

# DBSA PSA SOLAR BACKUP PROGRAMME

## FINAL ENGINEERING REPORT FOR TENDER SUPPORT

### Tintswalo Hospital

*For Tender support*

| Document Item              | Detail                                                                                                                  |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Client / Programme         | Development Bank of Southern Africa (DBSA), acting as Implementing Agent on behalf of the National Department of Health |
| Facility                   | Tintswalo Hospital                                                                                                      |
| Cluster                    | Cluster 2                                                                                                               |
| PSP / Support Organisation | PMT Solutions                                                                                                           |
| Prepared by                | Rajandren Chetty                                                                                                        |
| Reviewed by                | Rajandren Chetty, Professional Engineering Technologist                                                                 |
| Revision                   | Final Engineering Report for Tender Support                                                                             |
| Issue Status               | Review and sign-off                                                                                                     |
| Date                       | July 2026                                                                                                               |
| Stage 1 Foundation         | Tintswalo Hospital Preliminary Technical Report                                                                         |

Professional verification: [Rajandren Chetty - ECSA PrivySeal](#)

## Document Control

| Revision   | Date      | Prepared by      | Reviewed by      | Description                                                                                                     |
|------------|-----------|------------------|------------------|-----------------------------------------------------------------------------------------------------------------|
| Draft v2.1 | July 2026 | Rajandren Chetty | Rajandren Chetty | Expanded tender-support structure and detailed BOQ.                                                             |
| Draft v2.4 | July 2026 | Rajandren Chetty | Rajandren Chetty | Final master-template amendments: warranties, fire safety, solar carport, generic SLD and appendix corrections. |

Cluster 2 issue-control requirement: the report shall be reviewed and signed off by Rajandren Chetty before submission to DBSA.

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## List of Abbreviations

| Abbreviation | Meaning                                                         |
|--------------|-----------------------------------------------------------------|
| AC           | Alternating Current                                             |
| BESS         | Battery Energy Storage System                                   |
| BOQ          | Bill of Quantities                                              |
| CoC          | Certificate of Compliance                                       |
| DB           | Distribution Board                                              |
| DBSA         | Development Bank of Southern Africa                             |
| DC           | Direct Current                                                  |
| EMS          | Energy Management System                                        |
| EPCM         | Engineering, Procurement and Construction Management Contractor |
| FAT          | Factory Acceptance Test                                         |
| PCS          | Power Conversion System                                         |
| PSA          | Pressure Swing Adsorption                                       |
| PSP          | Professional Service Provider                                   |
| SAT          | Site Acceptance Test                                            |
| SLD          | Single-Line Diagram                                             |
| SPD          | Surge Protective Device                                         |
| STS          | Static Transfer Switch                                          |

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## 1. Executive Summary

This Final Engineering Report has been prepared for the DBSA PSA Solar Backup Programme to support tender development, technical review and EPCM procurement for Tintswalo Hospital. It builds on the completed Stage 1 preliminary technical assessment and preserves the engineering truth thread established during site reconnaissance, concept development and preliminary design.

The PSA oxygen generation plant is treated as a critical medical load because it produces medical-grade oxygen for patients requiring oxygen support. The proposed solution therefore prioritises continuity of PSA operation during load shedding, grid interruptions, weak-grid conditions and extended outages.

The retained tender-support basis comprises approximately 120.615 kWp of solar PV using approximately 187 modules at 645 Wp each, preliminary annual solar generation of 210,775 kWh/year, a 500 kWh BESS planning class, a 125 kW PCS planning class and a 200 kVA standby generator planning class.

The operating philosophy is based on supply-on-demand resilience. Solar PV supports the PSA during daylight and charges the BESS. The BESS supports morning and evening shoulder periods, short interruptions, transient events and controlled source transfer. The generator provides extended-duration support during prolonged outages, poor solar availability or low state of charge. Grid supply remains a fallback where present.

OpenSolar values from the preliminary reports are retained for tender support. They remain preliminary. Final module orientation, azimuth, inclination, shading and yield shall be verified during EPCM detailed design. Non-optimal preliminary layouts shall be corrected to a north-facing orientation where practical before procurement.

This report provides engineering due diligence supporting the tender documentation and establishes the technical guardrails within which the appointed EPCM shall complete the final design. Detailed cost build-up and rates remain in the BOQ, cost register and tender evaluation matrix.

Before construction, the appointed EPCM shall undertake a mandatory seven-consecutive-day load profile study and site verification exercise. The measured data shall establish steady-state load, maximum demand, transient starting current, compressor cycling, daily energy consumption, power factor and time-of-use behaviour.

