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SCOPE OF WORK

ENQUIRY NO: CTT

DESCRIPTION: APPOINTMENT OF SERVICE PROVIDER(S) TO DESIGN, SUPPLY, DELIVER, INSTALL, INTEGRATE AND COMMISSION OF A ROOF TOP SOLAR PHOTOVOLTAIC (PV) SYSTEM AT THE PETROSA HEAD OFFICES, PAROW, CAPE TOWN.

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1 GENERAL

1.1 Introduction

The Petroleum Oil and Gas Corporation of South Africa (PetroSA) requires the service of an accredited service provider to DESIGN, SUPPLY, DELIVER, INSTALL, INTERGRATE AND COMMISSION a Roof Top Solar Photovoltaic(PV) system at its Parow Head Office (Main building) located at 151 Frans Conradie Drive, Parow, Cape Town. (Latitude: -33.8997, Longitude: 18.6024). The primary objectives of the PV system include but not limited to:

- Reduce electricity consumption from the municipal utility provider.
- Achieve significant operational cost savings on energy.
- Diminish the corporate carbon footprint, supporting PetroSA's sustainability commitments and South Africa's National Development Plan 2030

The CONTRACTOR shall have Construction Industry Development Board (CIDB) Grading of 4EB/4EP or higher in the following Class of works (EB or EP). Only CONTRACTORS with relevant experience and appropriately qualified personnel to deliver the required services are eligible to submit tenders.

CONTRACTORS are required to submit proposals for the commercial options as outlined in Section 6 of this document.

A **COMPULSORY Site Visit** will be held at Petrosa, 151 Frans Conradie Drive, Parow, Cape Town on the 14th of April 2026 at 11h00. Only bidders who attend the COMPULSORY Site Visit, as recorded in the official attendance register, will be considered eligible to submit a bid. A mandatory safety induction session will be held, commencing at 11h00, and all bidders are required to be seated at this time. Bidders are required to bring their own personal protective equipment (PPE). The use of safety shoes, Overalls, a hard hat, and a reflective jacket is mandatory for entry to specific areas. Entry to the roof area will be limited to 1 (one) representative per company. Any bid submitted by a bidder who did not attend the Compulsory Site visit, will be deemed non-responsive and will not be considered for evaluation.

PetroSA reserves the right to proceed with the works and to determine the scope and

methodology of delivery. This includes the right to select any of the system options described in this document, or to elect not to proceed with any option, at the COMPANY'S discretion.

1.2 Site Overview

The PetroSA Head Office (Main Building) is a multi-story commercial facility that accommodates a range of administrative and operational functions, including offices, meeting rooms, information technology (IT) server rooms, and other essential workspaces supporting daily business activities. The building is primarily oriented along a northwest–southeast axis.

The estimated total available roof surface area is approximately 4,141.38 m², comprising a flat roof with clip-in flat sheet metal roofing featuring a concealed fixing system.

The electrical supply to the building is provided by the City of Cape Town (CoCT) through the municipal grid and integrated with a diesel Standby generator available as an emergency backup during power outages. Uninterrupted Power Supply (UPS) capability is installed to maintain continuous power to critical loads during power interruptions or grid-to-generator and generator-grid changeover. In the event of grid failure, non-essential loads are temporarily disconnected until the generator supply comes online.

The Grid Tied solar power system will automatically draw supplementary electricity from the local utility provider, City of Cape Town, with a complete switchover occurring when no solar energy is available.

2 SCOPE OF WORK

The CONTRACTOR shall provide a complete turnkey solution and shall be the single-point responsibility for project management, design, procurement, installation, integration with the existing systems, testing, commissioning, training and documentation as well as final handover of a fully operational grid-tied, non-exporting PV system.

2.1 Project Management

The CONTRACTOR shall be responsible for the supply, delivery, and installation of all equipment, components, and materials necessary for the complete and functional

operation of the Solar PV system. The scope shall include, but not be limited to, the following:

- Solar Photovoltaic (SPV) modules – crystalline type, in the quantity required to meet the system capacity.
- Inverter(s) / Power Conditioning Unit (PCU), in the quantity required to meet the system capacity.
- Module mounting structures and maintenance access walkways.
- Energy metering equipment.
- Array junction boxes.
- DC (Direct Current) distribution box.
- AC (Alternating Current) distribution box.
- Protection systems, including earthing, lightning, and surge protection.
- All necessary cabling and wiring.
- Fire protection system.
- Ventilation system.
- Miscellaneous items and accessories required for a complete and operational installation.

CONTRACTORS are advised that reasonably required information relevant to this tender will be provided, upon request, during the clarification period. No information will be issued outside the formal clarification process. All responses deemed material will be issued to all bidders by way of formal addendum.

2.2 Site Assessment and Feasibility

2.2.1.1 Conduct a detailed structural assessment of the roof by a certified Professional Engineer to verify its load-bearing capacity for the proposed PV system, including static (dead) loads and dynamic (wind) loads. This assessment and reporting should be completed prior to costing and system delivery for acceptance, in the event that remedial repairs and/or modifications are required.

2.2.1.2 Perform a comprehensive roof condition and waterproofing integrity assessment to confirm suitability for the installation of mounting structures and electrical equipment. The assessment shall identify any necessary roof repairs or surface preparation prior to installation.

2.2.1.3 As part of the roof condition works, the CONTRACTOR shall apply a high-quality reflective cooling roof coating across the designated PV installation area. The coating shall be UV-resistant, weatherproof, and compatible with the existing roof membrane system. The reflective surface shall assist in reducing roof heat absorption, thereby lowering building cooling loads and improving system performance.

2.2.1.4 Conduct a shading and soiling analysis (including the impact of adjacent structures and generator exhaust outlets) for different seasonal sun paths to optimize PV array orientation and tilt angles.

2.2.1.5 Survey all existing roof obstructions such as vent pipes, Heating, ventilation, and air conditioning (HVAC) units, and access points, and design appropriate maintenance access walkways to ensure safe operational access post-installation.

