Employer's Requirements

Training, Operation, and Maintenance

Project: Engineer, Procure and Construction of Hybrid PV-Diesel-Battery Energy Storage System

Location: Pulau Tiga, Maluku, Indonesia

1 Purpose

PLN will be responsible for ongoing Operations and Maintenance (O&M) of the plant after practical completion and for the project life (20 years). O&M will be carried out by locally based PLN staff with support from the UP3 Ambon unit that oversees electricity provision in this location. Moreover, PLN Maluku and Maluku Utara (MMU) regional office is currently considering the creation of a specialised renewable energy unit that might take responsibility over the O&M activities for this and other sites in Maluku.

The Contractor will be required to undertake necessary training and capacity building, to ensure that PLN local and Ambon staff have the necessary capabilities to carry out O&M tasks. It is important to note that, in order to satisfy this part of the specification, the Employer expects that training and capacity building will be an integrated process. It must involve engagement of all relevant stakeholders through the design and construction phases, and must demonstrate an approach that can deliver long-term sustainability of the system.

Training will be done for three groups:

- Basic maintenance activities, local monitoring, oversight of location, cleaning, and other tasks to be done in P. Tiga by PLN staff local operators on a regular basis. This will also include being able to understand the different alarms or other possible issues that could arise and notify UP3 PLN staff. Local staff should have an O&M plan with key tasks to be done daily, weekly, and/or monthly. Local staff should be trained in use of laptop, logging information in reports, tracking tasks, and local monitoring interphase. Local operators should be able to carry out basic troubleshooting of inverter.
- Local operators should be trained also in basic electrical repairs. As well, O&M and repairing of AC units is required and local operators should be able to assess AC units and carry out basic repairs.
- Specialised training for PLN staff from the UP3 Ambon unit (Engineers and Operators) that will be monitoring site remotely, but also will be in charge of doing regular visits to site for inspections, and in case major faults/issues occur. Person should be familiarised with manuals of the different components, troubleshooting inverter, and be able to generate monthly reports, identify any issues, and carry out repairs.

All training activities should have a **thorough health and safety component** for local and Ambon staff, including risks, tailgate, procedures, protection equipment, labelling, and any other health hazards and measure that should be taken during O&M activities.

2 Training

PLN MMU will nominate up to 6 staff as the local operations and maintenance crew. Where possible, these staff will have existing skills and experience relevant to the operation of the power supply systems. Where recognized qualifications are required to be held by these staff, the Employer will make arrangements to meet these requirements.

2.1 Training scope

The Contractor shall:

- Develop training plans, to be approved by the Employer, to ensure that the O&M staff can effectively operate and maintain the system.
- Provide all necessary training and support in accordance with manufacturer or equipment supplier requirements.
- Training should cover all specific components, PV modules, inverters, BESS, diesel genset, and others, and system as a whole.

The O&M staff training is proposed to be provided in three phases: prior to commissioning, during commissioning, and post commissioning prior to operational acceptance. All training for O&M personnel including system control shall be conducted on site. It shall include all aspects of operation and maintenance of all the equipment and systems installed. Remote monitoring trainings can be done in Ambon and should encompass potential real-life situations/alarms on site.

Bidders should also provide contact details and information of suppliers, manufacturers, and other companies that might require support along the project's lifetime. Training **MUST** be completed prior to commencement of pre-commissioning.

This training is to be provided in the form of technical workshops in a class-room setting at a venue on Pulau Tiga. The training is meant for local plant operators, maintenance personnel as well as involved PLN engineers/staff and any other personnel affiliated to the O&M of the hybrid power plant.

The basic principles of the hybrid power plant's design and operation are to be explained, as well as in-depth sessions on the detailed workings of all system components, including PV modules, power conditioning equipment, BESS, switchgear, diesel generator, monitoring and control system, etc.

Hands-on fault-finding and problem solving sessions are to be conducted, including step-by-step checklists. Routine weekly and monthly reporting requirements are to be explained and implemented.

2.2 Training during commissioning

This training will have to be conducted on-site at the hybrid power plant by the contractor's experts and will include:

- Observation and explanations to operators
- Operator check lists

- Hands on experience during commissioning
- Question & answer sessions

2.3 Post commissioning training

This training can be provided on site as well as in classroom settings and should include:

- Verification that operators are fully familiar with plant operations and routine on-site maintenance activities
- Verification that operators are fully familiar with all maintenance, repairs and servicing aspects of the entire hybrid power plant.
- Verification that operators are familiar with problem solving and fault-finding, as well as aware of the weekly and monthly reporting requirements.