Based on the current PSP-stage assessment, the Tintswalo Hospital PV-BESS-PCS-generator solution is technically feasible for tender development, subject to the verification gates and sign-off requirements in this report.

| Executive Design Item          | Tender-Support Basis                                                                          |
|--------------------------------|-----------------------------------------------------------------------------------------------|
| PSA critical load              | Two PSA plants / high resilience                                                              |
| Solar PV                       | 120.615 kWp; approx. 187 x 645 Wp modules                                                     |
| Estimated annual PV generation | 210,775 kWh/year                                                                              |
| BESS                           | 500 kWh                                                                                       |
| PCS                            | 125 kW planning class                                                                         |
| Standby generator              | 200 kVA planning class                                                                        |
| Mounting                       | Primary roof and existing carports are not recommended; new dedicated PV structures required. |
| Report decision                | Proceed to tender support subject to the verification gates in this report.                   |

## 2. Project Background and Objective

The DBSA PSA Solar Backup Programme seeks to improve the energy resilience of hospital PSA oxygen generation facilities. Tintswalo Hospital forms part of Cluster 2 within the 20-hospital programme. This report provides the technical basis for tender documentation and EPCM procurement. It is not an issued-for-construction package.

## 3. Project Execution Philosophy

The project separates PSP engineering guardrails from EPCM construction design. The PSP defines the critical-load philosophy, preliminary sizing, functional architecture, site constraints, minimum technical requirements, BOQ scope and acceptance gates. The appointed EPCM verifies the site, completes the mandatory load study, develops the final design and BOQ, and submits construction-ready information for review.

- PSA treated as a critical medical load requiring supply-on-demand resilience.

- Stage 1 reconnaissance and preliminary reports retained as the engineering foundation.
- Final engineering report used for tender support and due diligence, not as an IFC package.
- Detailed BOQ is the principal input to tender pricing and evaluation.
- EPCM final design reviewed by PSP / DBSA electrical engineer before proceed approval.
- FAT, SAT, commissioning, training and close-out required before handover.

## 4. Site Assessment Summary

A rapid site reconnaissance was undertaken to capture available PSA nameplate information, breaker ratings, visible cable routes, equipment locations, potential PV mounting areas, roof and carport condition, open-space opportunities, access and security constraints. The assessment was visual and concept-level; final verification forms part of the appointed EPCM scope.

| Assessment Item      | Tintswalo Hospital Finding / Basis                                                            |
|----------------------|-----------------------------------------------------------------------------------------------|
| PSA plant            | Two PSA plants / high resilience                                                              |
| PV capacity          | 120.615 kWp Stage 1 basis                                                                     |
| Mounting opportunity | Primary roof and existing carports are not recommended; new dedicated PV structures required. |
| Cable route          | Final route, trenching and service clashes to be confirmed by EPCM.                           |
| Security             | Anti-tamper module fixing, fenced equipment bay, controlled access and equipment protection.  |
| Key uncertainty      | Measured PSA load profile, transient behaviour and final structural design.                   |

## 5. Design Development Methodology

The methodology below records the engineering and procurement sequence from site reconnaissance through handover and separates the PSP advisory role from the appointed EPCM detailed-design and construction role.

## DBSA PSA Solar Backup Programme - Delivery Methodology

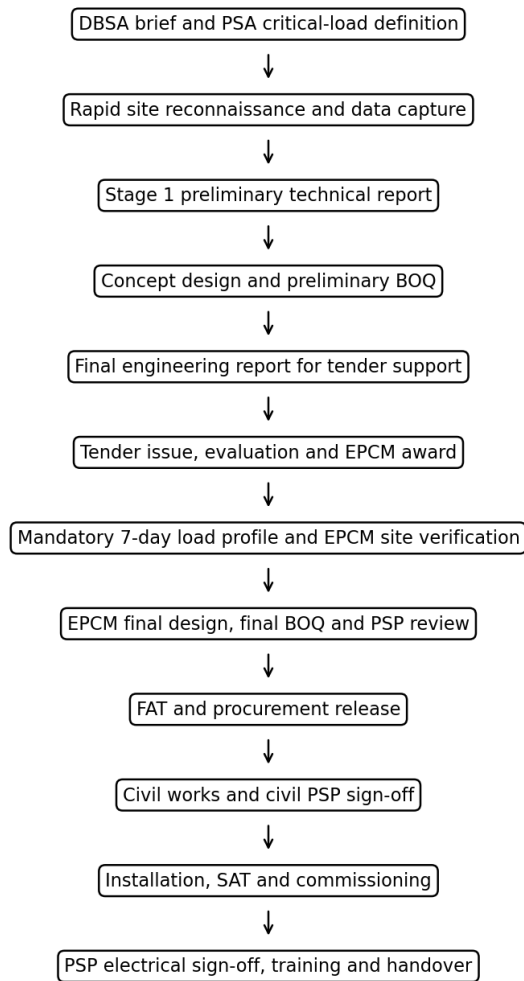


Figure 1: DBSA PSA Solar Backup Programme delivery methodology.

