

## **Request for Proposals (RFP) for Implementation of Renewable Energy & Energy Efficiency (REEE) Measures in Thirty-Four (34) MSMEs and Two (2) Local Communities in Lebanon**

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### **Annex 3: Preliminary Design**

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## I. General Notes

1. The sections of this Annex describe the contractor's scope of work in each site of each region.
2. The contractor shall be responsible of the electrical and structural designs of each system based on the below mentioned systems sizing.
3. The contractor shall abide by the locations specified for the installation of the REEE measures.
4. All obstacles affecting the performance of the PV systems shall be taken into consideration in the contractors' design, as they might affect the guaranteed performance ratio mentioned in Form 6 of the RFP.
5. All PV systems shall be equipped with a bypass component for maintenance purposes.

## II. Preliminary Design

1. The REEE measures to be implemented at the two local communities' sites are as follows (refer to Annex 7 for site photos):

*Table 1: REEE Measures – Local Communities Sites*

Site	Type of Solution	Description	Notes:
<b>Rayak Municipality</b>	Replacement of existing Sodium streetlights	Installation of two types of LED lamps to replace the existing Sodium lighting fixtures.	<p><b>Type 1:</b> Luminaires to be mounted at a height of 10 meters on each pole.</p> <p><b>Type 2:</b> Luminaires to be mounted at a height of 7 meters on each pole.</p> <p><b>Specifications required for Type 1 and Type 2 are listed in Annex 6.</b></p> <p>The total number of type 1 and type 2 luminaires will be at least 400 lamps.</p> <p>Contractor to remove existing Sodium lamp and install new LED lamp using the same existing source of electricity.</p>
<b>Kaa El Rim Municipality</b>	Replacement of existing Sodium streetlights	Installation of two types of LED lamps to replace the existing Sodium lighting fixtures.	<p><b>Type 1:</b> Luminaires to be mounted at a height of up to 10 meters on each pole.</p> <p><b>Type 2:</b> Luminaires to be mounted at a height of 7 meters on each pole.</p>

			<p><b>Specifications required for Type 1 and Type 2 are listed in Annex 6.</b></p> <p>The total number of type 1 and type 2 luminaires will be at least 100 lamps.</p> <p>Contractor to remove existing Sodium lamp and install new LED lamp using the same existing source of electricity.</p>
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2. The REEE measures to be implemented at the MSME sites in Aley region are as follows (refer to Annex 7 for site photos):

Table 2: REEE Measures – MSME Sites – Aley Region

Site	Type of Solution	Description	Notes:
<b>Al Ameer Dairy - Aghmid</b>  <i>Coordinates: 33.763925, 35.698984</i>	Upgrade of Existing PV System	<p>Existing system:</p> <ul style="list-style-type: none"> <li>• 9 x 520 Wp PV Panels</li> <li>• 5 kW inverter</li> <li>• 4 x 230 Ah, 12V tubular batteries</li> </ul> <p>New components to be added:</p> <ul style="list-style-type: none"> <li>• 7 x PV Panels, compatible with the existing</li> <li>• <math>\geq 8</math> kW single-phase hybrid inverter</li> <li>• 15 kWh lithium battery bank</li> </ul>	<p><b>Building Height:</b> ~ 3m</p> <p><b>PV Panels Location:</b> Rooftop</p> <p><b>Inverter Location:</b> Inside the building at ground floor level, wall-mounted on an internal wall (same location as the existing inverter)</p> <p><b>PV Panels to Inverter distance:</b> ~ 20m</p> <p><b>Inverter to Connection Point distance:</b> ~ 10m</p> <p>The contractor shall connect the new PV panels to the same array as the existing panels.</p> <p>The new PV panels shall be installed adjacent to the existing structure.</p> <p>The contractor shall safely disconnect the existing inverter and tubular batteries, and replace them with the new inverter and lithium battery bank.</p> <p>The contractor shall upgrade the existing panel board and protection devices to be aligned with Annex 6.</p>

