REQUEST FOR PROPOSALS:

Puerto Rico Resilient Schools Microgrid Project

November 9, 2018

Project Summary

Project Name: Puerto Rico Resilient Schools Microgrid Project, Phase I (Comerio, Aguas Buenas, and Corozal)

Task and objective: Rocky Mountain Institute has partnered with Save the Children to publish a Request for Proposals (RFP) for prospective bidders for **three (3)** resilient solar microgrids across three (3) public school sites to serve critical loads for those schools.

Contact Information

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Important Dates

Event	Date
Mandatory Site Visit	Tuesday, November 13, 2018
Request for Clarification Submission Deadline	Wednesday, November 28, 2018
Final Responses to Request for Clarification	Friday, November 30, 2018
Proposal Submission Date	Wednesday, December 5, 2018
Project Award Date	Wednesday, December 12, 2018

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Exhibits

I. Introduction and Project Background

On September 20, 2017, Hurricane Maria struck Puerto Rico, setting off the largest power outage in U.S. history. The entire Puerto Rico public school system was closed for two months following Maria. School-aged children in Puerto Rico have lost more than 13 million cumulative days of learning, with no comprehensive plan to recover thes lost learning time. Limited energy availability also impacted schools' ability to provide meals to students. While some schools now have diesel generators, Puerto Rico's school system remains vulnerable to extended grid outage from future hurricanes.

The nonprofit organizations, Rocky Mountain Institute (RMI) and Save the Children are partnering to develop solar-plus-storage microgrid projects at up to 12 public schools in communities severely impacted by Hurricane Maria. These schools were selected following in-depth assessments of the damage and material losses suffered by the schools, access to after-school programs, and reported psychosocial distress of children, their caregivers, teachers, and school social workers. The 12 microgrid projects will minimize lost learning due to power outages and ensure students are able to return to school as soon as possible in the event of future emergency or grid outage. In addition to becoming resilient learning environments for the 2018-2019 academic year and beyond, these schools will become unofficial locations for emergency preparedness for the community.

This RFP is an aggregated competitive procurement, aiming to provide resilient, renewable energy systems at **three (3)** schools to support their continued operation following future storms and extended power outages. While other public schools in Puerto Rico have closed, these high-enrollment schools have a very low likelihood of closure because they have accepted additional students from surrounding schools.

The scope of the proposed solar microgrid project must:

1. Include appropriate subcontracting for roof repair and waterproofing prior to the solar microgrid installation phase.
2. Include solar photovoltaic system and battery energy storage system, plus microgrid control capabilities such that the system is capable of powering school equipment both during normal grid operating conditions and during outages.
3. Integrate with existing energy generation systems, including onsite generators and the utility grid.
4. Power critical loads to support school operation during both grid outages and normal operation.
5. Be capable of exporting electricity to the grid in order to receive net metering credits.
6. Provide students and the broader community new educational opportunities to learn about renewable energy and energy conservation.
7. Ensure all lighting in the kitchen, libraries, and administrative office connected to the microgrid system are LEDs.
8. Comply with the Resilience measures described in the *Design and Installation Requirements* section.

The project scope may also include:

9. Implementing energy efficiency measures, such as retrofitting refrigerators
10. Bringing the existing electrical infrastructure up to applicable electrical codes and standards; these include but are not limited to relevant NEC 2017, UL, IEC, and IEEE technical codes.
11. Engaging in educational programing with school staff.

II. Overview

RMI is issuing this Request for Proposals (RFP) for turnkey Engineering, Procurement, and Construction (EPC) services to be provided at three public schools in Puerto Rico.

The objective of this RFP is to solicit competitive proposals from qualified and experienced contractors ("Bidders") to provide three Puerto Rico public schools with cost-effective solar photovoltaic (PV) microgrid systems comprising approximately 75 kWdc of solar PV and 120 kWh of lithium-ion battery storage, collectively referred to here as the "Project".

The desired outcome of this RFP is the successful negotiation and execution of an EPC Agreement for the scope of services described herein. Only one successful bidder shall be awarded the work. The goal of this RFP is to contract an EPC firm through an EPC Agreement that will design and build the systems on the three public school sites.

