AGRICULTURAL RESEARCH COUNCIL

REQUEST TO TENDER FOR:
TENDER NO: **ARC/33/03/2024**

SUPPLY, DELIVERY, INSTALLATION AND COMMISSIONING OF AN ALTERNATIVE POWER SOLUTION FOR THE GENOMICS LAB AND HPC AT THE ARC'S BIOTECHNOLOGY PLATFORM

Scope of Work and Technical Specifications

1. Scope of Work for the Tender & Mandatory Technical Specifications/Requirements

The Agricultural Research Council is looking for a service provider to assist the institution with the supply, delivery, installation and commissioning of a new "*alternative power solution for the genomics lab and HPC"* at the ARC' Biotechnology Platform Building situated on the ARC's Onderstepoort Campus, Onderstepoort. The envision solution is a new solar system with the appropriate battery backups to manage the critical equipment within the building during power failures and all the required accessories, wiring, breakers, etc. The solution must be grid tied and accept emergency generator supply and enable continued operations of critical equipment using the PV panels and/or batteries, whether there is generator or grid supply or not. The solution must include load partitioning to accommodate supply to normal, emergency, and critical circuits, with critical circuits prioritised when grid or generator supplies are not available. Any additional PV generated should be supplied to the emergency and standard circuits, with emergency circuits preferentially supplied after critical circuits. The priorities are critical (always – battery, PV, generator, and grid), emergency (when sufficient PV and generator supply are available with limited battery supply to prevent power spikes) and then standard supply (sufficient PV and grid are available). If possible, redundancy options (as an optional selection based on available budget) must also be indicated where possible (as an option), e.g. 2x smaller inverters in parallel rather than a single larger inverter to allow partial crucial power support in the case of an inverter failing.

Currently the building has both emergency and standard power supplies, with diesel generator backup for emergency circuits. The building has a main distribution board (DB), 3-phase power supply to a 63A emergency breaker and 3-phase 200A breaker to the standard power supply. Both supplies are then distributed to three DBs (DB-A to DB-C) from which circuits are run to isolators, lights, and plugs. The work also includes installing critical supply circuits to three new distribution boxes (to be provided) to which existing emergency installations/circuits must be transferred. Some standard circuits must also be moved to the opened emergency circuits – as indicated.

Since we require 25 years warranties on the PV panels, the work also includes the preparation and treatment of the roof to ensure paint protection for the duration of the PV panels' lifespans/warranty. This might be sub-contracted with more details provided to ensure an energy efficient roof coating is installed.

1.1 Roof Repairs and Cool Surface Painting.

Mandatory Technical Requirements	Compliance	
	Yes	No
• Supply SACSA/SABS/CRRC certified cool coating product and indicate applicator's experience and SACSA registration.		
• Minimum SRI (Solar Radiance Index) of 0.75 three years after application.		
• Provide at least a 10-year paint and applicator warranty on the paint and work performed.		

The ARC has decided to test the benefits of Cool surfaces on the roof of the Biotechnology Platform building's (Building 38, aka Old Hospital Building, 100 Old Soutpan Road (M35)). The roof consists of corrugated iron sheets, with wooden louvres at the top (Figure 1) for air movement and Fasi boards, gutters, and downpipes on the edges. The building has a footprint of ±910m^2 (Figure 2). The roof, louvres, fascia boards, gutters and downpipes must all be prepared and covered with a cool surface polymer/coating to allow passive cooling prior to PV installation.

1.1.1 Nature of the Work:

- Prepare the roof, wooden louvres, Fasi boards, gutters and down pipes appropriately, repair any broken parts, apply appropriate primer(s) and two coats of cool surface infra-red product paint/polymer over these areas as specified below.

- The infra-red polymer/paint selected must decrease the demand/load on the energy systems and thus electricity and/or diesel generator use and associated costs.

1.1.2 Requirements:

- Sand all wooden louvers/air vents down to remove loose paint, dirt etc. Repair any broken parts, replace all missing screws/fasteners on roof and seal with appropriate products. All work must comply with surface preparation and water proofing using materials inline and processes that are required for the infra-red cool surface product used. Ensure all leaks are sealed appropriately.

