flow of water from upstream.

### **4.2.3 CLEAN WATER SUPPLY**

Once the Nenggiri Power Station is ready, the water released from the dam during the generation will be stored in a temporary drainage pond known as Re-regulating Pond before being released in a controlled manner downstream of Sg. Nenggiri all year long. The release of water can guarantee the need for clean water supply for the daily use of the locals.

### **4.2.4 IMPROVEMENT TO THE IRRIGATION FOR AGRICULTURE**

Water released from the reservoir to the Sg. Nenggiri will ensure continuous water supply for agricultural activities downstream of the dam especially during the dry season.

### **4.2.5 POTENTIAL AQUACULTURE ACTIVITIES IN THE RESERVOIR**

The resulting reservoir can create several local economic activities such as aquaculture. Demand for farmed fish will increase given the scarcity in marine fishes due to its diminishing population.

### **4.2.6 ECO-TOURISM AND RECREATIONAL ACTIVITIES IN THE RESERVOIR**

The reservoir will be an attraction for eco-tourism and recreation activities that can generate income for the Kelantan state in general. This is evident in Lake Kenyir, where we see the Orang Asli settlers around Lake Kenyir are able to improve their economy and their lives as they benefit from the eco-tourism business.

### **4.2.7 ORANG ASLI SOCIO-ECONOMIC IMPROVEMENT**

Several Orang Asli settlements around the project site will be affected by the implementation of this Project. Their relocation has been included as part of the project development work and the new relocation areas will enhance their quality of life in a long-term. Apart from more comfortable homes, the Orang Asli will also have a better secure source of income through the rubber plantations which will be developed specifically for them.

#### **4.2.8 OPPORTUNITIES FOR LOCAL RESIDENTS AND CONTRACTORS TO PARTICIPATE IN THE PROJECT DURING CONSTRUCTION AND POST CONSTRUCTION**

An estimated 2,000 workers are needed during the project construction work and this will provide employment opportunities for locals as well as the Orang Asli. The Project Co has earmarked up to 10% of the contract value to be awarded to the local contractors.

Several works opportunities are also available post completion of the Project and during the power plant operation i.e. compound maintenance, security guards, skilled and unskilled works, etc.

#### **4.2.9 THE ECONOMIC GROWTH OF KELANTAN**

It is anticipated that the reduction of floods in Kelantan will further enhance economic activities which have not been able to be carried out due to floods for example, agriculture and manufacturing in certain parts of Kelantan. Reducing the effects of floods can also give confidence to existing investors and potentially attract new investors to invest in Kelantan.

### **4.3 LIFE EXTENSION PROGRAM OF SUNGAI PERAK HYDROELECTRIC SCHEME**

Main construction work packages of Project HLEP will be parceled out into four (4) main contracts:

- (i) EPCC Contract for Temengor, Bersia, Kenering Hydroelectric Stations and BGCC
- (ii) EPCC Contract for Chenderoh Hydroelectric Station
- (iii) EPCC Contract for Sungai Piah Hydroelectric Stations
- (iv) EPCC Contract for Civil Works for Non OEM Scope

The total project cost is estimated to be at RM6.7 billion. These construction works are estimated to take eight (8) years from the commencement date to complete with first unit Scheduled Commercial Operation Date (“SCOD”) expected in Jan 2026 and the last unit SCOD in Sept 2032.

The main objective for Project HLEP is major refurbishment to the scheme in order to extend the operating life and enhance the performance for the next 40 years after expiry of the existing Power Purchase Agreement (PPA) by August 2027.

The currently installed mechanical and electrical equipments at Sungai Perak Hydroelectric Scheme have reached the life expectancy or typical design life of 30-40 years. Parts are becoming obsolete and spares are no longer available. Changes in hydrological conditions require civil structures such as the dams, spillways, powerhouse to be reinforced or reconditioned to enhance the safety and integrity of the structures. In order to ensure safe, reliable operation and continuance of electricity supply to the grid for the next 40 years, major rehabilitation works need to be carried out. Also, the works will be crucial for the continuity of other vital functions of Sungai Perak scheme in flood control, irrigation, supplying domestic water and tourism attraction.

