PT SKS LISTRIK KALIMANTAN

IPP 3: PLTU Kalteng 1 (2X100 MW)

General and Technical Requirements & Scope of Work

Package Name:
Design, Supply and Installation of PV Solar Panel Project

PT SKS Listrik Kalimantan
Desa Tumbang Kajuei, Kecamatan Rungan, Kabupaten Gunung Mas
Kalimantan Tengah 74561, Indonesia

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1. Definition

The following words and expressions shall have the meanings hereby:

- **"Acceptance"** means acceptance of Facilities by the Employer after SLO certification and Commissioning of the Project and demonstration of functioning of the Project.
- **"Bid"** means the proposal submitted by the Contractor along with all documents/credentials/attachments, etc.
- **"Commissioning"** means the Project shall be considered commissioned if all equipment as per rated capacity has been installed and energy has transmitted into grid.
- **"Contract"** means the Contract Agreement entered into between the Employer and the Contractor, together with the Contract Documents referred to therein; they shall constitute the Contract, and the term "the Contract" shall in all such documents be construed accordingly.
- **"Contract Documents"** means the documents listed in the Form of Contract.
- **"Contractor"** means the company whose Bid to perform the Contract has been accepted by the Employer and is named as such in the Contract Agreement, and includes the legal successors or permitted assigns of the Contractor.
- **"Defect Liability Period"** means the period of validity of the warranties including O&M of the Facilities from Commissioning date, during which the Contractor is responsible for defects with respect to the Facilities (or the relevant part thereof).
- **"Good Utility Practice"** means at a particular time, those practices, methods and acts conforming to legal requirements and which are in accordance with standards of prudence applicable to the coal-fired electric utility industry which would have been expected to accomplish the desired result at the lowest reasonable cost consistent with reliability, safety and expedition.
- **"Guarantee Test(s)"** means the test(s) specified in the Technical Specifications to be carried out to ascertain whether the Facilities or a specified part thereof is able to attain the Functional Guarantees specified in the Technical Specifications
- **"Installation Services"** means all those services ancillary to the supply of the Equipment for the Facilities, to be provided by the Contractor under the Contract; e.g., transportation and provision of marine or other similar insurance, inspection, Site preparation works (including the provision and use of Contractor's Equipment and the supply of all use structural and construction materials required), installation including civil and allied works etc., testing, Pre-Commissioning, Commissioning, operations, maintenance, the provision of operations and maintenance manuals, training of Employer's Personnel etc.

- **"International Standard Engineering and Maintenance Practice"** means at a particular time, those standards, practices, methods and procedures conforming to legal requirements and that degree of skill, diligence, prudence and foresight which would reasonably be expected from a skilled and experienced maintenance contractor, and/or engineer participating in electrical power generation industry and engaged in the same type of undertaking under the same or similar circumstances which would have been expected to accomplish the desired result at the lowest reasonable cost consistent with reliability, safety and expedition and in accordance with the standards and instructions referred to in the Scope of Work.
- **"O&M"** means Operation and Maintenance of the Facilities.
- **"OHSE"** means Occupational Health, Safety and Environmental.
- **"Operational Acceptance"** means the acceptance by the Employer of the facilities (or any part of the facilities where the Contract provides for acceptance of the facilities in parts), which certifies the Contractor's fulfillment of the Contract in respect of Functional and Plant Performance Guarantees of the Facilities.
- **"Owner"** means PT SKS Listrik Kalimantan
- **"Plant"** means Kalteng-1 coal fired steam power plant namely PLTU Kalteng-1 (2x100 MW) which consist of Unit 1, Unit 2, and common facilities.
- **"Pre-Commissioning"** means the testing, checking and other requirements specified in the Technical Specifications that are to be carried out before Commissioning by the Contractor in coordination with Engineer-in-Charge.
- **"Project Document"** means any drawing, specification, datasheet, calculation sheet, design description, P&ID, process flow diagram, and any other documents issued by Owner as a reference for contractor in relation with the works to be performed under this document.
- **"SLK"** means PT SKS Listrik Kalimantan as project owner.
- **"SLO"** means *Sertifikat Laik Operasi*, is formal proof of recognition that an electrical power installation has functioned in accordance with specified requirements and has been declared fit for operation.
- **"Shop drawing"** means detailed drawings created by contractors, fabricators, or manufacturers to illustrate specific aspects of a construction project. These drawings provide detailed information about the materials, dimensions, fabrication methods, and installation procedures for various components of the project.
- **"Solar Power Plant" or "Solar PV Plant"** means Solar Photovoltaic Power Plant engineered, procured, supplied and commissioned by the Contractor in accordance with the provisions of this Agreement.