## 6. Recommended Technical Solution

The recommended architecture comprises a solar PV array, LFP BESS, grid-forming or grid-supporting PCS, EMS, dedicated standby generator, source integration, new AC protection and isolation, export limiting where applicable, earthing and bonding, safety labelling, remote monitoring and the civil works required for the selected mounting route.

| System Element     | Recommended Tender-Support Basis                                                                                                   |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Solar PV           | 120.615 kWp Stage 1 basis; 187 x 645 Wp Tier 1 modules.                                                                            |
| Mounting           | Primary roof and existing carports are not recommended; new dedicated PV structures required.                                      |
| BESS               | 500 kWh planning class; outdoor IP-rated LFP system with integrated BMS, thermal monitoring, smoke detection and fire suppression. |
| PCS / inverter     | 125 kW class with grid-forming / grid-supporting functions.                                                                        |
| Generator          | New low-noise 200 kVA standby generator class with automatic control and soft-load acceptance where applicable.                    |
| EMS / monitoring   | Integrated operating modes, alarms, event records, remote monitoring and reporting.                                                |
| Protection         | AC/DC isolation, SPDs, MCCBs, emergency stop, source labelling and protection coordination.                                        |
| Earthing / bonding | Equipotential bonding, lightning / surge protection and neutral-earth philosophy to applicable SANS / IEC requirements.            |

## 7. Energy Resilience and Operating Philosophy

Solar PV is the primary daytime energy source. The BESS supports shoulder periods, transient events and short-duration interruptions. The standby generator supports extended low-solar or low-state-of-charge conditions. Grid supply remains a fallback where available. The EMS shall preserve PSA continuity, coordinate source transitions, maintain battery reserve and limit unnecessary generator runtime.

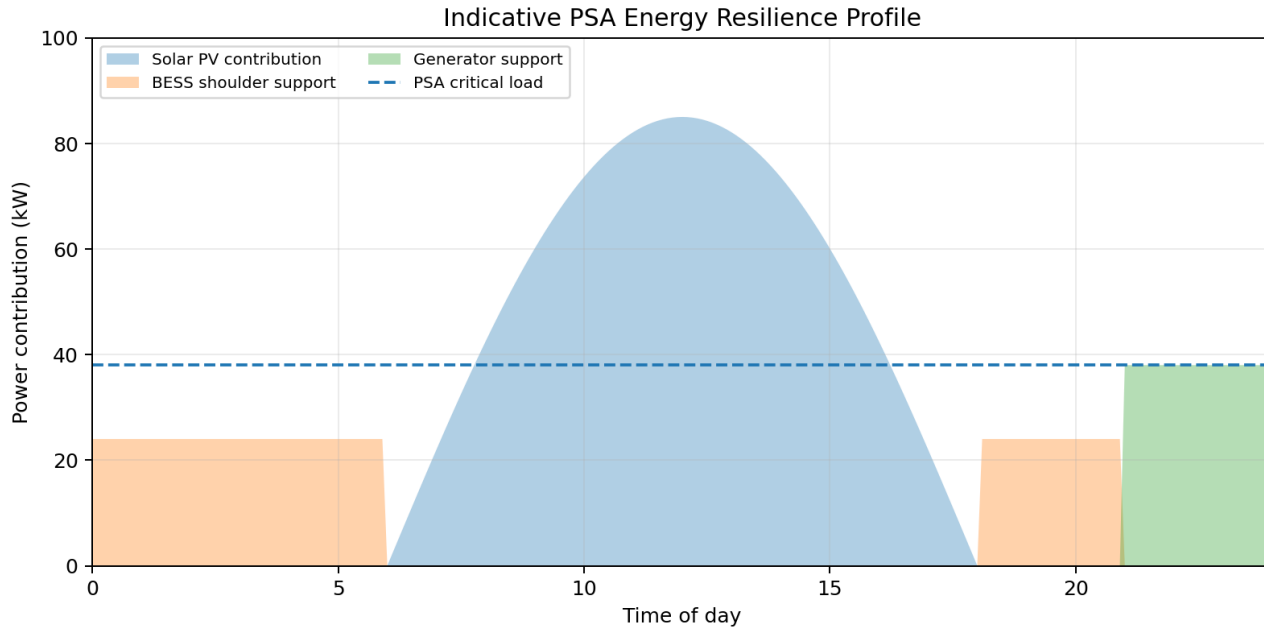


Figure 2: Indicative PSA energy resilience profile. This is a programme-level operating profile and does not represent measured site load data.

