



## **Employer's Requirements**

## **Remediation and Decommissioning**

**Project:** Engineering, Procurement and Construction of Hybrid PV-Diesel-Battery Energy Storage System

**Location:** Pulau Tiga, Maluku, Indonesia

## 1 Intended Purpose

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Pulau Tiga has a non-operational hybrid solar-diesel power plant, which was installed in 2012 and provided 24-hour electricity for the community for almost five years. It stopped working in 2017 mainly due to premature failure of the batteries. The community now receives 12 hours electricity per day, from 6pm to 6am, from a diesel generator. Bidders are to provide electricity for 24 hours a day from the new system.

The contractors is required to:

- Repair or replace security fencing
- Refurbish the power station building
- Clear necessary land
- Repair or remediate the diesel generator housing
- Repair or remediate all walkways



**Figure 1: Existing un-operational solar-battery power plant PV arrays**

## 2 Specific Requirements

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### 2.1 Powerhouse Building

The Powerhouse remediation shall ensure that all equipment, sub-systems and the integration of the hybrid power plant as a whole achieves the required functionality and performance as specified. The Powerhouse Building will house new components related to:

- The BESS Room
  - A separate room containing the BESS batteries and maintained at in appropriate environmental conditions as outlined in Section 6 (unless a kiosk style BESS is used)
  - The BESS inverters must be installed in a separate room to the batteries if practicable with the suppliers selected.



*Figure 2: Existing Battery Room*

- Switchboards to feed the island's electrical distribution network
- A monitoring and control room or board adjacent to the inverters or switchgear.
- A new diesel generator.
- Storage for tools, PPE, and minor spares room
- Toilet
- Musholla
- Safety services including first aid kit, spill kits, PPE, etc. as required
- Fire detection systems, fire extinguishers and fire blankets as required
- PV inverters may be installed inside the Powerhouse (or on the external walls) at the Bidders discretion.

Annex F has a detailed current layout of the powerhouse. Bidders should decide on how to rearrange the space inside the powerhouse to optimise operations.

- The contractor is required to provide all materials and labour required to remediate and/or provision the power station with building services including:
  - Reduce size of battery room to lower the space kept in controlled environmental conditions (if required)
  - Provision/remediation of general lighting and power to the site and building internal as required (including spares).
  - Provision/remediation of internet to the site:
    - Bidders can be encouraged to offer smart and low-cost options, e.g. outdoor router board, see details in Section 7.
  - Repair or replacement of all doors and windows and inclusion of the ability to lock all windows and doors
  - Provision of HVAC as required by the BESS and as outlined in Section 6.
  - Building internal fit out requirements, including office furniture, file storage, spare parts storage, tool storage etc. as required
  - Reconditioning of the building including repairs to the structure as may be needed
  - Repainting of the building to create a refreshed environment
  - Remediation of all internal electrical install for lightning and sockets
  - Remediation/provision of access ways (footpaths, driveways)
- The BESS room (if required)
  - Should be designed and insulated in such a way that space is minimized to reduce the need for a HVAC unit. Windows should be closed and sealed to improve thermal efficiency
  - To reduce the HVAC load, bidders may reduce the size of the BESS room by installing a suitably insulated wall.
  - Must contain at least two fire extinguishers appropriate for the equipment installed. A fire detection system must be installed and fire detection should be reported via the monitoring system.
- The Equipment room
  - Does not need to include a HVAC system unless this is required for the installed
- The monitoring room will have a laptop which is configured to display all required monitoring information
- The storage area will have racks provided for storing tools, PPE and all equipment required as part of the O&M procedures for the site.
- The toilet will be repaired to a usable standard.

## 2.2 Diesel housing

The current diesel generator is located in an open shed outside the powerhouse. The diesel housing shall be integrated in PLTS power house that have connecting room. The existing diesel housing needs to be repaired, including roof, wall cracks, door, replace mesh wiring, and floor to be used as a storage facility.



**Figure 3: Existing diesel generator housing shed**

### 2.3 Fuel storage

Currently diesel fuel is stored in plastic containers near the beach landing to ease delivery of fuel to P. Tiga. The fuel is usually carried up manually by operator to site on a daily basis.

A new fuel storage facility is required that is outside the community and within the existing site facility. The new location should ease both the delivery of fuel and the transport to site. To bear in mind will be the limited amount of fuel to be used, hence storage facility should hold 500 liters at a minimum. The new fuel storage facility will be located near PLTD. Fuel Storage shall be permanent, as close to the Genset. Storage area shall be concreted & bunded, to contain oil-spill. Oil-spill kit shall be provided



**Figure 4: Existing fuel storage facility within community**

### 2.4 Fence

- The contractor is required to remediate the existing perimeter fence at the power plant to ensure its integrity and continued ability to provide security to the site and by preventing unauthorized access.
- The fence shall be at least 2.4m high.
- The contractor will be required to provide:
  - Details of planned remediation of the perimeter fence, including materials specification
  - Treatment of corrosion for new and refurbished to main structural elements
  - Remediation of any holes or gaps in the fencing
  - Remediation of any gates, ensuring gates are operable and able to be locked.