- Sand down all Fasi boards, gutters, and downpipes of any loose paint and/or rust and seal with appropriate sealant and primer. Fasten any loose components with screws prior to painting.

- Apply and prepare appropriately for approved and complaint primer(s) application, e.g. wood primer for all wooden surfaces, anti-rust primer to treat any rusted areas, etc. All

work must comply with surface preparation and water proofing using materials inline and processes that are required for the infra-red cool surface product used.

- Apply 2 coats of an energy efficient infra-red product to allow for passive cooling of the roof surfaces, including wooden louvres, roof surfaces, gutters, Fasi boards and down pipes, etc. Also cover the overhanging ceiling boards.

- Manufacturer must provide written recommendations for optimal application of product.

- Colour of the roof to be in line with existing roof colour, with approval by Facilities Manager, ARC Onderstepoort Campus prior to application.

- Make good on any work and insure a leak-free product is delivered.

All measurements are indicatory and for suppliers to verify and measure during their mandatory site visit. The ARC will not be held liable for incorrect measurements.

Figure 1. Biotechnology Platform building's roof, wooden louvres, gutters, downpipes and Fasi boards showing that will require cool surface prep and painting.

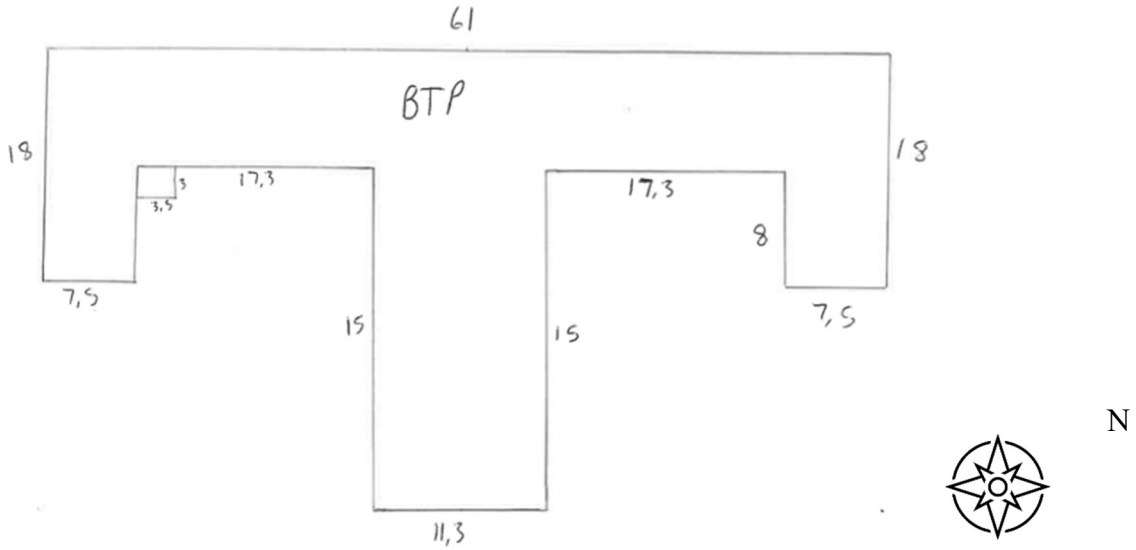

Figure 2. An estimated floorplan of the Biotechnology Platform Building (aka Building 38), ARC Onderstepoort Campus, 100 Old Soutpan Road. Note: Roof measurements for bidders to confirm at mandatory site visit.

1.2 Supply, Delivery, Installation, and Commissioning of a Grid-tied, new 3-Phase Solar PV System with Battery Backup for Critical Circuits.

Mandatory Technical Requirements	Compliance	
	Yes	No
• CIDB Grade 1 GB & Grade 3 EP.		
• Licenced Solar PV Green Card Practitioner.		