2. Introduction

PT SKS Listrik Kalimantan owns and operates a coal fired steam power plant with gross capacity 2x115 MW and sells electricity to PT PLN (Persero) under Power Purchase Agreement (PPA). The Plant is located in Tumbang Kajuei, Kecamatan Rungan, Gunung Mas Regency, and Central Kalimantan Province at coordinated 1 22' 27,6" S and 113 33' 59,1" S. The location is approximately 3.5-hours transportation by car from Palangkaraya.

The Company intend to built Solar PhotoVoltaic with total capacity not less than 494.32 kWp trough lumpsump turnkey contract.

3. Bidder Requirements

The bidder must posses proven experience in supply, design, installation, operation, maintenance, services, commissioning, testing and inspection of Photovoltaic Project with the following qualifications:

3.1. The bidder must hold valid business licenses to operate and perform its business activities in Indonesia and must comply with all applicable rules and regulations.

3.2. The bidder must have valid license to perform maintenance activities of Photovoltaic Project in accordance with applicable law.

3.3. The bidder must posses no less than 5 years of experiences for supply, design, installation, service, maintenance and inspection of Photovoltaic Project and specifically must have had performed on-site inspection of Photovoltaic Project with similar or larger capacity.

3.4. The bidder must have safety management system and preferably to hold relevance national and/or international certification related to occupational health, safety and environmental.

3.5. The bidder must perform site visit to familiarize itself with location of the Plant, condition of size, space available, condition of dormitory for Contractor, and other site conditions to enable a bidder to form a comphrehensive proposal under this package. In case a bidder opts for not doing site visit, then the bidder is deemed to have satisfied itself with site condition as mentioned above and all and risks associated with descrepency or inadequacy of data for forming a complete proposal shall be borne by themselves.

3.6. In principle, the Contractor intends to subcontract parts of materials and a specific Works, the Contractor must prior obtain the Owner's return approval.

3.7. All equipment shall be according to design, manufacture and installation and shall be completed for satisfactory operation, control, maintenance and safety under all conditions of service.

3.8. At all times, and at the site operator's request, construction noise must be kept to a minimum at critical times. This may require staging or ceasing roof installation works to reduce noise to the site

operator during critical times. Required installation dates are proposed in the solar PV installation and design briefs.

3.9. Working Day: Sunday – Saturday 8:00 AM – 5:30 PM

3.10. The Contractor shall submit all works procedures for Owner review and comments. If the Owner makes comments to any procedure of works, the Contractor must arrange revisions of such procedure to address the Owner's comment and must resubmit it to the Owner within 2 days of the Owner's comment.

3.11. The Works procedures shall indicate detailed steps of work, tools and equipment, and method of work. It shall also indicate all tools & equipment and the specifications of such tools & equipment used during the execution of works.

3.12. All electrical site work, including the installation of meters, solar PV panels, and inverters, shall be done by electricians licensed to carry out such work in the particular locality. The installation shall to be completed when it has passed all necessary tests and has been approved to the satisfaction of the distribution company. All necessary facilities, including all necessary instruments and test equipment and labour for carrying out tests, shall be provided by the Solar PV Contractor at no extra cost to the Client. The contractor shall provide training to the client's operating personnel on the operation and use of all equipment and systems installed under the contract. The contractor shall carry out commissioning and final acceptance tests as required by the project manager and as specified. The contractor shall provide a Certificate of Electrical Safety for the installation and include a copy in the manuals. The contractor must also provide a report that includes voltage and temperature measurements, the current and irradiance measurements, the earth fault protection test and also states the conditions of the PV array wiring after the test, including any repairs and corrections carried out as a result of the inspections.

3.13. Tenderers shall, by submitting a tender, acknowledge that they have adequate knowledge of the site constraints and proposed installation details, consulted with all relevant authorities having jurisdiction over the project, and have assessed their full liabilities for all such works and costs required in carrying out the works specified and shown. No recognition will be granted of any claims for additional costs resulting from the Tenderer's failure to comply with the above.

3.14. In addition to the day to day coordination during the project duration, the contractor is to allow for fortnightly project progress meetings. These meetings will discuss progress, OHSE, etc. The contractor shall minute fortnightly meetings and minutes of the meetings should be provided within 2 days of the meeting date. These meetings would be attended

by the SLK representative and the contractor, required consultants and subcontractors. The contractor shall report on a fortnight basis the following:

