



**SARAO**  
South African Radio  
Astronomy Observatory

## INVITATION TO BID

REQUEST FOR INFORMATION (RFI) FOR POWER SOLUTION FOR SARAO DATACENTRE

<b>Bidder Name:</b>	
<b>Number:</b>	<b>NRF SARAO SKA1 001 2019</b>
<b>Closing Date</b>	25 November 2019
<b>Closing Time:</b>	11:00 AM
<b>Briefing session date:</b>	13 November 2019 at 11:00 AM
<b>Briefing Session:</b> <b>Venue:</b> <b>Address:</b>	<b>The Auditorium</b> <b>SARAO Cape Town Office, Black River Park Building (North Entrance), 2 Fir Street, Observatory, Cape Town</b> <b>NOTE:</b> Bidders may connect to the briefing session at our Rosebank Offices (17 Baker Street, Rosebank, Johannesburg) using the following link: <a href="https://ska-vc.tenet.ac.za/join/AfHQckvP">https://ska-vc.tenet.ac.za/join/AfHQckvP</a>
<b>Bid documents collected from:</b>	SARAO website, Government Gazette, National Treasury's E-Tender Portal, and NRF website
<b>Bid Box Address</b>	2 Fir street, Black River Park, North Entrance, Observatory, Cape Town, 7925 Tender box opening hours: 08h00-16h00 on weekdays GPS coordinates: 33°55'58.9-"S; 18°28'14.8-"E Dimensions of tender box opening: 40X300mm
<b>Envelope Addressing</b>	On the face of each envelope, the Bid Number and Bidder's Name, Postal Address, Contact Name, Telephone Number and email address



## INTRODUCTION TO THE NRF

The National Research Foundation Act, Act 19 of 2018, establishes the National Research Foundation (“NRF”) as the juristic legal entity that will contract with the awarded bidder. The NRF supports and promotes research and human capital development through funding, the provision of National Research Facilities and science outreach platforms and programmes to the broader community in all fields of science and technology, including natural science, engineering, social science and humanities. Please visit the NRF website (<https://www.nrf.ac.za>) for more information.

## INTRODUCTION TO THE BUSINESS UNIT

The South African Radio Astronomy Observatory (SARAO) is a National Facility of the National Research Foundation (NRF) housing and operating South Africa’s national radio telescope shared facilities including such as the MeerKAT and KAT-7 telescopes in the Karoo in the Northern Cape, the Hartebeesthoek Radio Astronomy Observatory (HartRAO) in Gauteng, the African Very Long Baseline Interferometry (AVN) programme in nine African countries. SARAO manages the associated human capital development and commercialisation endeavours of government’s investment in astronomy. SARAO has offices based in Johannesburg and Cape Town, as well as the radio-protected SKA host site in the Karoo, 90km from Carnarvon in the Northern Cape, which hosts the Square Kilometre Array mid-frequency telescopes, MeerKAT, and KAT-7 radio telescope installations, as well as a number of guest instruments, including the HERA telescope. Further information about SARAO can be found on [www.ska.ac.za](http://www.ska.ac.za) and [www.NRF.ac.za](http://www.NRF.ac.za).

## INTRODUCTION TO THE SKAO

The SKA Organisation has been established with its headquarters at Jodrell Bank in Manchester, United Kingdom. It has jointly awarded its Square Kilometre Array (SKA) to South Africa and its eight African partner countries together with Australia. The SKA will be Africa’s largest science project acting as a hub for both local and international collaboration. The SKA Organisation is undertaking the following five key science projects:

- Probing the Dark Ages
- Galaxy Evolution
- The Origin and Evolution of Cosmic Magnetism
- Strong Field Tests of Gravity using Pulsars and Black Holes
- The Cradle of Life.