Sungai Perak Hydroelectric Scheme consists of Temengor, Bersia, Kenering, Chenderoh and Sungai Piah (Upper & Lower) hydroelectric stations. Temengor, Bersia, Kenering and Chenderoh hydroelectric stations form a cascade system along the Perak River to generate electricity. Whereas the upper and lower hydroelectric stations of Sungai Piah are situated along the Piah River, which drains into the Kenering reservoir.



The location and cascading system of the hydroelectric stations are shown in the Figure 1 & 2 below:

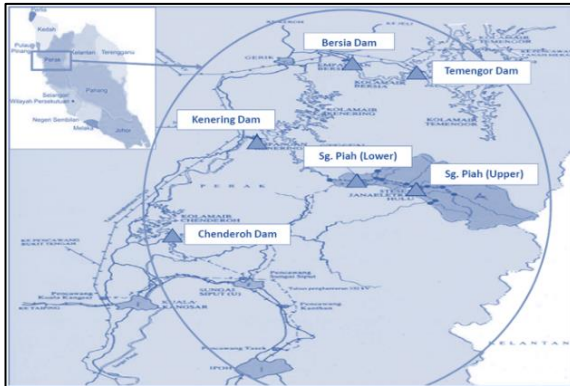


Figure 1: Location of hydroelectric stations

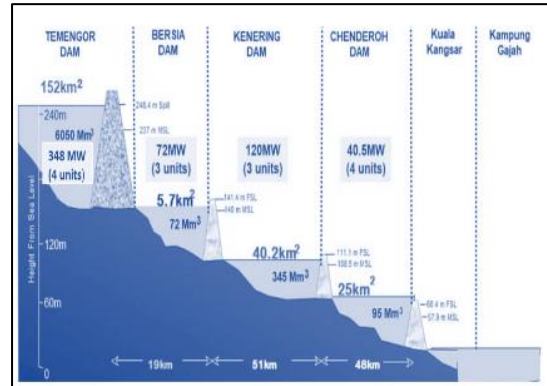


Figure 2: Cascading Scheme

The main technical data of the power stations are shown in Figure 3 to Figure 7 below:



Parameter	Data
Date of construction	1974 - 1978
Full Supply Level (FSL)	248.41m.asl
Catchment Area	3,420 km <sup>2</sup>
<b>Main Dam</b>	
Type	Earth core rockfill dam
Max. dam height	128.02 m.asl
<b>Powerhouse</b>	
Type	Surface
No. and type of generating units	4 Francis
Maximum discharge (All units)	390 m <sup>3</sup> /s
Installed Capacity (MW)	348 (4x87)
Rated Head	100.89 m
Annual average energy output (GWh)	896

Figure 3: Temengor Hydroelectric Station



Parameter	Data
Date of construction	1980-1983
Full Supply Level (FSL)	141.43m asl
Min Operating Level (MOL)	139.90 m asl
<b>Main Dam</b>	
Type	Concrete gravity with central overflow section earth core rockfill dam
Max. dam height	33.00 m asl
<b>Powerhouse</b>	
Type	Surface, at dam toe
No. and type of generating units	3 Kaplan
Maximum discharge (All units)	311 m <sup>3</sup> /s
Installed Capacity (MW)	72 (3x24)
Rated Head	26.5 m
Annual average energy output (GWh)	238