			The contractor shall install a new earthing system for the PV system.
<b>Al Hana Group – Bedghan</b>  <i>Coordinates: 33.775067, 35.679650</i>	Installation of Hybrid PV System with Storage	PV system size: 7.2 kWp  Hybrid inverter power rating: $\geq 8$ kW, single-phase  Battery bank capacity: 10 kWh	<b>Building Height:</b> ~ 3.5m (adjacent building) <b>PV Panels Location:</b> Rooftop (adjacent building) <b>Connection Point Location:</b> Ground Floor <b>PV Panels to Inverter Location distance:</b> ~ 40m <b>Inverter to Connection Point distance:</b> ~ 20m  PV panels shall be installed on an elevated steel structure at roof level.  Hybrid inverter and battery bank to be installed inside the adjacent building garage at ground level.  The contractor shall upgrade the existing panel board and protection devices to be aligned with Annex 6.  The contractor shall install a new earthing system for the PV system.
<b>Home Made Dairy and Mouneh – Bedghan</b>	Upgrade of Existing PV System	Existing system: <ul style="list-style-type: none"> <li>6 x 580 Wp PV Panels</li> <li>5.5 kW inverter</li> </ul>	<b>Building Height:</b> ~ 4m <b>PV Panels Location:</b> Rooftop <b>Inverter Location:</b> Wall-mounted on the entrance wall of the building

<p><i>Coordinates: 33.768359, 35.670671</i></p>		<ul style="list-style-type: none"> <li>4 x 200 Ah, 12V tubular batteries</li> </ul> <p>New components to be added:</p> <ul style="list-style-type: none"> <li>2.4 kWp total PV array power</li> <li>≥8 kW single-phase hybrid inverter</li> <li>5 kWh lithium battery bank</li> </ul>	<p>(same location as the existing inverter)</p> <p><b>PV Panels to Inverter distance:</b> ~ 15m</p> <p><b>Inverter to Connection Point distance:</b> Same location</p> <p>The contractor shall connect the new PV panels to the same array as the existing panels.</p> <p>The new PV panels shall be ground-mounted adjacent to the existing structure.</p> <p>The contractor shall safely disconnect the existing inverter and tubular batteries, and replace them with the new inverter and lithium battery bank.</p> <p>The contractor shall upgrade the existing panel board and protection devices to be aligned with Annex 6.</p> <p>The contractor shall install a new earthing system for the PV system.</p>
<p><b>Juthoor Al Ard - Charoun</b></p> <p><i>Coordinates: 33.797200, 35.705491</i></p>	<p>Installation of Hybrid PV System with Storage</p>	<p>PV system size: 8.4 kWp</p> <p>Hybrid inverter power rating:</p>	<p><b>Building Height:</b> ~ 14.4m</p> <p><b>PV Panels Location:</b> Rooftop</p> <p><b>Connection Point Location:</b> Ground Floor, under the stairs</p>

		<p>≥8 kW, single-phase</p> <p>Battery bank capacity: 10 kWh</p>	<p><b>PV Panels to Inverter Location distance:</b> ~ 40m</p> <p>PV panels shall be installed on an elevated steel structure at roof level, taking into consideration the staircase elevation and existing solar panels to avoid shading.</p> <p>Hybrid inverter and battery bank to be installed next to the Connection Point.</p> <p>Contractor shall install a new earthing system for the PV system.</p>
<p><b>Les Jardins Des Soussens - Bmohray</b></p> <p><i>Coordinates: 33.756821, 35.716543</i></p>	<p>Installation of Hybrid PV System with Storage</p>	<p>PV system size: 3 kWp</p> <p>Hybrid inverter power rating: ≥5 kW, single-phase</p> <p>Battery bank capacity: 5 kWh</p>	<p><b>Building Height:</b> ~ 3m</p> <p><b>PV Panels Location:</b> Rooftop of Pump House</p> <p><b>Connection Point Location:</b> Inside the Pump House (Ground Floor)</p> <p>PV panels shall be installed on an elevated steel structure at roof level.</p> <p>Hybrid inverter and battery bank to be installed next to the Connection Point.</p> <p>Contractor shall install a new earthing system for the PV system.</p>



