Section 6: Employer's Requirements

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1. Scope of Supply of Plant and Services

The scope of services requires the delivery of renewable-based power supply systems utilizing solar PV and battery storage on technically viable sites in the capital city of the Solomon Islands, Honiara, and Malaita Province, Auki outstation, and finally to selected schools that don't have access to the electricity grid.

They are categorized into five subprojects. The five sub-projects are listed below;

- Honiara Grid: Henderson Solar Farm 1.0 MW (Guadalcanal Province);
- Honiara Grid: Honiara Substation 4 MW/4 MWh BESS (Guadalcanal Province);
- Honiara Grid: Honiara East Substation 5 MW/20 MWh BESS (Guadalcanal Province);
- Auki Grid: Ambu Solar Hybrid Farm (1.5 MW solar PV, 1.0 MW/4 MWh BESS) (Malaita Province)
- Solar PV Schools Rooftop
    1. Su'u National Secondary School, (Malaita Province);
    2. Ruavatu Community High School, (Guadalcanal Province)

For Henderson Solar Farm, a solar PV capacity of 1,000 kWp is required to connect to the Honiara grid, supplementing an existing 1 MW solar system and 2MW Grid Connected soon to be constructed, which together adds up to 4 MW of system that will be integrated into the Honiara Grid.

While for Honiara Substation, a battery energy storage system (BESS) with a capacity of 4,000 kW and a rated energy capacity of 4,000 kWh is required to be interconnected to the Honiara Grid to provide spinning reserve and smoothing of variable renewable energy. An additional 5,000 kW / 20,000 kWh BESS is required to be interconnected to the Honiara Grid at the Honiara East substation.

In Malaita province, Auki grid, a solar-battery hybrid system is required at the "Ambu" site. This shall have a solar PV of at least 1,500 kWp, with BESS capacity of 1,000 kW and 4,000 kWh.

Finally, for two school buildings, a roof top 15kWp solar capacity is required, with a BESS capacity of 15 kW/26 kWh and internal wiring and fixtures.

Table 1 Summary description of scope of supply

No.	Name	Solar PV Capacity (kWp)	BESS Capacity (kW / kWh (BoL))	Province	Grid	Function
1	Henderson Solar Farm	1,000	-	Guadalcanal	Honiara	A 1 MW solar farm connected to the 11 kV distribution grid near Henderson Airport. Renewable energy produced will displace diesel generation.
2	Honiara Substation BESS	-	4,000 / 4,000	Guadalcanal	Honiara	A 4 MW/4 MWh BESS installed in the Honiara Substation and connected to the existing 11 kV bus. Provides spinning reserve reducing diesel

No.	Name	Solar PV Capacity (kWp)	BESS Capacity (kW / kWh (BoL))	Province	Grid	Function
						operation and improving efficiency in managing variable renewable energy.
3	Honiara East Substation BESS	-	5,000 / 20,000	Guadalcanal	Honiara	A 5 MW/20 MWh BESS installed in the Honiara Substation and connected to the existing 33 kV bus (Spare breaker available). Provides spinning reserve reducing diesel operation and improving efficiency in managing variable renewable energy.
4	Ambu Solar Hybrid Farm	1,500	1,000 / 4,000	Malaita	Auki	An integrated solar-BESS on a greenfield site at Auki, connected to existing 11 kV feeder. Dispatchable power supply displacing ~80% of diesel generation.
5	Solar PV Schools (2 of)	15	5 / 26	Guadalcanal and Malaita	Off-grid	An off-grid, integrated solar-BESS on a school building, meeting the educational and community needs for small scale power.

Table 2 Summary responsibility matrix (Y= contractor responsibility, N = Employer responsibility

No.	Name	Site fencing	Geotechnical, soil resistivity, underground services and contaminants survey	Unexploded Ordinance Survey	Vegetation clearing	Solar PV System	BESS (including 3 year OEM service package)	Substation (transformer and MV switchgear)	Overhead 11 kV transmission	Connect to existing grid	Communications, control and integration	Energy management system (EMS)[1]	LV Switchboard and building wiring and fixtures	Training and capacity building	2-year on-call support
1	Henderson Solar Farm	N	Y	Y	Y	Y	N	Y	N	Y	Y	N	N	Y	N
2	Honiara Substation BESS	N	Y	Y	N	N	Y	Y	N	Y	Y	Y	N	Y	Y
3	Honiara East Substation BESS	N	Y	Y	N	N	Y	Y	N	Y	Y	Y	N	Y	Y
4	Ambu Solar Hybrid	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y

5	Solar PV Schools (2 of)	N	N	N	N	Y	Y	N	N	N	N	Y	Y	Y	Y

Note: 1. The Scope of the EMS is detailed in Attachment B (BESS). For Ambu Solar Hybrid and the Solar Schools, the Contractor is fully responsible for the integration and dispatch of all systems through the EMS. For Honiara, the Contractor's scope is limited. Please refer to Attachment B (BESS) for details.

Without limitation, the contractor shall provide:

- All engineering and design (in accordance with best practice and as required for building permit and other permits)
- Logistics and planning for supply and installation, including compliance with gender, social and environmental safeguards requirements,
- Procurement / manufacture of all equipment
- Factory acceptance testing
- All site preparation necessary for installation in accordance with the requirements of the Initial Environmental Evaluation (IEE)
- Delivery and installation, including material inspection and pre-commissioning tests
- Commissioning, including functional performance testing
- detailed documentation, including asset register, operations and maintenance manuals
- comprehensive training and capacity building, including mandatory induction and refresher training on SEAH for all contractor's personnel
- project, social and environmental monitoring and reporting

Site signage as agreed with the Employer, including information on SEAH reporting details
The contractor is solely responsible for delivering fully functional, operational systems that meet the requirements of this specification, in compliance with local regulations and the Contract terms and conditions.

Limited support will be provided by the Employer, in the areas set out in Section 9.

Consents, licenses and permits are required, and shall be obtained by the responsible party, as defined in the following table:

Table 3 Consents, licenses and permits

Consent, license or permit type	Contractor	Employer
Development permit	-	R
Work permits	R	S
Construction permit	R	S
Land ownership	-	R
Connection application	R	-
Electrical Safety certificate	R	-
	R = responsible S = support	

2. Specifications (including Project Signage Requirements)

Notes

To ensure that project information is visible to the public during the execution of works under the project and that there is a precise acknowledgment of the funding source, Employer's team preparing the project signage requirements at site should ensure to follow Country's regulations on the display of project signage at site, where available. These requirements will be reviewed and may be adjusted based on due diligence conducted during project processing, including when projects are co-financed among others.

If the applicable Law does not have such regulations, ADB requirements shall be followed. Employer should seek Project Manager support in defining site-specific requirements such as visibility and use of materials etc. It is the responsibility of the Contractor to comply with these requirements and the Project Manager shall ensure its compliance during contract execution and include information in progress reports.

Below is a sample text provided for guidance and may be modified as per the project specific requirements.

1. The Contractor is responsible for the design, supply and installation of the project information signage. The signage shall provide relevant information to the public about the project, including the proper designation of the project, the Employer, the Contractor and the Bank.

2. For this purpose, one or several sign boards shall be installed at the Site as soon as practicable after the Commencement Date and shall remain in place at all times until Completion of the Facilities. If sign board(s) is(are) damaged or becomes unreadable during this period, it shall be promptly replaced by the Contractor at the Contractor's cost.

3. The sign board design shall be submitted by the Contractor to the Project Manager for approval in accordance with Sub-Clause 20.3 [*Approval/Review of Technical Documents by Project Manager*]. Unless otherwise required under the applicable Laws, the sign board design should comply with the following:

   a) General

      · The number and locations of sign board(s)

   b) Content

      · Country's flag/logo

      · Project and Contract title

      · Accepted Contract Amount

      · Time for Completion

      · Bank's name and logo (in accordance with Branding Tool Kit – Visual Identity guidelines of the Asian Development Bank and, as the case may be, the other financiers' requirements)

      · Employer's name

      · Contractor's name

- Project Manager's name
- Complaint handling contact information (email and/ or phone number)

c) Design

- The General layout including sample colors: to be proposed by the Contractor
- Dimensions: minimum of 2.5 Meters X 2.5 Meters
- Font size and type: they should be such as to ensure that the content shall be visible from a distance.
- Language of the signage: national and/or local language and English
- Material: the sign board(s) shall be made of a material that shall be weatherproof and appropriate to withstand the whole execution period until taking-over of the Works

4. No other signage is allowed except with the approval of the Project Manager. The Contractor shall not post, nor display any sign or item that could provide misleading information about the project. No national symbols or flags other than those of the Country may be displayed without the express approval of the Project Manager.

Detailed technical specifications are included in the following attachments to these Employer Requirements:

Table 4 Detailed technical specification attachments

Reference	Name	Description
A	General and Electrical	Includes a range of requirements for design, studies, project management, electrical equipment and testing that are generally applicable
B	Battery Energy Storage Systems	Detailed specifications and standards specific to BESS
C	Solar PV	Detailed specifications and standards specific to Solar PV installations
D	Control and communications	Detailed specifications of the communications and control requirements for all installations
E	Balance of plant	Specifications applicable to the balance of the plant, including general civil and structural aspects of all installations.
F	Initial Environmental Examination	Requirements for the project, including the Contractor's requirements. Includes Environmental Management Plan.
G	Gender Assessment and Action Plan	Requirements for the project, including Contractor's requirements, relating to

Reference	Name	Description
		gender, and prevention and mitigation risks and response to SEAH
H	Contract Management Plan Template	Required template for the Contractor to prepare for managing overarching project management requirements, roles and responsibilities.

2.1 Site locations

Site locations are shown in the following table. Perimeter maps are included in the Drawings.

Table 5 Site locations

No.	Name	Location	
		Latitude	Longitude
1	Henderson Solar Farm	-9.435412°	160.055037°
2	Honiara Substation BESS	-9.433047°	159.954071°
3	Honiara East Substation BESS	-9.424596°	160.053089°
4	Ambu Solar Hybrid Farm	-8.776086°	160.712124°
5	Solar PV Schools (2 of) Su'u National School (Malaita) Rauvatu Community School (Guadacanal)	 -9.166510° -9.448492°	 160.925029° 160.390274°

2.2 System Parameters

The main technical parameters of each installation are shown in the following tables.

Table 6 Henderson Solar Farm's main technical parameters (Guadalcanal)

Parameter	Unit	Value
Minimum DC rated capacity	MWp	1.0
Minimum AC rated capacity	MWac	0.8
Power factor capability	-	0.8 (rating of inverters and transformers must be at least 1 MVA)
Module type	-	Monocrystalline bifacial
Module efficiency	%	>21,5
Mounting	-	2P North facing fixed tilt at 10º
Inverter	-	String
Transformer	-	Outdoor
Point of connection	-	Overhead 11 kV distribution cable adjacent to the site as per connection diagram
Other		

Parameter	Unit	Value
Access road	m	200
Overhead 11 kV transmission to point of connection	m	10 (from site boundary)
Land size	ha	1.0

Table 7 Honiara Substation BESS main technical parameters (Guadalcanal)

Parameter	Unit	Value
Minimum DC capacity	MW	4.0
Minimum DC usable energy storage at the **beginning of life (BOL)**	MWh	4.0
Minimum AC capacity	MW	4.0
Power factor capability	-	0.8 (rating of inverters and transformers must be at least 5 MVA)
Battery type	-	LiFePO4
Inverter	-	Central grid forming
Transformer	-	Outdoor
Point of connection	-	11kV bus at Honiara substation The contractor will need to extend the bus and install an additional circuit breaker

Table 8 Honiara East Substation BESS main technical parameters (Guadalcanal)

Parameter	Unit	Value
Minimum DC capacity	MW	5.0
Minimum DC usable energy storage **for entire operating life**[1]	MWh	20.0
Minimum AC capacity	MW	5.0
Power factor capability	-	0.8 (rating of inverters and transformers must be at least 6.25 MVA)
Battery type	-	LiFePO4
Inverter	-	Central grid forming

[1] For clarity, BESS will be expected to have end of life usable energy storage of 20MWh, when subject to average daily cycling of 20MWh each day for its operational life.

Parameter	Unit	Value
Transformer	-	Outdoor
Point of connection	-	33kV bus at Honiara East substation The Contractor will need to extend the bus and install an additional circuit breaker
BESS Enclosure	Structure	Separate enclosure that has adequate fire separation from existing buildings,fire resistive construction, and fire suppression as per the National Building Code and referenced standards. A minimum separation distance between the BESS and any building shall be as per the BESS manufacturer's specifications, the owner's insurance provider, or building code but shall not be less than 6m.

