Ten X Residential Housing Project – Request for Proposal

HYBRID ELECTRICAL SYSTEM

Date:	10/8/2018
Project:	Ten X Residential Housing Project
Location:	Tusayan, AZ
Activity:	HYBRID ELECTRICAL SYSTEM
Bid Due Date:	**Friday, October 19th, 2018 by 5 pm MST**

Project Info

The following specifications are to be used to determine a proposal for the design, procurement, and installation of a complete Microgrid solution for the Ten X Housing Project as shown on attached plot plan. The Project area is located on a 20-acre parcel approximately three miles east of Highway 64 along Forest Road 302 in the Town of Tusayan, Coconino County. There are a total of 52 housing units: 18 @ 800sf each, 23 @ 1,400sf each, and 11 @ 1,900sf each. Potential areas for a fixed system ballasted ground mount are shown on the NE and SE areas of the plot plan. The Water/Wastewater Campus will have a building with South Facing sloped metal roof that could support approximately 30-40kw of the required solar. The building will be extended to provide areas for the Gensets, controls, and electrical gear based on final equipment needs and design.

The following components are to be used to integrate a ballasted ground mounted solar PV array/arrays, an Energy Storage Solution, Prime power gensets, and a monitoring and control system to distribute and maintain power for the off grid community being established.

Base proposal will include Design, engineering, procurement and installation of the HES power solution complete to transformers curb adjacent of lot lines as needed at housing unit locations.
Optional Proposal: Operations and Maintenance cost options available for the system, or various components as required for normal daily operations, and required maintenance intervals.

If you are interested in bidding this Project, please contact James Kelton to receive the necessary invite to Procore in order to download the drawings.

Email: james.kelton@premierbuilders.com
Phone: (520) 293-0300 ext. 139

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HYBRID ENERGY SYSTEM (HES) DESCRIPTION

The Hybrid Energy System (HES) is optimized to provide the lowest levelized cost of energy by minimizing fuel usage and run hours of the prime power generation facility. The HES should be designed with greater than 75% energy penetration from renewables. The HES system must be a scalable, single-branded, and sustained, material solution integrating conventional diesel and / or natural gas-fueled power generation and renewable power with smart energy storage, to provide a reliable, resilient, secure, and cost effective electrical power solution. The HES provider must have Factory authorized and trained service technicians and minimum parts inventory located with 100 miles of HES installation.

The HES needs to include gensets (C18's) as prime power and will integrate solar field approx. 800kW DC of Ballasted Ground Mounted PV System, 700kwac of smart string inverters, 500kw/1001kW-hr battery storage, capable of grid forming/following, interconnect switchgear and a Microgrid Master Controller (MMC). The BID shall include all costs for labor, materials, equipment, etc., and all other items necessary and incidental to construct the HES system Ten X Ranch new development approximately 3.2 miles outside of Tusayan, AZ. Post award documents shall include drawings, Operations & Maintenance Manuals, and other support documents specific to the project. Item includes all foundations, clearing and grubbing, structural, fencing, signage and electrical herein to make a complete usable HES and any other associated items not specifically named but identified on the drawings, RFP or specifications.

PART 1 - ELECTRICAL SYSTEMS

Unless dictated by local codes, standards and conditions, Local Electric Authority, or noted hereinafter, the design, construction and installation of all electrical system equipment, materials, components and devices should conform to the following codes, regulations, standards and recommended practices. Latest edition at time of request for proposals should govern.

ANSI - American National Standards Institute Standards
ASTM - American Society of Testing and Materials
CE – European Conformity
EIA - Electronic Industries Association
EU – European Union
IBC - International Building Code
IEC – International Electrotechnical Commission
IEEE - Institute of Electrical and Electronic Engineers

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IESNA - Illuminating Engineering Society of North America Handbook
NEMA - National Electrical Manufacturer's Association
NESC/IEEE C2 - National Electrical Safety Code
NEC/NFPA 70 - National Electric Code
NFPA - National Fire Protection Association Codes and Standards
UFC - Unified Facilities Criteria
UL - Underwriter's Laboratories

1.1 HYBRID ENERGY SYSTEM (HES)

The requirements of this section encompass the Design and Construction of a HES consisting of 800 kW of Ground Mounted PV, 500kw/1001kW-hr Grid forming battery Storage Module, four diesel genesets, paralleling switchgear, a Microgrid Master Controller (MMC), weather station, ethernet switch box, and necessary communications hardware for remote monitoring and video monitoring.

The HES shall be designed to contribute its fully rated output during optimum weather days. Due to the high penetration level of the PV system, excess energy generated during periods of low power demand, will automatically be stored in a self-contained 500kW Battery Storage System. The batteries within the ESS shall provide sufficient power to guarantee a smooth transient between generator load steps during volatile weather days when the PV system output fluctuates. The operational intent of running this islanded system with diesels gensets, energy storage batteries and PV, is to maximize use of PV energy and reduce diesel fuel usage, while maintaining optimum power reliability, availability and reserves.