2.2.1.6 Document all findings in detailed inspection report, including photographs, structural verification data, and recommendations for any remedial actions prior to system installation.

2.2.1.7 The CONTRACTOR shall undertake all necessary studies or procure data required to design a suitable system.

2.3 Engineering

The system shall achieve all performance criteria outlined in this Scope of Work.

All deliverables, from initial design to final certification, shall be executed in strict compliance with:

- All applicable South African National Standards (SANS) and Grid Code Requirements (NRS).
- Relevant International Electrotechnical Commission (IEC) standards.
- The City of Cape Town's (CoCT) Small-Scale Embedded Generation (SSEG) regulations.
- PetroSA's documented Health, Safety, and Environment (HSE) and operational policies.

The CONTRACTOR shall apply recognized engineering best practices to ensure a safe, reliable, and high-performance installation that minimizes lifetime operational costs.

The PV system shall be designed to achieve optimal performance, reliability, and long-term operational efficiency under Cape Town, South African climate conditions. The CONTRACTOR shall ensure that all design elements — including module selection, inverter configuration, cable sizing, protection coordination, and system layout — are optimised to minimise electrical, thermal, and shading losses.

The proposed PV system is to be integrated into the existing electrical reticulation at the Main Low Voltage Distribution Board (MLVDB) (400Vac, 3-phase), located on the Ground floor, and operated in compliance with City of Cape Town Small-Scale Embedded Generation (SSEG) requirements.

A dedicated plant room on the roof top is available for housing of the inverters and associated electrical equipment. The CONTRACTOR shall undertake all necessary studies, modification required to install & secure the inverter and associated equipment.

2.3.1 PV System Capacity and Design Basis

The CONTRACTOR shall design, engineer, and configure a complete rooftop Grid-Tied solar photovoltaic (PV) system with a **minimum nominal installed capacity of 300 kWp or higher**, optimised for maximum energy yield within the available rooftop area.

The final system capacity and configuration shall be verified and confirmed during the detailed design phase through a comprehensive technical assessment, which shall include:

- Analysis of historical and current energy consumption patterns, including review of municipal electricity billing data;
- Evaluation of operational load profiles, accounting for weekday, weekend, and seasonal variations;
- Consideration of future expansion or changes in building energy demand; and
- Site feasibility and roof utilisation studies, ensuring optimal array layout, tilt, and orientation for maximum self-consumption.

The PV system shall be designed to:

- Accommodate the climatic conditions of Parow, Cape Town, including high Ultra-Violet (UV) exposure, elevated ambient temperatures, and a coastal corrosion environment. All components, including PV modules, mounting structures, and cabling, shall be suitable for marine or near-coastal environments and designed for a minimum 25-year service life.
- Operate as a non-exporting grid-tied system, fully compliant with the City of Cape Town's Small-Scale Embedded Generation (SSEG) requirements, including certified zero-export protection and system anti-islanding features.
- Include a comprehensive, internet-enabled monitoring platform accessible to both the Contractor and PetroSA. The system shall provide real-time and historical data on key performance indicators (KPIs) such as solar irradiance, inverter output, daily energy yield, cumulative generation, system availability, and performance ratio (PR). Where required by CoCT, the PV system shall provide a **telemetry interface** for integration with the **City's SCADA/telecontrol system**, supporting the required protocol.

- Offset a minimum of 30% of the facility's total annual electricity consumption, validated against verified historical energy usage data and operational profiles.
- Ensure that component selection, electrical configuration, and installation layout maximise energy yield, minimise system losses, and ensure full compliance with SANS 10142-1, SANS 10142-1-2, and applicable structural standards.
- Be designed to achieve a minimum Performance Ratio (PR) of 75%, verified during commissioning under standard operating conditions, with a target benchmark of 80% representing optimal design and operation. The PR calculation shall account for inverter conversion losses, temperature effects, mismatch, soiling, and wiring losses.
- Utilise internationally recognised performance simulation software (e.g. PVsyst or equivalent) system, incorporating site-specific irradiance and temperature data to validate the projected annual energy yield and PR outcomes. The CONTRACTOR shall undertake all necessary studies or procure data required to design a suitable system.

The CONTRACTOR shall ensure that all final design packages are prepared, reviewed, and signed off by a competent Professional Engineer (Pr.Eng.) registered with ECSA, ensuring full compliance with applicable South African standards, City of Cape town requirements, and PetroSA's operational requirements.

2.4 System Minimum Requirements

2.4.1 Electrical Design

2.4.1.1 Develop a comprehensive Single-Line Diagram (SLD) illustrating the entire electrical configuration — from PV module strings and Array Junction Boxes (AJBs) to the main point of connection at the existing Low Voltage (MLVDB) Distribution Board.

2.4.1.2 Perform detailed cable sizing calculations for both the Direct Current (DC) and Alternating Current (AC) circuits to minimise voltage drop and thermal losses, ensuring compliance with SANS 10142-1 and relevant IEC standards.

2.4.1.3 Conduct protection coordination studies to ensure correct grading between all overcurrent and earth fault protection devices, including fuses, Miniature Circuit Breakers **(**MCBs), Moulded Case Circuit Breakers (MCCBs), and earth-leakage relays.

2.4.1.4 Design the AC integration into the existing facilities electrical reticulation including the required AC combiner or sub-distribution board and specify any required upgrades or modifications to the Main LV Distribution Board to accommodate the PV system.

2.4.1.5 Develop the earthing and bonding design, including system grounding, lightning, and surge protection measures.

2.4.1.6 Provide monitoring and communication system design detailing all interfaces (e.g., Modbus TCP/IP, Ethernet) for remote data access, energy monitoring, and system performance tracking.

2.4.1.7 All design drawings, calculations, and reports shall be signed and approved by a registered Professional Engineer (Pr.Eng.) prior to construction.

2.4.1.8 The design shall comply with CoCT SSEG zero-export requirements, and the CONTRACTOR shall be responsible for obtaining all necessary CoCT approvals prior to system energisation.