Table 9 Ambu Hybrid plant main technical parameters (Malaita)

Parameter	Unit	Value
Solar PV		
Minimum DC rated capacity	MWp	1.5
Minimum AC rated capacity	MWac	1.2
Power factor capability	-	0.8 (rating of inverters and transformers must be at least 1.2 MVA)
Module type	-	Monocrystalline bifacial
Module efficiency	%	>21,5
Mounting	-	2P North facing fixed tilt at 10º
Inverter	-	String
Transformer	-	Outdoor oil
BESS		
Minimum DC capacity	MW	1.0
Minimum DC usable energy storage at the **beginning of life (BOL)**	MWh	4.0
Minimum AC capacity	MW	1.0
Power factor capability	-	0.8 (rating of inverters and transformers must be at least 1.25 MVA)
Battery type	-	LiFePO4
Inverter	-	Central, grid forming

Parameter	Unit	Value
Transformer	-	Outdoor, oil type, 2.5 MVA, 0.8 PF, 11/0.415 kV, 50HZ
BESS Enclosure	Structure	Separate enclosure that has adequate fire separation from existing buildings,fire resistive construction, and fire suppression as per the National Building Code and referenced standards. A minimum separation distance between the BESS and any building shall be as per the BESS manufacturer's specifications, the owner's insurance provider, or building code but shall not be less than 6m.
Substation		
Switchgear	-	4-Way RMU including spare for future solar expansion
Point of connection	-	Overhead 11kV distribution cable adjacent to the site as per connection diagram.
Other		
Access road	m	200
Overhead 11 kV transmission to point of connection	m	1,200 (from site boundary)
Land size	ha	4.0
Access land	ha	0.16

Table 10 Solar Schools main technical parameters (Malaita and Guadalcanal)

Parameter	Unit	Value
Solar PV		
Minimum DC rated capacity	kWp	15
Minimum DC rated capacity	kWac	12
Module type	-	Monocrystalline monofacial
Module efficiency	%	>21,5
Mounting	-	Rooftop (Steel roof)
BESS		
Minimum DC capacity	kW	6
Minimum DC usable energy storage at the	MWh	26

Parameter	Unit	Value
beginning of life (BOL)		
Minimum AC capacity	MW	6
Battery type	-	LiFePO4
Inverter	-	Grid forming / standalone
BESS Enclosure	Structure	Separate enclosure that has adequate fire separation from existing buildings,fire resistive construction, and fire suppression as per the National Building Code and referenced standards. A minimum separation distance between the BESS and any building shall be as per the BESS manufacturer's specifications, the owner's insurance provider, or building code but shall not be less than 6m.
Other		
LV switchboard	-	1
LV distribution board	-	1
RCDs, cables, enclosures, metering etc.	-	1 set
GPOs	-	15
LED indoor lighting	Rooms	5
LED outdoor lighting	-	5
Existing Building Interventions	Building	Contractor shall perform structural and fire assessment and selection of building to install roof PV panels. Structural strengthening of roof and structure as required as well as upgrading any electrical wiring and fire requirements as per the National Building Code and referenced standards.

2.3 Site Conditions and Loading

A summary of Site Conditions applicable to all sites is shown in the following table. All parameters shall be reviewed and confirmed by the designer for each site. The installations, equipment, cabling shall be designed and constructed to be suitable for continuous unimpeded and immediately operational for its Design Life.

Table 11 Site conditions

Ref	Description	Value
1	Maximum temperature (°C)	50 °C estimated
2	Minimum temperature (°C)	5 °C estimated
3	Permanent Action	AS/NZS 1170.1 Self-weight. For existing roofs the minimum load shall be 0.15kPa.
4	Imposed Action	AS/NZS 1170.1
5	Wind Action	AS/NZS 1170.2. Use the greater regional wind speed of 69 m/s and Cyclonic Wind Region D (for Importance Level 4) / Cyclonic Wind Region C (for Importance Level 3). Use Climate Change Multiplier as per AS/NZS 1170.2 Equipment shall be certified by the manufacturer for this wind speed.
6	Earthquake Action	NZS 1170.5. Hazard Factor Z=1.0. Minimum Hazard Factor shall not be less than 0.35. The ZRu shall not exceed 1.5. Equipment shall be certified by the manufacturer for this earthquake action. Shake table testing certificates shall be provided.
7	Flood Action / Tsunami	Flood: See below. Tsunami: Site specific study and use of AS/NZS 1170 and ASCE 7
8	Volcanic Ashfall	Consultant site specific assessment to be performed related to determine loading, corrosivity, electrical interference/resilience, and protection/maintenance. Site, structures, and equipment shall be designed and specified accordingly.
9	Mean Annual Rainfall (mm)	3000-5000 estimated.

		Consultant to perform site specific assessment to determine intensity, duration, frequency for the appropriate design event. Site, structures, and equipment shall be designed and specified accordingly. Equipment and associated connections shall have appropriate IP / water penetration resistance.
10	Altitude	5-200 m above sea level
11	Environment conditions	– Outdoor site – Humidity levels up to 95% – Isokeraunic level – AS/NZS 1768 – – Corrosivity - ISO 9223 category C5 very high(Minimum or better) – Pollution level for insulation – medium – UV resistance - very High (AS/NZS 5033)
12	Other	– Presence of vermin, including but not limited to deer, termites, rabbits, snakes, rats, mice and other burrowing animals. Buildings and structures and the walls enclosing rooms and spaces shall be constructed to protect against the entrance and residency of rodents. Fences shall be designed to be resistant to damage by pigs. All materials and finishes shall be specified or treated as required for mold/mildew and termites. Ground treatment as required.

2.4 Operating Life

The Operating Life is the period for which the installations must perform to specification.

The Operating Life is 15 years for BESS and 25 years for solar PV.

2.5 Design life

Allowing for routine maintenance or specified consumables, all components, products, systems, constructions, and any other elements comprising the Facilities shall be designed to perform within their specifications without major refurbishment for the minimum Design life list, which is:

Table 12 Design life

Equipment type	**Design life (min)**
All equipment (excluding inverters, computers, servers and batteries)	30 years
Inverters	25 years
PV Inverter	10 years
Batteries used as the main storage element of the BESS	15 years
Computers, servers, and other batteries	10 years
Structure/Anchorage type	**Design life (min)***
PV Rack support frames/structures	30 years
PV Rack foundations (and anchorage of racks to foundations)**	50 years
Buildings and Facilities, BESS Enclosures**	50 years
Existing Roofs supporting PV panels and associated anchorages***	50 years
Fencing	30 years

*The design life for structures, building elements, and their anchorages shall be used with the National Building Code and AS/NZS 1170 standards to determine loads and other requirements. These design lifes assume normal maintenance.

**These structures/buildings/elements are intended to have a 50 year design life to ensure that these high initial investments survive hazard events and can be reused if the PV and PV Rack systems are destroyed or require replacement.

***The design life for existing roofs can be less if it can be shown that the remaining design life of the school is less.

2.6 Warranties

Equipment must include the following Supplier warranties.

Table 13 Warranties

Component Part	Warranty
PV Modules	10 years limited product warranty and 25 years limited power warranty guaranteeing that the power degradation shall not exceed 2% within the first year of use and thereafter 0.5% p.a. for 24 years For bifacial modules, the warranty must warrant a constant power bifaciality factor of the module for the above period. Module warranty must include a serial defects clause. Remedy for defects is limited to replacement or repair.
PV Module Support Structure	10 years product warranty
Battery racks and modules	10 years product warranty 15 years capacity warranty guaranteeing that rated power capacity of the BESS is maintained subject to annual average cycling of the BESS not exceeding 1 cycle per day.
DC Cables	10 years product warranty
Inverter	5 years product warranty
All other parts or work	Supplier's standard warranty term (minimum of 1 Year)

The Company must make provision for the take-over of all warranties by the Employer following completion.

2.7 Structural Importance Level / Risk level

Structures must be designed to the following structural importance levels (for wind, flood, and earthquake loads). All power generating facilities and associated equipment shall be immediately operational following any event during their design life with nominal maintenance.

Table 14 Structural Importance Level

Structure/Equipment type	Importance level (AS1170)
Solar mounting/racks/foundations	Level 3 or 4*
Structures supporting or interfacing to electrical equipment, such as the PCU, and control buildings	Level 3 or 4*
BESS enclosures	Level 4**
Minor structures such as fences and gates that do not interface with any equipment	Level 1
Existing School Building Roof	Level 3 or 4***
Other Buildings / Facilities	Level 3 unless noted otherwise

*Per the Draft National Building Code of the Solomon Islands "Power Generating facilities..and other public utilities not designated as post-disaster" shall be considered Level 3. If the power generating facility is designated as essential or has a post-disaster function, or supplies electricity to buildings that are importance level 4, then they shall be designed for Importance Level 4. The Client will confirm the Level with the consultant, but the Level shall not be less than Level 3.
**BESS enclosures shall be Level 4 as these buildings are hazardous due to the quantity of hazardous (toxic and flammable) materials and the potential of causing hazardous conditions that may extend beyond the property boundary.
***Existing school buildings shall be assessed and strengthened as required for all new loads/mass imposed by the PV panels and to accommodate all required anchorage of the PV panels to the roof. School buildings are considered Level 3, unless they are used for emergency evacuation and/or sheltering and thus shall be considered Level 4.

2.8 Drainage and Equipment Inundation

The Works shall be designed with drainage and foundations to avoid inundation, in accordance with the following requirements and events:

The designer shall prepare a site-specific flood / hydrological study for each site supplemented by historical records and accounts to determine the Defined Flood Level (DFL) for the defined flood event (DFE).

The site and around buildings must have suitable drainage so that no ponding results. Visible water must not be allowed to remain under or around for more than 1 hour after 10 minutes of maximum rainfall resulting from a storm with a return period of 5 years. Flood waters or waves resulting from a storm or cyclone with a return period of 30 years must not be allowed to enter a building nor impact electrical or mechanical equipment and associate cabling.

Exception: Mechanical and electrical systems, equipment and appliances are permitted to be located below the defined floor event elevation provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stress, including the effects of buoyancy, during the occurrence of flooding up to such elevation.

Fences and other flood protection measures shall be designed to prevent flood borne debris from entering the site and/or slow flood water velocity in order to minimize the damage to equipment and supporting structures. Access roads and hardstand areas can serve as flood protection measures.

The foundations shall be designed to account for any scour and undermining.

All equipment and associated connections shall have certificates stating their IP and resistance level to

flooding/water.

Table 15 Design Flood

Project infrastructure	Design Flood event (APE = average probability of exceedance)*
Access roads and hardstand areas – operable	10% APE
Access roads and hardstand areas – survive	2% APE
Access roads and hardstand areas - Elevation	Elevate access roads above the 500 year flood event*
Electrical Equipment including PV Modules, combiner boxes, meteorological stations	**Importance Level 3:** *Elevation***:* 500mm freeboard above 100 year flood event (1% APE**). Minimum 1m. *Structural:* 100 year flood event (1% APE**). **Importance Level 4:** *Elevation***:* The greater of 500mm freeboard above 100 year flood event (1% APE**) and 500 year flood event (0.2% APE**). Minimum 1m. *Structural:* 100 year flood event (1% APE**).
Buildings, delivery station, electrical enclosures including PCUs and BESS modules	**Importance Level 3:** *Elevation***:* 500mm freeboard above 100 year flood event (1% APE**). Minimum 1m. *Structural:* 100 year flood event (1% APE**). **Importance Level 4:** *Elevation***:* The greater of 500mm freeboard above 100 year flood event (1% APE**) and 500 year flood event (0.2% APE**). Minimum 1m. *Structural:* 100 year flood event (1% APE**).

*Rainfall and Sea Level Rise shall be based on a climate change IPCC scenario SSP2 – 4.5 for the design life.
** Including wave height and sea level rise. Flood elevation, velocity, and wave height if applicable shall be determined. Site specific studies should be performed that also include analysis of historical flood events with projections that include climate change.
***Elevation shall be from the measured from the bottom of lowest supporting horizontal structural member and the lowest part of cable, connection, panel, or equipment to the ground. When there is no underside, the elevation represents the top of the floor level.

Standards used for flood design shall include but not be limited to the latest edition of National Building Code, AS/NZS 1170, ASCE 7 with Supplement 2, and ASCE 24.

2.9 Architectural , Corrosion, Mold/Mildew, UV Resistance, Reflectivity, Fire

Structural / Architectural
All structures shall be designed to ensure they are culturally appropriate and fit within their surroundings. Traditional features, colors, and finishes shall be provided where possible. All paint finishes shall be graffiti resistant.

The Contractor must complete necessary studies to demonstrate that the proposed design satisfies the design life under the expected environmental conditions. Materials, manufacturing and construction techniques must be selected to minimise corrosion risk to the plant operation.

Anchor bolts shall be stainless or galvanized. Concrete reinforcing steel shall be provided the appropriate cover and concrete mix design/strength as per the National Building Code and AS/NZS standards.

Electrical
All electrical conduit and junction boxes shall be non-metallic. All electrical enclosures whether interior or exterior shall be corrosion, waterproof, and UV resistant using either coated aluminium or plastic. All cables shall be buried.

Mechanical Equipment and Air Conditioners
Mechanical Equipment and HVAC units used shall have coated coils and fan blades using an epoxy coating system approved by the Authority having jurisdiction prior to placing in operation and during routine maintenance.All exteriorly located mechanical equipment, pumps, and pipes shall be appropriately located, protected, and/or have the appropriate material specifications for its design life considering its environmental exposure and corrosivity.

Reflectivity
All surfaces of panels, equipment, structures, and finishes shall be low reflectivity through coatings, finish, and paint systems.

Windows & Finishes
All metallic window frames and components shall be anodized aluminium. Connections shall be corrosion resistant. All interior and exterior surfaces shall be painted with a mould-mildew, and UV resistant paint system that has low toxicity and low volatile organic compounds in compliance with national environmental legislation.

UV Resistance
All plastics shall be UV resistant (cables, conduits, clips, etc…). Refer to AS/NZS 5033 and IEC 61386-1.