Figure 4: Bersia Hydroelectric Station



Parameter	Data
Date of construction	1980-1984
Full Supply Level (FSL)	111.25m asl
Min Operating Level (MOL)	108.20 m asl
<b>Main Dam</b>	
Type	Composite dam (concrete & earth core rockfill)
Max. dam height	47.00 m asl
<b>Powerhouse</b>	
Type	Surface, at dam toe
No. and type of generating units	3 Francis
Maximum discharge (All units)	396 m <sup>3</sup> /s
Installed Capacity (MW)	120 (3×40)
Rated Head	34.7 m
Annual average energy output (GWh)	456

Figure 5: Kenering Hydroelectric Station



Parameter	Data
Date of construction	1927-1930
Full Supply Level (FSL)	60.45m asl
Min Operating Level	57.90 m asl
<b>Main Dam</b>	
Type	Concrete hollow buttress and gravity dam
Max. dam height	23.00 m
<b>Powerhouse</b>	
Type	Surface, at dam toe on right abutment
No. and type of generating units	3 Francis; 1 Propeller
Maximum discharge (All units)	303 m <sup>3</sup> /s
Installed Capacity (MW)	38 (3×10 + 1×8)
Rated Head	19.6 m
Annual average energy output (GWh)	248

Figure 6: Chenderoh Hydroelectric Station








Upper Scheme	Data
Date of construction	1987-1993
Type of powerhouse	Surface
Installed capacity (MW)	15 (2×7.5)
No and type of generating unit	2 horizontal Pelton (2-jet)
Annual average energy output (GWh)	80
<b>Lower Scheme</b>	
Date of construction	1987-1992
Type of powerhouse	Underground
Installed capacity (MW)	55 (2×27.5)
No and type of generating unit	2 vertical Pelton(4-jet)
Annual average energy output (GWh)	300

Figure 7: Piah Upper and Lower Hydroelectric Station

As Project HLEP will be directly undertaken by TPGSB without establishment of a special purpose vehicle, the Sustainability Sukuk Wakalah proceeds will be utilised by TPGSB directly for the Project HLEP.

Being one of the Eligible Projects, Project HLEP supports the six (6) United Nations Sustainability Development Goals (“UN SDGs”) identified by TNB, which are shown in the table below.