2.4.1.9 The Contractor shall coordinate with CoCT's network operations and provide a communication diagram, protocol mapping, and proof of end-to-end telemetry testing prior to final approval.

2.4.1.10 The Contractor shall obtain all necessary approvals formally, prior to installation and before commissioning of the system, from all relevant Authorities.

2.4.2 Solar PV Modules

2.4.2.1 The CONTRACTOR shall supply Tier-1 rated crystalline PV modules with a **minimum** nominal capacity of 400 Wp, efficiency of at least 21%, and a positive tolerance only.

2.4.2.2 Modules shall be selected for high durability, low degradation rates, and suitability for coastal environments.

2.4.2.3 Modules shall incorporate high-transmittance tempered glass, UV-resistant backsheets, and IP68-rated junction boxes with compatible connectors.

2.4.2.4 Each module shall include bypass diodes and factory-fitted MC4-compatible connectors.

2.4.2.5 Performance warranties shall include a minimum of 25 years linear output warranty (≥84.8% of initial power at year 25) and a 12-year product warranty covering materials and workmanship.

2.4.3 Inverter

2.4.3.1 The CONTRACTOR shall be responsible for the selection, sizing, and configuration of suitable inverters to achieve optimal system performance, reliability, and compliance with the overall design capacity. Only inverters appearing on the City of Cape Town's approved SSEG inverter list shall be used.

2.4.3.2 The inverter/s shall be a three-phase, grid-tied string inverter, designed for integration with low-voltage (400 V, 50 Hz) distribution systems.

2.4.3.3 The inverter shall operate under a net zero export configuration, ensuring no active power is exported to the municipal grid at any time. The system shall comply fully with the City of Cape Town (CoCT) Small-Scale Embedded Generation (SSEG) requirements.

2.4.3.4 The CONTRACTOR shall provide and configure zero-export control system, which may include an external power control unit, energy meter, or smart controller capable of real-time power flow limitation. The system shall maintain export at or below 0 kW under all operating conditions and provide real-time verification through CoCT's monitoring interface where applicable.

2.4.3.5 The inverter shall incorporate multiple Maximum Power Point Trackers (MPPTs) to optimise energy yield from independent module strings.

2.4.3.6 Nominal AC output parameters:

- 400 V, 50 Hz, three-phase with neutral

2.4.3.7 Minimum inverter efficiency shall be:

- Maximum efficiency ≥ 99%
- European weighted efficiency ≥ 98.5%

2.4.3.8 Power factor adjustable from 0.8 lagging to 0.8 leading, with THD < 3% at full rated load.

2.4.3.9 The inverter shall provide the following protection and operational features:

- DC and AC surge protection (Type II)
- Integrated DC isolators
- Reverse polarity, ground fault, and overcurrent protection
- Over/under-voltage and frequency protection
- Over-temperature and short-circuit protection
- Anti-islanding protection

2.4.3.10 Enclosure protection shall be IP66 minimum, suitable for outdoor installation and exposure to the coastal and corrosive atmospheric conditions typical of Parow, Cape Town. Cooling shall be by intelligent forced-air or equivalent thermal management to maintain full rated output over −20 °C to +60 °C ambient range.

2.4.3.11 The inverter shall include RS485, Ethernet, and Modbus TCP/IP communication interfaces and support integrated web-based or cloud-based monitoring, data logging, and remote fault diagnostics accessible to PetroSA and O&M personnel.

2.4.3.12 The CONTRACTOR shall be responsible for obtaining City of Cape Town (CoCT) SSEG pre-authorisation for the complete PV system design prior to commencement of installation works.

2.4.3.13 The submitted design package shall include inverter and protection device datasheets, single-line diagrams, protection settings, and zero-export configuration details, as required by CoCT.

2.4.3.14 The inverter shall include all auxiliary components and accessories necessary for full operational integration, including mounting brackets, communication hardware, AC/DC connectors, and surge protection devices.

2.4.3.15 The inverter shall be supplied with a minimum 5-year warranty, extendable to 10 years through the manufacturer or authorised distributor. Warranty coverage shall include parts, labour, and technical support.

2.4.4 Module Mounting Structures & Maintenance access

2.4.4.1 PV module array mounting structures shall be designed for flat roof installation using ballasted or non-penetrative systems where practical, compatible with local wind and load conditions.

2.4.4.2 PV module array mounting structures shall be designed for optimal tilt angle and azimuth orientation of the PV modules to maximise annual energy yield and ensure effective self-cleaning performance, taking into account the site's structural layout, shading conditions, and climatic parameters.

2.4.4.3 Structures shall be manufactured from hot-dip galvanized steel or marine-grade aluminium suitable for coastal corrosion environments.

2.4.4.4 Mounting structures shall incorporate provision for safe and durable maintenance access walkways between PV module arrays.

2.4.4.5 Walkways shall be non-slip, corrosion-resistant, and provide safe access to all modules, inverters, and junction boxes for maintenance.

2.4.4.6 The layout of walkways and access routes shall be clearly indicated on as-built drawings and approved by the Employer's Representative before installation.

2.4.5 Array Junction Boxes and Distribution Boxes

2.4.5.1 Array Junction Boxes (AJBs), DC Distribution Boxes (DCDBs), and AC Distribution Boxes (ACDBs) shall be manufactured from corrosion-resistant materials suitable for outdoor use and rated to a minimum IP65.

2.4.5.2 Each enclosure shall be equipped with:

- DC/AC isolators rated appropriately for system voltage and current.
- Surge Protection Devices (SPDs) of Type II, installed on both the DC and AC sides as applicable.
- DC fuses (AJB/DCDB) with appropriate string protection
- Cable glands and terminations rated for outdoor use and UV resistance.

2.4.6 The AC Distribution Boxes (ACDBs) shall include, as a minimum:

- Moulded Case Circuit Breakers (MCCBs) with appropriate ratings for inverter output.
- Surge arrestors (Type II) on the AC side.
- Terminals for safe and accessible interconnection between the inverter output and the main distribution board (MDB) or point of common coupling (PCC).
- Provision for earthing and neutral links, clearly labelled and segregated.