Fire
Solar PV systems shall not contain foam plastic such as extruded foam polystyrene. All PV panels, BESS, and cabling shall satisfy the requirements of the Fire Sections of the Building Code. Separation distance, fire resistivity, fire prevention, and fire suppression shall be provided as per the codes, standards, manufacturer requirements and best practice. All vegetation within a site shall be irrigated, maintained, and/or or fire resistive. The site perimeter and placement of equipment shall prevent fire from entering or exiting the site or starting a fire on neighboring sites.

2.10 Project Design and Engineering Report

Within 30 days of Letter of Acceptance (as defined in clause 44 of Section 2 ITB), the Contractor shall forward to the Employer, in soft copies, a report including all design, engineering, equipment with the technical specifications to be used and works to be undertaken. Thus report will serve as the basis of the detailed Engineering to be submitted and shall be supplemented with i) technical drawings, ii) single line diagrams, iii) PVsyst reports or other technical reports and iv) inspection requirements.

2.11 Standards

This project shall be designed and constructed to meet or exceed the requirements of national and local laws, regulations, policies, codes, standards, and guides of the Solomon Islands; and shall comply with Asian Development Bank policies, regulations, and guidelines. Design briefs shall be prepared for all disciplines.

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

- Australian / New Zealand Standards
- International Electrotechnical Commission (IEC) standards, and International Standards Organisation (ISO) standards
- Institute of Electrical and Electronics Engineers (IEEE) standards
- Underwriters Laboratories (UL) standards

The Facility must comply with the Standards specified in the Attachments, where key standards are as relevant to each part of the Facility.

Building Construction Design Standards
All buildings, facilities and structures shall be designed and constructed to meet or exceed the requirements of national and local laws, regulations, policies, codes, standards, and guides of the Solomon Islands; and shall comply with Asian Development Bank policies, regulations, and guidelines. When specific technical requirements are not addressed by national documents, the use of Australian/New Zealand and/or Internationally Accepted regulations, standards, and guidelines shall be used.

The Consultant shall prepare a design brief & features report that clearly specifies, but is not limited to, the scope, objectives, legal/regulatory environment, technical standards used, alternative standards used, hazard parameters used, design parameters, description of architectural/structural/Building Services/Civil systems and equipment, and key decisions/outcomes used for design. The design brief and features report shall utilize this bid document and other supporting documentation as a basis.

The latest edition of the following standards, codes, and guidelines shall be used as the basis for design and construction:

1. National Building Code of The Solomon Islands (NBC), 1990
2. Draft National Building Code of The Solomon Islands (NBC), 2024
3. The latest edition of Standards published by Standards Australia and Standards New Zealand; noting that the latest edition of the AS/NZS standards shall replace those listed in the NBC
4. AS/NZS 1170 series, AS/NZS 2312, AS/NZS 5033, NZS 4777, and AS 3000

Where the fore-mentioned standards, codes, and guidelines do not address a specific topic fully or adequately, the latest edition of the codes, standards, and guidelines shall be consulted and adapted for the Solomon Islands context, but shall not be limited, to the following, in no particular order:

1. Building Code of New Zealand, latest edition
2. National Construction Code of Australia, latest edition
3. Queensland Development Code, latest edition
4. FM Global property loss prevention data sheets (www.fmglobaldatasheets.com), including including Data Sheet 7-106 Ground-Mounted Solar Photovoltaic Power
5. 2024 International Building Code
6. 2024 International Fire Code
7. NFPA 70 National Electrical Code (NEC)
8. 2021 International Solar Energy Provisions
9. ASCE 7
10. ASCE 24
11. SEAOC Structural Seismic Requirements and Commentary for Rooftop Solar Photovoltaic Arrays, Wind Design for Solar Arrays Gravity Design Loads for Rooftop Solar Photovoltaic Arrays
12. Guidance for Managing Sea Level Rise Infrastructure Risk in Pacific Island Countries, PRIF 2022
13. California Division of the State Architect (https://www.dgs.ca.gov/dsa/publications#special_construction)
14. Benchmarking Infrastructure Maintenance in Pacific Island Countries - 2021 Baseline Assessment, PRIF 202
15. Other resources listed in "PRIF Building Code Bibliography" (https://www.theprif.org/online-repository-building-codes)
16. Pacific Center for Renewable Energy and Energy Efficiency (https://pcreee.org/list/publications)
17. Energy Efficiency Guidelines for Commercial & Public Buildings in the Pacific: Promoting Energy Efficiency in the Pacific (Phase 2), 2015 (https://pcreee.org/publication/energy-efficiency-guidelines-commercial-public- buildings-pacific-promoting-energy)
18. The Sustainable Energy Industry Association of the Pacific Islands (SEIAPI) (https://www.seiapi.com/guidelines/)

2.12 Completion process

Completion will be undertaken on a per-subproject basis. The general conditions of the contract and special conditions of the contract define the completion process and requirements, including pre-commissioning and commissioning. This section provides further description of this process and defines the specific tests that are required, at a minimum, during this process.

2.13 Acceptance and Commissioning Tests of PV Plants

Acceptance and commissioning tests shall be carried out in accordance with GCC 25 and as specified below. The following tests are specified:

1. Factory Acceptance test – at the Manufacturing Facility
2. Site acceptance tests – upon arrival at the site
3. Instrumentation Tests – when installed
4. SCADA Tests – when installed and when the plant is operating
5. Mechanical tests – after installation
6. Functional tests – after installation
7. Performance tests – after installation

Table - Acceptance and commissioning tests required for each component

Components	Acceptance tests at site	Mechanical tests	Functional tests	Performance tests
PV systems			✔	✔
PV modules	✔	✔	✔	
Mounting structures	✔	✔		
Floating systems	✔	✔		
Inverters	✔	✔	✔	
DC and AC cables	✔	✔	✔	
Junction boxes	✔	✔	✔	

2.13.1 Factory Acceptance Tests

The test specification for a factory acceptance test (FAT) shall include a program for the tests and detail the following:

1. Requirement to be tested;
2. Step-by step method of testing;
3. Expected results of tests.

Approval of the test specification/procedure will not prejudice the Employer's right to order additional tests, should the Employer deem, following approval but before his acceptance of the material, equipment, software or system(s) for shipment, that certain conditions or combination of conditions were not foreseen in the test specification, in order to demonstrate that performance requirement of this Specification has been met.

Tests shall only be conducted with the aid and in accordance with test specification(s) and standards clearly identified as approved for use by the Employer, and, where applicable, employ test instruments of suitable quality calibrated to the manufacturer's recommendations by a reputable agency within the previous six (6) months.

In addition to the specifications already provided for the Floating PV plant:

1. The test specification shall be supplied with the test results, and it shall:
    1. indicate the model
    2. indicate the time of the tests
    3. indicate the standards followed
    4. cover a substantial percentage of the supported features of the equipment
    5. indicate who carried it out
    6. If done by a third party, all the above requirements shall apply.
2. Factory acceptance tests shall be carried out by the manufacturer in accordance with the requirements of IEEE 1547, where applicable, including:
    1. Response to abnormal voltage test
    2. Response to abnormal frequency test
    3. Synchronization test

Sub-clause 2.13.2.

N/A

2.13.3 Site Acceptance Tests

The following tests will be carried out pursuant to GCC Clause 25.

The PV modules shall be prior to installation and upon arrival at the site of the project:

1. Inspected visually for defects.
2. The flash tests of all the modules shall be verified.

The inverters shall be prior to installation and upon arrival at the site of the project:

3. Inspected visually for defects.

The mounting structures shall be prior to installation and upon arrival at the site of the project:

4. Inspected visually for defects.

The coating must be visually verified and inspected.
Batteries shall be prior to installation and upon arrival at the site of the project:

5. Inspected visually for defects.
6. SOH tests must be verified.

DC and AC Cables, junction boxes and other electrical components s switching gears and transformers shall be prior to installation at the site of the project:

7. Inspected visually for defects.

The monitoring equipment shall be upon delivery at the site of the project:

8. Inspected visually for defects.

2.13.4 Mechanical Tests

The mechanical test is the first test to be performed with respect to the PV systems and shall occur on a date to be proposed by the Contractor and as approved by the Project Manager. The notice should not be less than 10 days before.

The Mechanical test is the standard procedure to verify that the PV systems have been built according to the requirements and includes:

Visual inspection
Verification of installation of all equipment
Areas for inspection include:

9. Mounting structure, bolts and fixtures
10. PV modules
11. DC and AC cables
12. Inverters
13. Batteries (battery coolant)
14. DC distribution system
15. Monitoring system for PV, batteries and weather station

16. Switchgear and transformer
17. Grid connection

The Employer shall determine whether the Mechanical Test has been successfully completed.

2.13.5 Functional Tests

The functional tests shall be done after the successful completion of the mechanical tests. The contractor shall submit a proposed date not less than 10 days before the test date.

The Functional Tests on the PV array shall be done according to IEC 62446 and include at least:

18. Continuity of earthing tests;
19. Polarity test
20. String open circuit voltage test
21. String short circuit current test
22. Insulation resistance of the DC circuits
23. Thermographic tests

The functional tests of the inverter shall be as per the equipment manufacturers' commissioning procedures and shall include also:

24. Thermographic tests

The functional tests of the BESS shall include at least and according to IEC 62933-2:

25. Continuity and validity of conductors
26. Earthing test
27. Insulation test
28. Protective and switching device test
29. Equipment and basic function test
30. Available Energy test
31. Safety function test (battery, communication and DC contactor operation check, etc)
32. EMC immunity test
33. Thermographic tests

Low Voltage equipment test according to IEC 62446-6 and IEC 62446-7 including also

34. Thermographic tests of cables.

The functional tests of the monitoring equipment shall be as per the manufacturer's guidelines and include at least:

35. Communication at the string level is required

Verification of the weather station operation

The functional tests of the SCADA communication system shall be as per the manufacturer's guidelines and include at least:

36. Power management system functionality under various scenarios (increasing demand, decreasing demand, etc)

The Employer shall determine whether the Functional Tests have been successfully completed.

2.13.6 System Performance Test

The system performance tests for the BESS shall be as per IEC 62933-2 and include:

Actual energy capacity test to determine the SOH (state of health) guarantee
Input and output power rating test
Round trip efficiency test to verify the round-trip efficiency guarantee
Expected service life test
System response test: time and ramp rate
Self-discharge system test
Rated voltage and frequency range test

The performance test for the PV plant follows the IEC 61724 to determine both the performance ratio (PR) and the AC capacity:

The Performance Test shall be done after the successful completion of the functional tests. The contractor shall submit a proposed date no later than 10 days before the test date.
The performance test shall have a duration of 5 days according to the following criteria:

- Total daily irradiation at the PV modules shall be at least 3.5 kWh / m²
- If the minimum daily irradiation is not reached, the test shall be extended according to the relevant number of days until 10 days to reach the minimum irradiation of 3.5 kWh / m²

The availability of the PV system and the Grid should be 100%. In case of unavailability, the test period should be extended according to the relevant number of days.
The PV system performance ratio (PR) shall be calculated on the basis of the operating data recorded by the monitoring system as follows:

37. The definition of PR according to IEC 61724:

$$PR_{meas} = \frac{\sum_{j} E_{meas,j}}{P_{nom} \cdot \sum_{j} \left(\frac{G_j}{G_{ref}} \cdot \left(1 - \frac{\beta}{100} \cdot (T_{\mathrm{mod}} - T_{meas,j}) \right) \right)}$$

Figure - Performance Ratio equation

- Emeas,j = Produced energy (in kWh) over each metering interval j;
- Pnom = Nominal power of the PV system in kWp. Sum of the individual module power of all installed modules as per the relevant datasheets;
- Gj = Irradiation in kWh/m² measured per each metering interval j with an on-site pyranometer with an identical inclination to the modules.
- Gref= 1 kW/m2, irradiance at the reference STC conditions
- PRmeas = the average PV system Performance Ratio during the testing period
- Tmeas,j = the average module temperature measured during each Metering Interval j by the temperature sensors placed on the reverse side of the modules (in °C). When several module temperature sensors are installed then the average measurement of the installed module temperature sensors will be considered
- Tmod = the average monthly PV module temperature expected

- β = Maximum power temperature coefficients of the PV modules as per the relevant datasheets. For the avoidance of doubt, β shall be a negative value
- j = 10 minutes interval.

The Employer shall compare the PR measurements with the expected PR (refer Appendix 8 functional guarantees of the contract agreement).

The Employer shall compare the determined AC capacity with the expected capacity in MWac

2.14 Support requirements

In addition to the requirements under the contract to resolve defects during the defects liability periods, the Contractor acknowledges the limited experience of the Employer in operating BESS and hybrid solar PV at this scale and will provide appropriate training and support including:

- Development of Operations and Maintenance plans and associated training.
- For solar schools:
    - Basic (consumer) electrical and fire safety training for all nominated staff, community representatives and senior students
    - Training materials and instructions to enable staff to provide similar training to future students.
- Comprehensive training to plant operators for all facilities pre and post completion, with follow up training 6 months post completion (for reinforcement and check on retention, including report on gaps). Minimum 2 days per site per training event.
- Phone based support to the Employer for troubleshooting faults and specialized procedures during the defects liability period (noting that the Contractor may be required to attend the site to rectify faults that are identified as defects).
- For BESS:
    - A service, warranty and monitoring agreement from the BESS original equipment manufacturer (OEM) or their authorized representative, that provides 3 years of specialist maintenance requirements of the BESS, included in the Contract sum.
    - Option for the Employer to continue the service, warranty and monitoring agreement on a rolling basis, on standard terms through direct agreement with the OEM or its representative.

