Section 6 Employer Requirements
Attachment D – Balance of Plant

1. Definitions

Unless explicitly stated in this document, or the Contract, definitions are as per the Standards.

2. Standards

All equipment shall be installed, and all work shall be carried out in accordance with statutory requirements. Where explicit local regulations are not applicable, all equipment and works supplied shall conform to the latest editions of the relevant international standards. The following order of precedence shall apply[1]:

- Australia/New Zealand Standards (AS/NZS)
- International Electrotechnical Commission (IEC) standards, and International Standards Organisation (ISO) standards
- ASTM International (ASTM) standards

Key standards applicable to the balance of plant are specified where relevant in this document.

In case the equipment or materials offered from a country where the relevant standards to which the equipment or materials offer better performance or safeguards for Solomon Power than the relevant standard required here, these are acceptable. The Contractor must substantiate any such claims by submitting an independent assessment by an appropriately qualified person that identifies differences in the standards and demonstrates the benefit for Solomon Power.

All referenced standards must be complied with unless an exception is granted by Solomon Power. If a Functional Requirement exceeds a standard listed, then that Functional Requirement shall be adhered to.

Standard(s) referred to shall mean the current Edition / Revision together with Amendments issued.

[1] If similar standards exist in different suites of standards, the lower priority standard need not be applied. Alternatively, the Contractor may seek Solomon Power's approval of application of the lower priority standard without application of the higher priority standard. Such approval shall not unreasonably be withheld.

3. Scope of work

The Contractor has single responsibility for delivery of all balance of plant required for the operation of the entire project facility, including but not limited to the solar PV, BESS and Substation facilities. This includes the design, documentation, certification, supply, delivery, installation, testing and commissioning of balance of plant works, meeting the functional requirements of this Specification.

The scope shall also include training and capacity building of local staff to operate and maintain the system as well as provide warranties for equipment and workmanship and performance guarantees and defects liability for the complete system.

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

- All weather access roads, hardstands and intersections.
- A ten (10) m clear asset protection zone shall be provided at the perimeter of the Facility.
- Overland and underground stormwater management, erosion and sediment control measures, where required.
- A building for storing spare parts and consumables and undertaking minor maintenance tasks (Ambu Hybrid and Henderson Solar PV only).
- All the tools required for ongoing operations and maintenance of the Facility.

4. Technical requirements

4.1 Civil works

4.1.1 Geotechnical investigation

The Contractor shall carry out geotechnical investigations of the site. The geotechnical information shall be sufficient to substantiate the suitability of the Contractor's design for the local conditions.

The geotechnical investigation shall establish all foundation, soil and material parameters relevant to the anticipated structures. In particular, a detailed investigation of the conditions for piling, including reactive soil conditions, and water table, is required. Laboratory analysis of soil samples is required.

For solar PV, a minimum of (1) one test pit and (2) two boreholes are required per 0.5 MWp installed capacity, distributed across the array area and PCU platform. For BESS, a minimum of (1) one test pit and (2) two boreholes is required.

The geotechnical investigation shall consider the following:

- subsurface conditions
- strength and foundations strata
- estimates of deformation and settlement
- soil reactivity and movement
- level, quality and quantity of ground water
- excavation conditions, ground support
- failure mechanisms that may be relevant, including landslide risk for the Ambu site.

Tests shall comply with relevant AS/NZS 1726.

The Contractor shall provide a geotechnical investigations report which incorporates both the factual and the interpretive data used in the design of the project site prior to construction for Solomon Power's information.

The geotechnical study shall be complemented with a hydrological study, especially for the Ambu site. The hydrological study shall address at least:

- Rainfall
- Surface Flows
- Long-term monthly average discharges
- Flood Analysis
- Ground water flows
- Behavior of Aquifers
- Water Stagnation

At the conclusion of the project, this shall be updated with any further site related findings during construction to provide a record of the geotechnical and hydrological nature of the sites in the future.

