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Project title:

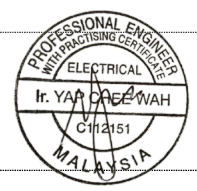
DEVELOPMENT OF 29.99MWAC LARGE SCALE SOLAR PHOTOVOLTAIC PLANT (LSS5) FOR NEFIN V POWER SDN. BHD. LOCATED IN TELUK INTAN, PERAK

Document title:

GENCO INTERCONNECTION FACILITIES ROUTING

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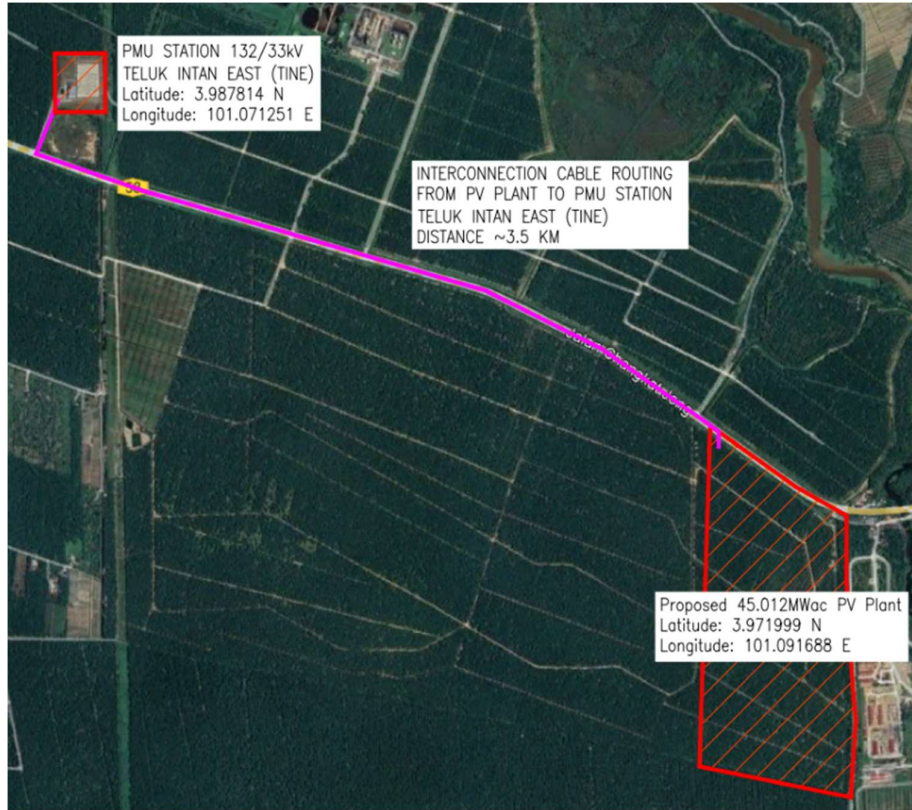
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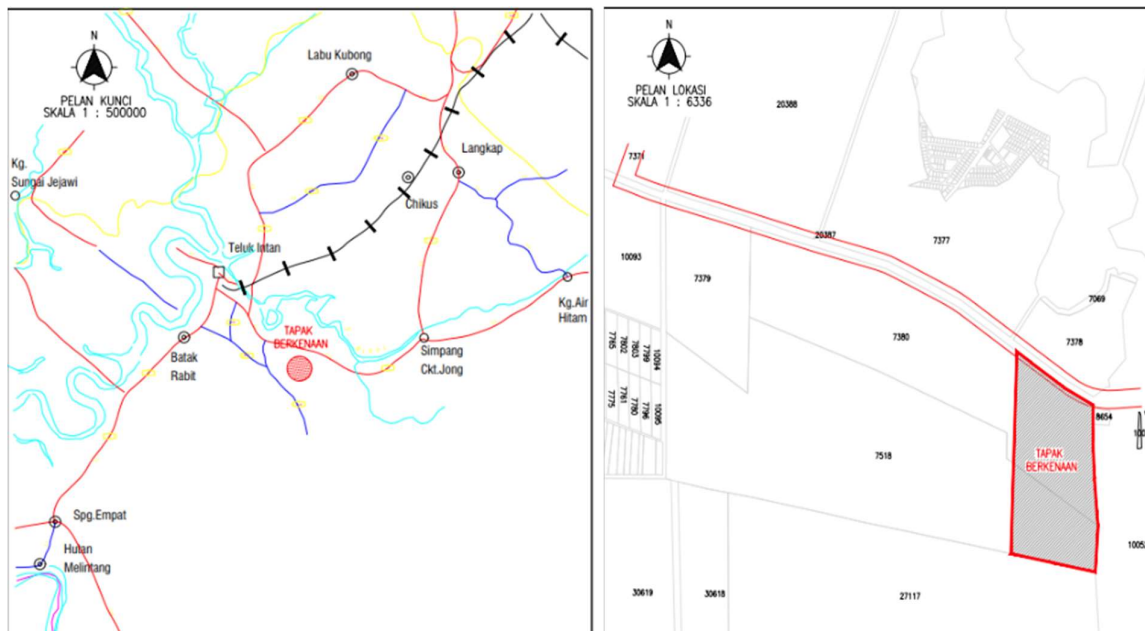
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2. Interconnection Line SPPIC