<b>Thymescape - Bmohray</b>  <i>Coordinates: 33.758989, 35.718946</i>	<b>Installation of Hybrid PV System with Storage</b>	<b>PV system size:</b> 8.4 kWp  <b>Hybrid inverter power rating:</b> ≥8 kW, single-phase  <b>Battery bank capacity:</b> 15 kWh	<b>Building Height:</b> ~ 3m <b>PV Panels Location:</b> Ground Area <b>Connection Point Location:</b> Existing inverter room <b>PV Panels to Inverter Location distance:</b> ~ 40m  PV panels shall be installed on an elevated steel structure at ground level.  Hybrid inverter and battery bank to be installed next to the Connection Point.  Contractor shall install a new earthing system for the PV system.
<b>Al Mawasem Nursery - Abey</b>  <i>Coordinates: 33.738129, 35.529408</i>	<b>Installation of Hybrid PV System with Storage</b>	<b>PV system size:</b> 4.8 kWp  <b>Hybrid inverter power rating:</b> ≥8 kW, single-phase  <b>Battery bank capacity:</b> 10 kWh  <b>Size of Variable Frequency Drive (VFD) to be installed for the milling</b>	<b>PV Panels Location:</b> Ground Area between two greenhouses <b>Connection Point Location:</b> Inside one of the greenhouses <b>Inverter Room Location:</b> Agricultural Room, provided that the location is secured against water leakage.  <b>PV Panels to Inverter Location distance:</b> ~ 50m <b>Inverter to Connection Point distance:</b> ~ 50m

		machine: 8 kW, single-phase	<p>PV panels shall be installed on an elevated steel structure on ground level.</p> <p>Contractor shall install a new earthing system for the PV system.</p> <p>Contractor shall install a new VFD for the milling machine.</p>
<p><b>Dahab B Trabo – Baysour</b></p> <p><i>Coordinates:</i> 33.7569690, 35.5669435</p>	Installation of Hybrid PV System with Storage	<p>PV system size: 3 kWp</p> <p>Hybrid inverter power rating: <math>\geq 5</math> kW, single-phase</p> <p>Battery bank capacity: 5 kWh</p> <p>Size of new irrigation pump: 3 HP</p>	<p><b>Building Height:</b> ~ 5m</p> <p><b>PV Panels Location:</b> Rooftop of Building</p> <p><b>Inverter Room Location:</b> Inside the Building</p> <p><b>Connection Point Location:</b> Outer wall of the building</p> <p><b>Inverter to Connection Point distance:</b> ~ 5m</p> <p>PV panels shall be installed on an elevated steel structure at roof level.</p> <p>The hybrid inverter and battery bank shall be installed next to the Connection Point, provided that the location is secured against water leakage.</p> <p>Contractor shall install a new earthing system for the PV system.</p>

			Contractor shall install a new irrigation pump powered by the PV system.
<b>Del Libano - Baysour</b>  <i>Coordinates: 33.755819, 35.556570</i>	Installation of Hybrid PV System with Storage	PV system size: 25 kWp  Hybrid inverter power rating: $\geq 40$ kW, three-phase  Battery bank capacity: 30 kWh	<p><b>Building Height:</b> ~ 7m  <b>PV Panels Location:</b> Rooftop of Building  <b>Inverter Room Location:</b> Electrical Room  <b>PV Panels to Inverter Room distance:</b> ~ 50m  <b>Inverter to Connection Point distance:</b> Same location</p> <p>PV panels shall be installed on an elevated steel structure at roof level.</p> <p>Hybrid inverter and battery bank to be installed next to the Connection Point, feeding the dedicated load of the pasta press machine.</p> <p>Contractor shall connect the output of the existing power sources to the AC input of the new hybrid inverter.</p> <p>The Contractor shall ensure that the connected loads do not cause overload or damage to the new system by installing the required protection devices in accordance with Annex 6.</p>

