EXHIBIT "C"

Request for Quotations Number 191002
Sequim Solar PV Project

Technical Specifications

PUD #1 of Clallam County
P.O. Box 1000
Carlsborg, WA 98324

April 19, 2019

A. SUMMARY OF WORK

The project includes but is not limited to:

a. The installation of new ground mounted solar PV panels, racking system including foundation, trenching, conduits, wiring, fuse boxes, combiner boxes, inverters, AC panel, metering, disconnects, and communication cable to existing PUD junction box.

b. See Exhibit D – Drawing Set A, detailing Solar PV System layout and material requirements.

c. Successful bidder must furnish all materials.

d. Successful bidder will be responsible for securing all electrical permits, building permits and any engineering required to complete the scope of work outlined in this bid.

e. Contractor shall commission the system according to the District's PV Commissioning Procedure outlined in Appendix D attached hereto, and shall coordinate commissioning scheduling with the District.

f. Contractor shall schedule a tour of the completed system with the District Project Manager, IT Technician and other interested staff.

B. PUD-FURNISHED TRANSFORMER

a. The District will coordinate the energization of the Solar PV System to an existing PUD 50 KVA 7200V-120/240V transformer located within the Sequim Substation.

C. FOUNDATION

a. Rack system must be installed with Sonotube style concrete foundation, ballast or equivalent.

D. RACK

a. Solar racking system shall be made of Hot Dipped Galvanized Steel per ASTM A123.

b. All fasteners shall be galvanized steel.

c. All wire clips shall be stainless steel.

d. Panels will be mounted at a 35 degree angle facing due south or as close to due south as possible based on yard configuration.

e. Panels will be arranged in two rows, each row containing panels configured 2X24 in portrait position.

f. RBI Solar Mounting System or equivalent ground mount racking systems.

E. FENCE REMOVAL

a. Remove and dispose of approximately 65' of chain link fence.

F. DC WIRING

a. All DC wiring will be #10 AWG PV Wire and rated for wet locations.

b. Insulation will be rated 2000V.

G. AC WIRING
    a. All AC wiring will be rated for wet locations.
    b. Insulation will be rated 600V.
H. TRENCH REQUIREMENTS
    a. Top of conduit will be minimum 42” below ground line.
    b. The trench shall be free of rocks or roots greater than 2" in diameter.
    c. See included spec for details.
I. TREE REMOVAL
    a. PUD will be responsible for the removal of all trees that obstruct solar PV panels.
J. PROJECT SITE
    a. 410 E Washington Street Sequim, WA 98382.
K. MATERIAL STORAGE LOCATION
    a. Contractor may store project related materials within the locked fence of the Sequim Substation.
L. GROUNDING
    a. Ground all rack posts to system ground.
M. CODE COMPLIANCE
    a. Installation shall be NEC 2017 compliant.
N. ELECTRICAL ENCLOSURES
    a. All electrical enclosures will be rated rain proof and UL listed.
O. SOLAR DISCONNECT
    a. Solar system will be labeled per NEC 2017 requirements
P. SOLAR PV PANELS
    a. Quantity 96 + 4 spares for a total of 100 Solar PV Panels. Each Solar PV Panel must be rated 325 Watts.
Q. INVERTER
    a. Quantity 4 + 1 spare for a total of 5 Solar inverters. Each inverter must be SMA Sunnyboy 7.7 240V or equivalent.
    b. Inverter must be capable of reporting energy monitoring and analysis to web based user interface through CAT5 Ethernet cable.

Appendix D: PV System Testing & Commissioning Procedure

The purpose of testing and commissioning is to verify the installation completeness and performance of the system being installed prior to system sign off.

The Contractor shall document all testing results for approval and submittal to the District.

The Contractor shall provide dispositions for any variances in test results and proposed corrective actions in writing.

PRIOR TO COMMISSIONING

The Contractor shall have completed the following tasks prior to the testing/commissioning inspection by the District.

- Complete installation.
- Install all required labeling.
- Verify that the installation is safe.
- Received AHJ final approval.

Once the Contractor has completed these tasks, the Contractor shall schedule the following tasks with the District:

- District's inspection of installation completeness.
- Initial system startup and interconnection to grid.
- Verification of system performance.

INSTALLATION VERIFICATION

Prior to system energization and testing, the District will perform a visual inspection to verify installation completeness, robustness, and that installation is adequate for interconnection to the grid. Any issues found shall be corrected by the Contractor prior to system testing.

INITIAL SYSTEM STARTUP

All overcurrent devices (AC & DC) and disconnects shall be open at the start of testing. Once the main disconnect has been closed, only one inverter string shall be grid tied at a time during testing. All strings shall be fully grid tied during the data acquisition testing phase.