2.4.6.1 All boxes shall be clearly labelled, numbered, and fitted with single-line diagram labels inside the cover for identification, maintenance, and compliance verification.

2.4.7 Energy Metering and Monitoring

2.4.7.1 A bi-directional four-quadrant energy meter shall be installed at the point of common coupling (PCC) to enable zero-export control.

2.4.7.2 Where the meter is intended to provide data for export limitation or CoCT verification / monitoring, the model and configuration shall be submitted to CoCT for approval as part of the SSEG design pre-authorisation process.

2.4.7.3 The meter shall interface with the inverter or EMS system for dynamic export limitation in accordance with CoCT zero-export operational requirements.

2.4.7.4 Data shall be accessible locally and remotely for performance verification and CoCT compliance reporting. Where CoCT requires telemetry or SCADA integration, the Contractor shall provide a communication interface and data mapping in line with CoCT's SCADA protocol requirements.

2.4.7.5 The Remote Monitoring System shall provide as a minimum the following data:

- Real-time power generation (DC & AC).
- Daily, monthly, and annual energy yield (kWh).
- System Performance Ratio (PR) and specific yield.

- Inverter status and fault alarms.
- Instantaneous grid parameters (voltage, frequency, power).
- Capability for automated alert generation (SMS/Email) for system faults or performance drops.

2.4.7.6 All metering, data acquisition, and communication configurations shall form part of the CoCT SSEG pre-authorisation submission, and final approval shall be obtained prior to system energisation.

2.4.8 Cabling and Connectors

2.4.8.1 All DC cabling shall be UV-resistant, double-insulated, tinned copper conductors with XLPO/PVC sheathing, suitable for outdoor use. DC cables shall be rated for not less than 1.5 kV DC, and designed for operation under local climatic and environmental conditions.

2.4.8.2 All AC cabling shall be XLPE/PVC insulated, armoured or unarmoured as required by installation conditions.

2.4.8.3 Cable sizing, routing, and protection shall be carried out in accordance with relevant SANS and IEC standards to ensure compliance with allowable voltage drop, current-carrying capacity, derating factors, and fault protection requirements. The Contractor shall perform and document all cable calculations as part of the detailed design submission.

2.4.8.4 All cable terminations, connectors, and joints shall be UV- and weather-resistant, IP68-rated, and MC4-compatible (for DC side) or equivalent, ensuring full electrical and mechanical compatibility. Connectors shall be of matching manufacturer and type to prevent mismatched contact resistance or thermal degradation.

2.4.8.5 Cables and connectors shall be installed using appropriate conduits, trunking, or cable trays, ensuring mechanical protection, correct bend radii, and segregation of AC and DC circuits in compliance with applicable electrical installation codes.

2.4.9 Protection Systems – Earthing, Lightning, Surge

2.4.9.1 All metallic components, PV module frames, and enclosures shall be bonded to a common earth network.

2.4.9.2 Lightning and surge protection systems shall be installed to protect the installation against transients and overvoltage events.

2.4.9.3 Surge protective devices shall be provided by the contractor on both DC and AC sides, and residual current devices (RCDs) shall be installed on AC circuits for personnel protection.

2.4.10 Fire Protection and Ventilation System

2.4.10.1 Fire safety measures shall include:

- CO_2-type fire extinguishers near inverter and DB areas;
- Adequate natural or mechanical ventilation to prevent overheating of inverter rooms;
- Fire-rated sealing for all cable penetrations through walls or roofs;
- Integration of smoke or fire detection devices with the building's existing alarm system.

2.4.10.2 All fire detection and protection equipment shall be certified for use in commercial electrical installations.

2.4.10.3 The Contractor shall verify the presence and operational condition of smoke detection and fire alarm devices within the room or area housing the inverters.

2.4.10.4 Where smoke detectors are not installed, the Contractor shall design, supply, and install compliant fire and smoke detection devices, integrated with the existing building fire alarm system.

2.4.10.5 The fire detection system shall be interfaced through appropriate signalling modules to ensure alarm activation is displayed at the central fire control panel.

2.4.10.6 The Contractor shall submit method statements and schematic diagrams of the fire detection and inverter room protection measures for approval before installation.

2.4.10.7 Adequate natural or mechanical ventilation shall be ensured in inverter and electrical equipment enclosures to prevent heat accumulation.

2.4.11 Labelling

2.4.11.1 All components and equipment shall be permanently labelled with UV-stable, corrosion-resistant signage.

2.4.11.2 Labels shall indicate circuit function, voltage level, and safety warnings such as “PV Array – Dual Supply” or “Danger – DC Voltage Present.”

2.4.11.3 The Contractor shall provide a labelling and signage schedule as part of the as-built documentation for approval prior to commissioning.

2.4.12 Structural Design

2.4.12.1 Design a PV array mounting structure system using aluminium or hot-dip galvanised steel, engineered in accordance with SANS 10160 and ISO 9223 (corrosion categories C4–C5).

2.4.12.2 Mounting design shall maintain full roof waterproofing integrity, using non-penetrating or ballasted supports wherever feasible. Where penetrations are unavoidable, detailed sealing methods using compatible materials shall be provided.

2.4.12.3 Provide layout drawings, structural load calculations, and fixing details for review and approval by PetroSA’s representative prior to installation.

2.4.13 Performance Modeling:

2.4.13.1 Conduct detailed energy yield simulations using industry-recognised software such as PVsyst, incorporating site-specific meteorological data and shading analysis.

2.4.13.2 Validate the proposed system design against target Performance Ratio (PR) and energy offset objectives (e.g. 30% reduction in grid consumption).

2.4.13.3 Submit a Performance Report including key modelling assumptions, losses, system capacity factor, and expected annual generation (kWh/year).