3. Environmental, Health and Safety Management Requirement

The Contractor must comply with all attached Employer's project specific requirements, including without limitation, the following:

3.1 Work Health and Safety Management

The Contractor is required to have in place a documented project Work Health and Safety Management System (WHSMS) that is based on the principles of AS/NZS 4801 Occupational Health and Safety Management Systems - Specification with guidance for use. The WHSMS shall also comply with Solomon Island and Asian Development Bank legislations, regulations, policies, and standards. Major elements of the WHSMS are expected to include processes and procedures for:

- Project risk identification, assessment and management
- Setting WHS objectives and measurable performance targets
- Identifying and complying with legal and other requirements
- Roles and responsibilities for WHS management
- Staff training and induction processes
- Responding to and managing complaints, non-compliances and incidents
- Health and safety reporting and correspondence for the project
- Internal auditing and monitoring of environmental performance
- Review and update of project environmental documentation

A high level of care shall be taken to minimise the potential impacts of the construction Works on the Contractor's workers, the Employer's employees and the general public.

The Contractor will be required to submit detailed documentation on their safety management, including a Site Specific Health and Safety Management Plan (SSHSMP) as per the SCC.

3.2 Environmental Safeguards Management

The Contractor is required to have in place a documented project Environmental Management System (EMS) that is based on the principles of AS/NZS ISO 14001 Environmental Management Systems – Requirements with Guidance for Use. The EMS shall also comply with Solomon Island and Asian Development Bank legislations, regulations, policies, and standards. Major elements of the EMS are expected to include processes and procedures for:

- Project risk identification and assessment
- Setting environmental objectives and measurable performance targets
- Identifying and complying with legal and other requirements
- Roles and responsibilities for environmental management
- Staff training and induction processes
- Responding to and managing complaints, non-compliances and incidents
- Environmental reporting and correspondence for the project
- Internal auditing and monitoring of environmental performance
- Review and update of project environmental documentation

- Grievance redress mechanism

A high level of care shall be taken to minimize the potential impacts of the land clearing and construction works on the public, local communities, the environment and the existing commercial operations.

The Contractor is required to prepare a detailed Site Specific Environmental Management Plan (SSEMP) and Construction Environmental Management Plan (CEMP). The CEMP will demonstrate compliance with the conditions/requirements of the Environmental Management Plan included in the project's Initial Environmental Examination (IEE). The Contractor shall prepare and submit all required documents as required by legislation and legislation for the necessary permits. No works shall commence until the CEMP is approved by Solomon Power and that includes site establishments and physical works.

Timing of land clearing shall be managed to minimise time that the site is left cleared prior to construction, so as to minimise erosion (elapsed time between completion of land clearing to commencement of construction should not be more than 1 month). Site must be stabilised, including appropriate drainage, erosion and sediment control at all times.

3.3 Social safeguards management

The Contractor must comply with the Gender Assessment and Action Plan responsibilities, including those related to prevention and mitigation risks and response to Sexual Exploitation, Abuse and Harassment (SEAH), as listed for Construction Contractor, and to provide applicable sex-disaggregated monitoring data as part of monthly progress reporting. The Contractor shall also comply with Solomon Island and Asian Development Bank legislations, regulations, policies, and standards.

The Contractor must prepare and implement a plan to minimize any community impacts associated with their work, including without limitation:

- Provisions for community information sessions relating to SEAH, STD/STIs and HIV/AIDS awareness
- Community notification of works and potential impacts
- Workforce and labor impact management
- Impact on adjoining properties and wear and tear of public roads and facilities
- Grievance Redress Mechanism, including reporting on SEAH incidents
- Documentation of any consultation or stakeholder engagement through minutes or report.

3.4 SEAH management

- ***SEAH Risk Management Plan Requirements***

The Bidder shall submit a SEAH Risk Management Plan that addresses risks to workers and community members, particularly women and children. The Plan must include the following minimum requirements, with the timeline and responsible staff:

1. ***Code of Conduct***
   The Bidder shall establish and enforce a Code of Conduct prohibiting SEAH-related behaviors, with clear consequences for violations. All personnel must sign the Code of Conduct as part of the employment contract.
2. ***Training***
   The Bidder shall ensure all personnel receive induction and refresher training on SEAH risks, behaviors, and reporting procedures.

3. ***SEAH reporting in Grievance Mechanism***
   The Bidder shall implement a confidential grievance mechanism with multiple reporting channels for SEAH-related complaints. This system must ensure survivor-centered handling, with clear SOPs for investigation functions and referrals to appropriate services for survivors.
4. ***Promotion of Reporting***
   The Bidder shall take actions to raise awareness of the SEAH reporting mechanisms among staff and community members, ensuring accessibility and clarity. This includes designing workplaces with visible signage displaying reporting channels and making reporting options easily accessible to all personnel and community members.
5. ***Monitoring and Reporting***
   The Bidder shall implement systems to monitor SEAH risks and actions taken, including regular audits of training, grievances, and incident reports.
6. ***Subcontractor Responsibilities***
   The Bidder shall ensure that all subcontractors and their personnel adhere to the same SEAH management requirements, including signing the Code of Conduct, completing training, and implementing grievance mechanisms.
7. ***Legal Compliance***
   The Bidder and subcontractors must comply with applicable local laws and international standards related to SEAH and the protection of vulnerable populations, including women and children.
8. ***Accountability***
   The Bidder shall provide regular reports on the implementation of the SEAH Risk Management Plan, including monitoring and incident handling.

The Contractor shall take all appropriate measures to prevent sexual exploitation, abuse and harassment of anyone by the Contractor or by any of its employees or any other persons who may be engaged by the Contractor to perform any services under the Contract. For these purposes, any sexual activity with any person less than eighteen years of age, regardless of any laws relating to consent, shall constitute the sexual exploitation and abuse of such a person.

In addition, the Contractor shall refrain from, and shall take all appropriate measures to prohibit its employees or other persons engaged by it from, exchanging any money, goods, services, offers of employment or other things of value, for sexual favors or activities, or from engaging in any sexual activities that are exploitive or degrading to any person.

The Contractor acknowledges and agrees that the provisions hereof constitute an essential term of the Contract and that any breach of this representation and warranty shall employer to terminate or suspend the Contract upon notice to the Contractor, without any liability for termination charges or any other liability of any kind.

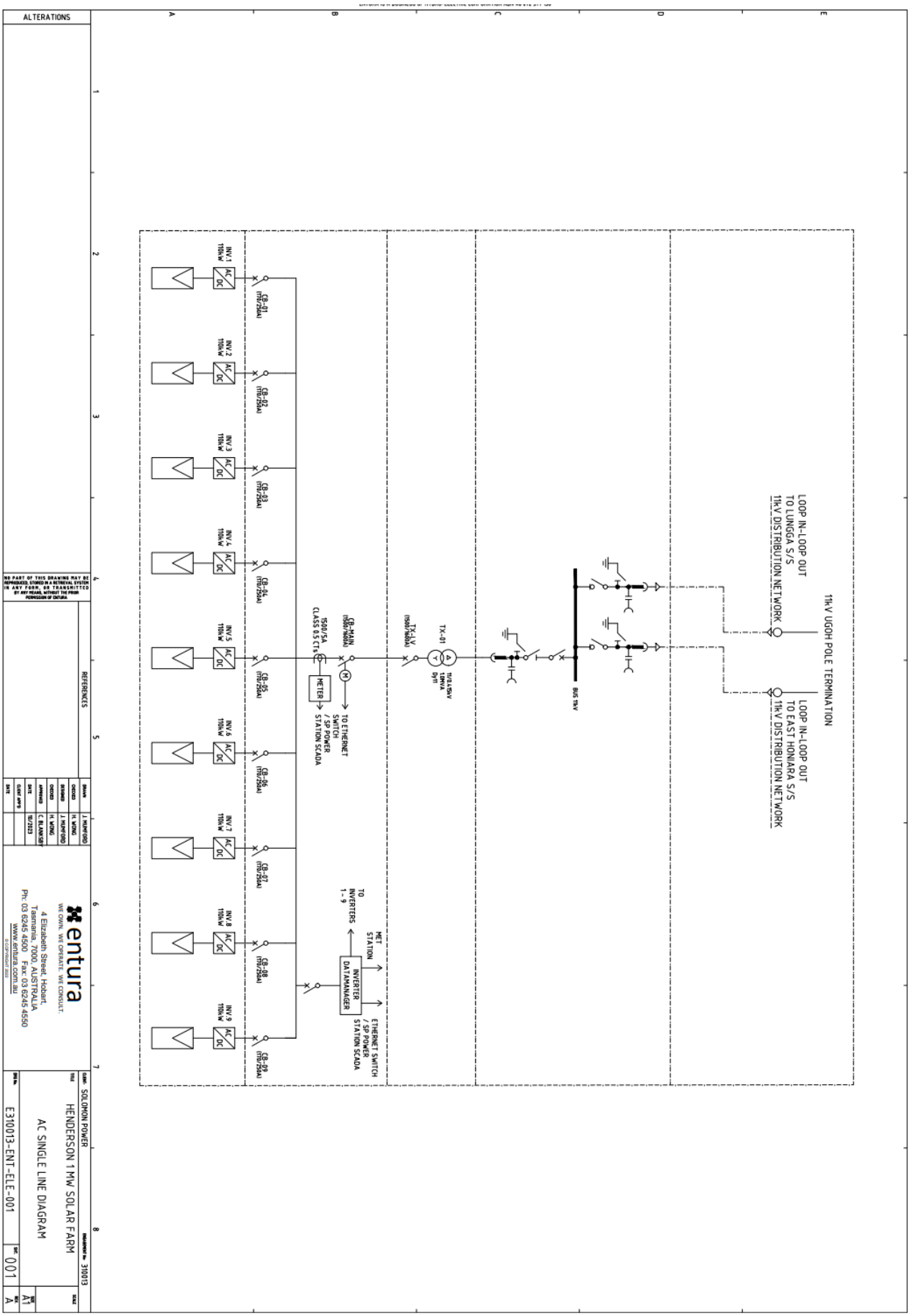
4. Drawings

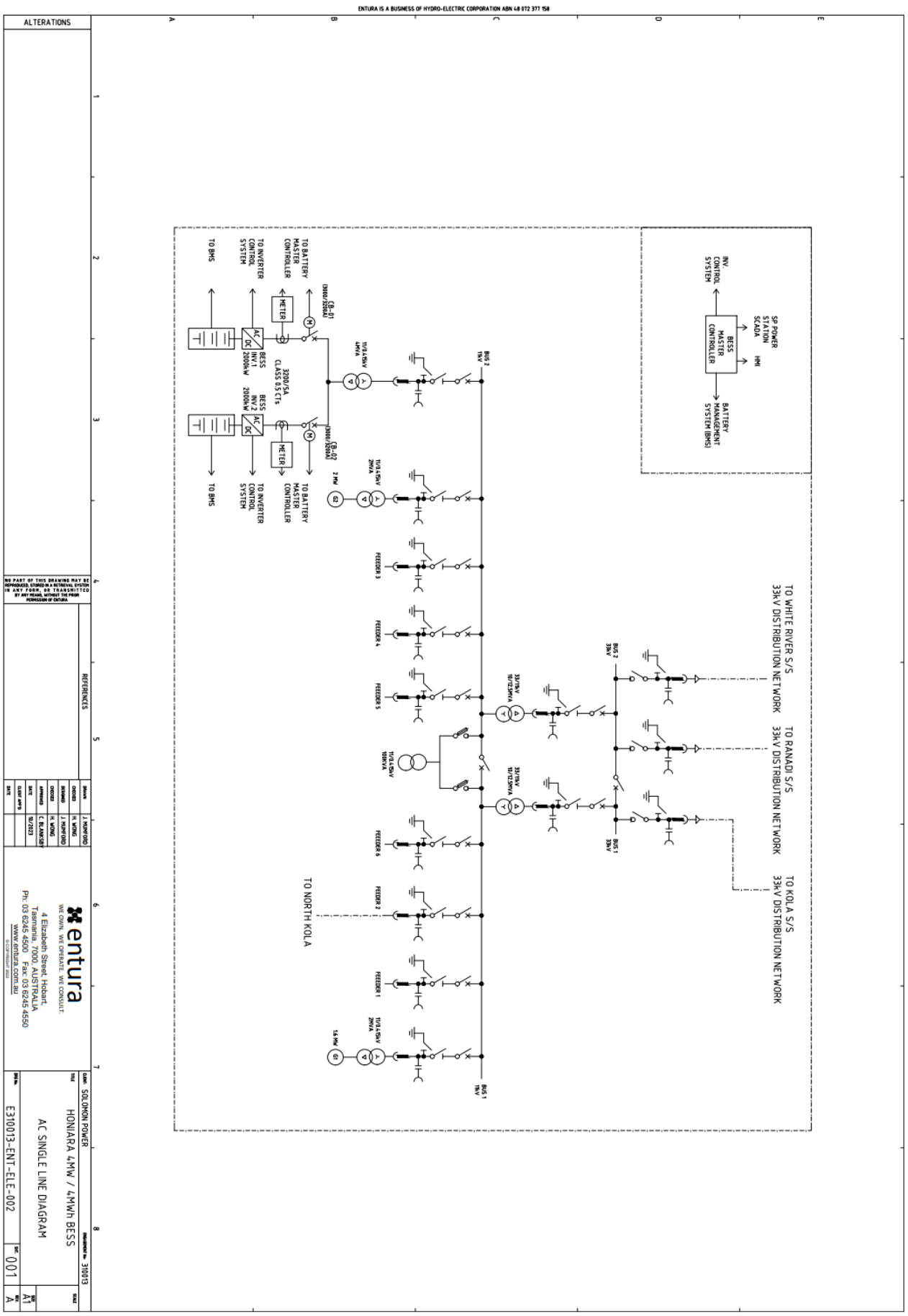
The following drawings are included (attached) as part of this specification:

Table 16 Site locations

No.	Name	Filename	Description
1	Henderson Solar Farm	E310013 HENDERSON CONCEPT SLD 001	Concept single line diagram
		E310013 HENDERSON CONCEPT GA 001	Concept site layout
2	Honiara Substation BESS	E310013 HONIARA CONCEPT SLD 001	Concept single line diagram
		E310013 HONIARA CONCEPT GA 001	Concept site layout
3	Honiara East Substation BESS	E310013 HONIARA EAST CONCEPT SLD 001	Concept single line diagram
		E310013 HONIARA EAST CONCEPT GA 001	Concept site layout
4	Ambu Solar Hybrid	E310013 AMBU CONCEPT SLD 001	Concept single line diagram
		E310013 AMBU CONCEPT GA 001	Concept site layout

Please note that the site-specific geotechnical studies and hydrological studies have not been undertaken and are not available. Consultant shall perform. See also Section 1.