1.1.1 PHOTOVOLTAIC (PV) SYSTEM

Provide a complete PV system consisting of, but not limited to PV modules, String inverters, racking, PV String Harnesses, combiner boxes, power panels/switch boards, conductors, conduits, communications wiring, cable trays, station electrical service from generator farm, and other equipment to provide a functioning PV System. Provide the applicable NEMA rating on all equipment.

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1.1.1.1 PV MODULES

The Potential array areas shown on the plot plan should utilize Mono PERC, 72 cell, 365w modules as the basis of design to ensure that the system is sufficiently large enough and makes efficient use of land. Other panels may be used but the design must fit on the fixed site dimensions shown. The PV modules shall be provided with the following minimum requirements:

- Shall have demonstrated a life cycle of at least 25 years.
- Shall have 25 years power warranty with Max degradation of 0.6%/Year or less.
- Shall have delivered -0/+5w positive power tolerance.
- Compatible with advanced 1000V plant architectures.
- Acceptable PV technologies include Mono-PERC Silicon or CdTe Thin Film.
- IEC and Other Standards as applicable to this design.

1.1.1.2 PV STRING HARNESSES

The DC wiring shall be as recommended by the PV manufacturer. A Photovoltaic String Harnesses is a pre-engineered wiring system that is desired but not limited to what is required for this solicitation. If a harness system is not used then all wiring and combiner systems shall be approved by the designer of record to meet the solicitation requirements. A wiring harness system if used shall meet the following minimum requirements:

- Pre-engineered interconnect harnessing to combine common string arrangements
- UL9703 listed or IEC as applicable
- 10 AWG / 1000V rated wire
- MCL or equivalent connectors

1.1.1.3 PV RACKING

The ballasted racking shall hold fixed PV module strings at the proper angle to optimize solar collection at the site location. Racking shall be designed to withstand 120 MPH wind loads. All electrical equipment, include inverters, wire harnesses, AC/DC disconnects or other distribution equipment shall be mounted or installed by means of structural support or elevated pads.

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1.1.1.4 PV STRING INVERTERS

50 kW PV String Inverters shall have transformerless, 480V three-phase output voltage, be UL/IEC listed for up to 1000 V DC maximum system voltage and have a peak efficiency above 98 percent. The inverter shall be equipped with all-pole ground fault protection and integrated AFCI for a safe, reliable solution. Inverter shall offer flexibility with a wide input voltage range suitable for both 600 V DC and 1,000 V DC applications and have two or more independent string inputs to allow for flexible design and a lower installed cost. Inverter shall be housed in a NEMA 3R enclosure and designed for easy mounting. Inverter shall be designed for operating temperatures between -25 °C and +60 °C.

The inverter shall deliver a future-proof solution with full grid management functionality, RS485, Ethernet and built-in Wi-Fi communications, and advanced monitoring. Smart inverter grid support functions include Utility-interactive controls for active and reactive power.

The PV String Inverter shall meet the following minimum requirements:

UL 1741, UL 1998, UL 1699B, IEEE 1547
FCC Part 15 (Class A & B)
UL 1741 SA advanced inverter capabilities
IEC

1.1.1.5 PV SYSTEM DISTRIBUTION

Design and Provide new underground 480V feeders from the PV system distribution system to the new step down transformers designed to serve the distribution of power to all points in the development as shown in attached Plot plan of area.

1.1.2 ENERGY STORAGE SYSTEM (ESS)

The grid stability or ESS Battery storage module shall be a scalable, rapidly deployable energy storage system. Energy storage systems will have the ability to integrate with solar or other renewable sources to provide short duration power when the renewable source is not available or erratic. The energy storage system must also provide temporary backup power to facilities in the event of a brief power outage. The ESS shall:

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- Provide 500kW continuous power output and a minimum nameplate battery capacity of 1001 kW-hr.
- Be packaged as a 30 or 40 Foot ISO Containerized solution, using two 250 kW bidirectional inverter, lithium ion batteries, NOVEC 1230 fire suppression, HVAC, Battery Management System and interior lighting.
- Have 3-Phase, 480V output with Electrically Operated Breaker.
- Lithium-Ion batteries from a Tier 1 Supplier.
- Interact with the power system frequency and voltage to add power when needed to compensate for energy fluctuations in the power system.
- House an Ethernet Switch Box which provides a connection and integration point for the PV inverters, Microgrid Master Controller, and any necessary customer communication.
- Be designed for installation on concrete pad and easily connected with bottom or side entry conduit for power out, shore power and communication.
- Be factory tested.
- Grid Forming and Grid Following.
- Designed for 80% Depth of Discharge (DOD).