3.14.1. All OHSE incidents

3.14.2. All quality non-conformances

3.14.3. Project program compared to contract program

3.14.4. Register of extension of time claims

3.14.5. Register of variations showing items to be approved and date approval is required

3.14.6. Register of design changes

3.14.7. Register of request for information showing items to be responded to and date response required

3.14.8. Forthcoming hold points and witness points

3.14.9. Works progress photographs

Table 3-1: Contractor experience and preferences

Experience	The head contractor must have a minimum of 5 years experience in the solar PV industry, including documented evidence of similar sized commercial solar PV systems (with references).
Experience: Commercial Solar	The head contractor must have direct experience in the supply, design and installation of commercial solar systems of a similar size. Vendor candidates must have an official letter as an official/officially appointed distributor of the "product"/"brand" manufacturer so that the claim process can go through them or the manufacturer's warranty can be valid if there is damage within the warranty period.
Experience: Grid Connection	The head contractor must have direct experience with solar PV grid connection approvals in the IEC 62446-1 distribution network, for systems of a similar capacity.
Local Presence	Contractor to have in-house staff based in local area for the project duration, are preferred.
Referees	The contractor must provide at least three reference project outlines, including description, design input requirements, technical performance, construction program, budget and client contact.

Table 3-2: Project team and capabilities

Project Manager	The contractor shall have an in-house locally based project manager responsible for continuous attendance on site during installation periods, contractor management and liaison with staff and the public.
Project Management	Preference given to contractors with accredited project management procedures and a dedicated project manager.
Submission	Preference given to contractors that provide a professional submission which outlines details of their understanding of a solar PV project from inception to commissioning and ongoing maintenance, including site specific installation and safety issues at a publically accessible buildings and areas.

4. Scope of Works

The Contractor shall design, supply equipment & materials, installation, testing, commissioning, and obtain SLO for complete Solar PV with total capacity 494.32 kWp, including but not limited to the following:

4.1. Engineering

4.1.1. Design of Solar PV System in accordance with standards including solar PV modules, grid connect solar inverters, solar mounting systems, new AC and DC switchgear, cabling, support, civil works, protection and monitoring system.

4.1.2. Provide Drawings:

4.1.2.1. Design Analisys and Drawing

4.1.2.2. Design Calculation and Design Data Sheet

4.1.2.3. Construction Drawing

4.1.2.4. Shop Drawing

4.1.2.5. As Built Drawing

4.1.3. Provide OHSE manuals

4.1.4. Project Handover Certificate.

4.1.5. Provide Quality Plan of Solar PV System, including Inspection Test Plan (ITP) and Test Procedure.

4.1.6. Provide project schedule of Solar PV System, including key milestone schedule and Work Breakdown Structure (WPS).

4.1.7. Provide Project Execution Plan (PEP) and submit to Owner for approval

4.1.8. Provide Solar PV Operation & Maintenance manuals and operating procedure.

4.1.9. Provide training of Solar PV Operation & Maintenance.

4.2. Procurement & Logistic

4.2.1. Supply of complete materials of Photovoltaic Solar Panel System based on approved design including solar PV modules, grid connect solar inverters, solar mounting systems, new AC and DC switchgear, cabling, support, civil works, protection and monitoring system.

4.2.2. Deliver the complete material of Photovoltaic Solar Panel System including solar PV modules, grid connect solar inverters, solar mounting systems, new AC and DC switchgear, cabling, support, civil works, protection and monitoring system to PT SKS Listrik Kalimantan Plant Site, including custom clearance import tax.

4.2.3. Provide Packing List of material prior to be dispatch and submit to Owner

4.2.4. Provide Storage Management Plan for receiving and storage of Photovoltaic Solar Panel System material

4.3. Construction

4.3.1. Provide manpower for installation, supervision, and quality control of Photovoltaic Solar Panel System including solar PV modules, grid connect solar inverters, solar mounting systems, new AC and DC switchgear, cabling, support, civil works, protection and monitoring system.

4.3.2. Provide Installation Procedure including Methode of Work, step by step of installation work of Photovoltaic Solar Panel System.

4.3.3. Provide Equipment, tools and consumables for installation of Photovoltaic Solar Panel System.

4.3.4. Supply and install additional temporary roof safety hardware as required for lifting materials and working at heights for construction.

4.3.5. Provide Project Quality Plan for installation of Photovoltaic Solar Panel System

4.3.6. Provide Construction Report of installation of Photovoltaic Solar Panel System in daily, weekly and monthly basis

4.3.7. Install Photovoltaic Solar Panel System including solar PV modules, grid connect solar inverters, solar mounting systems, new AC and DC switchgear, cabling, support, civil works, protection and monitoring system based on approved Construction Drawing

4.3.8. Conduct inspection based on ITP and provide test report of Photovoltaic Solar Panel System.

4.3.9. Conduct Electrical connection of Solar PV array to low voltage system via existing switchboards.

4.3.10. Conduct housekeeping, remove and dispose of all associated wrapping, rubbish or debris related to the installation of the solar system and deliver to designated area of waste.