The first phase of the SKA1-MID project includes the addition of 133 antennas to the 64-dish MeerKAT radio telescope and the second phase of the project and will include up to 2 000 antennas distributed across South Africa and its eight African partner countries. SKA1-MID consists of:

- The existing MeerKAT phase of 64 antennae (precursor to the SKA) and the 133 antennae included in the current phase.
- A core area (approximately 2,5km in radius) which is land owned by the NRF and includes the MeerKAT radio telescope and will include approximately 75% of the antennae.
- Three spiral arms extending out from the core to for about 120km each.

Further information about SKAO at [www.skatelescope.org](http://www.skatelescope.org).

# BACKGROUND TO SCIENCE PROCESSING CENTRE (SPC) FACILITY

The Science Processing Centre (SPC) is a bespoke data centre facility in early design phase that will host the SKAO's SKA1-MID Science Data Processor (SDP) data centre and the South African SKA Regional Centre (ZA\_SRC) data centre in Cape Town, South Africa. The facility shall provide all the required infrastructure to support the high performance computing (HPC) equipment in each data centre. Such infrastructure includes power, back-up power, road access, office facilities, loading bays, receiving area and integration/testing room (assembly/staging area).

Although at an early stage of design it is estimated that the power requirement for the facility will be between 3-10 MW which includes power for the computing equipment, cooling systems, backup power systems and all ancillaries. It is expected that commercial off the shelf (COTS) HPC equipment will be installed in up to 200 19" racks (750 mm x 1400 mm x 48 RU) on a solid load-bearing floor. The number of racks will depend upon the cooling solution chosen. Each rack is expected to consume between 15 and 95 kW. It is expected that 95% of the heat load generated by the COTS equipment will be transferred out of the data centre and dissipated into the atmosphere by a facility level cooling system, most likely using liquid water. The remaining 5% of the heat load is expected to be dissipated by air.

The facility aims to achieve the highest possible levels of energy efficiency by optimising the equipment used and reducing the power usage effectiveness (PUE) to 1.05 or below. The use of so called "hot water cooling", where ingress temperatures exceed 45°C is noted as a possible solution.

This document requests information from industry regarding possible power solutions for the proposed SPC Facility.

The goal of this Rfl is to survey industry for potential solutions, what these solutions will cost and to receive suggestions on how such solutions could be funded. It is anticipated that the solutions proposed could be influenced on where the final site is located i.e. An Eskom supply area (footprint) or a City of Cape Town Supply Area. All solutions should also include potential legislative implications and comment and/or guidance on how to achieve the relevant legislative requirements for each potential supply area.

## QUALIFICATIONS

We invite Independent Power Producers (IPP's), individuals, consultants, systems integrators, and manufacturers with a proven track record in the provision of power supply solutions to respond.

These solutions are not limited to any particular technology and may include standalone power supplies/generation or a combination of Eskom/Municipal Supplies, Storage and co-generation.

Please provide:

- Relevant certifications and qualifications of systems
- Contactable reference sites where the solution has successfully deployed and operated.

## INFORMATION REQUESTED

The cost of energy over the 50-year lifespan of the project will be the most significant cost driver for the facility. The availability and cost of power could potentially drive other design solutions, such as the physical location of the facility (Eskom or City of Cape Town Supply Area), energy mix as well as power availability and backup requirements.

Indications are that the SKAO will provide a limitation on the energy tariff they are prepared to pay for the SPC Facility over the 50-year lifespan of the facility. The exact tariff that the SKAO will pay, has not yet been published, but it is anticipated that these tariffs will align with global commercially available renewable energy tariffs.

All feasible power supply technologies and solutions will be considered. All solutions proposed must however meet all NERSA and RSA Legislative requirements, if applicable.