4.1.2 Clearing and grubbing

The Contractor is responsible for the preparation of the Site, including all clearing and grubbing. Where grubbing is the process of removing the stumps and associated root balls of trees and bushes and roots larger than 50mm in diameter and clearing to remove all vegetation to ground level and safe removal of vegetation to the nominated spoil stockpile locations, this shall also include loose material, rubbish and existing structures including fences, retaining walls, concrete slabs and small service pits. Clearing and stripping of vegetation shall be minimised to the extent practical and shall be approved by Solomon Power before being undertaken.

Any vegetation matter or appropriate topsoil cleared shall be retained onsite at the nominated spoil stockpile locations and, where practicable, mulched or otherwise and used to support ongoing erosion and sediment control measures or form part of the overall rehabilitation plan for the site.

Unless specified otherwise, grubbed holes (and any area requiring filling due to the removal of a structure) shall be backfilled with compacted site won material.

4.1.3 Earthworks

The Contractor is responsible for carrying out Earthworks to the design grades and levels required to construct the Facility. This includes, without limitation:

- Filling of voids, gullies, channels, etc., to achieve necessary levels for construction. Any filling shall include compaction in layers not exceeding 250 mm to at least 95% minimum dry density or as required by the design.
- Constructing drainage systems for stormwater management, taking into consideration any findings of the geotechnical study in relation to landslide risk on the Ambu site.
- Trenching and backfilling for underground services.
- Placement and compaction of fill as required.
- Miscellaneous earthworks including construction of mounds, earthworks associated with drainage works, special verge treatments, median and side drains (earth drains) and cut-off drains.
- Surplus material fills or stockpiles compacted to achieve a compaction standard equivalent to the surrounding materials.
- Searches for existing services shall be undertaken prior to the commencement of construction. Any existing services potentially affected by construction shall be identified and managed in accordance with the Project Approvals.

Earthworks will be designed as far as practical to avoid any cut and fill and, where necessary, to balance cut and fill across the Site. The Contractor is responsible for managing any excess or importing any deficit of fill.

Proof rolling is the process of identifying any unsuitable material by moving a heavy vehicle over the formation, subgrade or wearing surface and observing the resultant deformation. Material that is observed to move excessively under the loading of the machinery is deemed to be unsuitable material and shall require remedial works to reinstate.

Any earthworks shall be revegetated or otherwise subject to erosion control measures, particularly around piles and foundations.

4.1.4 Roads and hardstands

Permanent internal access road(s) shall be all weather access and provided access and cater for all construction, operations and maintenance activities for the nominated design life.

The Contractor is responsible for designing and constructing any off-site road upgrades or improvements necessary to enable the construction materials and equipment to be transported from their designated locations to the entrance of the Project Site.

Road requirements shall include intersections with existing roads and localised upgrades as required to connect to external roads and shall be compliant with:

- Comply with relevant Australia/New Zealand Standards (AS/NZS) and the local Authorities' standards.
- Allow full and safe access to the Works, including but not limited to the following considerations on the main road adjacent to the site:
    - Site distance for all vehicles for entry and exit to site.
    - Speed limit during construction.
    - Stacking distances.
    - Turning radius for entry and exit for construction vehicles.
    - Notifications and provisions for temporary road closures if required.
- Allow delivery and supply of all Plant, Materials and Equipment required for the Works.

Primary internal roads shall be of a minimum trafficable width of six (6) m, and secondary internal roads shall have a minimum trafficable width of four (4) m.

A trafficable, ten (10) m asset protection zone (APZ) must be established between the site boundary fence and the solar arrays.

Road design shall be integrated with stormwater management and drainage design to ensure that it is functional and that there is minimal damage to roads during the nominated design rainfall events and that the drainage transfer systems are sufficiently sized without erosional damage.

Compacted roads, platforms and hardstands top layers, including approved base course and subbase layers, shall be designed with the foundation's California Bearing Ratio (CBR) values to reflect long term subgrade moisture content and have appropriate crossfall to shed surface run-off.

The subgrade shall be prepared to produce a tight dense surface. Completed sections of subgrade shall be maintained in a well-drained condition. At the completion of the fill placement and prior to placing pavement, the Contractor shall arrange for an inspection of the subgrade for the purpose of verifying the strength of the subgrade. Any unsuitable material shall be removed and replaced prior to placing the pavement courses. Where the subgrade occurs in rock, the excavated surface shall be blinded with site won granular fill material and graded, shaped and compacted.