The proposed project site is located approximately 3.5 KM from PMU Teluk Intan East. To facilitate grid interconnection, a 132 kV transmission line is planned to be constructed, utilizing an underground installation method. The underground cable route, extending over 3.5 KM, will be implemented using the Horizontal Directional Drilling (HDD) technique to ensure minimal surface disruption and to enhance reliability and safety in the transmission of power from the project site to PMU Teluk Intan East.

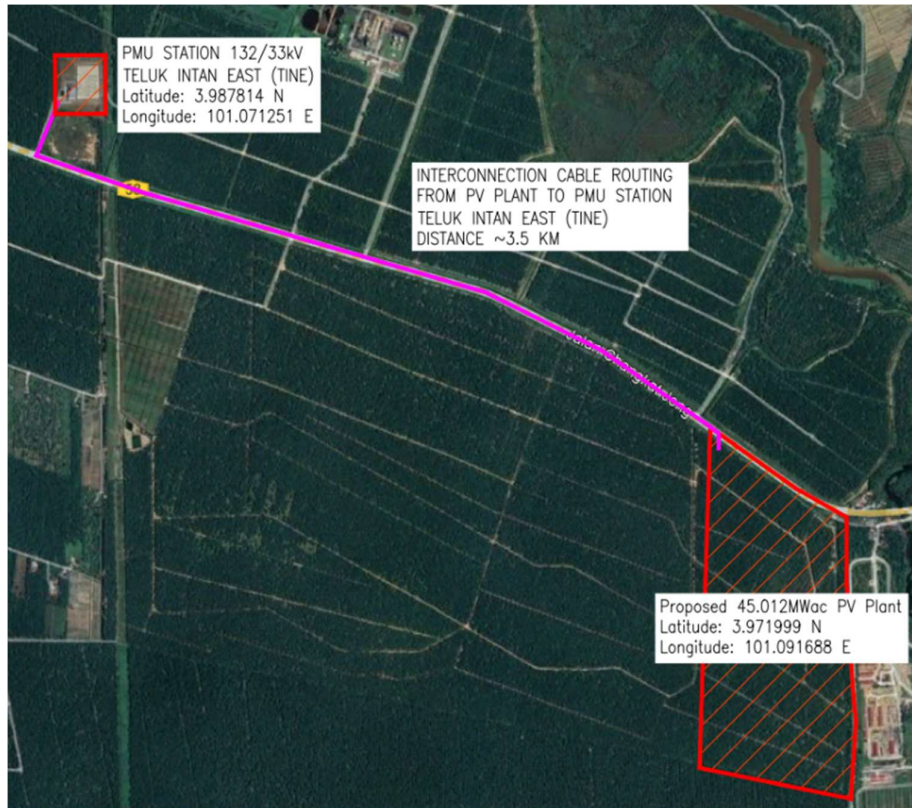



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3. SPP Interconnector

The SPP interconnector (SPPIC) shall connect to the SPPIF to the TNBIF via underground cable. The cable sizing shall be 3 x 1c x 400mmsq Aluminium XLPE and shall run underground for 3.5km between two termination points.

The cables shall be fed through 150mm corrugated High Density Poly-Ethylene (HDPE) double wall pipes. The method of installation is horizontal directional drill (HDD) as per requirements from local authorities. Besides the power cables, the SPPIC shall include two [2] 48-cores fibre optic cables that shall carry the data communication between RTU's located inside the control rooms of the TNBIF and SPPIF. Each Fibre optic cable shall be installed in pipes adjacent to the 132kV underground cables.