11kV UGOH POLE TERMINATION
LOOP IN-LOOP OUT
TO LUNGGA S/S
11kV DISTRIBUTION NETWORK
LOOP IN-LOOP OUT
TO EAST HONIARA S/S
11kV DISTRIBUTION NETWORK
BUS 1kV
TX-01
TO ETHERNET SWITCH / SP POWER STATION SCADA
METER
TO INVERTERS 1 - 9
MET STATION
INVERTER DATAMANAGER
ETHERNET SWITCH / SP POWER STATION SCADA
ALTERATIONS
REFERENCES
entura
4 Elizabeth Street, Hobart,
Tasmania, 7000, AUSTRALIA
Ph: 03 6245 4500 Fax: 03 6245 4550
www.entura.com.au
SOLOMON POWER
HENDERSON 1 MW SOLAR FARM
AC SINGLE LINE DIAGRAM
E310013-ENT-ELE-001
001
A1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SP POWER STATION SCADA
HMI
BESS MASTER CONTROLLER
INV. CONTROL SYSTEM
BATTERY MANAGEMENT SYSTEM (BMS)
TO WHITE RIVER S/S 33kV DISTRIBUTION NETWORK
TO RANADI S/S 33kV DISTRIBUTION NETWORK
TO KOLA S/S 33kV DISTRIBUTION NETWORK
TO NORTH KOLA
BUS 1 11kV
BUS 2 11kV
BUS 1 33kV
BUS 2 33kV
33/11kV 10/12.5MVA
33/11kV 10/12.5MVA
11/0.415kV 500kVA
11/0.415kV 4MVA
11/0.415kV 2MVA
11/0.415kV 2MVA
4 MW
2 MW
FEEDER 1
FEEDER 2
FEEDER 3
FEEDER 4
FEEDER 5
FEEDER 6
3200/5A CLASS 0.5 CTs
METER
METER
BESS 1 MW/1 MWh 2000kW
BESS 2 MW/1 MWh 2000kW
TO BATTERY MASTER CONTROLLER
TO BATTERY MASTER CONTROLLER
TO INVERTER CONTROL SYSTEM
TO INVERTER CONTROL SYSTEM
TO BMS
TO BMS
REFERENCES
DRAWN J. HUMFORD
CHECKED N. WONG
DESIGNED J. HUMFORD
ORDERED N. WONG
APPROVED C. BLANKSBY
DATE 18/7/23
CLIENT APPR.
DATE
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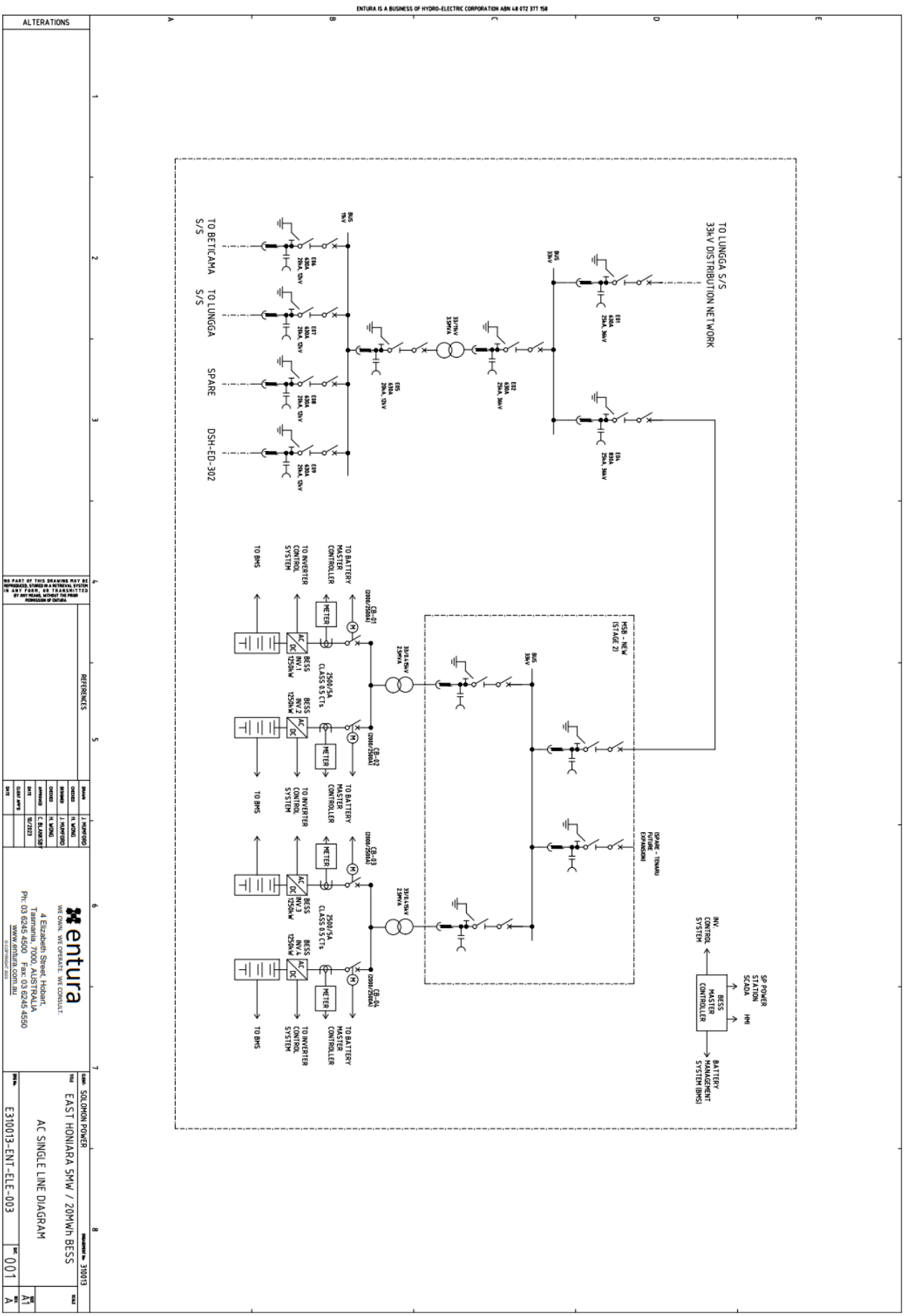
CLIENT SOLOMON POWER
TITLE HONIARA 4MW / 4MWh BESS
AC SINGLE LINE DIAGRAM
JOB No. 39013
DRG No. E310013-ENT-ELE-002
SHEET No. 001
SIZE A1
REV. A

Single-S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TO BETICAMA S/S
TO LUNGGA S/S
SPARE
DSH-ED-302
MSB - NEW (STAGE 2)
SPARE - TENARU FUTURE EXPANSION
SP POWER STATION SCADA
BESS MASTER CONTROLLER
HMI
INV. CONTROL SYSTEM
BATTERY MANAGEMENT SYSTEM (BMS)
TO BATTERY MASTER CONTROLLER
TO INVERTER CONTROL SYSTEM
TO BMS
METER
BESS INV.1 1250kW
BESS INV.2 1250kW
BESS INV.3 1250kW
BESS INV.4 1250kW
2500/5A CLASS 0.5 CTs
33/0.415kV 2.5MVA
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EAST HONIARA 5MW / 20MWh BESS
AC SINGLE LINE DIAGRAM
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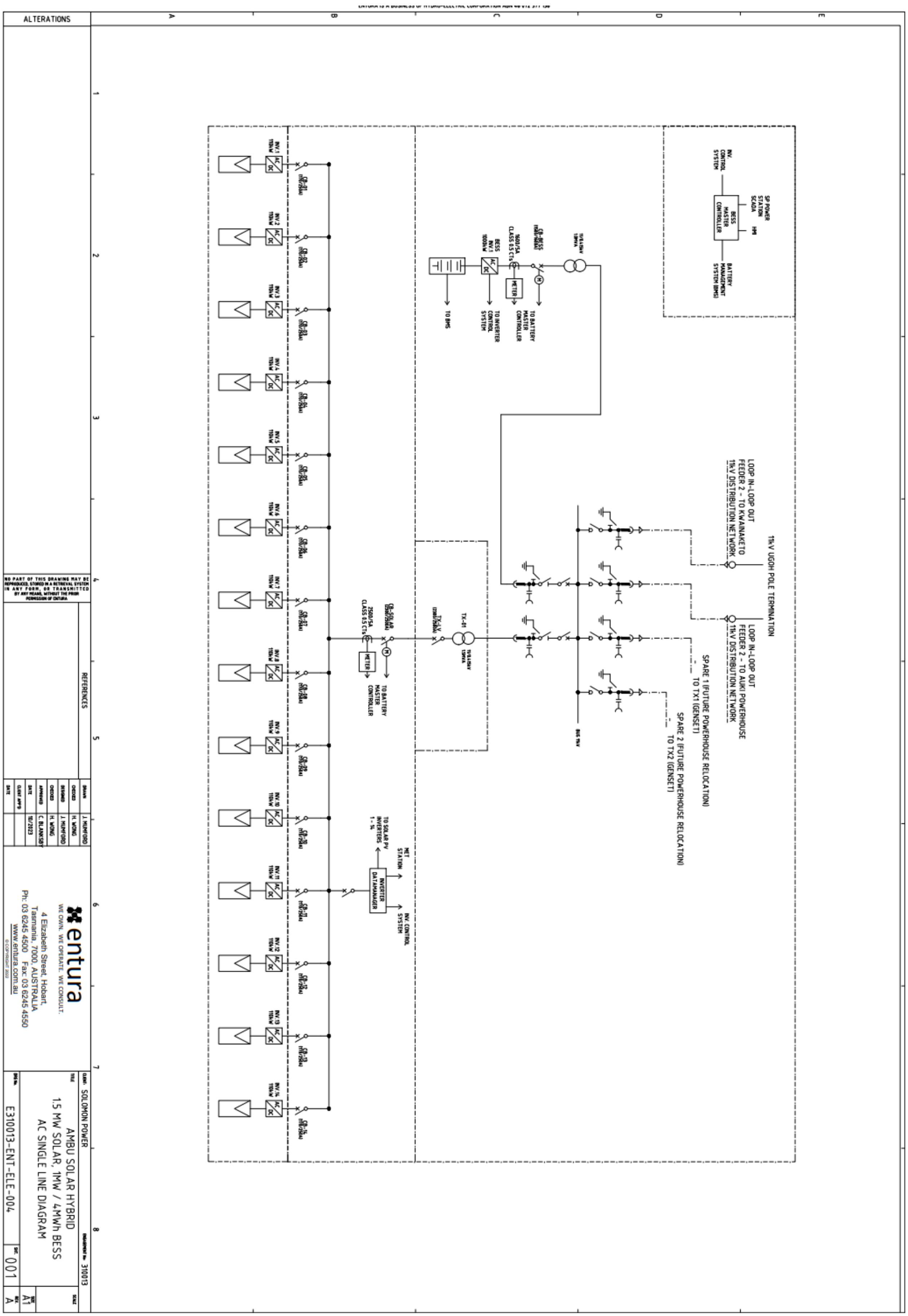
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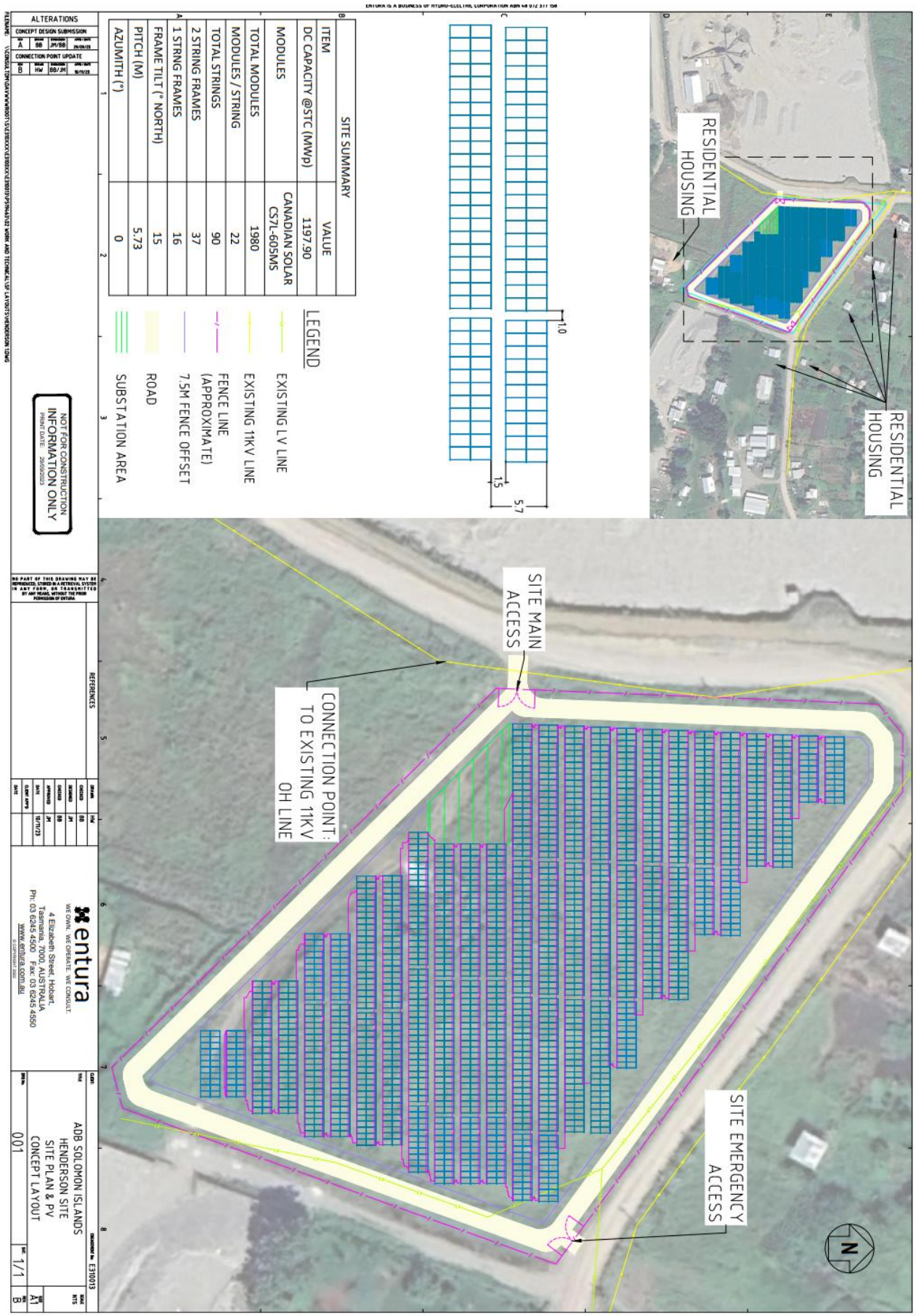
SOLOMON POWER
AMBU SOLAR HYBRID
1.5 MW SOLAR, 1MW / 4MWh BESS
AC SINGLE LINE DIAGRAM
E310013-ENT-ELE-004
001
A1
A
11kV UGOH POLE TERMINATION
LOOP IN-LOOP OUT
FEEDER 2 - TO KWAINAKETO
11kV DISTRIBUTION NETWORK
LOOP IN-LOOP OUT
FEEDER 2 - TO AUKI POWERHOUSE
11kV DISTRIBUTION NETWORK
SPARE 1 (FUTURE POWERHOUSE RELOCATION)
TO TX1 (GENSET)
SPARE 2 (FUTURE POWERHOUSE RELOCATION)
TO TX2 (GENSET)