Sustainability Pillars	Roles of Project HLEP	Relevant UN SDGs				
<p><b>Environment</b></p>	<ul style="list-style-type: none"> <li>• Adopt an energy efficient and lower emission design and technology as well as increase share of cleaner and more efficient energy compared to other types of power plant such as those powered by gas turbines.</li> <li>• Sungai Perak hydroelectric scheme harness the natural water from rivers, henceforth providing clean energy to the system and environment and minimize fossil fuels consumptions allowing the country to produce energy without being dependent on other fuel sources and without fear of fuel shortage.</li> <li>• Provide fast start-up and capable of increasing Peninsular Malaysia transmission grid system stability by providing ancillary services to support the high voltage transmission grid, such as fast frequency response, black start, voltage support and reactive power.</li> <li>• Sungai Perak hydroelectric scheme has proven flood control / mitigation capabilities and able to forecast inflows and plan water discharge for each station during monsoon season.</li> <li>• Being a cascading hydro scheme, Sungai Perak is able to provide clean water source and keep huge volume of water, to the tune of 6.06 x 10<sup>9</sup> m<sup>3</sup> (Temengor Dam), 64 x 10<sup>6</sup> m<sup>3</sup> (Bersia Dam), 352 x 10<sup>6</sup> m<sup>3</sup> (Kenering Dam) and 95 x 10<sup>6</sup> m<sup>3</sup> (Chenderoh Dam) stored in the reservoir, and then released in regulated manner to the downstream throughout the year.</li> <li>• The following assessments were conducted to ensure that the Project is in compliance with the required environmental related regulations:</li> </ul> <table border="1" data-bbox="492 1661 1222 1957"> <thead> <tr> <th data-bbox="492 1661 634 1759">Date of Approval</th> <th data-bbox="634 1661 1222 1759">Approval of Assessment</th> </tr> </thead> <tbody> <tr> <td data-bbox="492 1759 634 1957">Oct 2021</td> <td data-bbox="634 1759 1222 1957">Environmental Impact Assessment (“EIA”) waiver by Department of Environment (“DOE”) for Structural Strengthening Works for Temengor, Bersia, Kenering and Chenderoh Dams.</td> </tr> </tbody> </table>	Date of Approval	Approval of Assessment	Oct 2021	Environmental Impact Assessment (“EIA”) waiver by Department of Environment (“DOE”) for Structural Strengthening Works for Temengor, Bersia, Kenering and Chenderoh Dams.	  
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<b>Jan 2024</b>	Environmental Management Plan (“EMP”) approved by Perak’s DOE for Bersia and Kenering Switchyard Relocation.							
<b>Social</b>	<ul style="list-style-type: none"> <li>Stimulate local economy, provide new jobs to locals and generate business opportunities starting from the execution of the Project.</li> <li>HLEP project is expected to bring enormous multiplier effect to the economy of the area, such as opening up new employment and business opportunities which in turn will uplift the socioeconomic and living standards of the surrounding communities</li> <li>Support GDP growth, in particular, significantly increasing the GDP share for the State of Perak.</li> <li>Improve sustainable revenue of TPGSB and ultimately to TNB and will benefit the government and the nation as a whole.</li> </ul>							
<b>Governance</b>	<ul style="list-style-type: none"> <li>The Project has strengthened the relationship of TPGSB and TNB with relevant authorities and stakeholders.</li> <li>Focus on governance was paramount to ensure all relevant authorities and stakeholders (listed below) were involved for the planning, approvals and execution of the Project.</li> </ul> <table border="1"> <thead> <tr> <th>Type of Authorities/ Stakeholders</th> <th>Authorities/ Stakeholders</th> </tr> </thead> <tbody> <tr> <td><b>Malaysia Government</b></td> <td> <ul style="list-style-type: none"> <li>Suruhanjaya Tenaga</li> <li>Kementerian Peralihan Tenaga dan Transformasi Air (PETRA)</li> <li>Northern Corridor Economic Region (NCER)</li> </ul> </td> </tr> <tr> <td><b>Perak State Government</b></td> <td> <ul style="list-style-type: none"> <li>Unit Perancangan Ekonomi Negeri (UPEN)</li> <li>Pejabat Pengarah Tanah Dan Galian (PTG)</li> <li>Jabatan Alam Sekitar Negeri (JAS)</li> <li>Majlis Daerah Lenggong, Kuala Kangsar and Gerik</li> <li>Jabatan Pengairan Dan Saliran (JPS)</li> <li>Jabatan Perhutanan Negeri</li> </ul> </td> </tr> </tbody> </table>	Type of Authorities/ Stakeholders	Authorities/ Stakeholders	<b>Malaysia Government</b>	<ul style="list-style-type: none"> <li>Suruhanjaya Tenaga</li> <li>Kementerian Peralihan Tenaga dan Transformasi Air (PETRA)</li> <li>Northern Corridor Economic Region (NCER)</li> </ul>	<b>Perak State Government</b>	<ul style="list-style-type: none"> <li>Unit Perancangan Ekonomi Negeri (UPEN)</li> <li>Pejabat Pengarah Tanah Dan Galian (PTG)</li> <li>Jabatan Alam Sekitar Negeri (JAS)</li> <li>Majlis Daerah Lenggong, Kuala Kangsar and Gerik</li> <li>Jabatan Pengairan Dan Saliran (JPS)</li> <li>Jabatan Perhutanan Negeri</li> </ul>	
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	<b>Local Resident</b>	<ul style="list-style-type: none"> <li>Local Villagers</li> <li>Private Land Owners</li> </ul>	

#### 4.4 BENEFITS OF PROJECT HLEP

##### 4.4.1 ELECTRICITY GENERATION

It is crucial to ensure all six stations with a total number of eighteen generating units to continue reliable and safe supply to the grid. Water as a source of fuel for power generation is clean energy and has no emissions. The river water used in Sungai Perak allows the country to produce energy without being dependent on other fuel sources and without fear of fuel shortage.