PV module protective film shall not be removed until initial startup. This is to protect the modules from damage during construction and to reduce the electrical hazards on the job site. Once the film has been removed and the panels allowed to acclimate for the manufacturer's specified time period the following tests shall be performed:

1) Verify main disconnect is closed.
2) Verify DC disconnects are open.
3) Verify inverter string feeder breaker is closed and all others are open.
4) With Inverter DC disconnect open:
    a. Verify correct Vdc_{OC} and polarity at each DC disconnect.

    b. Verify correct Vac_{OC} at each Inverter.
5) With Inverter DC disconnect closed:
    a. Verify correct Vdc and polarity at each DC disconnect.
    b. Verify correct Vac_{OC} at each Inverter.
    c. Verify Imp for each inverter.
        i. Assuming consistent weather conditions, inverters should be producing within 0.1A of each other. Determine cause if difference is greater than this.
    d. Verify correct Vac, Iac, and Pac at each Inverter.
6) Open DC disconnect and repeat steps 4 and 5 for all other inverters on string.
7) Once the parameters for a "string" of inverters has been verified to be correct, close the DC disconnects for all inverters on the string and verify Vac, Iac, and Pac for each home run.
8) Open inverter string feeder breaker.
9) Move to next inverter string and repeat steps 3-8. Continue until all modules, inverters, and strings have been tested and verified.

Note: The Contractor will recheck all questionable test values and provide troubleshooting as needed.

DATA COLLECTION VERIFICATION

Once all the modules and inverters have been verified to be operating within expected parameters, testing of the data collection system can take place.

1) Setup and Input any necessary information into the ECU (registration, serial numbers, etc.) and set unit for inverter detection as required.
2) Grid tie the inverters string by string until all are active.
    a. Verify all DC disconnects are closed.
3) Wait for the manufacturer's recommended time period to allow the ECU to detect and categorize all the inverters.
4) Verify that all inverters have been cataloged by the ECU and telemetry is being received.
5) Train District personnel in using the interface to verify production and perform basic troubleshooting.
    a. ECU Troubleshooting testing shall include turning a string off, disconnecting an inverter, and disconnecting a PV Module.

PERFORMANCE VERIFICATION

As ideal conditions are not likely to exist during startup/testing to determine if the system is capable of functioning at the rated capacity, the following approximation shall be used. Measurements shall be taken over a period of a minimum of 3 days, twice per day at 10am and

3pm. The Contractor is responsible for additional test periods as required to demonstrate adequate system performance.

The approximation used for expected system performance for given non-ideal environmental conditions, PE, can be calculated by the following:

PE = 75kW × 0.927 x KI × KT

- KI = Irradiance Factor
    - The Contractor shall use a pyranometer to measure the actual irradiance in watts per square meter (W/m^2). This measurement shall be taken in the same plane as the modules, with the same azimuth and tilt angle.
    - Divide the measured irradiance by the STC irradiance (1000 W/m^2) to obtain KI.
- KT = Module Cell Temperature Factor
    - Determine TC by measuring the cell temperature in Celsius using a thermocouple, thermistor, or infrared thermometer.
    - Use the manufacturer's coefficient of power, CT.
    - KT = 1 + (CT x (TC – 25°C))
- A minimum of 5 irradiance and temperature readings shall be taken at each testing session and the average utilized in the calculation. Readings shall be taken at 30 second intervals.

The actual production values indicated at the ECU must be documented at the same time the temperature and irradiance measurements are taken in order to present a fair comparison. An average of the actual production values shall also be used.

Should the estimated vs actual production differ by 5% or more, the Contractor shall perform troubleshooting to determine the cause and correct it or provide a disposition as to why the variance exists.

TESTING AND COMMISSIONING RESULTS SUBMITTAL

The Contractor shall tabulate test results in an easily understandable format. Any necessary checklists or forms required to document testing information shall be developed and provided by the Contractor. At a minimum the following test results shall be submitted to the District for approval.

Initial System Startup:

- Vdc_{OC} and Vac_{OC} values with DC disconnect open.
- Vdc, Imp, Vac, Iac, and Pac values with DC disconnect closed.
- Vac, Iac, and Pac values for each string home run.

Data Collection Verification:

- Inverter Serial Numbers with positional references within array.

Performance Verification:

- Date and time of measurements
- Irradiance and Module Temperature measurements and the average result used in calculations.
- Calculated expected system performance values.
- Actual production values from ECU unit.
- A comparison of the calculated vs. actual production results with the % difference indicated for all test periods.
- Error conditions caused for ECU troubleshooting testing and associated screen shots of ECU alarms.

30KW Solar PV Location
410 E Washington St. Sequim, WA 98382