OpenSolar values are retained for preliminary energy estimation and concept development. Final orientation, azimuth, inclination, shading and production modelling shall be confirmed during EPCM detailed design. Any preliminary non-optimal orientation shall be corrected to the preferred north-facing arrangement where practical before final layout approval.

## 8. Civil / Structural / Mounting Recommendation

Primary roof and existing carports are not recommended; new dedicated PV structures required. A new solar carport shall be a single-pitch structure orientated towards true north, or as close as practical, at an inclination selected to maximise annual yield while maintaining drainage, wind loading, maintenance access and hospital operational requirements.

| Civil / Structural Item | Requirement                                                                                                                                       |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| New solar carport       | Confirm footprint, true-north orientation, inclination, foundations, drainage, corrosion protection, wind loading, access and anti-tamper fixing. |
| Roof alternative        | Only where sheeting, purlins, trusses, bracing, fixings, access, remaining life and waterproofing are confirmed.                                  |
| PCS / BESS / generator  | Confirm plinths, anchoring, drainage, bollards, fencing, fire access and maintenance clearances.                                                  |
| Cable routes            | Confirm trenching, service clashes, reinstatement and hospital disruption controls.                                                               |
| Dual-use benefit        | Where practicable, use the structure for protected staff / ambulance parking or another approved hospital use.                                    |

## 9. Electrical Design Basis

| Design Item          | Tintswalo Hospital Tender-Support Basis | Final Verification                                        |
|----------------------|-----------------------------------------|-----------------------------------------------------------|
| PSA planning load    | Two PSA plants / high resilience        | Seven-day load logging and OEM data.                      |
| Solar PV             | 120.615 kWp; 187 x 645 Wp               | Final layout, azimuth, shading, yield and stringing.      |
| Annual PV generation | 210,775 kWh/year                        | Final EPCM simulation and selected equipment.             |
| BESS                 | 500 kWh                                 | SOC, DoD, efficiency, autonomy and thermal / fire review. |
| PCS                  | 125 kW class                            | Transient response, overload, fault contribution          |

|                       |                                |                                                                                       |
|-----------------------|--------------------------------|---------------------------------------------------------------------------------------|
|                       |                                | and source interface.                                                                 |
| Generator             | 200 kVA class                  | Starting support, fuel, exhaust, controls and operating logic.                        |
| AC/DC protection      | Tender-support concept         | Fault level, discrimination, SPD and cable calculations.                              |
| Neutral-earth bonding | To be finalised                | Final topology for grid, generator, PCS and islanded operation.                       |
| Design spreadsheet    | PSP electrical sizing workbook | Reviewed flattened PDF extract to be included in Appendix A; no live formulas issued. |

## 10. Mandatory Seven-Day PSA Load Profile Study

The appointed EPCM shall undertake a minimum seven-consecutive-day electrical monitoring campaign before final design approval. The study is mandatory because nameplate information does not define actual running load, compressor cycling, transient current, daily energy or time-of-use behaviour.

| Study Element    | Minimum Requirement                                                                               | Engineering Use                                            |
|------------------|---------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| Instrumentation  | Class 0.5 or better three-phase power-quality logger.                                             | Reliable measurement basis.                                |
| Logging interval | Not greater than one minute; 30 seconds preferred where practical.                                | Capture daily profile and short-duration events.           |
| Parameters       | Phase V/I, kW, kVA, kVA <sub>r</sub> , power factor, frequency, kWh and power-quality indicators. | Confirm steady-state demand and energy use.                |
| Transient events | Capture compressor starts, inrush, cycling and maximum demand.                                    | Confirm PCS overload and generator response.               |
| Operating notes  | Record grid outages, generator operation, PSA downtime and abnormal events.                       | Separate representative operation from abnormal days.      |
| Daily energy     | Determine kWh/day and night-time demand.                                                          | Confirm usable BESS energy and autonomy.                   |
| Time-of-use      | Identify daytime, shoulder and night operating periods.                                           | Configure charging, discharge reserve and generator logic. |
| Review gate      | Submit raw CSV/Excel data, plots, interpretation and revised design.                              | PSP / DBSA electrical engineer approval before proceed.    |

Illustrative example only: a 36-46 kW planning load may operate at 32-38 kW steady state, peak at 44-50 kW during compressor cycling, and produce a short-duration start current of approximately 2.0-2.5 times nominal current. The final design shall use measured values rather than this example.