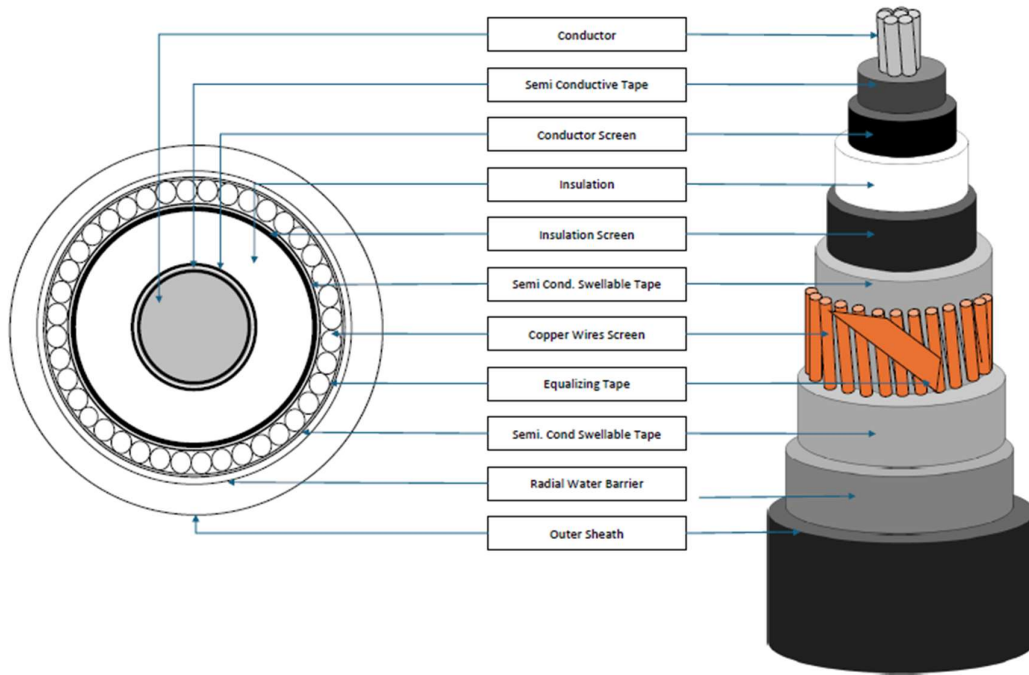


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3.1. 132kV Cable


The cable size shall be used is 400mmsq cable with this specification:

Description	Unit	Value
Reference Standard	-	IEC 60840, IEC 60228
Rated Voltage (U _o /U _m)	kV	76/132 (145)
Conductor	-	Aluminium, Class 2 compacted stranded, water-blocking tape/yarn
Cross-Sectional Area	mm ²	400
No. of Strands	Nos	≥ 53
Approx. Conductor Diameter	mm	23.34
Conductor Resistance (20°C)	Ω/km	0.0780
Short Circuit Rating	kA	1s: 37.79 2s: 31.25 3s: 21.82
Insulation	-	XLPE Compound, average thickness 20.0 mm, approx. diameter 69.6 mm
Conductor Screen	-	Semi-conductive bonded, min. thickness 0.8 mm
Insulation Screen	-	Semi-conductive bonded, min. thickness 0.8 mm
Metallic Screen	-	Annealed copper wires (57 × 2.23 mm), short circuit rating 22.13 kA (3s)
Equalizing Tape	-	Annealed copper tape (1 × 0.1 mm), open helix, dia. 79.6 mm
Radial Water Barrier	-	Semi-conductive swellable tape (1 × 0.5 mm), dia. 81.7 mm
Longitudinal Water Barrier	-	Laminated Al (PE/Al/PE), 1 × 0.03 mm, dia. 82.3 mm
Outer Sheath	-	PE Compound ST7, thickness 4.0 mm (min.), black, graphite coated, dia. 90 mm
Drum Type	-	Steel drum
Ampacity (buried, flat)	A	683 (air @ 30°C) 472 (ground @ 20°C, F) 474 (ground @ 20°C, D)
Induced Voltage Drop	mV/A/m	0.1066
Additional Notes	-	Burial depth 0.8 m, soil resistivity 1.5 K·m/W, duct size 150 mm



Cable bending radius:

Condition	Rule of thumb	Min. bend radius	Min. bend diameter
During installation/pulling	20 × OD	1.80 m	3.60 m
After installation (set in place)	15 × OD	1.35 m	2.70 m
(Conservative/site constraints)	25 × OD	2.25 m	4.50 m

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3.2. Method of Construction

The 132 kV, 400 mm² XLPE cable shall be installed with strict adherence to the manufacturer's recommended bending radius. During installation and pulling, a minimum bending radius of 1.80 m (20 × OD) shall be maintained, while after installation the cable shall not be bent below 1.35 m (15 × OD). For site constraints, a conservative bending radius of 2.25 m (25 × OD) may be applied.

To accommodate these requirements, the cable will be routed underneath the pavement road and aligned to ensure a smooth transition to the cable sealing end termination point without exceeding the permissible bending radius. Table below are the proposed method of the under-pavement cable routing.

Activity	Method	Responsibility	Remarks
Preparation	Review drawings, confirm utility-free route, check cable drums, arrange tools & equipment.	Site Engineer / Supervisor	Ensure compliance with approved IFC drawings.
Excavation & Trench Prep	Excavate trench to required depth/width, provide sand bedding, install ducts under pavement.	Civil Contractor	Duct entry/exit must allow required bending radius.
Cable Laying / Pulling	Position drum on jacks, pull with rollers/winch, maintain bending radius ≥ 1.80 m during pulling.	Cable Laying Crew	Pulling tension must not exceed manufacturer's limit.
Bending Radius & Alignment	Check bends at duct exit and sealing end, maintain ≥ 1.35 m after installation, ≥ 2.25 m if constrained.	Supervisor / QA Inspector	Use rollers and protective covers to avoid sheath damage.
Termination (Sealing End)	Prepare cable end, install termination kit, bond metallic screens to earth.	Termination Specialist	Follow manufacturer's termination manual and IEC 60840.
Backfilling & Reinstatement	Backfill with fine sand, install protective tiles/tapes, compact layers, reinstate pavement.	Civil Contractor	Ensure 150 mm sand cover above cable before tiles.
Testing & Commissioning	Perform IR, sheath integrity, HV withstand, and PD tests; energize after approval.	Testing Engineer	Testing as per IEC 60840 and project specifications.