			Contractor shall install a new earthing system for the PV system.
<b>Fromage Blanc - Aley</b>  <i>Coordinates: 33.8069328, 35.5957122</i>	Installation of Hybrid PV System with Storage	PV system size: 6 kWp  Hybrid inverter power rating: $\geq 8$ kW, single-phase  Size of Variable Frequency Drive (VFD) to be installed for the cold room compressor: $\geq 5$ kW, single-phase  Battery bank capacity: 15 kWh	<b>PV Panels Location:</b> Apartment Terrace (5-meters high from ground level) <b>Connection Point Location:</b> Inside adjacent apartment <b>Inverter to Connection Point distance:</b> Same location <b>PV Panels to Inverter Room distance:</b> ~ 50m  PV panels shall be installed on an elevated steel structure at terrace level.  Hybrid inverter and battery bank to be installed next to the Connection Point.  Contractor shall install a new VFD for the cold room compressor procured by the owner.  Contractor shall install a new earthing system for the PV system.
<b>Kheir El Ard - Aitat</b>  <i>Coordinates: 33.7840636, 35.5535264</i>	Upgrade of Existing PV System	Existing system: <ul style="list-style-type: none"> <li>• 10 x 545 Wp PV Panels</li> <li>• 11 kW inverter</li> </ul>	<b>Building Height:</b> ~ 8m <b>PV Panels Location:</b> Rooftop <b>Inverter Location:</b> Wall-mounted on the entrance wall of the store

		<ul style="list-style-type: none"> <li>• 4 x 260 Ah, 12V tubular batteries</li> </ul> <p>New components to be added:</p> <ul style="list-style-type: none"> <li>• 5.45 kWp total PV array power</li> <li>• ≥12 kW single-phase hybrid inverter</li> <li>• 15 kWh lithium battery bank</li> </ul>	<p>(same location as the existing inverter)</p> <p><b>Inverter to Connection Point distance:</b> Same location</p> <p>The contractor shall connect the new PV panels to the same array as the existing panels.</p> <p>The new PV panels shall be ground-mounted adjacent to the existing structure.</p> <p>The contractor shall safely disconnect the existing inverter and tubular batteries, and replace them with the new inverter and lithium battery bank.</p> <p>The Contractor shall ensure that the connected loads do not cause overload or damage to the new system by installing the required protection devices in accordance with Annex 6.</p> <p>The contractor shall upgrade the existing panel board and protection devices to be aligned with Annex 6.</p> <p>The contractor shall install a new earthing system for the PV system.</p>
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<p><b>Tomagiallo – Dweir El Remen</b></p> <p><i>Coordinates:</i> 33.7563103, 35.5833985</p>	<p>Upgrade of Existing PV System</p>	<p>Existing system:</p> <ul style="list-style-type: none"> <li>• 6 x 600 Wp PV Panels</li> <li>• 5 kW inverter</li> <li>• 4 x 240 Ah, 12V tubular batteries</li> </ul> <p>New components to be added:</p> <ul style="list-style-type: none"> <li>• 7 PV Panels, compatible with the existing</li> <li>• ≥8 kW single-phase hybrid inverter</li> <li>• 15 kWh lithium battery bank</li> </ul>	<p><b>Building Height:</b> ~ 10m</p> <p><b>PV Panels Location:</b> Rooftop</p> <p><b>Inverter Location:</b> Ground level, under the stairs (same location as the existing inverter)</p> <p><b>PV Panels to Inverter distance:</b> ~ 30m</p> <p><b>Inverter to Connection Point distance:</b> Same location</p> <p>The contractor shall connect the new PV panels to the same array as the existing panels.</p> <p>The new PV panels shall be installed on an elevated steel structure adjacent to the existing structure.</p> <p>The contractor shall safely disconnect the existing inverter and tubular batteries, and replace them with the new inverter and lithium battery bank.</p> <p>The contractor shall upgrade the existing panel board and protection devices to be aligned with Annex 6.</p> <p>The contractor shall install a new earthing system for the PV system.</p>
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3. The REEE measures to be implemented at the MSME sites in Chouf region are as follows (refer to Annex 7 for site photos):