The following constraints are applicable and should be considered when responding to this RFI:

1. Solutions proposed for the SPC should comply with the requirements specified in the SKA1 Consumer Load Power Quality Standard SKA-TEL-SKO- 0000293.
2. Proposals must meet all legislative requirements, including NERSA licensing and details/comment on timelines and process to be followed to obtain the necessary licenses.
3. The site shall be located in the Western Cape Province.
4. The site should be located in close proximity to Fibre Optic infrastructure in an effort to avoid spending significant Capex on fibre connectivity.
5. Potential Wheeling of Power – Proposals should include potential challenges with this approach (Both Eskom and CoCT Supply Areas), any legislative considerations and recommendations in terms of possible siting options should be included as part of the response.
6. Energy Tariffs – Eskom vs CoCT supply Areas and indicative tariff structures. In order for respondents to work off the same set of assumptions, two scenarios should be assumed. Namely, Eskom tariff increase of 10% p.a. (best case scenario) and a tariff increase of 30% p.a. (worst case scenario) for the next 10 years.
7. Land availability and size required – Assume building footprint of 12 000m<sup>2</sup> plus land necessary for IPP (if required)
8. Scalability – Is it possible to increase power supply to the site sometime in the future (say 10MW) – desirable but not a mandatory requirement for this RFI.
9. Respondents can make certain assumptions when responding to this RFI but should provide a full list of assumptions used.
10. Details of proposed generation/power supply technologies including any licensing requirements that may be applicable to both the technology and size of the installation.

The information received from this RFI might be used as input to the facility siting trade-off model and will therefore potentially have a significant influence on where the final site is located.

## **SPC POWER SUPPLY REQUIREMENTS**

The SCP Facility is a static system, consisting almost entirely of electronic and cooling loads. These loads are essentially constant throughout the year (24x7x365), with only small variations in power consumption due to:

1. Cooling system loads, which are affected by ambient external temperature.
2. Varying consumption of the science data processing equipment, due to varying workload during the different science data processing operations.
3. It may be possible for the facility to implement “Load Curtailment” functionality if required. For example, it may be possible to reduce loading to 80% of nominal loading during periods of load shedding. This functionality may assist reducing potential energy storage or equipment sizing to minimize cost and improve power availability.

For the purposes of this RfI it must therefore be assumed that all electronic loads are operating at their full capacity throughout the year (24x7x365), since this represents the worst-case annual energy demand. As the actual power figures are still unknown, responses to this RFI should cater for 2 x consumption options, namely:

1. 3MW
2. 5MW

Comments of potential scalability to 10MW would be of interest, but do not necessarily need to be included as part of this RFI.

## POWER AVAILABILITY AND QUALITY

It should be noted that the SKA has a purely science mission and does therefore not demand extremely high levels of availability as might be required by (for instance) a defence project. Nonetheless, normal operations will be 24 hours each day for close to 365 days per year and >99% availability is anticipated for the power supply.

Solutions proposed for the SPC should conform to the requirements specified in the SKA1 Consumer Load Power Quality Standard (SKA-TEL-SKO- 0000293, attached for information only).

## POWER PURCHASE AGREEMENT DURATION

Responses to this RFI should include a proposed PPA duration. It is expected that this will typically be around 20 years in line with industry practices, but any duration between 10 and 30 years is acceptable.

The proposed system need only be designed for the nominated duration of the PPA. The proposer must separately provide costs for the decommissioning and removal of the system at the end of the PPA, but this should not include rehabilitation of the site (which will be by Others).

A PPA may be used to supplement the local grid supply (Eskom or CoCT) or the IPP could manage the local grid aspects themselves.

## REQUIRED INFORMATION

It is requested that all responses contain the following minimum information:

1. Respondent details including:
  - a. Company / organisation name, registration number and address
  - b. Overview of business / research activities
  - c. Statement of expertise in the area of interest
2. Technical details including:
  - a. Operational description of the system
  - b. Sub-system level sizing parameters, for example:
    - i. Area of collecting array
    - ii. Energy storage sub-system
    - iii. Generator outputs
    - iv. Other key parameters.