## 2.5 Walkways

- The contractor is required to repair all walkways within the compound to allow safe and easy transport of materials and staff around the site
- The design life of all upgraded and repaired walkways should be at least 10 years.

## 2.6 Waste management

- The dissembling, decommissioning, transportation, and delivery of these old assets has to be done in close coordination with PLN Maluku and Maluku Utara (PLN MMU) Office.
- Table XX shows a list of the different likely destinations of the main components as well as some of their key characteristics.
- The contractor will be required to provide a detailed decommissioning plan outlining recycling and disposal details, with the following information:
  - Identify which materials will be reused, which shall be recycled and which will be disposed of
  - Recycling facilities that will process recyclable materials
  - Disposal facilities that will be used for non-recyclable materials
  - Recycling and disposal methodology
  - Health and safety measures plan for each particular component
- The contractor will be required to provide proof that all materials were removed from Pulau Tiga and properly reused/recycled/disposed. This should include providing receipts, certificates and photographic evidence.
- Under no circumstance are hazard materials, specifically but not limited to batteries, to be gifted or sold to any individual, group, company or organization that is not specifically a battery recycling facility.
- Table 2 summarises recycling and disposal companies in Ambon that can provide details on costs, options, transportation,
- All Bidders are expected to follow good practices when managing waste. A plan covering the key aspects, risks, mitigations, safety measures, and actions to ensure waste is managed in an environmentally-friendly way.
- In Annex G NZMATES has developed a waste management and decommissioning plan specific for Maluku that provides further information for Bidders.

**Table 1: Components that require waste management**

Component	Quantity	Size (mm)	Weight (kg)	Destination
<b>PV modules</b>	396	1580x808x35	33,4/unit	Sirimau PLN Warehouse
<b>Inverters</b>	2	1900x1200x1050	800/unit	Extra all usable component for reuse Recycle Landfill
<b>Batteries</b>	120	470x206x166	37,5/unit	Recycle
<b>Combiner Box</b>	2	400x300x100		Extra all usable component for reuse Recycle Landfill
<b>String Box</b>	15	300x200x100		Extra all usable component for reuse Recycle

				Landfill
<b>Battery Protection box</b>	1	300x200x100		Extra all usable component for reuse Recycle Landfill
<b>Distribution panel</b>	1	1000x600x500		Extra all usable component for reuse Recycle Landfill Landfill

**Table 2: Waste management and recycling companies in Ambon**

<b>Company</b>	<b>Contact</b>	<b>Location</b>	<b>Services</b>
UD Berkah Ilahi	HP: 0823 9788 3050 (owner: Yanto)	Jalan Ahuru	Collector
UD. Nafisah	HP: 0821 9793 7704 owner: Hj Husen	Aster depan MCM dan cabang di Talake/Kota,	Collector
Multi Prima Usahatama, PT	<u>(021) 6007155</u>	Jl. Pangeran Jaya Karta 117 Blok B No. 24 Desa/Kelurahan Mangga Dua Selatan Kecamatan Sawah Besar Kabupaten/Kota Jakarta Pusat	Disposal Waste B3
PT. Andhika Makmur Persada	<u>(021) 46826016</u>	Jl. Inspeksi Cakung Drain No. 5 & 6 Cakung Barat, Jakarta Timur 13910	Disposal Waste B3



## 2.7 Material Requirements

- While choosing materials and their finishes, due regard shall be given to the humid, saline, tropical conditions under which equipment is to operate over the full 20 year system design life.
- Material specifications, including grade or class shall be shown on drawings submitted for approval.
- Given the expected environmental conditions at each site, exposed metal (steel) shall be minimised wherever possible. Where metal is exposed it shall have suitable material grade or protective coatings as appropriate.
- Selection of suitable building materials such as concrete, concrete block is required.
- Fresh water must be brought to site given the limited access in P. Tiga
- Materials and additional work should match the existing power station and fencing as closely as possible, deviations from existing materials shall be approved by the employer.

### 3 Scope of Works

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The scope of works shall include but not be limited to the following:

- Remediation of security fencing
- Remediation and refurbishment of power station building and diesel generator room. All materials and labour required to remediate the powerhouse structure including walls and roof to ensure integrity and water tightness of the structure.
- A structural assessment of the powerhouse in advance of construction
- Drawings showing planned remediation to powerhouse
- Clearing of land
- Remediation of walkways
- Decommissioning of all main components of the existing defunct solar-battery power plant, including PV modules, PV mounting structures, batteries, inverters, lightning arrester, cabling, and related equipment. This shall include:
  - Removal from site
  - Shipping from Pulau Tiga to Ambon to be recycled, stored in PLN's scrapyards in Sirimau, or disposed of in an environmentally sound way (where recycling is not possible).
  - The contractor will have to present a detailed plan to the Employer on how this shall be achieved.
- All equipment shall be installed and all work shall be carried out in accordance with relevant Indonesia government statutory requirements (including amendments) or equivalent. Where an applicable Indonesian standard is not available, applicable IEC international standards shall be referred to as best practice.
- Submission of a full set of architectural, structural and building services design drawings and associated design documentation for review and approval prior to any material procurement or commencing works on site.
- Training and capacity building for local staff for operation and maintenance of all new or refurbished structures of the power station, including land maintenance.