## 11. Tender Scope and EPCM Returnables

| Returnable                  | Minimum Requirement                                                                  |
|-----------------------------|--------------------------------------------------------------------------------------|
| Load study                  | Raw logger data, profiles, events and engineering interpretation.                    |
| Final design report         | Operating philosophy, calculations, assumptions and interfaces.                      |
| SLD / construction drawings | Final source integration, isolation, protection and metering detail.                 |
| PV layout and stringing     | Final module count, orientation, string voltages/currents and DC protection.         |
| BESS / PCS sizing           | Usable kWh, autonomy, SOC reserve, efficiency, transient and thermal limits.         |
| Generator integration       | Start/stop logic, load acceptance, fuel, exhaust, acoustic and access details.       |
| Cable schedule / protection | Cable sizing, voltage drop, fault level, discrimination and SPD coordination.        |
| Earthing / bonding          | Grid, generator, PCS and islanded-mode neutral-earth philosophy.                     |
| Civil / structural          | Carport, plinth, trench, security and drainage signed design inputs.                 |
| FAT / SAT / commissioning   | Approved scripts, witnesses, test results, CoC, as-builts, O&M manuals and training. |
| Final BOQ                   | Site-specific quantities, rates and total tender price.                              |
| Discrepancy justification   | Technical and commercial motivation for any deviation from PSP guardrails.           |

## 12. Standards and Compliance Requirements

The installation shall comply with applicable South African legislation and current applicable editions of SANS 10142, NRS 097 where applicable, IEC 62548, IEC 62446-1, IEC 60364-7-712, IEC 61215, IEC 61730, IEC 62109, IEC 62933, IEC 62619 / IEC 63056 as applicable, IEC 61439, IEC 60947, IEC/SANS 62305, SANS 10400-T, the Occupational Health and Safety Act and Construction Regulations. SSEG documentation shall be completed by the EPCM and submitted to the relevant supply authority where required.

## 13. Risks, Assumptions and Exclusions

| Risk / Assumption               | Implication                                                 | Required Control                                                                                                                                                                    |
|---------------------------------|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PSA load not yet logged         | BESS, PCS and generator sizing may change.                  | Mandatory seven-day monitoring and OEM data.                                                                                                                                        |
| OpenSolar values preliminary    | Yield may change with final azimuth, shading and equipment. | Final EPCM energy model and north-facing optimisation where practical.                                                                                                              |
| Structural design pending       | Carport foundations and steel sizes may change.             | Civil / structural design and certification.                                                                                                                                        |
| Cable route not final           | BOS quantities and cost may change.                         | Confirm routes and service clashes during detailed design.                                                                                                                          |
| Fire / environmental interfaces | Additional controls may be required.                        | Outdoor IP-rated BESS with integrated detection and suppression, minimum separation in accordance with OEM and fire authority requirements, and full fire/OHS/environmental review. |
| Final price not in report body  | Commercial values may differ at tender.                     | Use detailed BOQ, cost register and competitive tender evaluation.                                                                                                                  |

## 14. Recommended Tender Configuration

| Item                | Recommended Configuration                                                                                               |
|---------------------|-------------------------------------------------------------------------------------------------------------------------|
| Solar PV            | 120.615 kWp Stage 1 basis; approximately 187 x 645 Wp Tier 1 modules.                                                   |
| Mounting            | Primary roof and existing carports are not recommended; new dedicated PV structures required.                           |
| BESS                | 500 kWh outdoor LFP BESS planning class; integrated BMS, fire detection, fire suppression and minimum 10-year warranty. |
| PCS                 | 125 kW grid-forming / grid-supporting PCS planning class.                                                               |
| Generator           | New low-noise 200 kVA standby generator class.                                                                          |
| EMS and monitoring  | Remote monitoring, alarms, source control and event recording.                                                          |
| Protection          | Complete AC/DC protection, emergency isolation, earthing, bonding, surge protection and permanent labelling.            |
| Implementation gate | Mandatory seven-day load study, EPCM final design and BOQ, PSP review, FAT/SAT, commissioning and handover.             |

Proceed with the higher resilience option due to dual PSA plants.

The full site-specific detailed BOQ is provided in Appendix G and shall form a principal input to the tender documentation.

## 15. Conclusion

The Tintswalo Hospital PSA solar backup solution is technically feasible as a tender-support basis. This report preserves the Stage 1 engineering truth thread, records the recommended technical solution and defines the EPCM verification gates required to protect the PSA critical medical load. Final implementation remains subject to the required PSP sign-off, EPCM detailed design and formal DBSA approval.