RESIDENTIAL HOUSING
RESIDENTIAL HOUSING
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MODULES
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TOTAL MODULES
1980
MODULES / STRING
22
TOTAL STRINGS
90
2 STRING FRAMES
37
1 STRNG FRAMES
16
FRAME TILT (° NORTH)
15
PITCH (M)
5.73
AZUMITH (°)
0
LEGEND
EXISTING LV LINE
EXISTING 11KV LINE
FENCE LINE (APPROXIMATE)
7.5M FENCE OFFSET
ROAD
SUBSTATION AREA
10
15
5.7
SITE MAIN ACCESS
CONNECTION POINT: TO EXISTING 11KV OH LINE
SITE EMERGENCY ACCESS
N
ALTERATIONS
CONCEPT DESIGN SUBMISSION
CONNECTION POINT UPDATE
NOT FOR CONSTRUCTION
INFORMATION ONLY
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HENDERSON SITE
SITE PLAN & PV
CONCEPT LAYOUT
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HIBISCUS AVENUE
N
NATIONAL ARCHIVES OF SOLOMON ISLANDS
SITE MAIN ACCESS
KING SOLOMON HOTEL
40 FOOT CONTAINERS: MOVABLE
SP STAFF HOUSING
WORKSHOP AND STORAGE AREA
GENERATION BUILDING
33kV OH LINE
DIESEL TANKS
RESIDENTIAL PROPERTIES
WATER TANKS
11kV SWB: BESS CONNECTION POINT
TRANSFORMER YARD
LEGEND
33kV POWER LINE
FENCE LINE (APPROXIMATE)
BESS AREA PRIORITY 1
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SITE SUMMARY
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BESS CAPACITY (MW/MWh)
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INFORMATION ONLY
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REFERENCES
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CHECKED JM
DESIGNED BB
CHECKED JM
APPROVED RP
DATE XX/XX/23
CLIENT APP'D
DATE
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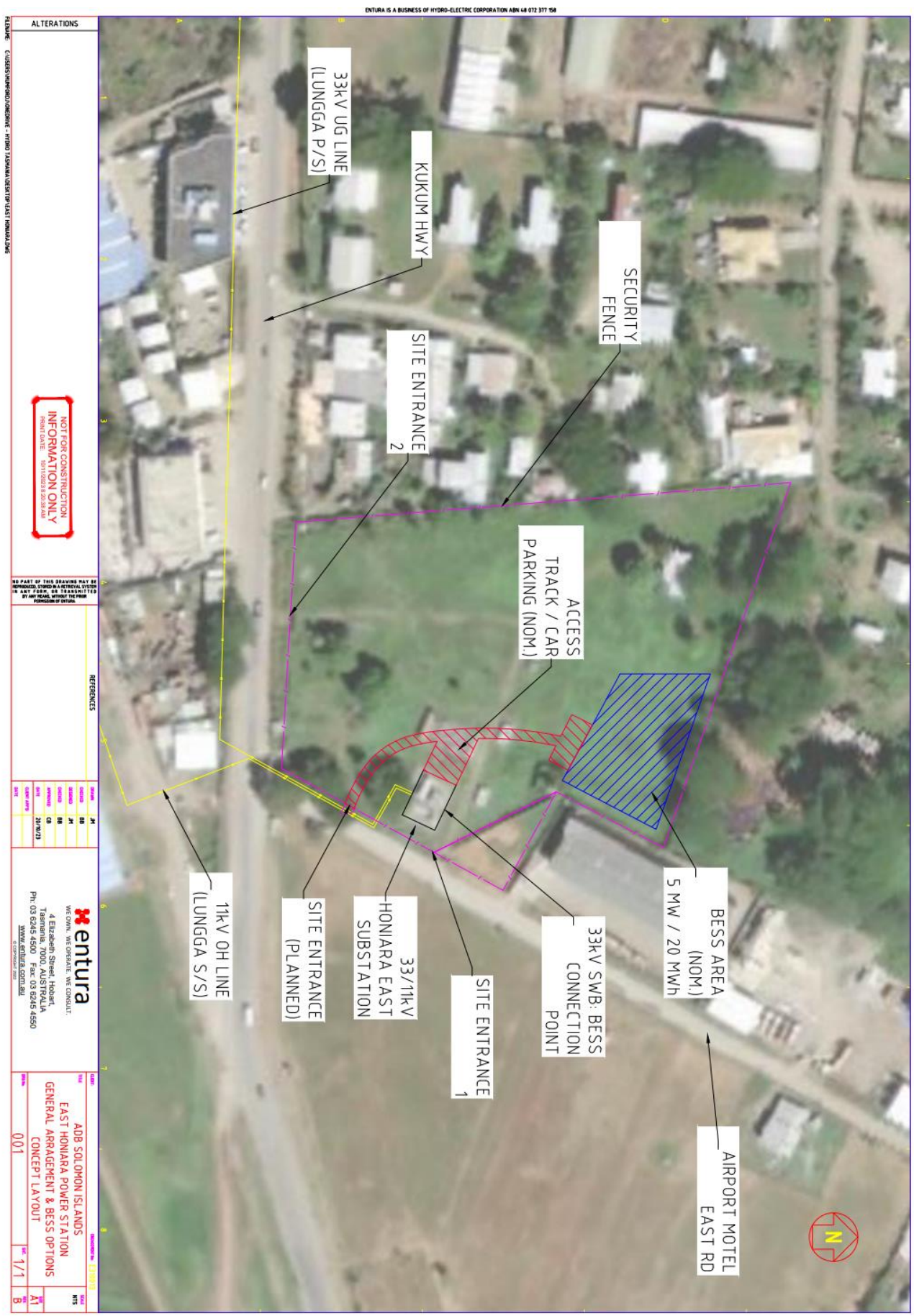
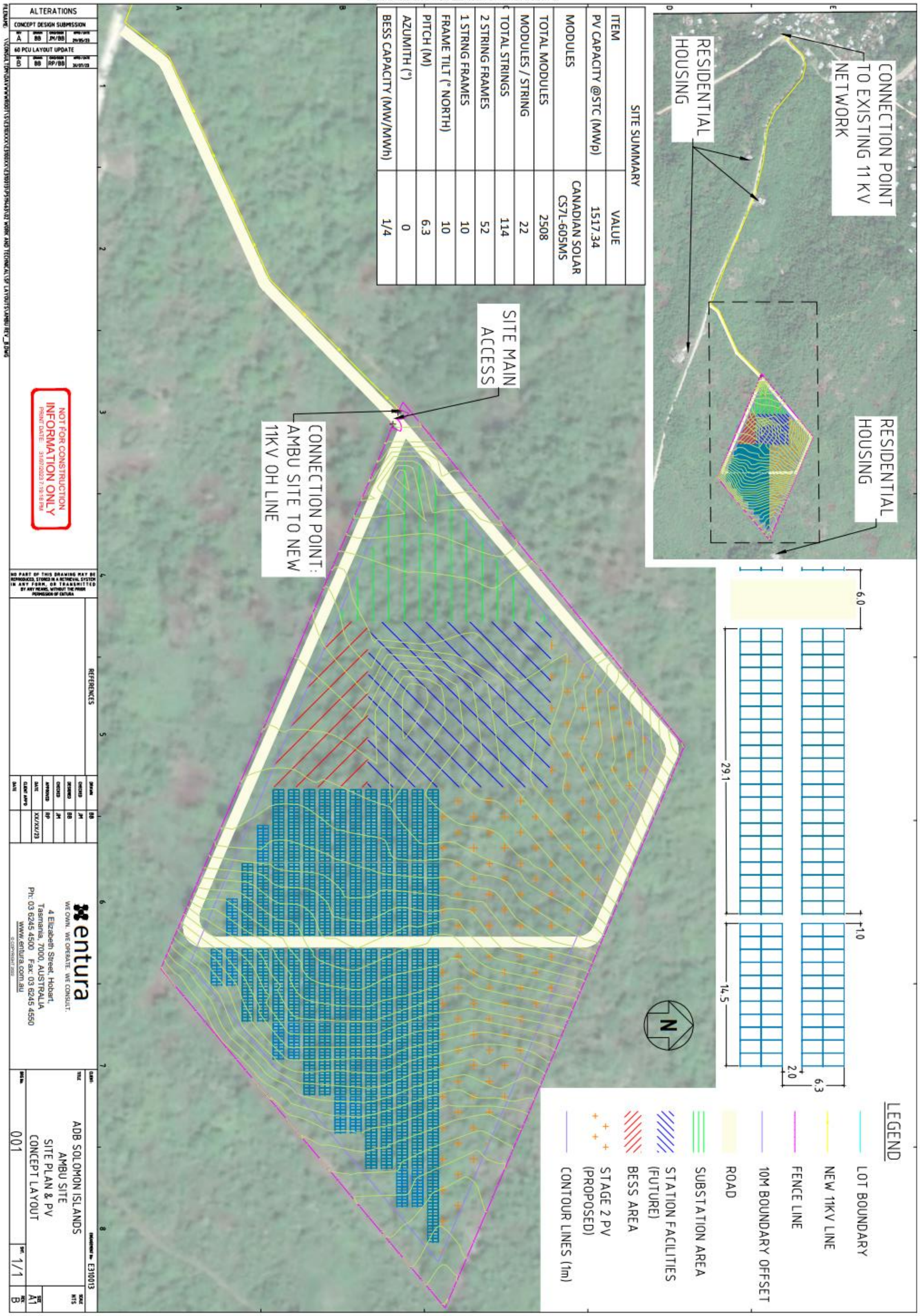
GENERAL ARRAGEMENT & BESS OPTIONS
CONCEPT LAYOUT
DRG No. 001
SHT. 1/1
SIZE A1
REV. A
FILENAME: C:\USERS\BROOKB\ONEDRIVE - HYDRO TASMANIA\DESKTOP\WIP\SOLOMON IS\HENDERSON 1.DWG