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4. Site Picture



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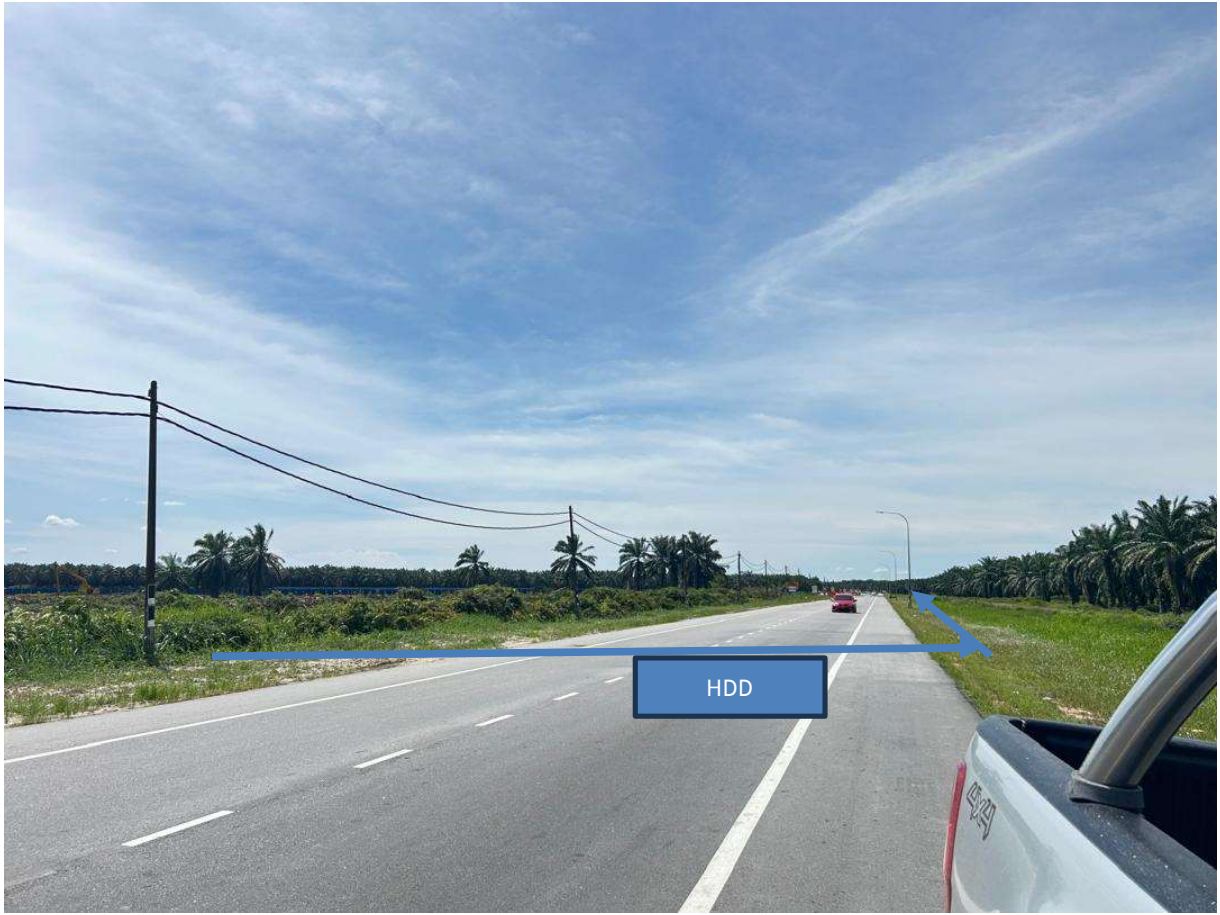
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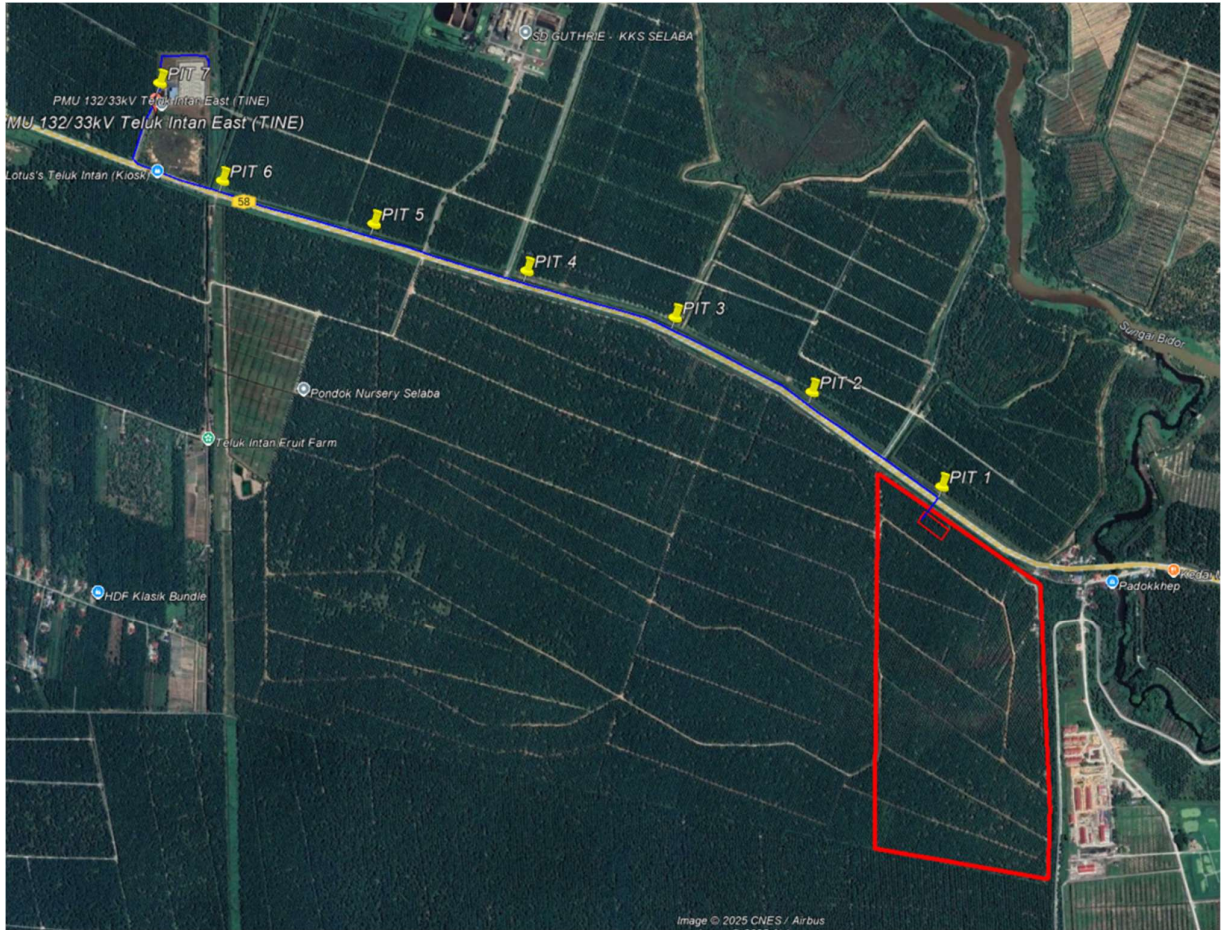
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5. Routing Plan