Roads and tracks shall be designed to minimise cut and fill and cross drainage requirements consistent with property boundaries, drainage paths and other site constraints.

Roads and tracks shall be designed to minimise impact on cultural heritage and clearance of native vegetation, any necessary impacts on cultural heritage or clearing of native vegetation shall be performed in accordance with the Project Documents.

The site won engineered fill material is to be used for roads, and hardstands shall be compacted to a minimum dry density ratio of at least 98% based on an approved international equivalent standard.

Hardstands arrangements shall be designed, constructed and maintained to be suitable for the installation, operation and maintenance of the Project Site. A permanent car parking hardstand suitable for light vehicles must be established adjacent to each solar farm inverter station or substation. The performance of each hardstand shall be verified with an appropriate test (such as a plate bearing test) prior to the erection of the equipment.

The construction compound shall house the temporary site offices, welfare facilities, storage/laydown area and all office, messing, toilet and washing accommodation required to execute the Works and shall be separately securely fenced.

The Contractor shall be responsible for the design, construction, removal and reinstatement of the civil works at the construction compound or compounds.

Appropriate road furniture such as signage, guideposts and guardrails shall be installed in accordance with the appropriate local road authority standards.

4.1.5 Stormwater management, drainage, erosion and sediment control

The Contractor shall prepare a site hydrological assessment as part of the drainage design and demonstrate that the drainage design is suitable for managing stormwater, including inflows, for the specified design AEP requirement.

A Drainage, Erosion and Sediment Control Plan shall be produced which addresses the following issues:

- Meet any requirements under the development consent.
- Maintain, to the extent practical, existing natural drainage patterns and flows.
- Minimise erosion and soil loss, particularly around piles.
- Protect key equipment and structures, including access road(s) and foundations.
- Avoid pooling of water in any locations on site.
- Ensure that the site does not substantially increase, concentrate, or otherwise significantly alter flows external to the site.

Drainage, erosion and sediment controls shall be installed to Best Practice Erosion and Sediment Control (IECA Australasia, 2008) or other local or international standard as applicable.

Drainage conduits to be used in the drainage system on the site shall be compliant with the local stormwater and drainage standards and the Drainage, Erosion and Sediment Control Plan with respect to material type and shall be installed safely and in accordance with the manufacturer’s recommendations using the correct bedding material and installation techniques.

The inlet and outlet areas shall be appropriately installed, protected and maintained to reduce the effects of erosion from the design flows encountered.

The Contractor shall be responsible for the installation and maintenance of the plan throughout the construction period.

4.2 Concrete works

The Contractor shall provide a detailed method statement for quality control and concrete batching and transport, which shall detail and maintain on-site storage of cement, aggregates and all other materials required for concrete production such that he concrete works shall comply with all Applicable Standards and Building Codes, such that:

- The design and construction of the concrete works must comply with the Project Approvals.
- Concrete works are in accordance with the design Drawings.
- Materials used in the concrete are compliant with the appropriate standards.
- Reinforcement shall be free from loose rust and any material that may impair the bond with the concrete.
- Welding of steel reinforcing materials shall be done in accordance with ISO 10721-2 and shall be of a quality suitable for structural purposes.
- Formwork shall be in good condition, capable of supporting all loads applied to it during construction, sufficiently rigid to prevent movement or deflection and provide a standard quality surface finish to the concrete.
- The concrete strength shall be defined by the characteristic compressive (cylinder) strength at age twenty-eight (28) days and shall be in accordance with the design requirements.
- Concrete shall be transported, placed, compacted and cured in accordance with applicable standards.
- Adequate precautions shall be implemented in finishing to prevent plastic shrinkage cracking.
- The Contractor shall provide and maintain a concrete batching plant(s) with all equipment, facilities, approvals and permits that are required for the associated batching plant(s).

4.3 Steel structures

BESS at Honiara may need to be installed on raised platforms to avoid inundation. Where steel structures are used for such purposes, these shall comply with the National Building Code, the Standards, and particular consideration shall be given to the ability to satisfy site corrosion requirements.