4.4. Commissioning & Testing

4.4.1. Provide Pre-Commissioning & Commissioning Procedure

4.4.2. Provide Pre-Commissioning & Commissioning Test Plan

4.4.3. Conduct testing refer to Pre-Commissioning & Commissioning Test Plan

4.4.4. Provide Test Report (single system and comprehensive system test report)

4.4.5. Ensure that all equipment of Solar PV System installed is in accordance with the design parameters and work properly

4.4.6. Ensure that the power produced is in accordance with the requirement, it cannot be less than what was agreed in the contract (494.32 kWp), there should be no over supply or less of supply.

4.4.7. Ensure that the protection system can work properly and does not cause disruption to the existing electrical system at the Plant.

4.5. Miscelenaeous

4.5.1. Provide SLO (Sertifikasi Laik Operasi) - *certification for operational worthiness*, which is mandatory in accordance with the regulations of the government of the Republic of Indonesia

4.5.2. Conduct Operation & Maintenance training for Owner Operator including troubleshooting training.

4.5.3. Provide Safety Shutdown Procedure documentation and training in the basic operation, maintenance, and troubleshooting of the system to onsite staff and maintenance staff

4.5.4. Equipment warranties as stated in this document

4.5.5. Provision of warranty period from the date of practical completion

4.5.6. The Owner must at all time have full access to the Contractor work. The Owner's personnel must have full access to witness any and all of the Contractor's work.

5. Technical Specification

5.1. General

Design, supply and install a grid interactive photovoltaic generating system(s) as documented, incorporating the following:

5.1.1. Photovoltaic arrays and necessary support structure

5.1.2. Grid connected inverter/(s)

5.1.3. Balance of System components including DC and AC cabling and switchgear, data cabling, junction boxes, switchboard, conduits, cable tray, mounting brackets, etc

5.1.4. Connection to low voltage power system

5.1.5. kWh meter for displaying and monitoring PV system performance

5.1.6. Testing and commissioning

5.1.7. Training basic operation, maintenance, and trouble-shooting of the PV system

5.1.8. Operation and Maintenance manual

5.1.9. All permanent and temporary safety and access equipment necessary for lifting materials and working at heights

5.1.10. All supports, brackets, drilling, penetrations, fire stops, water proofing and other building works associated with the above

Where site specific design and install documents are supplied, the location and orientation of the PV arrays on the roof is given as a guide. The tenderer can suggest alternative options on the roof layout, however; must ensure a minimum total PV capacity is maintained and all shading and roof obstacles adequately considered, in addition to heritage, planning, structural and architectural issues.

Table 5-1: Standards

IEC 62548-1:2023	Installation of photovoltaic arrays
IEC 62446-1	Grid connection of energy system via inverters Part 1: Installation requirements
IEC 62446-1	Grid connection of energy system via inverters Part 2: Inverter requirements
IEC 62446-1	Grid connection of energy system via inverters Part 3: Grid protection requirements
IEC 62548-1:2023	Wiring Rules
IEC 62548-1:2023	Lightning Protection

IEC 62548-1:2023	Conduits and Fittings for Electrical Installation
IEC 62548-1:2023	Selection of cabling
IEC 63112:2021 **IEC 62548-1:2023**	Electrical installations – Testing guidelines

5.2. Solar PV Panel Technical Requirements

Table 5-2: Solar PV Panel requirements

Design Wp DC	550Wp up to 600Wp
Cell	Mono-crystalline
Normal Operating Cell temperature	45°C-85°C- +/-2°C
Module Efficiency	>20%
Performance Warranty:	At least 90% at 10 years At least 80% at 25 years Any insurance guarantee underwriting the long-term performance warranty should be specified, such as third party insurance arrangements.
Manufacturing warranty	Minimum 10 years from date of installation Any insurance guarantee underwriting the long-term manufacturing warranty should be specified, such as third party insurance arrangements.

5.3. Inverter Technical Requirements

Table 5-3: Inverter Technical requirements

Efficiency	>98% Peak efficiency
Three-phase	Provide a fully balanced three phase AC output
Data Logger	Provide Smart Data Logger
Warranty	Minimum 10 years required from date of installation, and include full onsite replacement of a faulty unit Any insurance guarantee underwriting the long-term performance warranty should be specified, such as third party insurance arrangements.