ENTURA IS A BUSINESS OF HYDRO-ELECTRIC CORPORATION ABN 48 072 377 158
ALTERATIONS
NOT FOR CONSTRUCTION
INFORMATION ONLY
PRINT DATE: 10/11/2023 8:20:38 AM
REFERENCES
entura
WE OWN. WE OPERATE. WE CONSULT.
4 Elizabeth Street, Hobart,
Tasmania, 7000, AUSTRALIA
Ph: 03 6245 4500 Fax: 03 6245 4550
www.entura.com.au
ADB SOLOMON ISLANDS
EAST HONIARA POWER STATION
GENERAL ARRAGEMENT & BESS OPTIONS
CONCEPT LAYOUT
001
1/1
A1
NTS
33kV UG LINE (LUNGGA P/S)
KUKUM HWY
SECURITY FENCE
SITE ENTRANCE 2
ACCESS TRACK / CAR PARKING (NOM.)
BESS AREA (NOM.) 5 MW / 20 MWh
33kV SWB: BESS CONNECTION POINT
SITE ENTRANCE 1
33/11kV HONIARA EAST SUBSTATION
SITE ENTRANCE (PLANNED)
11kV OH LINE (LUNGGA S/S)
AIRPORT MOTEL EAST RD
N


SITE SUMMARY
ITEM | VALUE
PV CAPACITY @STC (MWp) | 1517.34
MODULES | CANADIAN SOLAR CS7L-605MS
TOTAL MODULES | 2508
MODULES / STRING | 22
TOTAL STRINGS | 114
2 STRING FRAMES | 52
1 STRING FRAMES | 10
FRAME TILT (° NORTH) | 10
PITCH (M) | 6.3
AZUMITH (°) | 0
BESS CAPACITY (MW/MWh) | 1/4
CONNECTION POINT TO EXISTING 11KV NETWORK
RESIDENTIAL HOUSING
RESIDENTIAL HOUSING
SITE MAIN ACCESS
CONNECTION POINT: AMBU SITE TO NEW 11KV OH LINE
LEGEND
LOT BOUNDARY
NEW 11KV LINE
FENCE LINE
10M BOUNDARY OFFSET
ROAD
SUBSTATION AREA
STATION FACILITIES (FUTURE)
BESS AREA
STAGE 2 PV (PROPOSED)
CONTOUR LINES (1m)
6.0
29.1
1.0
14.5
2.0
6.3
N
ALTERATIONS
CONCEPT DESIGN SUBMISSION
60 PCU LAYOUT UPDATE
NOT FOR CONSTRUCTION
INFORMATION ONLY
REFERENCES
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4 Elizabeth Street, Hobart, Tasmania, 7000, AUSTRALIA
Ph: 03 6245 4500 Fax: 03 6245 4550
www.entura.com.au
ADB SOLOMON ISLANDS
AMBU SITE
SITE PLAN & PV
CONCEPT LAYOUT
E310013
001
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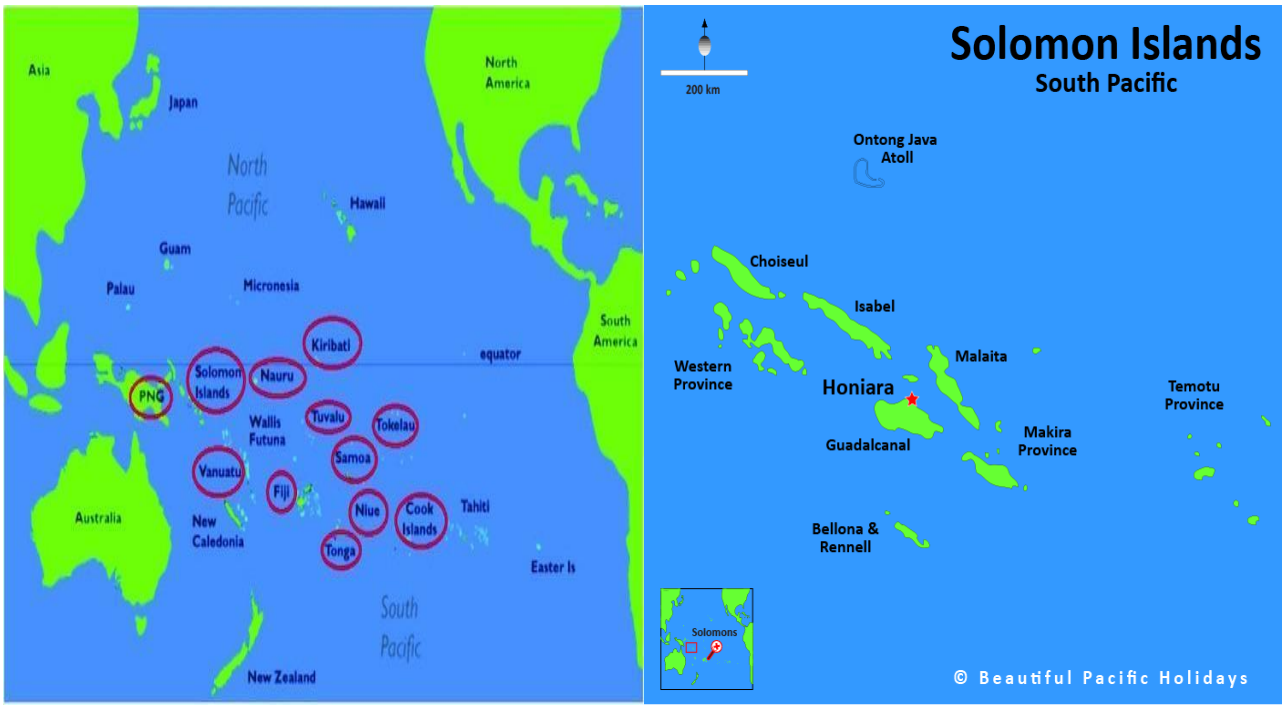
NTS
A1
B

5. Supplementary Information

The following supplementary information is provided for information only. The supplementary information may contain inaccuracies and may change without notice. It is included to assist Applicants in evaluating their interest in the IFB. Applicants may not rely on the supplementary information in any way. Where supplementary information relates to particulars that may impact the Bidder's offer, the Bidder should make its own enquiries or seek clarifications, and satisfy itself as to the actual situation.

5.1 Project Country

Solomon Islands is a small island developing state (SIDS) known as a country that comprises of culture diversities. Comprised of nearly 1,000 smaller islands covering a land mass of about 28,000 km, the islands were grouped into nine administrative provinces: Guadalcanal, Isabel, Temotu, Malaita, Makira-Ulawa, Western, Central, Choiseul, and Renell-Bellona. Based on the 2019 census report, the country has a total population count of 721,445 of which, including informal residents/settlers, approximately 85,000 reside in Honiara (main capital) and around 75 % of the population lives in the villages. The main economic drives are mining, agriculture, fishing, logging, manufacturing, and tourism. Even though the impact of COVID-19 had hit hard on the country's economy, the border restriction has been lifted and commercial flights have extended their route to New Zealand apart from regular trips to Australia, Fiji, PNG, and Vanuatu.



Location of Solomon Islands

Throughout the Solomon Islands there exist relatively stable temperatures all year round with little seasonal variation. Average temperatures fluctuate between 24.5 -26.5^{0}C. A decrease in mean monthly temperature of about 2 ^{0}C for every 300 meters of elevation has been found in many tropical areas of the Solomon Islands.

With regards to rainfall, the average annual rainfall is usually within 3000-5000 mm whereas the monthly average ranges from 150-350 mm and usually peaks between January and March.

Malaita province is the second highest population centre in the Solomon Islands but has relatively slow development compared to the Western province this is due to land issues. Moderate demand for services and goods, and a distance of about 110 km enables daily shipping and domestic flights from Honiara to Auki. There are a range of local services and industries, including concrete supply, quarry, construction machinery, and skilled labour / professional business. Local facilities and access are not considered a significant constraint for this subproject. There are no specific local sub-contractors that have been approached by, or approved by this project. Contacting local sub-contractors is encouraged but is the responsibility of the contractor.

ADB classifies Solomon Islands as a Fragile and Conflict Affected Country (FCAS). This classification takes into account multi-dimensional factors including political instability, weak governance and institutional capacity, economic and social insecurity, and greater vulnerability to the effects of climate change and natural hazards.

5.2 Honiara Grid - Solar Farm site location

This site is approximately 700 m south of Henderson International Airport in Honiara (Guadalcanal), 900 m north-west of Fighter One Solar Farm and 13 km from the nearest port and is accessible by road transport. It is a relatively flat site, covered with weeds and other vegetation requiring management. The land is owned by Solomon Power, fully fenced and free of settlement or other economic use by the community. The site is adjacent to a 11 kV feeder which will be used for connecting to the grid. There are two other solar farms in close proximity (1 MW Fighter 1 and 2 MW Henderson Extension which is under development). Both are connected to the same feeder.

5.3 Honiara Grid – Honiara Substation BESS

Honiara Substation has space which is suitable for the installation of a battery energy storage system (BESS). The site is flat, cleared, fenced and well maintained. It is situated around 1.4 km from the nearest port and accessible by road transport. The system is required to connect to the 11kV bus at the Honiara Substation (11kV switchboard). The benefit of this BESS is that can reduce diesel generator run hours by providing spinning reserve capacity, thereby reducing the typical number of operating generators by one. Not only such, but mitigating operations and maintenance costs, extend generator life span, decrease depreciation, increase generator efficiency at higher loading, and overall reduces fuel consumption. The land site is owned bythe Solomon Power, fully fenced and free of settlements.

The Honiara Substation site is situated adjacent to a creek and historically flooding has been experienced at this site. Refer to the Specifications for requirements in respect of flooding.

5.4 Honiara Grid – Honiara East Substation BESS

Honiara East Substation has space which is suitable for the installation of a battery energy storage system (BESS). The site is flat, cleared, fenced and well maintained. It is situated around 10.7 km from the nearest port and accessible by road transport. The system is required to connect to the 33kV bus at the Honiara East Substation (33kV switchboard). The benefit of this BESS is that can reduce diesel generator run hours by providing spinning reserve capacity, thereby reducing the typical number of operating generators by one. Not only such, but mitigating operations and maintenance costs, extend generator life span, decrease depreciation, increase generator efficiency at higher loading, and overall reduces fuel consumption. The land site is owned by the Solomon Power, fully fenced and free of settlements.

5.5 Auki Grid – Ambu Solar Hybrid Sites

This site is located approximately 2 km east of Auki in Malaita province, and 2.5 km from the nearest port. The 4 hectares of land is owned by Solomon Power and is fully fenced, with moderate slopes of up to 9%. It is vegetated with weed species that require clearing. Additionally, it has a 200 m x 8 m land parcel owned by Solomon Power that shall be used for access to the site road. This access has a basic track in place that is

not suitable for construction traffic and will require an upgrade. The proposed Ambu solar hybrid will connect to the existing southern 11kV feeder site and interconnected to the Auki grid.

Auki township has a population of approximately 7,000. It is serviced by a port and beach landing that is suitable for unloading/loading a container truck for transporting containerized freight to the site. Commercial shipping and flights operate between Honiara and Auki several times per week. There are commercial accommodations and basic medical facilities available in Auki.

5.6 Pilot Sites – Solar PV Schools

The location of Solar PV Schools shall be at a location within Malaita or Guadalcanal provinces, and remote from existing grids. Details of each site are outlined in Table 5 Site Locations.
A typical school building example is shown below.

Figure 1: Solar Rooftop School - Wairokai CHS (Source: MECDM, Sept 2020)

6. Certificates

6.1 Form of Completion Certificate

Contract: [. . . . *.insert name of contract and contract identification details*. . . . .]

Date:

Certificate No.:

To: [. . . . *.insert name and address of contractor*. . . . .]

Dear Ladies and/or Gentlemen,

Pursuant to GCC Clause 24 (Completion of the Facilities) of the General Conditions of the Contract entered into between yourselves and the Employer dated [. . . . *.insert date*. . . . .], relating to the [. . . *.brief description of the Facilities* . . . .], we hereby notify you that the following part(s) of the Facilities was (were) complete on the date specified below, and that, in accordance with the terms of the Contract, the Employer hereby takes over the said part(s) of the Facilities, together with the responsibility for care and custody and the risk of loss thereof on the date mentioned below.

1. Description of the Facilities or part thereof: [. . . .*description* . . . .]

2. Date of Completion: [. . . .*date* . . . .]

However, you are required to complete the outstanding items listed in the attachment hereto as soon as practicable.

This letter does not relieve you of your obligation to complete the execution of the Facilities in accordance with the Contract nor of your obligations during the Defect Liability Period.

Very truly yours,

[. . . .*Signature* . . . .]

Project Manager

6.2 Form of Operational Acceptance Certificate

Contract: [. . . . *.insert name of contract and contract identification details*. . . . .]