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6. Obstruction clearing

6.1. Introduction

Based on the recent site visit and inspection carried out by the project team, it has been observed that the existing 11kV TNB power line cable is currently posing a significant obstruction to the designated temporary access route leading into the site. This unforeseen condition affects the planned movement of construction vehicles, machinery, and overall site logistics. The presence of the overhead utility not only restricts access but also raises safety considerations that must be addressed before any further progress can be made. As a result, the issue requires immediate attention and coordination with the relevant authorities to ensure that appropriate mitigation or relocation measures can be implemented without delay.

6.2. Site Picture



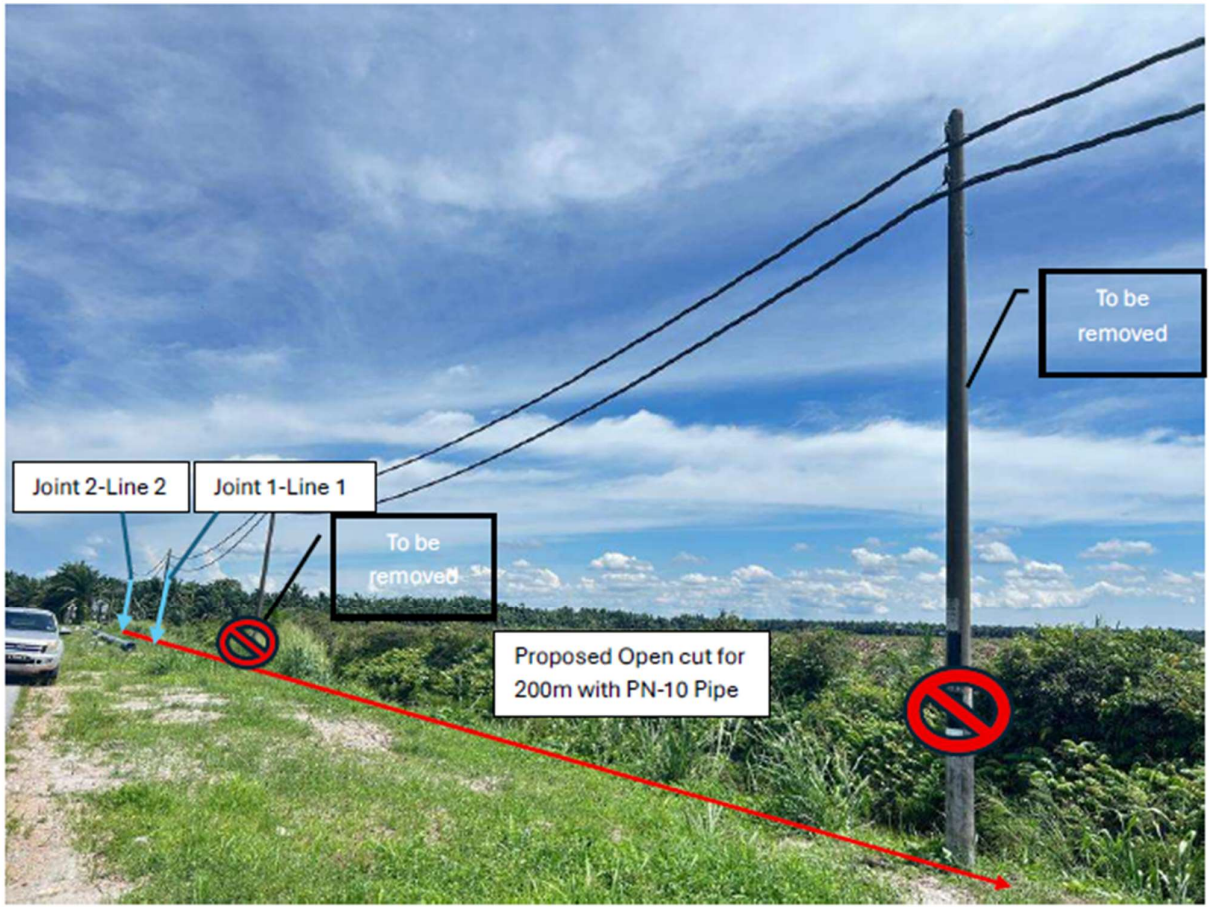
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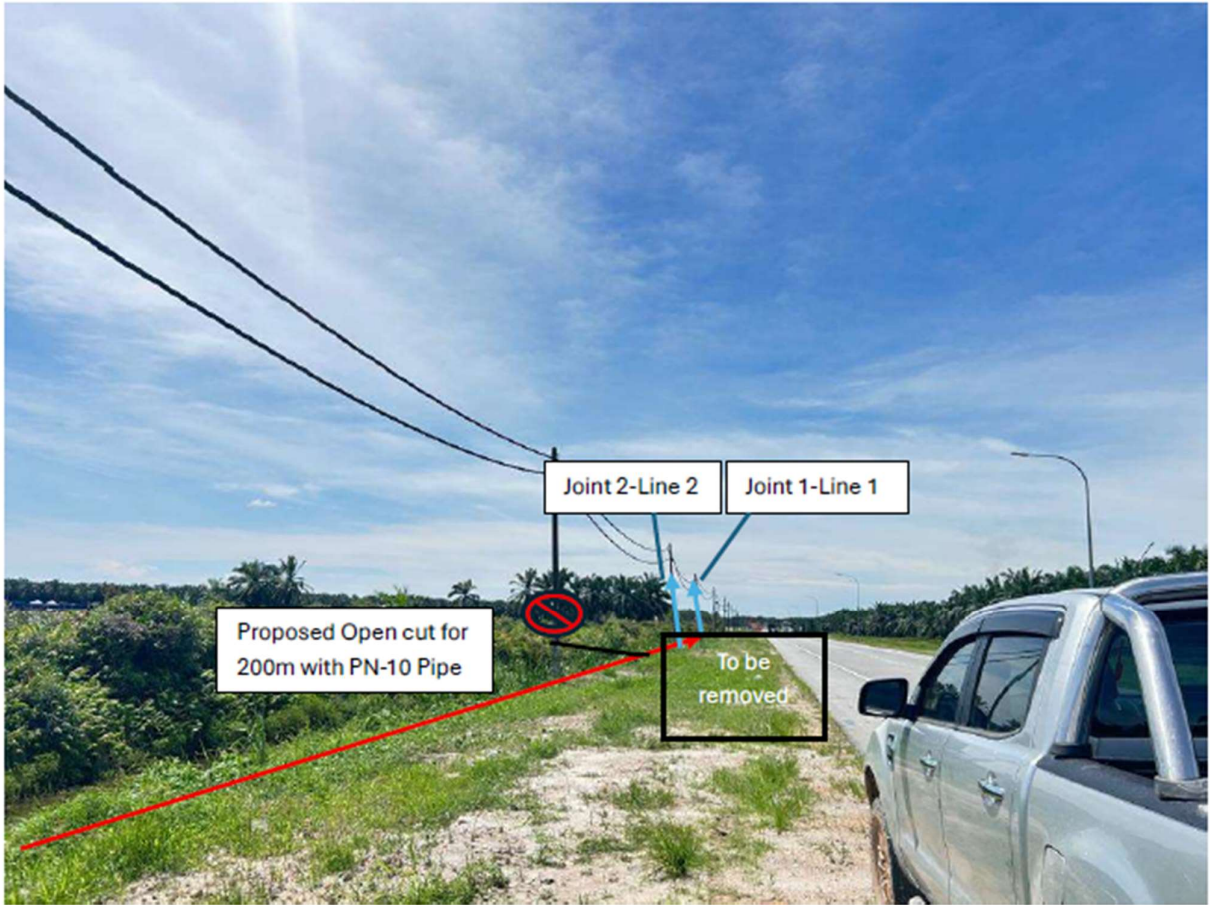