### Appendix A - Design Sheet Extract

| Design Parameter  | Current Tender-Support Value |
|-------------------|------------------------------|
| PV capacity       | 120.615 kWp                  |
| Module count      | 187 x 645 Wp                 |
| Annual generation | 210,775 kWh/year             |
| BESS              | 500 kWh                      |
| PCS               | 125 kW                       |
| Generator         | 200 kVA                      |

The reviewed PSP electrical design spreadsheet shall be inserted as a flattened PDF/image extract before final issue. The report will not include live formulas or an editable workbook.

### Appendix B - Preliminary Technical Specification

- Tier 1 PV modules certified to IEC 61215 and IEC 61730.
- Minimum PV module product warranty: 15 years.
- Minimum PV module performance warranty: 25 years.
- Maximum first-year power degradation: 2%.
- Maximum subsequent annual degradation: 0.55%.
- LFP BESS as design basis with integrated BMS, EMS communications and minimum 10-year warranty.
- Outdoor IP-rated equipment cabinets suitable for the hospital environment.
- Grid-forming / grid-supporting PCS, AC/DC isolation, SPD protection, earthing and bonding.
- Remote monitoring, OEM-supported commissioning, FAT/SAT and full handover documentation.

## Appendix C - Standards and Compliance Matrix

| Discipline              | Principal Requirement                             |
|-------------------------|---------------------------------------------------|
| LV installation and CoC | SANS 10142-1                                      |
| Grid interface          | NRS 097 where applicable                          |
| PV array design         | IEC 62548                                         |
| PV commissioning        | IEC 62446-1                                       |
| PV modules              | IEC 61215 and IEC 61730                           |
| PCS safety              | IEC 62109                                         |
| BESS safety             | IEC 62933 and IEC 62619 / IEC 63056 as applicable |
| LV assemblies           | IEC 61439                                         |
| Switchgear              | IEC 60947                                         |
| Lightning and earthing  | IEC/SANS 62305 and SANS 10142-1                   |
| Fire safety             | SANS 10400-T and local authority requirements     |
| OHS                     | OHS Act and Construction Regulations              |

## Appendix D - Civil / Structural Review

The civil / structural review shall confirm the final carport footprint, foundations, true-north orientation, inclination, wind loading, drainage, corrosion protection, access, maintenance clearances, plinths, trench routes, security and reinstatement requirements.

## Appendix E - Fire Safety and OHS Requirements

- Outdoor IP-rated LFP BESS enclosure with integrated thermal monitoring, smoke detection and approved fire suppression.
- Minimum separation and emergency access to be confirmed by the OEM, fire authority and final site layout; a 3 m separation shall be targeted where practicable.
- Emergency stop and source isolation procedures.
- Generator fuel, exhaust and heat-source controls.
- Safety file, RAMS, hospital access and traffic controls.
- Permanent warning signage and staff awareness.

## Appendix F - Environmental Requirements

- Environmental screening and permitting triggers.
- Dust, noise, waste, traffic and hospital-access controls.
- Stormwater, drainage, erosion and trench reinstatement.
- Waste disposal and recycling records.
- Protection of hospital operations during construction.