- c. System-level performance parameters including, for example:
    - i. Power delivered
    - ii. Storage capacity in hours
  - d. High level system diagrams including:
    - i. Electrical Single Line Diagrams (SLD's)
    - ii. General Arrangement (GA) Diagrams
  - e. Simplified calculation and simulation results to support the sub-system sizing and system-level performance claims
  - f. Supporting information for major system components including brochures, reports, etc.
3. Power availability estimates
  4. Estimated power cost consisting of:
    - a. Estimated power tariffs (in 2019 Rand Cents / kWh) that the SKAO would be charged over the Power Purchase Agreement duration.
    - b. If a thermal solution is proposed, please present the tariffs for this separately.
    - c. Documents showing how this estimate has been calculated
  5. An estimate of the duration of the design, construction and commissioning phases of the proposed solution.

## EVALUATION

Responses will be evaluated against the following list of criteria (in descending order of importance):

1. Technical feasibility
2. Total life cycle cost to the SKA project (which should consist mainly of power tariffs)
3. Compliance with site-specific requirements, excluding RFI

The responses will be evaluated by a working group within the SKA Project.

## PROJECT TIMELINES

All equipment to be utilised by the facility needs to be generally available (GA) by 3rd quarter of 2022.

## TIME FOR RESPONSE

We look forward to your response by **Monday, 25 November 2019 by 11h00AM (SAST)**.

## RFI RESPONSE DOCUMENT OWNERSHIP

All RFI responses submitted by vendors and/or implementation partners become the property of the NRF, who will use it solely for purposes of further planning for SARA0 Datacentre Power Solution at the NRF.

### Important to note:

1. Please note that this enquiry is not a Request for Quotation/Proposal but a Request for information only and

therefore non-committal and does not constitute a guarantee of business, or an agreement to negotiate a binding agreement.

2. Due to the specific need that this RFI process has to fulfil, NRF wishes to clarify that this invitation is not intended to impede, amend or replace any current or future procurement process that NRF has engaged in or will engage in.
3. This RFI is a stand-alone information-gathering and market-testing exercise, intended only to inform and assist NRF further decisions. No respondent, through submission of information will gain any right to participate in any future process, and participates herein on the basis that it is providing information voluntarily to strengthen a potentially beneficial process for all stakeholders. In addition, no participant shall be prevented or excluded from participation in the bidding process due to submission of information in response to this RFI
4. All participants responding to this RFI process need to ensure that they have received all information and remain solely responsible for satisfying themselves as to the information required in responding hereto and are fully responsible for all costs incurred in relation hereto and under no circumstances will any resultant cost be borne by NRF.
5. NRF reserves the right not to proceed with any further engagements on the requirements presented.

<b>INVITATION TO BID (SBD 1)</b>			
<b>Bid number</b>		NRF SARAO SKA1 001 2019	
<b>Closing date and time</b>		25 NOVEMBER 2019 at 11.00AM	
The NRF recognises the date and time as recorded on its systems for closure purposes			
HIGH LEVEL SUMMARY OF BID REQUIREMENTS			
<b>REQUEST FOR INFORMATION (RFI) FOR POWER SOLUTION FOR SARAO DATACENTRE</b>			
<b>Number of ORIGINAL bid documents for contract signing</b>			1
<b>Number of EVALUATION copies (Mark pages as "Evaluation Copy" and number all pages sequentially):</b>		1	
<b>TWO ENVELOPE SYSTEM</b>		N/A	
<b>PRICE VALIDITY PERIOD FROM DATE OF CLOSURE</b>		N/A	
<b>Bidding procedure enquiries are directed in writing to:</b>		<b>Technical information queries are directed in writing to:</b>	
Section	SCM	Section	Contract Lead
Contact person	Ms Anwuli Okecha	Contact person	Craig Smith
E-mail address	<a href="mailto:anwuli@ska.ac.za">anwuli@ska.ac.za</a>	E-mail address	<a href="mailto:csmith@ska.ac.za">csmith@ska.ac.za</a>

## SUPPLIER INFORMATION

**Name Of Bidder:**

Physical Address:

**Telephone Number**

Code

Number

**Cell Phone Number**

Code

Number

**Facsimile Number**

Code

Number

**E-Mail Address**