2.4 Continued O&M support

The contactor will be expected to continue providing remote O&M support for a minimum duration of one (1) year after the commissioning date of the power plant and should be on-call to assist remotely via telephone, email and video conferencing with any critical and urgent issues concerning the O&M of the hybrid power plant during this period.

Provide a quote for a 5-year maintenance contract.

3 O&M Manuals and Labelling

3.1 Submission

The contractor shall provide:

- Full equipment Dossier (MDR), catalogs, parts and consumable lists shall be provided in hardcopy and soft copy.
- Full sets of O&M manuals on-site in physical and digital format. Two (2) hard copies and one (1) electronic copy on a USB flash drive or via cloud transmission.
- Full set of electrical, civil and mechanical drawings to be provided on-site in physical and digital format. Two (2) hard copies and one (1) electronic copy on a USB flash drive or via cloud transmission.
- All training materials and documentation should be provided in **Bahasa Indonesian**

Troubleshooting and fault rectification processes must be clearly laid out in system O&M manuals. Draft copies of the proposed O&M manuals shall be submitted in sufficient time for their approval and completion before practical completion (minimum 1 week before). Practical completion certificates will not be issued until the manuals are provided and completed.

A4 size, typed on durable printing paper, each page consecutively numbered, neatly bound in durable hard-backed vinyl covers permanently labelled.

3.2 Content

Provide the information necessary for the satisfactory long-term operation and regular maintenance of the installation, including:

- Comprehensive Table of Contents
- General Description of Project
- List of major equipment and their function including data sheets
- Balance of System materials listing
- Operating Instructions
- List and description of all programming variables, including the As-Commissioned values
- Programming instructions for all major components (where relevant) and copies of the most recent firmware versions
- Serial Numbers for all Equipment
- Maintenance Instructions
- Manufacturer's Literature
- Test Records and Commissioning Data
- Compliance Certification
- Warranty Terms and Claim Procedure
- As-Constructed Drawings.
- Index

3.3 Maintenance software/tools (Optional)

Bidders are invited to propose maintenance software or other tools that can facilitate maintenance activities, and that could be replicated/used in other sites as well. An automated Maintenance tools (CMMS, MEX etc) is highly recommended. This as an option to the above manuals and procedures.

3.4 Labelling

To facilitate smooth O&M of the power plant, the contractor is expected to provide complete and comprehensive labelling of all electrical components, wiring, and connections in both English and Bahasa Indonesian, for ready reference to system schematics and electrical drawings. All equipment, components within an enclosure Shall be labelled in accordance with the drawing, GA etc. Any enclosures outdoors shall have “Traffolyte” labels engraved, not with marker pens. All AC/DC services shall be segregated and Label “AC Cables” “DC systems “. All labels shall be permanent.

3.5 Spare Parts and Tools

The contractor shall provide:

- All tools or equipment necessary to operate and maintain the system. Tools are to be of a suitable quality for site conditions.
- Any customary and special tools, as well as auxiliary devices i.e. lifting devices, ropes, etc. necessary for assembly and disassembly of all parts.
- Special tools designed and supplied for the project, can be used by the Contractor during erection and handed over to the Employer in good working condition without any wear and tear.
- Sufficient stock of consumables, as well as minor parts, for a minimum of 2 years operation.

All the spare parts supplied shall be of same material / workmanship and interchangeable with the corresponding parts of the executed work, protected against corrosion and marked “Approved” with identification labels.

The following minimum number of spares shall be supplied by the contractor:

- PV modules – 5 pcs
- MC4 connectors – 10 pcs
- MCCB – 1 pcs
- MCB for PV and Battery Inverter – each 2 pcs
- PV and Battery fuse – each 4 pcs
- DC Surge Protective Device (SPD) type 1 – 1 pcs
- AC Surge Protective Device (SPD) type1– 1 pcs

The following minimum tools should be purchased for O&M activities:

- PV tester, e.g. Benning or Seaward
- Multi-meter
- Infrared thermometer

- Laptop
- Earth Tester

4 Community training

NZMATES community engagement staff will be carrying out training for community on energy use, efficiency, costs, and other general knowledge. Bidders are expected to carry out at least 3 training/information sessions aimed at the community on the work progress and feedback mechanisms. This complimentary to the feedback channels and regular communications with P. Tiga representatives.

1. Pre-works: introduction of company, project, people, provide contacts, work plan, and other key information of different stages, disturbances, risks, and any other relevant information for community members.
2. During works: progress on activities and any updates as work advances.
3. After completion: provide an overview of the system focused on the Do's and Don'ts near to the site for safety, and explain risks.