## Appendix G - Site-Specific Detailed BOQ

| Item | BOQ Item                      | Description                                                                                                                                                                                                           | Unit  | Quantity |
|------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|
| 1    | PV modules                    | Tier 1 modules, nominal 645 Wp or approved equivalent                                                                                                                                                                 | No.   | 187      |
| 2    | PV mounting structure         | One new purpose-designed solar carport / approved mounting structure including steel, foundations, rails, clamps and fasteners                                                                                        | lot   | 1        |
| 3    | Anti-tamper fixing            | Security clamps / anti-tamper fasteners for accessible PV modules                                                                                                                                                     | lot   | 1        |
| 4    | PV DC cabling                 | UV-rated red/black solar cable, final length by routing study                                                                                                                                                         | m     | TBC      |
| 5    | PV connectors                 | Certified compatible connectors and spares                                                                                                                                                                            | pairs | TBC      |
| 6    | DC protection box             | String combiner / protection, DC isolator, gPV fuses where required and Type 1/2 SPD                                                                                                                                  | No.   | 1        |
| 7    | PCS / inverter                | Grid-forming / grid-supporting PCS, 125 kW class                                                                                                                                                                      | No.   | 1        |
| 8    | BESS                          | Outdoor LFP BESS, 500 kWh class, including BMS, thermal management, detection, suppression and 10-year minimum warranty                                                                                               | No.   | 1        |
| 9    | EMS / control                 | EMS, source control, monitoring gateway and HMI                                                                                                                                                                       | lot   | 1        |
| 10   | Static transfer / changeover  | STS / source integration and maintenance bypass arrangement                                                                                                                                                           | No.   | 1        |
| 11   | Standby generator             | 200 kVA class low-noise generator with controls, weather/acoustic enclosure and integration                                                                                                                           | No.   | 1        |
| 12   | AC protection kiosk           | New AC protection / isolation kiosk adjacent to PSA MCCB kiosk, including MCCB, SPD, metering, labels, E-stop and maintenance bypass                                                                                  | No.   | 1        |
| 13   | AC cable rerouting            | Remove existing grid feeder from PSA kiosk, terminate at new AC kiosk, install new 16/25 mm <sup>2</sup> 4-core feeder to STS grid input, return protected PCS output to AC kiosk and short loop to existing PSA MCCB | m     | TBC      |
| 14   | Cable containment             | Trays, conduits, sleeves, glands, lugs and accessories                                                                                                                                                                | lot   | 1        |
| 15   | Earthing and bonding          | Earth electrodes, conductors, lugs, bonds and test points                                                                                                                                                             | lot   | 1        |
| 16   | Lightning / surge protection  | AC/DC SPDs and lightning-risk coordination measures                                                                                                                                                                   | lot   | 1        |
| 17   | Civil plinths and foundations | BESS, PCS, generator and carport foundations / plinths                                                                                                                                                                | lot   | 1        |
| 18   | Trenching and reinstatement   | Cable trenches, ducts, backfill and reinstatement                                                                                                                                                                     | lot   | 1        |
| 19   | Security works                | Fencing, gate, double locks, bollards and access control                                                                                                                                                              | lot   | 1        |

|    |                                     |                                                                                      |     |   |
|----|-------------------------------------|--------------------------------------------------------------------------------------|-----|---|
| 20 | Remote monitoring                   | LTE/Wi-Fi router, metering integration, dashboard setup and alarms                   | lot | 1 |
| 21 | Safety signage and labelling        | DB, circuit, power-point, source, isolation and dual-supply labels                   | lot | 1 |
| 22 | Seven-day load study                | Logger installation, monitoring, data export, analysis and revised design report     | lot | 1 |
| 23 | Shading / wind / structural studies | Final shading, orientation, wind-load and structural verification                    | lot | 1 |
| 24 | FAT                                 | OEM-neutral FAT scripts, witness attendance and records                              | lot | 1 |
| 25 | SAT and commissioning               | Functional testing, protection tests, outage simulation and performance verification | lot | 1 |
| 26 | CoC and handover                    | CoC, as-builts, test sheets, O&M manuals, training and close-out pack                | lot | 1 |

#### Appendix H - Mandatory Seven-Day Load Profile Study

Appendix H incorporates the detailed requirements in Section 10 and forms a mandatory post-award EPCM deliverable before final design approval.

#### Appendix I - Safety Signage and Labelling Requirements

- All DBs, breakers, circuits, socket outlets and isolation points shall be permanently labelled.
- Kiosks, PCS, BESS, STS, generator interface, AC protection and DC protection boxes shall identify all sources.
- Dual-supply warning: THIS EQUIPMENT IS FED FROM MORE THAN ONE SOURCE. ISOLATE ALL SUPPLIES BEFORE WORKING ON THIS EQUIPMENT. VERIFY DEAD BEFORE TOUCH.
- Kiosk warning: THIS KIOSK IS FED FROM TWO SUPPLY POINTS. ISOLATE BOTH SUPPLIES BEFORE WORKING ON THIS EQUIPMENT.

#### Appendix J - Commissioning and Handover Checklist

- Final approved design, SLD, cable schedule and protection settings submitted.
- Seven-day load study reviewed by PSP / DBSA electrical engineer.
- PV, BESS, PCS, generator, STS, EMS and monitoring commissioned.
- Earthing, insulation, polarity, phase rotation, protection and neutral-earth arrangement tested.
- Normal, outage, low-SOC, generator-support and grid-restoration modes demonstrated.
- CoC, OEM certificates, as-builts, warranties, O&M manuals and training records submitted.
- Safety signage and labelling installed and inspected.
- Snags closed or accepted with defined close-out dates.

#### Appendix K - EPCM Final Design Returnables

The EPCM shall submit the final design report, project-specific SLD, layouts, cable schedules, protection coordination, earthing and neutral-earth philosophy, structural design, fire/OHS method statements, environmental controls, final BOQ, FAT/SAT procedures and commissioning plan before proceed approval.

#### Appendix L - Preliminary Report Reference

Foundation document: Tintswalo Hospital Preliminary Technical Report. The preliminary report shall be read together with this final engineering report, the detailed BOQ and subsequent approved EPCM final-design submissions.