Separate proposals for operations and maintenance (O&M) services for up to a 10-year term following installation will be accepted. Bids for O&M are optional (not required to be considered for award of the primary EPC contract) and will be considered separately.

III. Site Details

A. Project Locations

School 1

Site Name:	Comerio
Address:	Escuela Maria C. Santiago Carr 172 Km 1 Hm 5, Bo. Naranjo Sector Sabana Comerio, PR (Google Maps)
Coordinates:	18.222936, -66.202087
Number of Students:	*350 enrolled*

School 2

Site Name:	Aguas Buenas

Address:	Escuela Su Bayamoncito Carr 156 Km 42 Hm 3 Bo. Bayamoncito Aguas Buenas, PR 00703 (Google Maps)
Coordinates:	18.239032, -66.161983
Number of Students:	*320 enrolled*

School 3

Site Name:	Corozal
Address:	Esc Demetrio Rivera Carr 802 Bo Palmarito, Corozal, PR 00720 (Google Maps)
Coordinates:	18.268788, -66.339629
Number of Students:	*324 enrolled*

B. Current Energy Sources

All of these schools are PREPA customers. Backup gensets may exist onsite.

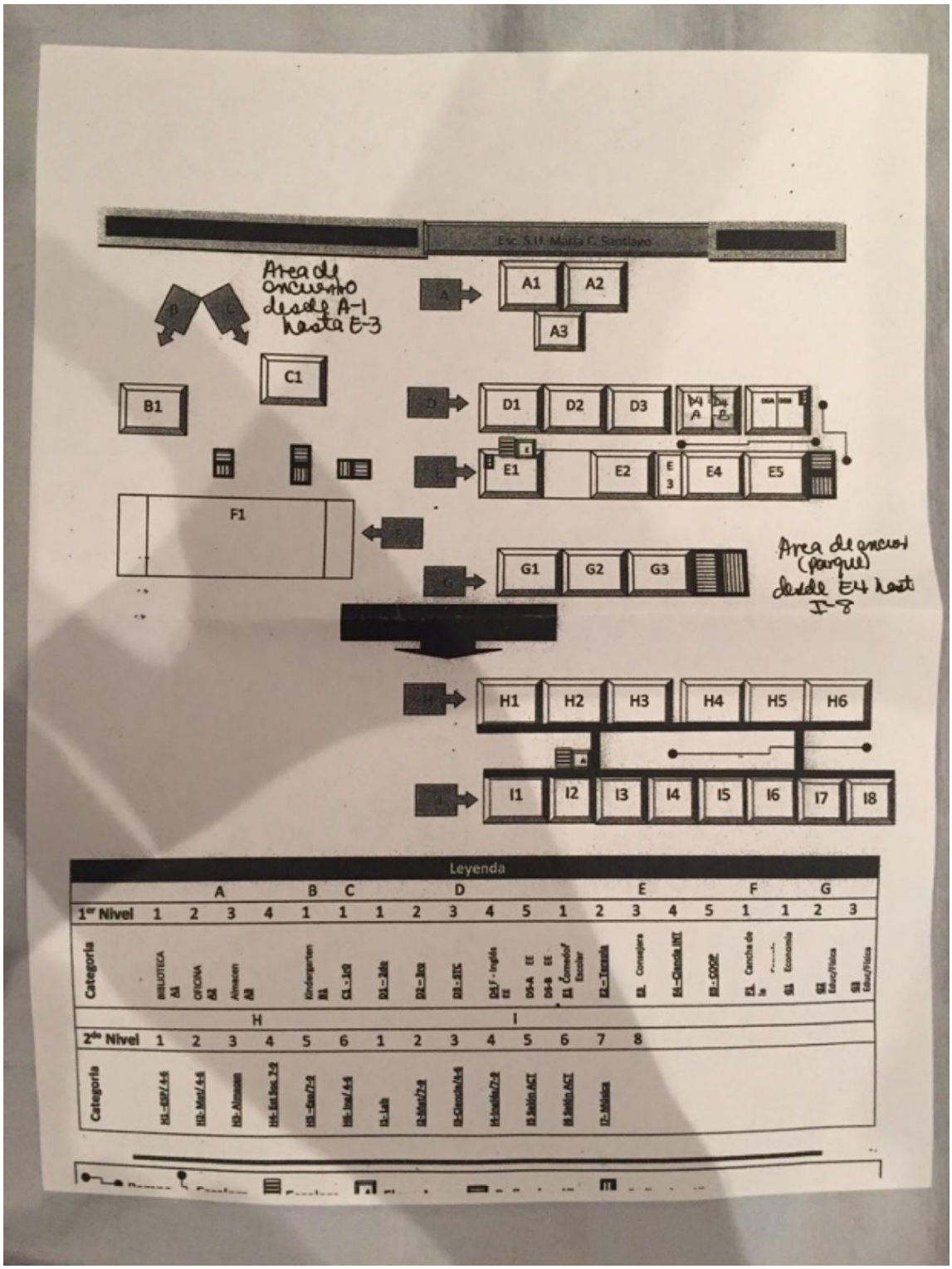
IV. Project Specifications

1. All major work that might be disruptive to students such as onsite roof repair and electrical repair work shall occur during January 8 – 11, 2019 or outside school hours.
2. The EPC Contractor shall create a **critical loads circuit** for specific rooms and end uses, listed in **"Exhibit A - Critical Loads."** All switches and sockets that are connected to this circuit shall be clearly and obviously labeled as such.
3. All lighting connected to the microgrid system shall be LED lighting.
4. The re-roofing work must include a waterproofing guarantee such that the schools' roofs remains free of water damage for 10 years.
5. Please locate all equipment such that serviceability is maximized and conduit and wire run lengths are minimized.
6. Wiring connected to the microgrid should be up to NEC 2017, UL, IEC, IEEE, and other relevant codes.

A. Site Layouts

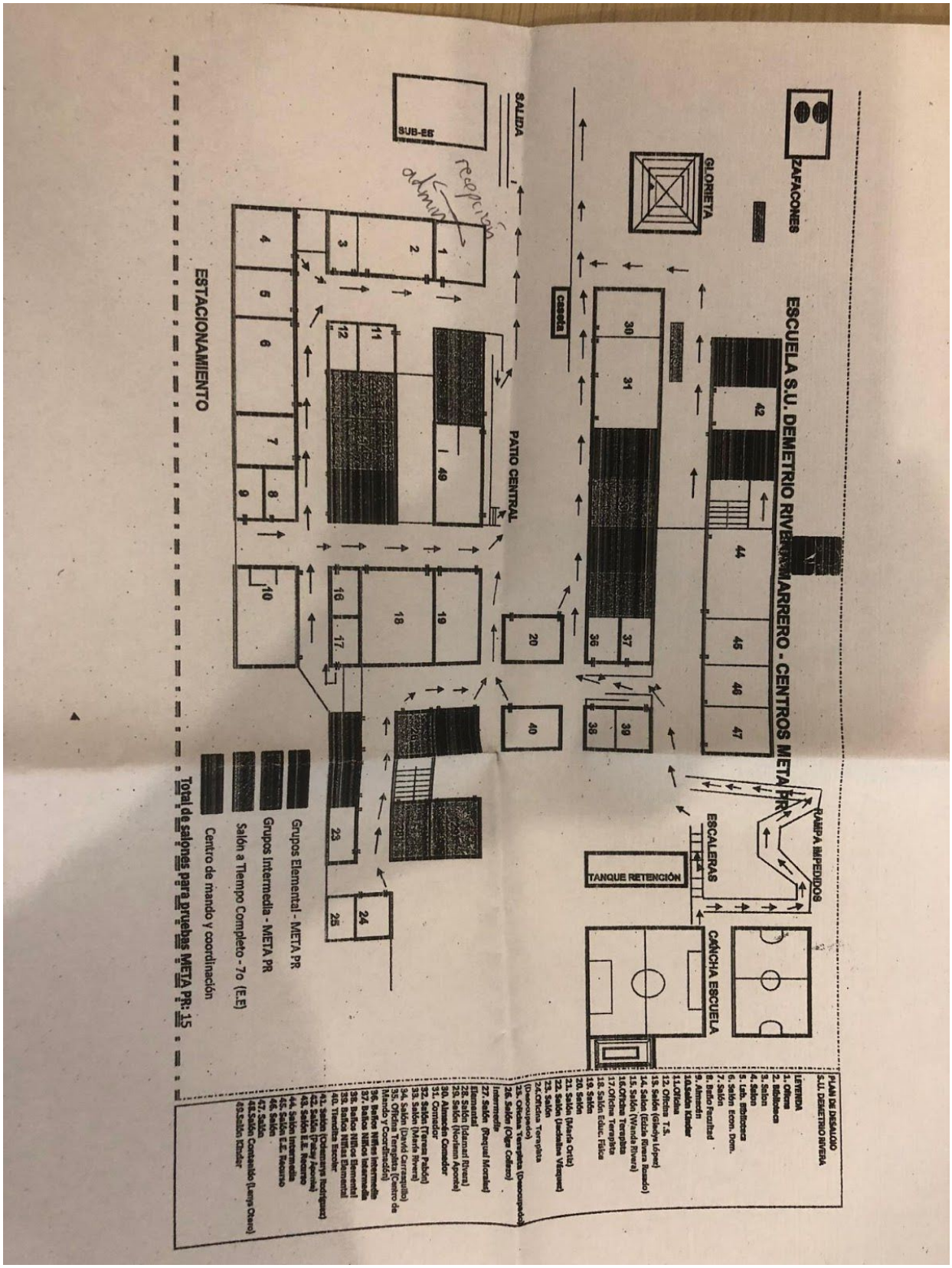
Note: an updated site layout will be provided after the site visit