2.5 SITE ESTABLISHMENT

2.5.1 Site Facilities

The CONTRACTOR is responsible for providing their own site office, mess facilities, and secure storage for tools and materials. The location of these facilities on the property is subject to the approval of the PetroSA Project Manager. The CONTRACTOR shall be responsible for security of its assets, including project material during the project duration.

The CONTRACTOR shall also provide and maintain hygienic ablution facilities for their staff for the project duration.

The CONTRACTOR shall construct a temporary platform that will provide CONTRACTOR personnel safe roof access without requiring entry inside the PetroSA building.

The CONTRACTOR shall implement identification systems which will allow visible identification of all construction personnel at any given time.

2.5.2 Working Hours and Staging

Normal working hours are Monday to Friday, 08h00 to 16h30. No work shall be permitted outside these hours, on weekends, or on public holidays without prior written authorisation from the PetroSA Project Manager.

All construction activities, particularly those generating excessive noise or requiring power shutdowns (e.g., welding, electrical board integration), must be scheduled in advance, possibly after hours or weekends, to minimise disruption to office operations. A detailed

staging plan for equipment and materials must be submitted and approved prior to mobilization.

All works must be conducted to ensure the continuous safety of building occupants.

Access to the roof and plant rooms will be controlled. All access arrangements, material delivery schedules, and lifting operations must be coordinated with and approved by the PetroSA Project Manager.

2.6 INSTALLATION

2.6.1 All installation works shall be executed in a safe, orderly, and professional manner, ensuring minimal disruption to the ongoing operations of PetroSA's Head Office.

2.6.2 The CONTRACTOR shall prepare and adhere to a detailed work execution schedule, including planned shutdowns, isolation procedures, and coordination milestones, which shall be approved by the Employer prior to commencement.

2.6.3 All works shall conform to the approved design drawings, specifications, and applicable South African standards.

2.6.4 The CONTRACTOR shall coordinate all necessary electrical and utility isolations required for the integration of the solar PV system with the existing facility network. All isolations shall be carried out safely and only by competent and authorised personnel, in compliance with PetroSA's internal permit-to-work system and applicable Occupational Health and Safety Act (Act 85 of 1993) requirements.

2.6.5 The CONTRACTOR shall provide all necessary temporary works, scaffolding, access platforms, lifting equipment, and safety barricades to ensure safe and efficient installation on the flat rooftop areas. All rooftop works shall comply with fall protection and working-at-height regulations, including risk assessments and method statements approved by the Employer's Safety Officer.

2.6.6 Installation shall include provision for maintenance access walkways between module rows, inverters, and cable routes to ensure safe and efficient long-term operation and servicing. Walkways shall be non-slip, UV-resistant, and compatible with the existing roof waterproofing system.

2.6.7 All penetrations, fixings, and interfaces with the existing roof structure shall be properly sealed and waterproofed using materials compatible with the existing roofing system. The Contractor shall be responsible for restoring all disturbed areas to their original or better condition upon completion.

2.6.8 The Contractor shall ensure that all equipment is installed in a manner that prevents exposure to direct water ingress, excessive heat, or mechanical damage. Adequate ventilation and clearance shall be maintained around all electrical enclosures and inverters in accordance with manufacturer recommendations.

2.6.9 The Contractor shall coordinate with PetroSA's facility management to schedule and execute any necessary power interruptions, shutdowns, or tie-ins to the existing LV distribution board, ensuring these activities occur outside of critical business hours where practical.

2.6.10 All installation works shall be inspected and approved by the supervising engineer prior to system energisation. No portion of the works shall be concealed prior to inspection and acceptance by the Employer's representative.

2.6.11 Contractor shall ensure that there is no unplanned power interruption during the installation and testing of the rooftop PV system. Power Interruptions should be clearly communicated and coordinated with PetroSA

2.7 TESTING, COMMISSIONING, AND PERFORMANCE VERIFICATION

2.7.1 All testing and commissioning activities shall be undertaken under the direct supervision of the contractor's registered Professional Engineer (Pr. Eng) and Installation Electrician (IE), duly registered with the Department of Employment and Labour.

2.7.2 The Contractor shall be fully responsible for performing and documenting all factory acceptance testing (FAT) (where applicable) and on-site commissioning tests to verify the safety, functionality, and performance of the complete PV system prior to handover.

2.7.3 As a minimum but not limited to, the following on-site tests and verifications shall be performed:

- Visual and mechanical inspection of all modules, mounting structures, cabling, terminations, and protective devices to ensure compliance with design and workmanship standards.

- Insulation resistance and continuity testing of DC and AC circuits.
- Functional testing of inverters, protection relays, isolation devices, and associated control systems.
- Verification of inverter communication, data logging, and monitoring system functionality, including local and remote access to system performance data.
- Validation of the zero-export functionality, including testing of the CoCT-approved zero-export controller or energy meter under varying load and generation conditions to confirm compliance with City of Cape Town SSEG zero-export requirements.
- Grid synchronization and anti-islanding testing, witnessed by the responsible engineer or authority where applicable.
- Measurement and verification of system performance, including Performance Ratio (PR), specific yield, and system efficiency against design values under standard operating conditions.
- Verification of all earthing, surge, and lightning protection systems for compliance with SANS 62305 and project specifications.

2.7.4 Upon successful completion of all tests, the Contractor shall compile and submit a comprehensive Commissioning Report including all test results, calibration certificates, and manufacturer commissioning forms for Employer review and approval.

2.7.5 The CONTRACTOR shall obtain and submit the following prior to practical completion:

- Valid Certificate of Compliance (CoC) issued by a registered Installation Electrician for the entire PV installation.
- NRS 097-2-1 compliance test report for each inverter.
- City of Cape Town SSEG registration approval and zero-export compliance certificate.
- Manufacturer warranties and as-built documentation, including operating manuals and maintenance schedules.

2.7.6 System performance shall be monitored during an initial observation period of not less than 7 consecutive days following commissioning to confirm stable operation and expected generation output. Any anomalies or deficiencies shall be rectified by the Contractor prior to final acceptance.