5.4. PV mounting system

5.4.1. Framing and roof attachment

The contractor is to provide mounting details of the selected PV array. The documentation is used as a guideline. Specific details of the mounting structure are to be provided in the tender submission. The contractor shall:

5.4.1.1. Provide the installation manual identifying methods for safely constructing and securing the equipment on sites

5.4.1.2. The contractor shall provide information on how the frame is to be mounted on the roof to maintain this certification

5.4.1.3. The mounting frame/support for the PV arrays is to be weatherproof and corrosion resistant. The lifetime of the mounting structure must exceed the lifetime of the PV arrays

5.4.1.4. All dissimilar metals must be mechanically separated to prevent galvanic corrosion

5.4.1.5. Provide a minimum 10-year warranty on framing

5.4.1.6. The contractor is responsible for ensuring adequate and safe connection of the roof framing to the building/roof structure. The contractor is required to provide structural certification of the installed solar mounting system and the suitability of the building structure for the installed solar PV system.

5.4.2. Structural engineering approval

The contractor is responsible for providing a letter and certification from a professional structural engineer on the structural suitability of the building(s) for the proposed solar PV installation(s). The site-specific structural engineering letter should include the following:

5.4.2.1. Confirmation of the structural suitability of the existing buildings for the proposed PV system framing and panels including additional dead and wind loads

5.4.2.2. Maximum short-term dead loads possible during construction and recommended locations for dead loads, including total load from any unit of plant or equipment and total load to any single support point

5.4.2.3. Confirmation of the suitability of the recommended fixing systems of the solar PV framing, if not incompliance with the framing manufacturer instructions including maximum roof height and purlin spacing

5.4.2.4. The contractor is responsible for any short-term loads during construction and adequate and safe attachment to the roof structure for the life of the system.

5.5. Design and Installation

5.5.1. General

The system must comply with:

5.5.1.1. IEC 62548-1:2023

This international standard sets out design requirements for PV arrays, including DC array wiring, electrical protection devices, switching and earthing provisions, and final power conversion equipment (PCE).

5.5.1.2. IEC 62109-1:2010

This safety standard defines the minimum requirements for the design and manufacture of PCE for protection against electric shock, energy, fire, mechanical and other hazards.

5.5.1.3. IEC 62446-1

This international standard is for testing, documenting, and maintaining grid-connected PV systems. It sets standards for how system designers and installers must provide information and documentation to customers.

5.5.1.4. IEC 63112:2021

This standard defines the required coverage of the monitoring and protection in PV installation codes and standards.

5.5.2. Solar PV Array Location and Design

The contractor is responsible for conducting a shading assessment. Shading analysis has been conducted for the roof areas where required, in addition to identification of roof obstacles restricting the placement of solar PV arrays.

Designs that depart from that indicative PV array layout on the attached drawings are only permitted with the project manager's written approval, provided the required overall solar PV capacity is maintained, and that all shading, roof obstacles, heritage and architectural issues are duly considered and confirmed.

General design rules that must be strictly adhered are:

5.5.2.1. Panel arrays shall be located to ensure ease of access for maintenance and repair of the solar system

5.5.2.2. All panels must be able to be safely and easily accessed, with any one panel able to be accessed by removed only one other panel

5.5.2.3. Be configured square to the roof line in an orderly and visibly appealing fashion

5.5.2.4. Be located to minimise the effects of shade from surrounding infrastructure and vegetation

5.5.3. Inverter Installation

5.5.3.1. Inverters must be located where they can receive adequate ventilation to not compromise inverter efficiency;

5.5.3.2. Inverters are to be located so that they are not exposed to the weather, and not be in a location that has direct sunlight between 9 am and 3 pm at the equinox, the contractor is responsible for adequate shade and weatherproofing of the inverter location (Shelter)

5.5.3.3. Inverters are accessible to maintained via a safe access point;

5.5.3.4. Inverters must be protected by a vandal resistant steel cage/ventilated box or similar where the inverter is otherwise accessible to the public;

5.5.3.5. Inverters shall be installed as per the manufacturers guidelines

5.5.4. Cabling

5.5.4.1. DC Voltage drop shall be below 3% between the solar PV array or string and the respective inverter

5.5.4.2. AC Voltage drop shall be below 1%

5.5.4.3. Installation in a logical and reasonable way such that cables are easily accessible and not subject to damage

5.5.4.4. Any cabling subject to rain, UV, or the like shall be designed for that location

5.5.4.5. Where cabling is likely to be subject to mechanical stress or potential damage, appropriate cover strips and shielding shall be used

5.5.4.6. Wiring through cavity walls shall protect against moisture bridging

5.5.4.7. Do not run wiring through the damp course or flashing

5.5.4.8. Installation of cables within walls shall be run vertically

5.5.4.9. Installation of cables within solid walls shall use conduit

5.5.4.10. All cable shall be labelled

5.5.5. Labelling

All labelling of the system shall be of trifoliate engraved type, adequately secured and screwed where exposed, and comply with the requirements.