Site 1: Comerio



Site 2: Aguas Buenas

Site 3: Corozal



B. Sizing and Design

The solar microgrid shall be designed to be +/- 5% the solar and storage capacity described in the table below.

#	Site	Proposed Solar Capacity Target (kWdc)	Proposed Battery Storage (kWh)
1	Comerio	25 kWdc	40 kWh
2	Aguas Buenas	25 kWdc	40 kWh
3	Corozal	25 kWdc	40 kWh
	TOTALS	**75 kWdc**	**120 kWh**

The solar and battery capacities in the table above were reached by running a HOMER model based on the load profiles derived from prior school site visits. The load profiles focus only on the critical loads at each site and assume these loads are being used for a certain period of time each day, based on interviews of school staff. See "**Exhibit A – Critical Loads**" for more information.

C. Design and Installation Requirements

This section provides guidelines for the design and installation of a PV solar system. It is agreed that the system shall comply with NEC 2017 requirements and that the installer will perform the work following industry standard in a timely manner.

It is understood that worker safety—and the safety of students and staff—is of top priority and that all safety rules shall be enforced by the EPC Contractor, who will be responsible for all work safety. Any violation of the safety rules will result in the immediate expulsion of the faulty worker from the job site. Furthermore, since the project site is a public school, all workers working the presence of children shall comply with and sign the Child Safeguarding policy and provide documentation of a background check as outlined in "**Exhibit F - Child Safeguarding Policy**".

All components and equipment should be installed per manufacturer's specifications and in accordance with NEC 2017 workspace clearance requirements.

<u>General</u>

- Systems shall be roof-mounted and shall be interconnected to the grid.
- System (including supports and wiring) shall not interfere with any existing roof drains, water drainage, expansion joints, air intakes, electrical and mechanical equipment, or antennas.

- All PV hardware and structural components shall be corrosion-resistant.
- All equipment and racking shall be designed and verified by a Structural Engineer to withstand sustained winds of at least 156 MPH; preferred 175 MPH.
- Project must be compliant with all applicable building, mechanical, fire, seismic, structural and electrical codes and standards; these include but are not limited to relevant NEC 2017, UL, IEC, IEEE, and ASCE technical codes.
- Solar layout shall meet all local fire department, code and ordinance requirements for roof access.
- All equipment should be secured with necessary anti-theft mechanisms to reduce the possibility of theft (include anti-theft screws).
- EPC shall provide confirmation that the PV systems will be designed to comply with applicable UTILITY interconnection requirements.
- Systems with remote monitoring capabilities are prefered.

Roofing

- Remove any roofing in poor condition.
- Apply necessary coatings to ensure roof waterproofing for 10+ years.