##### 4.4.2 FLOOD MITIGATION

Early in the monsoon season, the water level in the reservoir will be lowered to provide plenty of rainwater space during the monsoon period. This is a "standard operation procedure" at TNB hydro stations. Frequent flooding downstream can be reduced by the presence of dams that control the flow of water from upstream.

##### 4.4.3 CLEAN WATER SUPPLY

The water from the dam during the generation will be released in a controlled manner to the downstream all year long. The release of water can guarantee the need for clean water supply for the daily use of the locals. Currently there are three water treatment plants along the hydroelectric scheme operated by Lembaga Air Perak to provide the clean water to the community.

##### 4.4.4 IMPROVEMENT TO THE IRRIGATION FOR AGRICULTURE

Water released from the reservoir will ensure continuous water supply for agricultural activities downstream of the dam especially during the dry season. There are numerous water intake points along Sungai Perak for both potable water supply and irrigation needs. Water from Sungai Perak is also used for irrigation purposes in the Seberang Perak and Sg Manik Irrigation Schemes. The Teluk Sena irrigation off-take is an example which supplies water to the Seberang Perak Irrigation Scheme.

##### 4.4.5 AQUACULTURE ACTIVITIES IN THE RESERVOIR

The reservoir created several local economic activities such as aquaculture. Demand for farmed fish will increase given the scarcity in marine fishes due to its diminishing population. For example, Freshwater Fish Farming Synergy Program involving Aquaculture Industrial Zone (ZIA) area of 100 hectares at Temengor lake.

##### 4.4.6 ECO-TOURISM AND RECREATIONAL ACTIVITIES IN THE RESERVOIR

The development of Sungai Perak hydroelectric scheme reservoirs has created economic growth where a variety of recreational opportunities and tourism industries was developed. Without a

doubt, the economic opportunities created have been the source of revenue to the State of Perak. For example, Temengor reservoir is an attraction for eco-tourism and recreation activities with 117,500 hectares and Royal Belum State Park is a key attraction spot.

#### **4.4.7 OPPORTUNITIES FOR LOCAL RESIDENTS AND CONTRACTORS TO PARTICIPATE IN THE PROJECT DURING CONSTRUCTION AND POST CONSTRUCTION**

An estimated 2,000 workers are needed during the project construction work and this will provide employment opportunities for locals. TPGSB has earmarked up to 30% of the contract value to be awarded to the local contractors and 10% to the bumiputera contractors.

Several works opportunities are also available post completion of the Project and during the power plant operation i.e. compound maintenance, security guards, skilled and unskilled works, etc.

#### **4.4.8 THE ECONOMIC GROWTH OF PERAK**

The hydro scheme will be maintained as flood control in Perak and further enhance economic activities which might not been able to be carried out due to floods. Reducing the effects of floods can also give confidence to existing investors and potentially attract new investors to invest in Perak.

# **EXTERNAL REVIEW AND POTENTIAL EVOLUTIONS**

**5 EXTERNAL REVIEW**

TPGSB has appointed MARC Ratings Berhad (“**MARC**”) through MARC Solutions as an independent party to issue a Second Opinion Report on the alignment of the Framework to the Sustainability Guidelines/Framework (“**SPO**”). The Framework and MARC’s Second Opinion Report will be made publicly available at [www.tnbgenco.com.my](http://www.tnbgenco.com.my) when possible as its ongoing commitment to transparency and integrity.

**6 POTENTIAL EVOLUTIONS**

As the Sustainability Sukuk market may be subject to changing market and regulations as it evolves, TPGSB looks to enhance and improve its Framework from time to time and publish any supplementary content at [www.tnbgenco.com.my](http://www.tnbgenco.com.my).





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