2.8 TRAINING

2.8.1 General Requirements

The CONTRACTOR shall provide comprehensive training for PetroSA's nominated operations and maintenance personnel to ensure safe, efficient, and competent operation of the rooftop solar photovoltaic (PV) system.

Training shall be conducted after commissioning but prior to final handover of the system.

A training attendance register shall be maintained and signed by all participants.

A copy of the attendance register and training certificates shall be included in the project handover documentation.

2.8.2 Scope of Training

Training shall cover, but not be limited to, the following topics:

- Overview of the PV system design, configuration, and major components.
- Safe system operation, isolation, and shutdown procedures.
- Routine inspection and preventive maintenance requirements.
- Use of monitoring systems, data logging interfaces, and fault detection tools.
- Inverter operation, alarm interpretation, and response procedures

2.9 DOCUMENTATION DELIVERABLES

The CONTRACTOR shall supply all documentation necessary to complete the Work.

The contractor shall submit all documents in a timely manner (and in accordance with the Document Register/ Schedule) to ensure Company comments are received and incorporated prior to implementation of the document.

2.9.1 Documentation Timing

Master Schedule	One (1) week before site establishment
Safety File	Three (3) weeks before site establishment
Installation drawings	Before the completion of site establishment
PV system Installation As-built drawings	One (1) week after installation
Hand over documents	Three (3) weeks after PV system commissioning

2.9.2 Handover Drawings and Documentation List

Upon completion of the rooftop solar photovoltaic (PV) system installation, the Contractor shall provide a comprehensive handover package to PetroSA. The package shall include all documentation, training material, and certifications necessary to ensure safe operation, maintenance, and regulatory compliance of the installed system.

The CONTRACTOR shall provide three (3) hard copies of the handover documentation and as-built detail design drawings as listed, along with one(1) electronic set. These must be submitted upon completion, prior to final acceptance and handover.

The CONTRACTOR shall submit detailed “As-built“ design drawings of all engineering drawings in Bentley Micro station DGN format or alternatively in AutoCAD format.

PetroSA will issue drawing templates with PetroSA title blocks and drawing numbers. The CONTRACTOR must utilize these templates for all As-built detail design drawings.

The handover documentation and drawings shall comprise of the following:

2.9.3 As-built Drawings:

- Detailed electrical, structural, and layout drawings including SLDs, cable routing, earthing layout, and inverter communication topology reflecting the final installation.

2.9.4 Detailed Design Documentation:

- Complete design package including all electrical, structural, and civil drawings, calculations, and supporting design documents.

2.9.5 Datasheets and Test Certificates:

- Documentation for all major components, including PV modules, inverters, mounting structures, cabling, and other critical equipment.

2.9.6 Structural Certification:

- Certification confirming compliance of mounting frames and structural elements with applicable standards and design requirements.

2.9.7 Certificates of Compliance and SSEG Application Documents:

- All regulatory certificates required for grid connection, including Certificates of Compliance (CoC) and Small-Scale Embedded Generation (SSEG) application documentation.

2.9.8 Commissioning Test Reports:

- Reports of all on-site commissioning tests, demonstrating conformity with technical specifications and performance requirements.

2.9.9 Operation and Maintenance (O&M) Manual:

- Comprehensive instructions covering safe operation, routine and preventive maintenance, troubleshooting, and emergency procedures.

2.9.10 Warranty Documentation:

- Copies of manufacturer and contractor warranties covering PV modules, inverters, and installation works.

2.9.11 Spare Parts List:

- Recommended spare components to ensure system continuity and minimal downtime.

2.9.12 Software / SCADA Documentation (if applicable):

- User manuals and technical guides for system monitoring, data logging, and remote access functionalities.

2.9.13 Safety and Risk Assessment Documentation:

- Handover of safety procedures, risk assessments, and mitigation measures related to the installed PV system.

2.9.14 Service Level Agreement (SLA)

- Submit a proposal for ongoing maintenance beyond the provisional period. PetroSA shall not be compelled to appoint the Contractor for ongoing maintenance.

2.9.15 Energy Yield Simulation and Validation Report:

- Comparison of expected versus actual system energy production, including verification of performance against design assumptions.

2.9.16 Load Factor Report:

- Load factor information is required to confirm energy offtake certainty and support accurate pricing, savings estimates, and risk allocation under both ownership and PPA commercial models.

2.9.17 Project Closeout Report:

- Summary of the project, including objectives met and challenges faced. Final project budget and any variations from the initial budget.

2.9.18 Contact Information

- List of key contacts for ongoing support, including project managers, technicians, and manufacturer representatives.

2.9.19 Final Acceptance Document

A document signed by the client indicating acceptance of the completed work and system performance

3 APPLICABLE CODES AND STANDARDS

The PV system design and installation shall comply with all relevant South African and international standards, including but not limited to:

Requirement	Standard / Regulation	Key Contractor-Obligations
Electrical wiring & general LV installation	SANS 10142-1 – Wiring of Premises	All AC and DC wiring associated with the PV system must meet SANS 10142-1: correct cable sizing, overcurrent protection, earthing/bonding, certificates of compliance issued.
PV-specific wiring/design	SANS 60364-7-712 (IEC 60364-7-712) – Requirements for PV power supply systems	DC array wiring, module isolators, DC/AC interface, labelling and roof layout must comply with the PV-specific wiring standard.
Grid-interface / embedded generation connection	NRS 097-2-1 – Grid connection of embedded generation (small-scale)	Inverter must meet the utility interface requirements: anti-islanding, voltage/frequency protection, zero-export configuration, testing and documentation.
Power converter safety	SANS/IEC 62109-1 & 2	Inverter units must be certified to this standard (manufacturer docs), ensuring safety, insulation and internal protection.
Building & structural compliance	SANS 10400 (Parts A, L, T) & SANS 10160 – Actions on structures	Roof structural loads (dead, live, wind) must be reviewed by a registered structural engineer; mounting system design must comply; fire access/roof penetrations must