Racking System

- All racking shall be built using aluminum (preferred), stainless steel, or galvanized steel.
- The racking system shall be securely bolted to the roof and all roof penetrations shall be properly flashed to ensure roof waterproofing remain intact.
- The PV mounting structure and the PV array shall constitute an assembly that can sustain 156 mph wind speeds. Also see Resilience section below.
- EPC Contractor, or subcontractor firm, shall evaluate roof capability of supporting the weight of the array.

Photovoltaic Modules / Arrays

- All photovoltaic modules shall be guaranteed by the manufacturer to retain an output power of at least 80% of their nominal value over a period of at least 20 years. Positive tolerance on modules output preferable.
- All PV modules shall be equipped with bypass diodes.
- PV modules shall be provided with PV wire leads terminated by MC4 connectors preferably long enough to allow for leapfrog wiring.
- All exposed wire shall be specified as photovoltaic (PV) wire as per UL 4703.
- UL listed electrical conductors rated at 90°C and specified for wet location shall be used in conduits for PV connections when leaving the array.
- Rapid shutdown system shall be installed where required as per NEC 2017.
- Each string shall be protected by an overcurrent protection device rated as per NEC 2017.
- Each string shall be connected to a device allowing for manual disconnect.

- The use of a fused DC disconnect is the preferred method for over current protection and manual disconnect of each string.
- Existing roof should be left in good condition, with no cracks, damage, broken shingles, or excessive visible wear.
- All roof penetrations should be properly flashed where required: Must comply with IBC standards and product manufacturer installation instructions.
- All conductors should be securely managed underneath the array: conductors may not be loose and may not contact roof surface.
- All wire management devices should be UL listed and intended for solar array installations.
- All conductors leaving the array should be in conduits, and bend radius shall be no smaller than 5 times the diameter of the conductor.
- All array conductors shall be properly supported within 12 inches maximum of entering a box and every 4.5 Ft maximum along the way.

Inverters

- All solar inverters used shall be UL approved with a minimum efficiency of 94% at all power level.
- All battery inverters used shall be UL approved with a minimum efficiency of 90% at all power level.
- Solar inverter outputs shall be protected by a properly-sized circuit breaker.
- Battery inverter AC input and output shall be protected by a properly sized circuit breaker.
- For solar inverters, the PV source open circuit voltage shall be kept below the inverter maximum input voltage. Low temperature Voc adjustment should apply as per PV manufacturer's specification or NEC 2017.

Batteries

- Battery bank shall be designed to sustain a maximum ambient temperature without major losses.
- DC Voltage drop shall not exceed 0.2 volts per cell above 45°C.
- The designed daily depth of discharge (DOD) and total number of cycles shall be specified by the EPC contractor. Batteries shall be enclosed preferably in a non-metallic battery box, well ventilated with a properly-installed temperature sensor.
- The battery bank shall be protected by a properly-sized class T fuse.
- Battery bank shall be designed to protect each facility’s critical loads.
- Protected loads shall be located on back-up load panels with automatic transfer switch
- Recommended battery chemistry: Lithium Ion.

Conductors

- A maximum of 3% voltage drop shall be allowed on all AC circuits. A maximum of 2% voltage drop shall be allowed on all DC circuits.
- All underground conductors shall be rated for use in wet locations.
- All conductors shall be copper-stranded, unless otherwise specified.
- All conductors shall be UL-approved and rated at 90°C for wet locations.
- All conductors shall be derated for ambient temperatures and number of conductors per conduit as per NEC 2017.

Conduits

- Conductor fill factor shall be as per NEC 2017 Chapter 9. For runways greater than 100 feet, the next bigger conduit size shall be used for ease of installation.
- The 4 ninety-degree bend rule applies. Properly sized junction boxes (above ground) and hand holes or manholes (underground) shall be used where needed.
- Raceway depth for underground installations shall be as per NEC 2017.
- Conduits shall be fastened as per NEC 2017.

Junction / Combiner Boxes

- Combiner boxes shall be rated for the maximum system voltage. Fused combiner boxes are preferred.
- Junction/combiner boxes shall be easily accessible for inspection.
- Junction box fill shall be as per NEC 2017.
- All outdoor boxes shall be rated at least per NEMA 3R.
- Proper rain tight connectors shall be used when installed outdoor.
- Additional approved sealing method shall be used when entering the top of an outdoor box. Myers hub are a good option.
- UL listed surge protectors are mandatory on each combiner box.