Grid Stability or Energy Time-shift Module must be a fully integrated Energy Storage System packaged with Bi-directional Power Inverter(s), Lithium-Ion batteries, Fire suppression, HVAC and ancillary equipment for 480V, 3-Phase output. ESS must be factory tested and factory listed for UL 1741 (SA) and UL 9540. ESS must have fire suppression per NOVEC 1230. ESS must have climate control system to extend battery life. The ESS shall provide the following specific features:

RENEWABLE INTEGRATION

The ESS must be designed to seamlessly integrate with an array of renewable energy systems, gas or diesel reciprocating gensets, utilities, peripheral cluster controllers and Microgrid Master Controller to allow for maximum renewable penetration and full asset control. The system shall have curtailment functionality to control the PV inverters (and communications to them from the microgrid controller) to reduce power output when needed. The grid forming Bi-Directional Power (BDP) inverters shall allow generator sets to be completely switched off to further reduce fuel consumption and operating costs.

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GRID STABILIZATION OR ENERGY TIME-SHIFT MODULE

The grid stabilization or Energy Time-shift module shall protect against typical power problems, including power failure, voltage sags/surges, and under/over voltage conditions.

STANDARD EQUIPMENT

- Bi-directional power inverters
- Energy storage batteries
- Color HMI touchscreen
- Remote communications via Modbus TCP/IP
- HVAC system to maintain 15°C to 27°C (60°F to 80°F) interior temperatures
- Interior AC lighting and convenience receptacles
- NOVEC 1230 Fire suppression system
- Shore Power connection and circuit breaker panel

FEATURED APPLICATIONS

- Renewable smoothing
- Grid firming/grid stabilization
- Facility backup
- Spinning reserve (if designed/needed)

BI-DIRECTIONAL POWER INVERTER

The Bi-Directional Power inverters shall provide the following features:

- Intelligent controls for the charging and discharging of the energy storage equipment.
- Static VAR compensator
- Full four-quadrant output power factor control of VAR/pf
- Automatic anti-islanding
- Parallel-ready to allow multiple modules to be used in parallel to increase total power output
- 50% overload capability for 10 minutes given sufficient battery energy.
- Automatically switching between grid-following and grid-forming modes and must do so within 1ms.
- Capable of switching from full charging to full discharging in < 1 ms.

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ALL PROPOSALS MUST INLCUDE A TIMELINE FOR PROCURMENT OF ALL NECESSARY COMPONENTS. PROPOSALS THAT DO NOT INLCUDE A TIMELINE WILL NOT BE CONSIDERED FOR AWARD.

A. Attachments

1. Drawing Log **(Exhibit "A")**.
2. Geotechnical Engineering Study, *Dated March 27, 2018* **(Exhibit "B")**.
3. Insurance Requirements **(Exhibit "C")**.

EXHIBIT "A"

DRAWING LOG

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Drawing No.	Drawing Title	Rev. No.	Drawing Date
C-101	10X RANCH GRADING PLANS COVER SHEET		8/24/2018
C-102	10X RANCH GRADING PLANS NOTES		8/24/2018
C-103	10X RANCH GRADING PLANS		9/13/2018
C-104	10X RANCH GRADING PLANS		9/13/2018
C-105	10X RANCH GRADING PLANS RECOMMENDED MICRO HOME PRECISE GRADING DETAILS		8/24/2018
C-106	10X RANCH GRADING PLANS BOX CULVERT DETAIL		8/24/2018
C-107	10X RANCH GRADING PLANS SECTIONS		8/24/2018
C-108	10X RANCH GRADING PLANS SECTIONS		8/24/2018
C-109	10X RANCH GRADING PLANS BOX CULVERT DETAILS		8/24/2018
E01	10X RANCH ELECTRICAL COVER SHEET	60%	9/21/2018
E02	10X RANCH REMOTE LIFT STATION PLAN	60%	9/21/2018
E03	10X RANCH WATER PLANT ELECTRICAL SITE PLAN	60%	9/21/2018
E04	10X RANCH WATER PLANT BUILDING POWER PLAN	60%	9/21/2018
E05	10X RANCH WATER PLANT BUILDING LIGHTING PLAN	60%	9/21/2018
E06	10X RANCH WATER PLANT SINGLE LINE DIAGRAM	60%	9/21/2018
E07	10X RANCH WATER PLANT LOAD CALCULATION & SCHEDULES	60%	9/21/2018
E08	10X RANCH ELECTRICAL DETAILS	60%	9/21/2018

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EXHIBIT "B"

GEOTECHNICAL ENGINEERING STUDY

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EXHIBIT "C"

INSURANCE REQUIREMENTS