Requirement	Standard / Regulation	Key Contractor-Obligations
		comply with building regs.
Building and fire safety compliance	SANS 10400 / SANS 10177	Protect occupants, minimize fire spread, and provide adequate fire detection, fighting, and extinguishing equipment./ test protocol for fire testing of materials, components, and elements, covering surface fire spread, fire resistance, and more.
Earthing / lightning / surge protection	SANS 62305 / SANS 10313 & SANS/IEC 61643	A lightning risk assessment must be done; surge protective devices (AC & DC) must be fitted; earthing of frames and array must comply with local distributor / installation requirements.
Module equipment qualification	SANS/IEC 61215 / SANS/IEC 61646	PV modules must carry appropriate qualification/certification to assure performance & durability in SA climate.
Municipal/distributor approval	City of Cape Town “Rooftop PV & Renewables” guidelines + approved inverter list	Submit PPE, single line diagram, equipment schedules, installer/engineer sign-off; ensure inverter selected appears on the City’s approved list. (sseg.org.za)
Quality assurance / installer competence	South African Photovoltaics Industry Association („SAPVIA“) / PV GreenCard	The installation contractor should hold a PV GreenCard and follow SAPVIA installation guidelines for best practice and long-term reliability.

4 CONTRACTOR PERSONNEL REQUIREMENTS

The CONTRACTOR shall employ a dedicated, experienced project team with clearly defined roles and responsibilities. The CONTRACTOR shall provide proof of these credentials for all relevant staff before work commences.

Where key personnel of the CONTRACTOR are specified in the contract, they shall not be replaced without prior written approval from the COMPANY. Any replacement personnel shall work with the person to be replaced for a reasonable handover period, which shall be to the CONTRACTOR'S sole account.

4.1 **Project Organization** (Organogram)

The CONTRACTOR shall submit a detailed project organisation chart during the mobilisation phase. This chart must clearly illustrate the lines of authority, On- and Off-Site Staff, communication, and reporting between all key personnel on the project, from the Project Manager down to the supervisory and trade foremen levels. It must also identify the primary points of contact for PetroSA.

4.2 Minimum Key Personnel Requirements:

The following key positions must be filled by individuals who remain dedicated to the project for its duration. Resumes and proof of qualifications for each nominated individual must be submitted for PetroSA's review and approval prior to the commencement of work.

Key personnel should include at least, amongst others but not limited to:

Project Manager	
Qualifications	▪ Must hold a relevant tertiary qualification (e.g., BSc/BEng in Electrical or Mechanical Engineering and a Project Management qualification) with proven track record of managing projects of similar scope and complexity.
Experience	▪ Minimum of 5 years of experience in managing successfully completed commercial or industrial solar PV or electrical construction projects.
Responsibilities	▪ Single point of accountability for the project's overall execution, including program, budget, quality, safety, and

	client liaison.
Site Manager / Senior Supervisor	
Qualifications	▪ Must hold a relevant Electrical trade qualification (Electrical) as minimum.
Experience	▪ Minimum of 5 years of experience in commercial solar PV installation and site supervision.
Responsibilities	▪ Day-to-day management of all on-site activities, supervision of work crews, ensuring compliance with the construction program, and maintaining site safety and quality standards.
Professional Engineer (Pr. Eng.)	
Qualifications	▪ Must be registered as a Professional Electrical Engineer registered as a professional with the Engineering Council of South Africa (ECSA).
Experience	▪ Chartered with demonstrable experience in the design of electrical systems and/or structural systems for commercial renewable energy projects.
Responsibilities	▪ Overall responsibility for the design integrity. The Pr. Eng. must review, approve, and stamp all design calculations, single-line diagrams, and structural drawings, taking professional responsibility for their compliance with all applicable standards.
Design Engineer / Technologist	
Qualifications	▪ Must hold a National Diploma or higher in Electrical Engineering.
Experience	▪ Minimum of 3 years of experience in the detailed design of grid-tied solar PV systems, including performing yield simulations and protection studies.
Responsibilities	▪ Preparation of the detailed design package under the

	guidance of the Pr. Eng., including layout drawings, cable schedules, and equipment specifications.
Competent Safety Officer	
Qualifications	▪ Must hold a recognized SAMTRAC or equivalent certification and be registered with the SACPCMP as a Construction Health and Safety Officer.
Experience	▪ Proven experience on construction sites, preferably in electrical and roofing works.
Responsibilities	▪ Development and implementation of the Project Safety File, daily site inspections, conducting risk assessments, investigating incidents, and ensuring continuous adherence to the OHS Act and PetroSA's HSE requirements.
PV GreenCard Accredited Installation Electrician	
Qualifications	▪ Must be a registered Installation Electrician with the Department of Labour and hold a valid PV GreenCard accreditation.
Experience	▪ Significant hands-on experience with the installation and termination of DC and AC components of PV systems.
Responsibilities	▪ Direct supervision of the electrical installation team, ensuring all electrical work complies with SANS 10142-1 and the project specifications. This individual will be responsible for the final electrical testing and commissioning and the signing of the Certificate of Compliance (CoC).

4.3 Subcontractor Management

Any subcontractor proposed by the CONTRACTOR for specialist services (e.g., structural steelwork, crane operation) must be pre-approved by PetroSA. The Contractor retains full responsibility for the performance, quality, and HSE

compliance of all subcontractors, and their personnel must meet the appropriate qualifications and standards.

5 HEALTH AND SAFETY REQUIREMENTS

5.1 HSSEQ Tender Submission

The CONTRACTOR shall provide PetroSA with the required HSSEQ submission demonstrating proactive approach to all Health, Safety and Environmental matters and compliance to applicable legislation and standards.