Splicing

- All splicing shall be accessible for visual inspections and shall be of the waterproof type if located underground.

Grounding

- The PV array equipment and all metallic components must be properly bonded and grounded, unless otherwise specified.
- All grounding of equipment shall be in accordance with NEC 2017.
- Grounding conductors are not allowed to be spliced unless using irreversible compression-type connectors.
- Grounding bushings shall be used to terminate all metallic conduits where required.

Resilience

To ensure that the proposed system may withstand hurricane-force winds, the EPC Contractor must:

- Design the system to be built to the FEMA recommendations for high wind regions.[1,2]
- Specify high-load (up to 5,400 Pa uplift) PV modules, based on structural calculations; these are currently available from a number of Tier-1 module manufacturers.
- Perform structural engineering in accordance with ASCE 7 and site conditions, with calculations for wind forces, reactions, and attachment design.
- Check with racking manufacturer that actual site conditions comply with their base condition assumptions from wind-tunnel testing.
- Specify bolt QA/QC process to avoid inadequate torquing of bolts.
- Specify bolt hardware locking solution.
- Specify through-bolting of modules as opposed to top-down or T clamps, or if top clamping is required, use clamps that hold modules individually or independently.
- Require structural engineer review of lateral loads due to racking and electrical hardware—often lateral loads are missed, and recent failures have proven them to be a critical source of weakness (e.g., combiner boxes attached to end solar array posts caused increased loading and led to failure).
- Specify all hardware be sized based on 25 years (or project life) of corrosion.
- Not use self-tapping screws.

Operations and Maintenance Requirements (If proposing an O&M services contract)

At a minimum, the O&M contract should include:

- Regular preventive and corrective maintenance including:
    - Detailed inspection of all equipment.
    - Cleaning of all panels and remove any debris in installation area.
    - Ensure proper functioning of inverter and batteries and perform routine preventive maintenance on battery banks and inverter, per manufacturer's operating guidelines.
    - Submitting warranty request to manufacturers in the case of equipment malfunctioning.
    - Inspect all foundations for cracks and premature failure .
    - Make adjustment to the structure and replacement of required support pieces.
- Remote monitoring:
    - If and when an issue to a system is detected, Company will notify the School and schedule a service visit.
    - Provide customer with access to the online monitoring portal for the system.

[1] https://www.fema.gov/media-library-data/20130726-1644-20490-8474/757_apd_7_metalroof.pdf
[2] https://www.fema.gov/media-library-data/20130726-1604-20490-4255/ra2_asphalt_shingle_roofing.pdf

V. Scope of Work and Deliverables

A. Installation

The EPC Contractor shall procure and safely install all solar equipment for the school sites, including but not limited to PV panels, inverters, conduit, wires, breakers, racking, junction boxes, batteries, microgrid controls, and monitoring equipment. By accepting this request, your company will supply the following scope, included but not limited to the following areas.

The EPC Contractor shall perform and manage the installation and commissioning of the solar microgrid. including the electrical protection system, selectivity, and grounding system – to match the designed outputs and system characteristics. The installation shall maintain the integrity of building structures and electrical systems, complying with client's safety and environmental standards, NEC 2017 standards, and proposed timeline described in your proposal.

The EPC Contractor shall perform the needed mobilization for the installation and commissioning of the solar microgrid system, utilizing all solar energy industry good practices, and shall be held accountable for any liability caused by EPC crew members or subcontractors on client's facility.

EPC shall be responsible for a 1-year Workmanship Warranty.

B. Documentation

At the end of the project, the EPC Contractor must provide the following documentation to RMI:

- All technical documentation, including Components data sheets and listing
- Warranties
- Installation and operation manuals
- As-built version of system drawings, cable lists and routing, wirings, grounding system, protection system, as well as single line adjustments in electronic media file and hard copy

C. Employee Policy

Promote equal opportunity treatment for local employees hiring under your company's contract for and during the project, providing lodging options. Provide all necessary safety equipment to installers onsite, including but not limited to hard hats, fall protection for all work to be performed 6 ft above ground level, bright color working vest and insulating gloves.

A preference is given to EPCs that hire Puerto Rican crew members. See "**Exhibit C - EPC Qualification**

Form".