6.3. Relocation proposal

During the recent site visit conducted together with TNB representatives, it was proposed by TNB that four existing poles be removed to facilitate the required works. These include the two poles currently functioning as drop points and an additional two poles serving the jointing section of the 11kV line. To execute this relocation, TNB recommended the implementation of an open-cut excavation method along a total length of approximately 250 meters.

However, based on observations made during the site walk, it was noted that a newly installed gas pipeline is located within the proposed working corridor. The pipeline is positioned approximately 6.74 meters from the road edge, with a measured depth of 1.982 meters. This existing utility crosses the intended open-cut alignment and may pose potential constraints or risks to the proposed relocation works. Therefore, further coordination and detailed assessment will be necessary to ensure that the proposed method can be carried out safely and in compliance with all applicable utility protection requirements





List of Pole to be removed

No	Pole No
1	

2



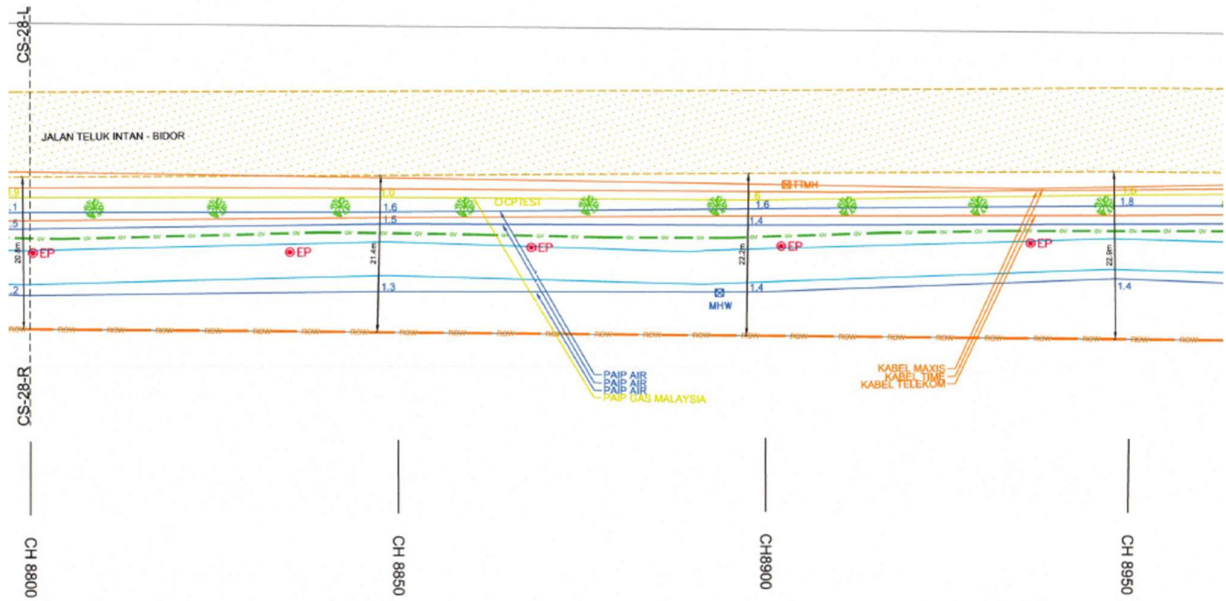
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Based on the site measurements and coordination during the joint inspection, it was confirmed that the proposed cable relocation alignment maintains a minimum 1-meter clearance from the newly installed gas pipeline. The gas pipeline is located approximately 6.74 meters from the road edge, and this distance ensures compliance with utility separation requirements to avoid interference or safety risks during construction.


The proposed open-cut trench for the TNB cable relocation will be constructed with a width of 700 mm and a depth of 1,500 mm, in accordance with TNB installation standards. This trench dimension provides adequate space for duct installation, sand bedding, cable protection layers, and warning tape placement, while ensuring structural stability and safe working conditions during the excavation process.