4.4 Buildings

A spare parts and maintenance building shall include:

- Shelving for all spare parts, tools and other materials necessary for the operations and maintenance of the site.
- A workbench, and LV power supply sufficient for minor maintenance tasks
- An operator console/workstation, including desk and chair, with access to the site HMI
- All relevant drawings, procedures, log books, operations and maintenance manuals and related documentation
- Indoor and outdoor lighting, security and all-weather access, day and night.
- All necessary mechanical (heating, ventilation and air conditioning), electrical (power, lighting, communications, internet and security), fire (detection), and civil (drainage, trenching, and structural) services.
- Shall be vermin proof, adequately insulated, and temperature controlled.

Any buildings shall comply with the National Building Code.

4.5 Tools and consumables

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

All tools supplied shall be of a high quality and fit for purpose and include:

- All accessories are required for the maintenance of the system.
- Any customary and special tools, as well as auxiliary devices.
- Special tools designed and supplied for the project can be used by the Contractor during erection and shall be maintained in good working condition and replaced periodically.

Supplied tools can be used by the Contractor during installation and commissioning, however, they must be handed over to Solomon Power in good working condition with minimal wear and tear.

5. Quality management

In addition to the overarching quality management requirements, the Contractor should show that:

- The work is complete and free of visible damages that might affect the safety of the component and the personnel or have environmental impacts.

- The component has been installed in accordance with the design, manufacturer instructions, and good industry practice.

- The work provides access to operations and maintenance as required.

Specific requirements for quality control of the Balance of Plant are addressed here.

- The performance of each hardstand shall be verified with an appropriate test (such as a plate bearing test) prior to the erection of the equipment.

- The roads shall be compacted to a minimum dry density ratio of at least 98%.

- The Contractor shall conduct a dilapidation survey of all external roads used to access the site (for transport of personnel and equipment) prior to commencement of work. The Contractor shall repeat the dilapidation survey at the completion of construction work. The Contractor shall remediate any damage to the roads that exceed normal wear and tear and are therefore attributable to the project.

- The Contractor shall also monitor the condition of external roads, identify any damage caused by vehicles used for the project, and remedy such damage in a timely manner.

6. Documentation

Documentation is to be submitted for the design, quality assurance and final construction of the balance of plant works.

Where noted, documents are to be provided in the local language as well as English and on a per-installation basis.

Typical deliverables are listed below. These are specific to the balance of the plant.

	Deliverable	**Typical revisions (IFU=issued for use; IFC=issued for construction)**	**Local language version**	**Per installation**
	Design			
1	Design drawing package to include, at a minimum:			

	Deliverable	**Typical revisions (IFU=issued for use; IFC=issued for construction)**	**Local language version**	**Per installation**
a	Basis of design report	30% / 80% / IFC		Yes
b	Site layout	30% / 80% / IFC		Yes
c	Sub-surface works layout	80% / IFC		Yes
d	Grading plan for any earthworks	30% / 80% / IFC		Yes
e	Site drainage plan, erosion and sediment control plan	80% / IFC		Yes
f	Detailed design and architectural drawings for buildings	30% / 80% / IFC		Yes
g	Civil Specifications documents, including detailed installation and materials compliance requirements	80% / IFC		Yes
3	Studies:			
a	Civil and structural engineering reports	80%		Yes
b	Hydrology study	80%		Yes
	Prior to site works			
1	ITP and ITC containing, as a minimum, the following information for each significant activity identified in the relevant process:	Draft / IFU		
a	Description of activity			
b	Specification requirements/reference			
c	Person responsible for activity (title)			

	Deliverable	**Typical revisions (IFU=issued for use; IFC=issued for construction)**	**Local language version**	**Per installation**
d	Hold Points and Witness Points			
e	Activity checklists			
f	Inspection and test type			
g	Tolerances or other acceptance criteria			
h	Identification of relevant procedure and quality records			
i	Test/inspection frequency			
j	Work item or work lot identification			
k	The Employer may request the Contractor to include additional Hold Points or Witness Points and the Contractor must make provision for the Contractor and the Employer to sign off at such points.			
2	Dilapidation survey	IFU		Yes
	During site works			
1	Completed ITCs and quality documentation	Final		Yes
	After completion of site works			
1	Dilapidation survey (external roads)	IFU		Yes