D. Equipment Availability

Please specify where you will acquire the solar energy system equipment and specify the availability of the equipment in your warehouse or with your distributor. If you will need to order any equipment from overseas, please specify delivery time and include shipping cost in your Bill of Materials

E. Net Energy Metering

- EPC Contractor shall coordinate with PREPA to ensure that the project satisfies all criteria for interconnection of the project to the PREPA electric distribution system. This includes coordinating all negotiations, meetings, design reviews, and conducting interactions with PREPA necessary to completing system interconnection.
- EPC Contractor is responsible for preparing required submissions for obtaining the Net Energy Metering (NEM) and interconnection agreement from the utility. The Department of Education will sign the NEM and interconnection agreements, not the contractor.
- EPC Contractor shall manage interconnection and startup of project in coordination with PREPA. EPC Contractor shall, at its own expense, pay any interconnection, processing, and other fees and expenses as may be required by PREPA for interconnection and operation of the project.

F. Additional EPC Responsibilities

- EPC shall be responsible for all required permitting with local agencies.
- EPC shall provide as-built drawings and operations manual at project completion.

VI. Selection Criteria

The proposal will be evaluated on the following criteria:

Price	50%
Proposed Equipment, Design, and Quality Plan	25%
Project Timeline	15%
Relevant Experience, Track Record	10%

Please See "**Exhibit B – Selection Criteria**" for a more detailed table.

VII. Proposal Requirements

The submitted proposal shall include all of the following:

1. Company & Team Summary, including copies of business registration and professional Electrician and PV installer licenses
2. EPC Qualification Form (**Exhibit C**)
    - If awarded the project, all onsite personnel will be required to complete a background check, inclusive of the installation crew and any subcontractors, as outlined in "Exhibit F - Child Safeguarding Policy".
3. Roofing company details and roofing plan
4. Scope of Work for this project, including any exclusions/exceptions
5. Equipment and Pricing List (**Exhibit D**)
    - The quote contained within the proposal shall follow the format contained within Exhibit D and should include all items not marked as optional.
    - The 1-year workmanship warranty shall be included in the Labor Cost.
    - The proposal may optionally include a quote for a 10-year O&M Services Contract. This contract should be quoted as a prepaid, lump sum contract payable upon system commissioning.
6. Proposed System Design
    - Please include layouts, a single line diagram of the entire system, and system details such as estimated annual energy production in kWh/year.
    - Production estimates shall account for shade effects at each array location.
    - The single line diagram shall include all conductor and conduit sizes.
7. Project Timeline (**Exhibit E**)
8. Staging Plan
    - In the Staging Plan, please indicate how you plan to store materials at the site during construction and how you plan to have construction vehicles enter and exit the site. Please also indicate if there is anything you need the client to provide while onsite, such as access to electricity, water, restrooms, etc. or whether you will be providing these necessities. Access to the site will be strictly limited to working personnel.
9. Quality Control and Risk Mitigation Plan

VIII. Important Notes

RMI is a nonprofit that may receive pledged donations from equipment manufacturers and distributors including PV modules, racking, inverters, and batteries. A preference will be made to any bidder that is able to integrate donated equipment into the project.

The Solar Schools Initiative is planning five (5) additional projects in the near future. Following RFPs will likely be issued in groups of multiple projects similar to this one. Please note your interest/preferences and capacity for bidding on future similar projects.

IX. Submission Instructions and Deadline

To be considered for this bidding process, please present your Proposal following the proposal requirements described in this RFP by 11:59 pm Atlantic Time on **Wednesday, December 5, 2018**.

All contractors may submit their questions regarding the RFP to amifsud@rmi.org. All RFP questions shall be to be submitted by **Wednesday, November 28, 2018.**

X. Execution of EPC Agreement

The scope of this RFP includes the turnkey EPC services for the implementation of the Project and will be executed through an EPC Agreement. The contractual structure of the parties under the EPC Agreement shall be as follows:

- RMI = Project Owner
- EPC contractor = EPC seller; implementer of the EPC agreement scope of services

RMI will execute an EPC Agreement with the successful Bidder for a negotiated dollar amount (USD). The winning Bidder will be considered the EPC Contractor, and RMI will be the purchaser, owner, and operator of the constructed system.