#### Appendix M - Typical Secure Solar Carport and Equipment Bay

The illustration below is conceptual and does not represent the final construction design. The solar carport shall be a single-pitch structure orientated north where practical, with an inclination selected to maximise annual energy yield and to provide effective drainage. Modules shall use approved clamps and anti-tamper fasteners. The first bay may accommodate the PCS and BESS on a raised plinth within a lockable palisade enclosure, subject to final fire, ventilation, access and structural requirements.

## POWER CONVERSION SYSTEM (PCS) – SECURED INSTALLATION

Installed in Bay 1 of Solar Carport on Raised Plinth with Lockable Palisade Fencing



Figure M-1: Typical secure solar carport and equipment bay - illustrative only.

### Appendix N - Generic Functional Single-Line Diagram

The generic diagram below illustrates the tender-support functional architecture only and is not an official or issued-for-construction SLD. The appointed EPCM shall prepare the final project-specific SLD, protection settings and cable schedules. The retrofit cable philosophy is: locate a new AC protection kiosk next to the existing PSA MCCB kiosk; remove the existing grid feeder from the PSA kiosk and terminate it at the new AC kiosk; install a new 16/25 mm<sup>2</sup> four-core feeder from the AC kiosk to the STS grid input; return the protected PCS output to the protection side of the AC kiosk; and use a short AC loop from the AC kiosk output to the existing PSA MCCB kiosk.

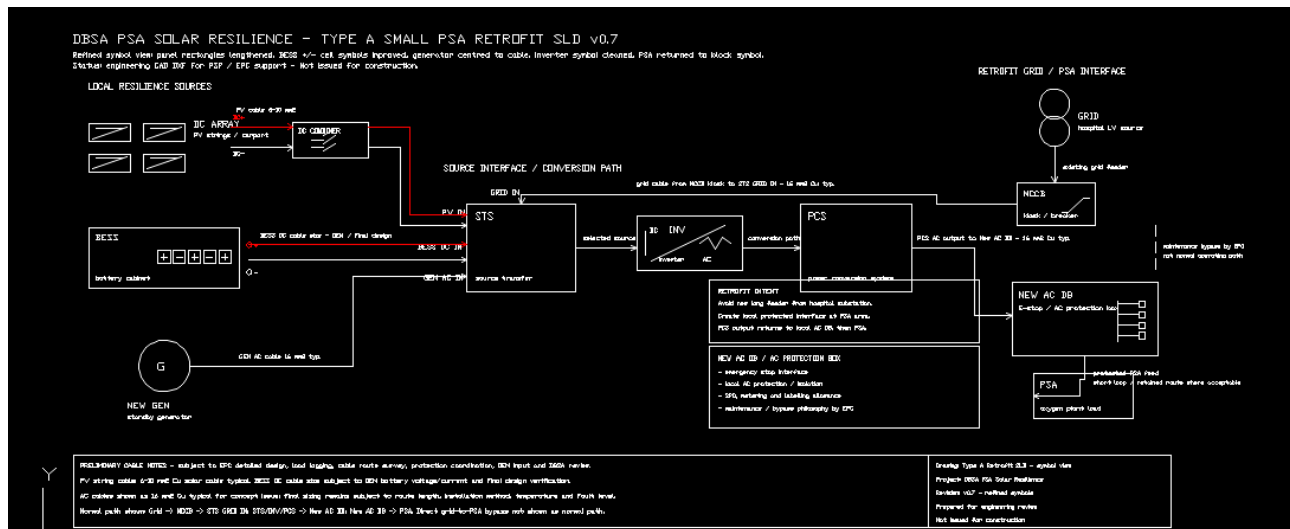


Figure N-1: Generic functional SLD - tender support concept only; not for construction.

## Appendix O - Typical Outdoor BESS Installation and Fire-Safety Requirements

The BESS shall be an outdoor IP-rated LFP system with integrated BMS, thermal monitoring, smoke detection, emergency isolation and an approved fire-suppression system. The final location and separation distances shall follow the OEM design, fire authority requirements and the project-specific fire-risk assessment. A minimum 10-year BESS warranty shall be required.



Figure O-1: Typical outdoor BESS configuration - illustrative only.

### Sign-off and Review

| Organisation / Role                                           | Name                                                    | Signature                                                                             | Date         |
|---------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------------------------------------|--------------|
| Lead Electrical Engineer - Prepared / reviewed and signed off | Rajandren Chetty, Professional Engineering Technologist |  | 13 July 2026 |

Professional verification: [Rajandren Chetty - ECSA PrivySeal](#)