JALAN TAR 11.4m
LONGKANG TANAH 4.0m

DATUM : -8 METER

	11.419	0.664	0.000	1.942	3.320	4.776	6.740	8.859	9.115	12.851	14.167	16.063	20.742
DISTANCE IN METER													
GROUND LEVEL IN METER	2.607	2.597	2.588	2.315	2.247	2.159	1.982	1.805	1.556	2.003	2.096	2.266	2.384
DEPTH IN METER		T-0.6		G-0.7	T-0.6	T-0.6	PROP. GV		W-0.2		W-1.3	W-1.1	R.O.W.

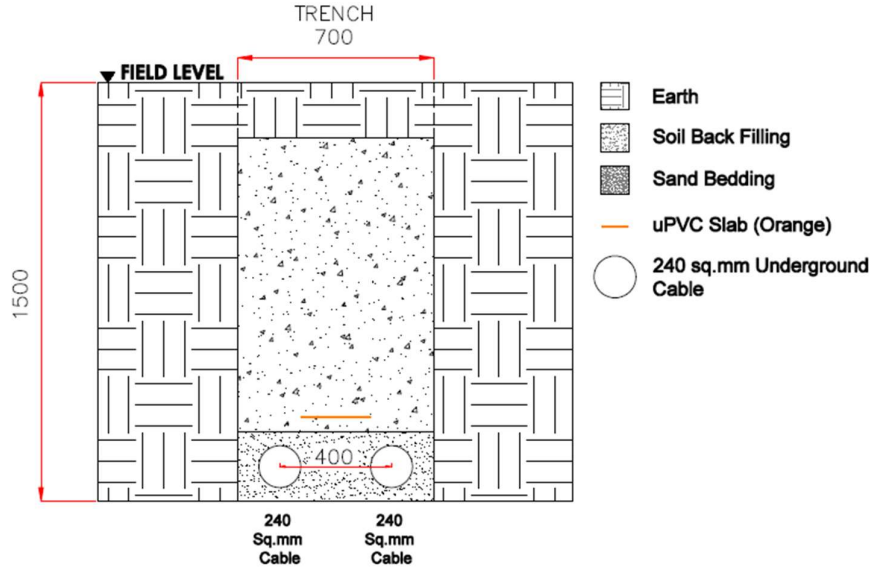
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6.4. Construction method

No.	Activity	Description / Methodology
1	Pre-Construction Survey & Preparation	<ul style="list-style-type: none"> Conduct detailed site survey and mark excavation alignment. Identify and mark all existing utilities (gas, water, sewer, telecom, electrical). Carry out pre-condition photo documentation.
2	Permit & Authority Coordination	<ul style="list-style-type: none"> Obtain required permits from TNB, Gas Malaysia, and relevant authorities. Coordinate with utility owners for supervision, especially near high-risk utilities (gas pipeline).
3	Traffic & Safety Management	<ul style="list-style-type: none"> Implement Traffic Management Plan (TMP). Install warning signage, barriers, cones, and lighting. Conduct safety briefing before work begins.
4	Initial Excavation Works	<ul style="list-style-type: none"> Begin excavation using excavator/backhoe within marked boundaries. Conduct manual excavation near sensitive utility zones. Maintain safe working distance from utilities.
5	Excavation to Required Depth	<ul style="list-style-type: none"> Excavate to specified depth per TNB requirements (approx. 1.2–1.5 m or as required). Provide shoring or trench support where soil is unstable or depth exceeds safety limits. Stockpile excavated soil safely away from trench edges.
6	Utility Protection Measures	<ul style="list-style-type: none"> Hand-dig around exposed utilities to avoid damage. Provide protection such as sand bedding, timber boards, or casing. Near gas pipe (depth: 1.982m, 6.74m from roadside): All works supervised by Gas Malaysia; no mechanical excavation allowed directly above pipeline.
7	Cable Duct/Cable Installation	<ul style="list-style-type: none"> Prepare trench base with sand bedding. Lay TNB-approved cable ducts, tiles, and warning tapes. Conduct cable pulling, jointing, and termination under TNB supervision.
8	Inspection & Approval	<ul style="list-style-type: none"> TNB to inspect trench alignment, duct placement, and utility clearance. Corrective actions taken if non-compliance is detected.
9	Backfilling & Compaction	<ul style="list-style-type: none"> Backfill with approved materials in layers. Compact each layer to required density. Reinstate surface to pre-existing condition (road, pavement, turf, etc.).
10	Site Restoration	<ul style="list-style-type: none"> Clear debris and remove temporary barriers. Restore affected areas to original or better condition.
11	Documentation & Handover	<ul style="list-style-type: none"> Prepare as-built drawings, photos, and inspection reports. Submit documentation to TNB and client for final approval and closure.

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6.5. Open Cut Trench Design



This trench design reflects the proposed alignment for the relocated TNB cable, maintaining a minimum 1-meter separation from the newly installed gas pipeline to comply with safety and utility clearance requirements.