1.2.1 Requirements:

- Supply, deliver, install and commission of a new "*alternative power solution for the genomics lab and HPC"* at the ARC' Biotechnology Platform Building situated on the ARC's Onderstepoort Campus, Onderstepoort. The envision solution is a new solar system capable to carry the building emergency and standard loads, with the appropriate battery backups to manage the critical equipment within the building during power failures. The building has a main distribution board (DB), 3-phase power supply to a 63A emergency breaker and 3-phase 200A breaker to the standard power supply. All the required accessories, wiring, breakers, etc. for a fully functional solution must be included in the offer. The solution must be grid tied and accept emergency generator supply and enable continued operations of critical equipment using the PV panels and batteries, whether there is generator or grid supply or not. The solution must include load partitioning to accommodate supply to normal, emergency, and critical circuits, with critical circuits prioritised when grid or generator supplies are not available. Any additional PV generated should be supplied to the emergency and standard circuits, with emergency circuits preferentially supplied after critical circuits. The priorities are critical (always – battery, PV, generator, and grid), emergency (when sufficient PV and generator supply are available with limited battery supply to prevent power spikes) and then standard supply (sufficient PV and grid are available). If possible, redundancy options must also be indicated where possible (as an option), e.g. 2x smaller inverters in parallel rather than a single larger inverter to allow partial crucial power support in the case of an inverter failing.

- Move selected emergency circuits to the critical load for continued battery backup at the Biotechnology Platform building, ARC Onderstepoort Campus, Gauteng. Currently the building has both emergency and standard power supplies, with diesel generator backup for emergency circuits. The building has a main distribution board (DB), 3-phase power supply to a 63A emergency breaker and 3-phase 200A breaker to the standard power supply. Both supplies are then distributed to three DBs from which circuits are run to isolators, lights, and plugs. The work also includes installing critical supply circuits to three new distribution boxes (to be provided) to which existing emergency installations must be transferred. Some standard circuits must also be moved to the opened emergency circuits – as indicated.

1.2.2 Technical Implications:

- The construction must include delivery, installation, certification and commissioning of a complete grid tied solar system with battery backup, which

would include, solar (PV) modules/panels, cable connectors (MC), solar cable, DC junction boxes, grid tied PV inverter(s), batteries, DC cables, data loggers, distribution boards, communication cables, etc.

- *PV system type:*
  - Roof mount: Perform structural analysis on the roof to ensure the roof structure is fit for installation and to ensure the structural integrity of the building is not compromised (see last section for roof treatment). The roof is corrugated iron sheets as indicated in the figures.
  - The solar panels placement must comply with building codes.
  - Supply and install the appropriate new 3-phase grid tied inverter(s) to allow critical and all emergency circuits power running during the day. A 50KWh inverter is envisioned, but will be discussed at the site meeting. Our preferred invertor types are Victron, Deye, SunSynk, or similar inverter. The inverter must have internal phase management to adjust to variations within each phase.
  - Provide both a single and "multiple smaller inverters in parallel" as options within the design. Multiple smaller inverters will enable some redundancy to breakdowns. The selection will be budget dependent.
  - All inverters must have at least a 10-year warranty.

- *Type of solar panels*
  - Supply and install Mono-Crystalline PV modules, with 20% or better efficiency.
  - Each solar module should have a maximum power output (Pmax) of between 545 to 595 W, depending on the optimal size for the roof structure.
  - The selected Mono-Crystalline PV should be finalized in consultations with ARC-BTP personnel who supervise the construction.
  - Panels/Modules must be SABS tested, locally obtainable with at least 25 years warranty, e.g. Canadian solar, JA Solar, Trina, Jinko, Longi, or equivalent might be used.
  - Solar PV modules are to be mounted on the main building, with all holes sealed with silicon during installation.
  - Installation of PV panels to be in most cost/energy efficient location, depending on the space requirement and the potential to increase the solar day.
  - The PV system must be well balanced to supply enough capacity to charge battery to full capacity within a small time period, with some battery capacity used to manage optimal running during partial cloudy days.
  - The layout and orientation of the modules should allow for the elimination of the shading effect and thus improving energy generation efficiencies. Installation to take into account external shade factors to ensure maximum generation for a long as possible.

- *Battery bank:*
  - Install lithium-Ion (LiFe) or lithium-Ion Phosphate (LiFePO4) battery bank for a backup power of 3 hours (amount of backup 55 kWh: 3hrs x 55kWh = 165kWh).
  - The installer to consider Depth of Discharge of batteries when sizing the appropriate battery bank to allow optimal usage and life expectancy.