Date:

Certificate No.:

To: [. . . . *.insert name and address of contractor*. . . . .]

Pursuant to GCC Subclause 25.3 (Operational Acceptance) of the General Conditions of the Contract entered into between yourselves and the Employer dated [. . . *date. . .*], relating to the [. . . *brief description of the facilities*. . .], we hereby notify you that the Functional Guarantees of the following part(s) of the Facilities were satisfactorily attained on the date specified below.

1. Description of the Facilities or part thereof: [. . . *description . . .*.]

2. Date of Operational Acceptance: [. . . *date* . . .]

This letter does not relieve you of your obligation to complete the execution of the Facilities in accordance with the Contract nor of your obligations during the Defect Liability Period.

Very truly yours,

[. . . .*Signature* . . . .]

Project Manager

7. Change Orders

7.1 Change Order Procedure

7.1.1 General
7.1.2 Change Order Log
7.1.3 References for Changes

7.2. Change Order Forms

7.2.1 Request for Change Proposal
7.2.2 Estimate for Change Proposal
7.2.3 Acceptance of Estimate
7.2.4 Change Proposal
7.2.5 Change Order
7.2.6 Pending Agreement Change Order
7.2.7 Application for Change Proposal

7.1. Change Order Procedure

7.1.1 General

This section provides samples of procedures and forms for implementing changes in the Facilities during the performance of the Contract in accordance with GCC Clause 39 (Change in the Facilities) of the General Conditions.

7.1.2 Change Order Log

The Contractor shall keep an up-to-date Change Order Log to show the current status of Requests for Change and Changes authorized or pending. Entries of the Changes in the Change Order Log shall be made to ensure that the log is up-to-date. The Contractor shall attach a copy of the current Change Order Log in the monthly progress report to be submitted to the Employer.

7.1.3 References for Changes

(1) Request for Change as referred to in GCC Clause 39 shall be serially numbered CR-X-nnn.

(2) Estimate for Change Proposal as referred to in GCC Clause 39 shall be serially numbered CN-X-nnn.

(3) Acceptance of Estimate as referred to in GCC Clause 39 shall be serially numbered CA-X-nnn.

(4) Change Proposal as referred to in GCC Clause 39 shall be serially numbered CP-X-nnn.

(5) Change Order as referred to in GCC Clause 39 shall be serially numbered CO-X-nnn.

Note:

(a) Requests for Change issued from the Employer's Home Office and the Site representatives of the Employer shall have the following respective references:

Home Office	CR-H-nnn
Site	CR-S-nnn

(b) The above number "nnn" is the same for Request for Change, Estimate for Change Proposal, Acceptance of Estimate, Change Proposal and Change Order.

7.2 Change Order Forms

7.2.1 Request for Change Proposal Form

[*Employer's letterhead*]

To: [*Contractor's name and address*] Date:

Attention: [*Name and title*]

Contract Name: [*Contract name*]
Contract Number: [*Contract number*]

Dear Ladies and/or Gentlemen:

With reference to the captioned Contract, you are requested to prepare and submit a Change Proposal for the Change noted below in accordance with the following instructions within [*number*] days of the date of this letter [or on or before (*date*)].

1. Title of Change: [*Title*]
2. Change Request No./Rev.: [*Number*]
3. Originator of Change:
   Employer: [Name]
   Contractor (by Application for Change Proposal No. [Number Refer to Annex 6.2.7])
4. Brief Description of Change: [*Description*]
5. Facilities and/or Item No. of equipment related to the requested Change: [*Description*]
6. Reference drawings and/or technical documents for the request of Change:
   Drawing No./Document No. *Description*
7. Detailed conditions or special requirements on the requested Change: [*Description*]
8. General Terms and Conditions:
   (a) Please submit your estimate showing what effect the requested Change will have on the Contract Price.
   (b) Your estimate shall include your claim for the additional time, if any, for completing the requested Change.
   (c) If you have any opinion that is critical to the adoption of the requested Change in connection with the conformability to the other provisions of the Contract or the safety of the Plant or Facilities, please inform us in your proposal of revised provisions.
   (d) Any increase or decrease in the work of the Contractor relating to the services of its personnel shall be calculated.
   (e) You shall not proceed with the execution of the work for the requested Change until we have accepted and confirmed the amount and nature in writing.

[*Employer's name*]
[*Signature*]
[*Name of signatory*]
[*Title of signatory*]

7.2.2 Estimate for Change Proposal Form

[*Contractor's letterhead*]

To: [*Employer's name and address*] Date:

Attention: [*Name and title*]

Contract Name: [*Contract name*]
Contract Number: [*Contract number*]

Dear Ladies and/or Gentlemen:

With reference to your Request for Change Proposal, we are pleased to notify you of the approximate cost to prepare the below-referenced Change Proposal in accordance with GCC Subclause 39.2.1 of the General Conditions. We acknowledge that your agreement to the cost of preparing the Change Proposal, in accordance with GCC Subclause 39.2.2, is required before estimating the cost for change work.

1. Title of Change: [*Title*]
2. Change Request No./Rev.: [*Number*]
3. Brief Description of Change: [*Description*]
4. Scheduled Impact of Change: [*Description*]
5. Cost for Preparation of Change Proposal: [*insert costs, which shall be in the currencies of the contract*]

(a)	Engineering		(Amount)
	(i) Engineer	_____ hours (hrs) x _____ rate/hr =	_____
	(ii) Draftsperson	_____ hrs x _____ rate/hr =	_____
	Sub-total	_____ hrs	_____
	Total Engineering Cost		_____
(b)	Other Cost		_____
	Total Cost (a) + (b)		_____

[*Contractor's name*]
[*Signature*]
[*Name of signatory*]
[*Title of signatory*]

7.2.3 Acceptance of Estimate Form

[*Employer's letterhead*]

To: [*Contractor's name and address*] Date:

Attention: *[Name and title]*

Contract Name: *[Contract name]*
Contract Number: *[Contract number]*

Dear Ladies and/or Gentlemen:

We hereby accept your Estimate for Change Proposal and agree that you should proceed with the preparation of the Change Proposal.

1. Title of Change: [*Title*]
2. Change Request No./Rev.: [*Request number/revision*]
3. Estimate for Change Proposal No./Rev.: [*Proposal number/revision*]
4. Acceptance of Estimate No./Rev.: [*Estimate number/revision*]
5. Brief Description of Change: [*Description*]
6. Other Terms and Conditions: In the event that we decide not to order the Change accepted, you shall be entitled to compensation for the cost of preparing the Change Proposal described in your Estimate for Change Proposal mentioned in para. 3 above in accordance with GCC Clause 39 of the General Conditions.

[*Employer's name*]
[*Signature*]
[*Name of signatory*]
[*Title of signatory*]

7.2.4 Change Proposal Form

[*Contractor's letterhead*]

To: [*Employer's name and address*] Date:

Attention: [*Name and title*]

Contract Name: [*Contract name*]
Contract Number: [*Contract number*]

Dear Ladies and/or Gentlemen:

In response to your Request for Change Proposal No. [Number], we hereby submit our proposal as follows:

1. Title of Change: [*Name*]
2. Change Proposal No./Rev.: [*Proposal number / revision*]
3. Originator of Change: Employer: [*Name*] / Contractor: [*Name*]
4. Brief Description of Change: [*Description*]
5. Reasons for Change: [*Reason*]
6. Facilities and/or Item No. of Equipment related to the requested Change: [*Facilities*]
7. Reference drawings and/or technical documents for the requested Change:
   [*Drawing/Document No./Description*]
8. Estimate of increase/decrease to the Contract Price resulting from the Change Proposal:

		Amount [*insert amounts in the currencies of the Contract*]
(a)	Direct material	_____
(b)	Major construction equipment	_____
(c)	Direct field labor (Total hrs)	_____
(d)	Subcontracts	_____
(e)	Indirect material and labor	_____
(f)	Site supervision	_____
(g)	Head office technical staff salaries	
	Process engineer _____ hrs @ _____ rate/hr	_____
	Project engineer _____ hrs @ _____ rate/hr	_____
	Equipment engineer _____ hrs @ _____ rate/hr	_____
	Procurement _____ hrs @ _____ rate/hr	_____
	Draftsperson _____ hrs @ _____ rate/hr	_____
	Total _____ hrs	
(h)	Extraordinary costs (computer, travel, etc.)	_____

(i) Fee for general administration, % of Items _____

(j) Taxes and customs duties _____

Total lump sum cost of Change Proposal [*Sum of items (a) to (j)*]

Cost to prepare Estimate for Change Proposal [*Amount payable if Change is not accepted*]

9. Additional time for Completion required due to Change Proposal
10. Effect on the Functional Guarantees
11. Effect on the other terms and conditions of the Contract
12. Validity of this Proposal: within [Number] days after receipt of this Proposal by the Employer
13. Other terms and conditions of this Change Proposal:

    (a) You are requested to notify us of your acceptance, comments or rejection of this detailed Change Proposal within [Number] days from your receipt of this Proposal.

    (b) The amount of any increase and/or decrease shall be taken into account in the adjustment of the Contract Price.

    (c) Contractor's cost for preparation of this Change Proposal: [*. . . .insert amount. This cost shall be reimbursed by the employer in case of employer's withdrawal or rejection of this Change Proposal without default of the contractor in accordance with GCC Clause 39 of the General Conditions . . . .*]

[*Contractor's name*]
[*Signature*]
[*Name of signatory*]
[*Title of signatory*]

7.2.5 Change Order Form

[*Employer's letterhead*]

To: *[Contractor's name and address]* Date:

Attention: *[Name and title]*

Contract Name: *[Contract name]*
Contract Number: *[Contract number]*

Dear Ladies and/or Gentlemen:

We approve the Change Order for the work specified in the Change Proposal (No. [*number*]), and agree to adjust the Contract Price, Time for Completion, and/or other conditions of the Contract in accordance with GCC Clause 39 of the General Conditions.

1. Title of Change: [*Name*]
2. Change Request No./Rev.: [*Request number / revision*]
3. Change Order No./Rev.: [*Order number / revision*]
4. Originator of Change: Employer: [*Name*] / Contractor: [*Name*]
5. Authorized Price:
   Ref. No.: [*Number*] Date: [*Date*]
   Foreign currency portion [*Amount*] plus Local currency portion [*Amount*]
6. Adjustment of Time for Completion
   None Increase [*Number*] days Decrease [*Number*] days
7. Other effects, if any

Authorized by: _____ Date: _____
Employer

Accepted by: _____ Date: _____
Contractor

7.2.6 Pending Agreement Change Order Form

[*Employer's letterhead*]

To: *[Contractor's name and address]* Date:

Attention: *[Name and title]*

Contract Name: *[Contract name]*
Contract Number: *[Contract number]*

Dear Ladies and/or Gentlemen:

We instruct you to carry out the work in the Change Order detailed below in accordance with GCC Clause 39 of the General Conditions.

1. Title of Change: [*Name*]
2. Employer's Request for Change Proposal No./Rev.: [*number/revision*] dated: [*date*]
3. Contractor's Change Proposal No./Rev.: [*number / revision*] dated: [*date*]
4. Brief Description of Change: [*Description*]
5. Facilities and/or Item No. of equipment related to the requested Change: [*Facilities*]
6. Reference Drawings and/or technical documents for the requested Change:
   [*Drawing / Document No. / Description*]
7. Adjustment of Time for Completion:
8. Other change in the Contract terms:
9. Other terms and conditions:

[*Employer's name*]

[*Signature*]

[*Name of signatory*]

[*Title of signatory*]

7.2.7 Application for Change Proposal Form

[*Contractor's letterhead*]

To: [*Employer's name and address*] Date:

Attention: [*Name and title*]

Contract Name: [*Contract name*]
Contract Number: [*Contract number*]

Dear Ladies and/or Gentlemen:

We hereby propose that the work mentioned below be treated as a Change in the Facilities.

1. Title of Change: [*Name*]
2. Application for Change Proposal No./Rev.: [*Number / revision*] dated: [*Date*]
3. Brief Description of Change: [*Description*]
4. Reasons for Change:
5. Order of Magnitude Estimation (amount in the currencies of the Contract): [*Amount*]
6. Scheduled Impact of Change:
7. Effect on Functional Guarantees, if any:
8. Appendix:

[*Contractor's name*]
[*Signature*]
[*Name of signatory*]
[*Title of signatory*]

8. Personnel Requirements

Using Form PER - 1 and PER - 2 in Section 4 (Bidding Forms), the Bidder must demonstrate that it has personnel who meet the following requirements:

No.	Position	Total Work Experience [years]	Experience In Similar Work [years]
1	Project manager	8	4
2	Logistics manager	5	3
3	Site supervisor	10	5
4	Electrical engineer	10	5
5	Electrician	5	3

Using Form EXP-6 in Section 4 (Bidding Forms), the Bidder must demonstrate that it has EHS personnel who meet the following requirements:

Key Personnel as determined by the EMP and other safeguard management plans

Item No.	Position/specialization	Relevant academic qualifications	Minimum years of relevant work experience	Minimum time on-site (%FTE)
1				
2				
3				

9. Equipment Requirements

Using Form EQU in Section 4 (Bidding Forms), the Bidder must demonstrate that it has the key equipment listed below:

No.	Equipment Type and Characteristics	Minimum Number Required
1	None	None
2		
3		
4		
5		