5.5.6. Earthing

Earthing (or grounding) solar panels is an important safety measure to protect against electrical hazards, such as lightning strikes or faults in the system. When properly earthed, any excess electrical charge is safely directed into the ground, reducing the risk of electrical shock or fire. The earthing shall be done in accordance with latest standards. Each array structure of the PV yard, earthing grid for switchyard, all electrical equipment, inverter, all junction boxes, etc. shall be grounded properly. Earthing shall be below from 1 mili-Ampere.

6. General Warranty

The Contractor shall guarantee that the Works shall be:

6.1. Free from any defects

6.2. In accordance with Intenational Standard Engineering and Maintenance Practice and Good Utility Practice, and Indonesia Regulation.

6.3. Conform to General Technical and Requirement and its Appendices.

6.4. Provision of 5-year-warranty and 5-year defects liability period from the date of practical completion

6.5. Solar Panel manufacturer's warranty minimum period of 10 years

6.6. Solar Panel performance warranty minimum performance of at least 90% at 10 years and at least 80% at 25 years

6.7. Inverter warranty minimum 10 years from date of installation

6.8. PV mounting system warranty minimum 10 years from date of installation

6.9. Solar Panel performance guarantee minimum performance of at least 90% at 10 years and at least 80% at 25 years

7. General Requirement of the Works

7.1. Documentation Package (Hardcopy Covered, Softcopy PDF and Editable)

7.1.1. Factory Acceptance Test (Video Attached)

7.1.2. Site Acceptance Test

7.1.3. Manual Book

7.1.4. Part List and Detail Part Specification

7.1.5. Document Shipping

7.1.6. Technical and Installation Drawing

7.1.7. Safety Agreement and Contractor Safety Management System (CSMS)

7.1.8. Final Document

7.1.8.1. List of Content

7.1.8.2. Company Profile

7.1.8.3. Company Contact

7.1.8.4. Certificate of Company and Personnel

7.1.8.5. S-Curve or Progress Report

7.1.8.6. Daily, Weekly, Monthly Report (Photo Attached)

7.1.8.7. RFI and Inspection List

7.1.8.8. Commissioning Report

7.1.8.9. As-Built Drawing (Hardcopy, PDF and CAD) - In Separate Document

7.2. Documentation Requirement

7.2.1. Pre-Installation and Shop Drawing

Prior to the commencement of the installation of the solar system, the contractor shall provide detailed documentation and shop drawings for approval by SLK. The contractor shall provide shop drawings a **minimum of 2 weeks** prior to the proposed commencement date for approval. The Pre-installation and shop drawings shall include as a minimum:

7.2.1.1. 'For construction' drawings including

7.2.1.1.1. Proposed roof panel layout drawings which are fully labelled and scaled in A3 format. This shall include proposed panel orientation, spacing between panel rows and proposed mounting/fixing to the roof structure.

7.2.1.1.2. Single line electrical wiring diagrams clearly stating: DC and AC electrical design including string layout, isolator sizing, wiring sizing, and proposed AC connection details.

7.2.1.1.3. Location of proposed inverters and mounting, including a photo of the proposed location and schematic diagrams.

7.2.1.1.4. Description of proposed AC and DC wiring runs including location of wiring runs, fixing and mechanical protection

7.2.1.1.5. Detailed descriptions and models of all equipment proposed in the installation including panels, inverters, isolators and monitoring equipment as a minimum

7.2.1.2. Fully detailed Scope of works document including details of all equipment supplied and description of works

7.2.1.3. Project Safety Plan which, includes site specific information on project details, first aid representation of the install team, evacuation procedures and locations, site isolation and signage requirements, proposed work areas and access, project roles and responsibilities and OHSE site specific issues

7.2.1.4. Site specific Safe Work Method Statement and/or JSA

7.2.1.5. All document must be submitted refer to Document no 2 instruction

to bidders - Installation Solar Panel

7.2.2. Document

The installed solar systems manuals shall be supplied with three (3) copies (Hard-copy) & Soft-copy. The manuals shall include the following as a minimum:

7.2.2.1. The Manuals shall be supplied in a ring binder with the project name clearly displayed on the cover.

7.2.2.2. The Manuals shall be split into sections such as Solar PV panels, inverter accessories, monitoring system (kWh), as-built drawings, equipment shop drawings, certificates, schedules, warranties, maintenance history etc., with appropriate dividers and an index.

7.2.2.3. All equipment information sheets shall be supplied.

7.2.2.4. A set of hard-copy and soft-copy as Operation & Maintenance manual/user manual, engineering and electrical as built drawings shall be supplied within the Manuals. All soft-copy should be given to user with editable and unlocked file format.