Below must be included in the HSSEQ submission:

- Training records/ Certificate of Competence including, Work at Heights, First Aid and Firefighting training aligned with relevant unit standards (SAQA) and be delivered by an accredited provider
- Letter of Good standing
- Risk Assessment and method statement/documented procedures
- Certification/equipment maintenance service records/fit-for purpose documents machinery
- SHEQ Policies

5.2 Safety File Requirement for Successful Contractor

The successful bidder will be required to develop, submit and maintain a comprehensive safety file for the duration of the project

- Training records/ Certificate of Competence including, Work at Heights, First Aid and Firefighting training aligned with relevant unit standards (SAQA) and be delivered by an accredited provider
- Letter of Good standing
- Medical Certificate of Fitness
- Risk Assessment and method statement/documented procedures
- Legal appointment letters and Organogram
- Certification/service records/fit-for purpose documents machinery
- PPE control register

- Notification to the Department (where applicable)
- SHEQ Policies and H& S Plan
- Equipment/tool /Portable Electrical Equipment Register
- Fall Protection and Rescue Plan
- Incident Management Procedure
- WCL2 Form Accident Report
- Emergency Plan and Emergency Contact Numbers

The CONTRACTOR shall ensure throughout all phases of the project that hazards and environmental protections have been identified, risks assessed and that appropriate measures to protect personnel, the environment, facilities etc. have been incorporated in the design and during the construction and shall perform Safety reviews as necessary. CONTRACTOR personnel shall take a full and active part in the overall safety of operations during all phases of the project.

All onsite contractor employees must complete an induction training session on PetroSA's Safety, Health, Environmental, and practical safety policies before starting work. They may also need to undergo specific accredited training, such as Working at Heights.

The CONTRACTOR shall have records of in-house induction of staff as well as signed daily activity information registers. (toolbox talks)

CONTRACTOR personnel shall attend the PetroSA provided "Permit to Work" training.

Cellular communication antennas and associated equipment are installed on the roof. The CONTRACTOR shall coordinate with the cellular service provider when accessing the roof area. Any interference or incident involving the antennas or associated equipment must be reported immediately to the PetroSA representative as well as the Cellular service provider.

The CONTRACTOR is responsible for ensuring that all staff undergo pre-placement medical examinations, certified by their local Occupational Medical Practitioner, that would have to be submitted to PetroSA’s Medical department for approval before commencing work for PetroSA.

6 COMMERCIAL OPTIONS

6.1 Overview

PetroSA intends to evaluate proposals for the Rooftop Solar Photovoltaic (PV) System based on **required commercial PRICING models**, namely:

- **Option 1 –Outright Ownership (Supply and Install Basis)**

  Option 2 – Power Purchase Agreement (PPA) and Monthly Rental Agreement

Bidders are required to submit **separate and fully costed proposals** for all options with the same system specifications, in accordance with the requirements set out herein. The COMPANY reserves the right to evaluate, compare, and select the most economically and technically advantageous model or combination thereof.

6.2 Procurement

The CONTRACTOR is responsible for providing all necessary plant, materials, tools, supplies, equipment, machinery, consumables, ablution facilities, supervision, and technical and professional expertise required to complete the Scope of Work.

All works and equipment installations are subject to verification of the roof's structural integrity. In the event that the roof, or any portion thereof, is assessed as structurally inadequate, the Company reserves the right to amend the scope of works, install reduced or alternative equipment configurations on structurally sound sections only, or require roof strengthening works to be completed before proceeding, or suspend the procurement process entirely without liability to any bidder.

6.3 Option 1 – Outright Ownership (Supply and Install Basis)

Under the Supply and Install model:

- The CONTRACTOR shall design, procure, supply, install, test, and commission the rooftop solar PV system as a turnkey contract.
- Ownership of the system shall vest in PetroSA upon completion and acceptance of the works.

- The CONTRACTOR shall provide a comprehensive defect liability period of 12 months from the date of commissioning, covering workmanship, equipment performance, and system operation.
- The CONTRACTOR shall offer operation and maintenance (O&M) support under a separate service agreement for at least 3 years post-handover.
- Payment terms shall be as defined in the contract and linked to approved milestones and successful commissioning.

The Bidder shall provide a detailed capital cost breakdown including a roof integrity report, design, equipment, installation, testing, commissioning, and training.

6.4 Option 2 – Power Purchase (PPA) and Monthly Rental Agreements

- The CONTRACTOR (or Independent Power Producer) shall design, finance, procure, install, operate, insure and maintain the rooftop solar PV system on PetroSA's premises for the duration of the agreement.
- The system shall be grid-tied with zero export, compliant with City of Cape Town (CoCT) Small-Scale Embedded Generation (SSEG) requirements and relevant South African standards.
- The CONTRACTOR shall be responsible for all operational, maintenance, insurance, and statutory compliance costs for the duration of the agreement.
- PetroSA will have the right to opt to procure the system at the end of the rental agreement term, at a commercially viable cost, draft a new rental agreement or the contractor must remove the system at no cost to PetroSA.

6.4.1 Under the Power Purchase Agreement model:

- PetroSA shall purchase energy generated by the system at an agreed tariff (Rand per kWh) for a fixed term, typically 10, 15 or 20 years.
- Ownership of the PV system shall remain with the CONTRACTOR for the duration of the PPA term.
- The tariff shall be structured to include all capital recovery, O&M, insurance and escalation terms.
- At the end of the PPA term, PetroSA shall have the option to:
- (a) Take transfer of ownership at a residual value, if applicable; or
- (b) Extend the PPA under revised commercial terms.
- (c) Opt out at no cost to PetroSA
- The Bidder shall clearly state the PPA duration, tariff structure, escalation rate, ownership transfer provisions, and performance guarantees offered under this model.

6.4.2 Under the Monthly Rental Agreement model:

- PetroSA shall lease the system from the contractor for a predetermined period and rate.
- The Bidder shall clearly state the Rental Agreement duration, rental rate, escalation rate, ownership transfer provisions, and performance guarantees offered under this model.
- Ownership, operation and maintenance of the PV system shall remain with the Contractor for the duration of the monthly rental term.
- At the end of the Rental term, PetroSA shall have the option to:

    (a) Take transfer of ownership at a commercially viable value; or

    (b) Extend the rental term under revised commercial terms.

    (c) Opt out at no cost to PetroSA