



National Radio Astronomy Observatory

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Statement of Work

Subject:	RFP for Generator Performance Analysis & Recommendation for Improvement
Award Type:	Firm Fixed Price
Period of Performance:	Deliver Study by May 30 th , 2022
NRAO Technical POC:	Jon Thunborg, NRAO Engineering Services Division Head 575-835-7407, jthunbor@nrao.edu
Vendor POC:	TBD

Background:

The National Radio Astronomy Observatory (NRAO) operates the Very Large Array (VLA) located approximately 50 miles west of Socorro, New Mexico. NRAO is a program of the National Science Foundation, operated by the non-profit Associated Universities, Inc. under a Cooperative Agreement.

The Very Large Array consists of 27 radio antennas in a Y-shaped configuration on the Plains of San Agustin and is situated at 6,970 feet in elevation. Near its core are a series of buildings and structures necessary to support operations and maintenance of the VLA. Approximately 40 staff work at the VLA site. The VLA is also supported by the Domenici Science Operations Center (DSOC), located on the campus of the New Mexico Institute of Mining and Technology in Socorro.

The VLA site is powered by utility power provided by Socorro Cooperative Electric. Due to the array's continuous observing, backup power is critical and this is provided by a backup generator for the site and a redundant backup generator for the control building. However, the site generator has been failing to perform as needed and NRAO wishes to engage an expert consultant to investigate the situation and recommend changes in order to improve the backup power provided from the existing generator and associated infrastructure.

VLA Generator History

The VLA site installed new switchgear and a new Caterpillar 3.5-Megawatt generator in 2018. After installation it was found that the generator would turn itself off during startup to protect it from the poor power factor due to the capacitive load on our array. This problem was remedied by staging the breakers on the array to turn on in a particular sequence. The control building, central site, and west arm turn on immediately and then the breakers wait 2 minutes until the power factor settles and then another array arm (each arm has 9 antennas) is switched on. After another 2-minute period the last arm is switched on.

The scheme above remedied our power factor problem. However, if the utility power was restored in the period between the time when the arm breakers were opened and the generator had not yet assumed load, the system would return to utility power without reclosing the arm switches.

The fix for the above problem was to have Siemen's reprogram our switchgear to force the generator to complete its cycle and assume the load for at least 15 minutes regardless of the utility status.

We are currently operating under the above condition but it is problematic because we go on generator power when the utility power has very short duration perturbations. The array arms are forced off for the required 2-minute intervals causing interruptions in our observing.

More recently, the generator itself failed to run due to issues with the fuel supply line, but that problem appears to have been solved.

Scope of Requested Services:

This Statement of Work (SoW) describes the requirements for the requested analysis report of the VLA site generator and related systems necessary to provide site backup power and minimize outages. The analysis should include a summary of the situation performance, root-cause analysis of major problems, and a recommendation for corrective actions to improve the performance. Analysis of the separate backup generator for the VLA control building is not within the scope of the requested work.

Deliverables:

The following deliverables are requested:

1. A complete analysis of the VLA site backup generator system ("System"), including
 - a. Generator performance
 - b. Genset controller performance and programming
 - c. Analysis of System interaction with array site
2. A detailed recommendation for improvement of the System in order to provide consistent backup power and improved transition between utility and backup power during utility outages and return to service. The recommendation shall include:
 - a. Specific actions for preventive maintenance
 - b. Specific actions for changes to the System, including hardware and software reconfigurations.
3. A cost estimate for recommended corrections that cannot be carried out by NRAO staff. The cost estimate shall be broken down as necessary to understand the individual cost associated with each recommended change.

Interaction with VLA Site

The winning vendor is expected to visit the VLA site to inspect the System and to interact with personnel responsible for its operations and maintenance. Site visitors are subject to our COVID safety policies, as will be explained by NRAO personnel. In short, visitors must be fully vaccinated. The vendor point of contact (POC) will arrange visits and necessary interactions with the VLA POC.