7.2.2.5. The as-built drawings shall include locations/mounting of all equipment, ratings of all equipment, catalogue reference numbers for all equipment, circuit numbers, routes of cable trays/submains/conduits/cables, etc., schematic diagrams.

7.2.2.6. The solar contractor shall insert their own company name and details into each drawing (as-built drawings become the responsibility of the contractor).

7.2.2.7. All as-built drawings shall be clear and legible to the project manager's satisfaction.

7.2.2.8. Space within the manual must be provided for the maintenance history of PV installation to be recorded.

7.2.3. Technical information and drawings

The manuals must include the following technical information and drawings:

7.2.3.1. List of equipment supplied including technical specifications and user manuals for all supplied panels and inverters

7.2.3.2. Proof of the selected solar panel type

7.2.3.3. Proof of the selected inverter

7.2.3.4. A list of actions to be taken in the event of an earth fault alarm

7.2.3.5. Step-by-step operating procedure
7.2.3.6. Emergency shutdown procedure documentation
7.2.3.7. Maintenance guidelines for the system
7.2.3.8. Commissioning sheet and installation checklist
7.2.3.9. Array frame engineering certificates for wind and mechanical loading,
7.2.3.10. Site-specific structural engineering certificate signed by a structural engineer
7.2.3.11. Installer/designer declaration of compliance
7.2.3.12. Warranty information on all supplied equipment
7.2.3.13. A copy of the Certificate of Electrical Safety
7.2.3.14. Drawings, including
7.2.3.14.1. General arrangement of equipment
7.2.3.14.2. A circuit diagram, including the electrical ratings of the PV systems, and the ratings of all fuses, circuit breakers and cable specifications
7.2.3.14.3. Support details.

7.2.4. Training and Handover

The contractor shall provide training and handover of the solar system after a certificate of electrical safety has been issued and meter changer over/re-configuration has been completed. The training shall be conducted for onsite maintenance staff, project managers, and building occupiers. The training must be organised in advance and conducted at a convenient time for all stakeholders. Training shall be undertaken on site and include the following subjects as a minimum:

7.2.4.1. Solar PV operation
7.2.4.2. Inverter operation
7.2.4.3. System isolation
7.2.4.4. System monitoring
7.2.4.5. Fault diagnosis and troubleshooting
7.2.4.6. Safety and emergency shutdown procedure
7.2.4.7. User manuals and drawings explanation
7.2.4.8. Preventive maintenance and Corrective maintenance

7.2.5. Practical Completion

All of the following items must, without exception, be completed prior to requesting the client to make final inspections for Practical Completion and the final invoice:

7.2.5.1. Test the complete installation works and leave the work area in perfect clean condition.

7.2.5.2. Thoroughly clean all equipment and parts.

7.2.5.3. Prepare complete operating and maintenance instructions, warranty documentation and 'as built' records to the approval of the Superintendent.

7.2.5.4. Carry out all specified testing and commissioning.

7.2.5.5. Supply all grid connection approval documentation from the distributor

7.2.5.6. Conduct training to SLK on safe operation of the system

7.2.5.7. Physically switch on the system

7.2.5.8. Ensure that the monitoring systems are configured.

7.3. Work location and no interference with operation unit

The Plant consist of 2 units i.e. Unit 1 and Unit 2. The Contractor and all its personnel or its subcontractor or its supplier shall only perform the works at the location designated by the Owner. It shall not in anyway interrupt or causes interruption to normal operation of Unit 1 and Unit 2 without permission from Owner.

The Contractor personnel, its subcontractor or supplier personnel shall not enter into Unit 1 and Unit 2 operation or shall not cross any barricade installed without permission from Owner. In case any Contractor's personnel is necessary to enter any operating unit or other area other than the area designated for the Contractor for purpose of completion of work under this document, then it shall prior apply a written permit to the Owner. If such permit granted, any such access or activity shall be accompanied by Owner personnel.

7.4. Health, Safety, and Environmental

The Contractor shall perform the works in accordance with applicable government rules and regulations including rules and regulation related with health, safety, and environmental. The Contractor must ensure that the Works be performed safely and without any harm to environmental. The Contractor must ensure that the execution

of the Work by the Contractor shall not caused harm to any other personnel, including but not limited to Owner's personnel, other contractor's personnel, or any third party personnel.

The Contractor must at all time comply to the Owner's rules and regulation of Health, Safety, and Environmental regulations, including specific direction by the Owner to enhance the safety and environmental protection which may be issued by the Owner from time to time during execution of the Works by the Contractor. The Contractor shall at all time comply with Heath, Safety, and Environmental regulation as attached to this document. The Owner may impose penalty to any Owner personnel who failed to comply with the Owner's HSE regulations. The Owner may also expel from the Plant any of the Contractor's personnel whom in the opinion of the Owner does not comply with the Owner HSE requirements.