- The battery bank must be automatically monitored to allow optimal usage, discharge, temperatures, etc. to ensure longevity and prevent potential fires.
- The battery bank must allow expansion in the future to increase the possible downtime of the grid and the ability to exchange faulty or poor units – should the need arise.
- Provide a 10-year warranty on the batteries and associated components.
- Provide two line items for and additional, optional 45KWh and 145KWh of batteries – should the budget allow. We would like to have 12h for 20KWh critical loads on battery backup for our stored samples requirements.
- Two appropriate LiFe/ LiFePO4 fire extinguishers must be provided and installed.
- Safety signs must also be installed where required.
- Indicate if there is currently a structure meant for housing the inverters and the storage batteries or the contractor should provide a customized shipment container etc. Ensure proper cooling for solution.

- *Commissioning:*
  - The PV system to be signed off by Professional Engineer (Pr. Eng.) or Professional Technologist (Pr. Tech.)
  - PV solar system design must be approved by Pr. Eng. or Pr. Tech
  - Letter of installation and commissioning approval from Eskom or municipality.
  - Installation must have been performed under the supervision of a qualified electrician according to the approved design.
  - Electrician must sign a certificate of compliance (CoC) for the installation and all associated electrical work.
  - Pr. Eng. signs off an as-built drawing, after system works as specified.
  - Installer or supplier provides any additional documents and reports for commissioning the PV system to client (ARC).
  - All compliance certificates/ Electrical audit/ Municipality registration/ permission and requirements according to current government regulations at time of commissioning, must be provided.
  - All circuits to be clearly labelled and indicated within plan and within distribution boxes.

- *System architecture:*
  - The system should allow for seamless integration for future expansion of the PV and battery bank.

- *Electrical loads:*
  - Server room, refrigeration (e.g. fridges, freezers, -80s, cold room) and key sequencers' circuits must be moved to critical loads. Load isolation is critical.
  - The electrical loads powered must be well balanced according to the expected solar output.
  - The allocation of solar PV power to loads will thoroughly and extensively be discussed and finalized with appointed installer before the construction begins, however, the discussion should be directed towards energy efficiency and optimal usage.
  - It is the responsibility of the installer to use meters to accurately measure spike wattage (Power consumption peak hourly), results of such measurements must be communicated to ARC and results must be used to accurately size both the PV and battery backup.

- The solution must be grid tied and accept emergency generator supply via the mains.
- The system must enable continued operations of critical equipment using the PV panels and batteries, whether there is generator or grid supply or not.
- The solution must include load partitioning to accommodate supply to normal, emergency, and critical circuits, with critical circuits prioritized when grid or generator supplies are not available.
- Any additional PV generated should be supplied to the emergency and standard circuits, with emergency circuits preferentially supplied after critical circuits.
- The priorities are critical (always – battery, PV, generator and grid), emergency (when sufficient PV and generator supply are available with limited battery supply to prevent power spikes) and then standard supply (sufficient PV and grid are available).

- Monitoring system*:*
  - LSD monitor system, mobile phone and computer linked.
  - Online/web monitor and controls the entire solar system
  - Controls PV and battery inverters
  - Controls batteries and monitors accurate battery percentage (state of charge)
  - Enable multiple users on the same account
  - Allow user / remote changing of the system.
  - Sends system notifications via emails
  - Interactive display on inverter(s)

- *Operation & maintenance:*
  - One (1) year cost free operation & maintenance, including optimal usage of the system after being commissioned.
  - User / ARC electrician training to operate the system

- *Standby generator & UPS:*
  - The system should allow for seamless integration with the existing standby generator and UPS.

- *Miscellaneous:*
  - All preliminary work, including draft technical drawings must be discussed with ARC personnel before construction begins.
  - Any downtime when connecting new solar power to existing grid should be done after normal working hours (08:00 – 16:30), Monday to Friday) to avoid disruptions to activities on the campus.
  - NOTE: ALL downtime MUST be cleared with BTP management at least a week in advance to allow proper shutdown of critical infrastructure and schedule work accordingly.
  - Allow for a 5% contingency fee ONLY approved by consultation with ARC Facilities and BTP management.
  - Note: This might be omitted from the order should it fall without the project budget.
  - Upgrade of electrical circuits, where necessary.
  - Safety file, risk assessment and system design to be included and submitted together with the bid documents.

ARC • LNR
Excellence in Research and Development