7.5. Quality of Works

The Contractor shall perform the Works with the highest quality standard and in accordance with Project Document, Good Utility Practice, International Standard Engineering and Maintenance Practice. The Contractor must provide adequate and competence quality control personnel to ensure that the quality of the Works meets with the requirements under this document. In no less than 14 days prior to starting of the maintenance works, the Contractor must submit an Inspection and Testing Plan (ITP) for Owner review and approval.

The Owner may reject any works if in the opinion of the Owner that such works does not meet the quality requirement under this document, Project Document or Good Utility Practice, International Standard Engineering and Maintenance Practice. If any works rejected by the Owner, the Contractor shall promptly take necessary action to rectify the works so that such works meet with quality requirements.

Upon completion of rectification works, the Contractor must submit notification to the Owner for further inspection. Any and all cost incurred for reworks shall be borne by the Contractor. Upon completion of the Works and Unit commissioning, the Owner will evaluate the result and quality of the Work.

The acceptance criteria for acceptance of the works shall be based on the following documents:

7.5.1. OEM equipment standards.

7.5.2. International standards or power industry standards.

7.5.3. If there is no relevant quality standard for the above two items, both parties shall negotiate to solve the problem and be approved by the Owner.

7.5.4. Main technical indexes of parameters after maintenance shall reach or close to the design level.

7.5.5. If the maintenance quality acceptance standard concedes or exempts the maintenance item, the Contractor shall submit a special report to the Owner for approval.

7.5.6. In the maintenance process, the Contractor shall fill in the concession release application form in case of any deviation, and then proceed to the next maintenance operation after signing the approval. After the end of the project, the whole acceptance can be carried out after the completion of the partial trial operation and the professional acceptance.

7.5.7. The Contractor must submit daily report, inspection report, and completion report in accordance with format acceptable to the Owner. The Owner has right to review and make comment to the report submitted by the Contractor. If the Owner make comment to any report, the Contractor must revise such report and resubmit it to the Owner with 2 days of the Owner's comment.

7.5.8. The Contractor must submit inspection request in the form of Request for Inspection (RFI) in accordance with Inspection and Testing Plan approved by the Owner. Any RFI must be submitted by the Contractor to the Owner in no less than 24 hours prior to inspection schedule.

7.5.9. Upon completion of the Works, the Contractor may propose completion certificate to certify that the Works has been completed by the Contractor in accordance with General and Technical Requirement and Project Documents. The Owner may review or comments the completion certificate or sign off such completion certificate if in the opinion of the Owner that all Works has been completed by the Contractor in accordance with General and Technical Requirement and Project Documents.

8. Schedule of Works

Progress	2024								
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Internal Technical Analysis									
Vendor Visit									
PR Created									
Technical Clarification									
Bidding									
PO Released									
Kick of Meeting ➢Project Execution Plan ➢Inspection Test and Plan ➢Mobilization and Demobilization Plan ➢Etc.									
Project Execution									
Pre-Commissioning and Commissioning									
Project Handover (Include Document Package)									

9. Detailed Objective

9.1. Schedule objective

The Contractor shall complete the works within time frame.

9.2. Health, Safety, and Environment Objective

The Contractor shall at all time comply with Health, Safety and Environment regulations and HSE requirement with the objective as follows:

9.2.1. No minor personal injury

9.2.2. No major personal injury and fatality

9.2.3. No equipment damage accidents

9.2.4. No fire accident at maintenance site

9.2.5. No traffic accidents

9.2.6. No environmental events will occur

9.2.7. No violation of regulations

9.2.8. The site shall not be ordered to stop work due to OHSE violation by Contractor.

9.2.9. Pollutant discharge in accordance with Indonesian national environmental standards or local government environmental standards

9.2.10. No environmental pollution event occurs during project

Sign
Prepared by
Reviewed by

9.3. Project Quality Objectives

The Contractor shall perform the Works in accordance with requirement and Project Document. The Contractor shall achieve quality objective as follows:

9.3.1. The completion rate of projects reaches 100%;

9.3.2. The completion rate of project test plan reaches 100%;

9.3.3. The completion rate of unit defect elimination plan reaches 100%;

9.3.4. Project partial trial operation success rate reached 100%;

10. Owner's Responsibilities

Unless explicitly specified in this document or contract, the Owner shall have any other responsibility with regard to execution of the Work. The Owner shall be responsible for:

10.1. Providing technical drawings of existing building, existing electrical panel and existing equipment specifications that relevant to Solar PV Panel project.

10.2. Providing dormitory for Contractor's personnel but exclude food and drink water.

10.3. Providing electricity for project activities (just power resources).