Table 3: REEE Measures – MSME Sites – Chouf Region

Site	Type of Solution	Description	Notes:
<b>– البان واجبان بتلون Batloun</b>  <i>Coordinates: 33.695528 35.648639</i>	Upgrade of Existing PV System	<p>Existing system:</p> <ul style="list-style-type: none"> <li>• 26 x 545 Wp PV Panels</li> <li>• 2 x 5 kW Sofar inverters</li> <li>• 8 x 5 kWh Amass lithium batteries</li> </ul> <p>New components to be added:</p> <ul style="list-style-type: none"> <li>• 7.2 kWp total PV array power</li> <li>• 2 x 5 kW hybrid inverters, compatible with the existing</li> </ul>	<p><b>Building Height:</b> ~ 4m</p> <p><b>PV Panels Location:</b> Rooftop</p> <p><b>Inverter Location:</b> Inside the kitchen at ground floor level (same location as the existing inverters)</p> <p><b>PV Panels to Inverter distance:</b> ~ 15m</p> <p><b>Inverter to Connection Point distance:</b> ~ 15m</p> <p>The Contractor shall dismantle the existing PV structure and install the new and existing PV panels on a new elevated structure at rooftop level, optimizing the orientation to ensure optimal charging of the existing lithium batteries.</p> <p>Contractor shall upgrade the existing panel board and protection devices in accordance with Annex 6.</p>
<b>Dairy Production from Goats – Chouf</b>  <i>Coordinates: 33.687743, 35.646053</i>	Installation of Hybrid PV System with Storage	<p>PV system size: 5 kWp</p> <p>Hybrid inverter power rating: ≥5 kW, single-phase</p>	<p><b>Building Height:</b> ~ 3m</p> <p><b>PV Panels Location:</b> Rooftop</p> <p><b>Connection Point Location:</b> Below the stairs (Ground Floor)</p> <p><b>Inverter Room Location:</b> Inside the Building (Ground Floor)</p>

		<p>Battery bank capacity: 10 kWh</p>	<p><b>PV Panels to Inverter distance:</b> ~ 20m</p> <p><b>Inverter to Connection Point distance:</b> ~ 15m</p> <p>PV Panels shall be installed on an elevated steel structure at roof level.</p> <p>Contractor shall install a new prefabricated room for the on-grid inverter, as per Annex 6.</p> <p>Contractor shall install a new earthing system for the PV system.</p>
<p><b>Ghanem Mills – Warhanieh</b></p> <p><i>Coordinates:</i> 33.7099573, 35.6638949</p>	<p>Installation of On-grid PV System</p>	<p>PV system size: 15 kWp</p> <p>On-grid inverter(s) power rating: ≥15 kW, three-phase</p> <p>Fuel saving controller</p>	<p><b>Building Height:</b> ~ 4m</p> <p><b>PV Panels Location:</b> Rooftop</p> <p><b>Inverter Location:</b> Outdoor prefabricated room, to be installed by Contractor</p> <p><b>PV Panels to Inverter distance:</b> ~ 20m</p> <p><b>Inverter to Connection Point distance:</b> ~ 20m</p> <p>PV Panels shall be installed on an elevated steel structure at roof level.</p> <p>The contractor shall install a fuel saving controller to manage PV injection into the Connection Point, which consists of an MTS controlling the transfer between the</p>



			<p>20 kVA three-phase diesel generator, 60 kVA three-phase diesel generator, and the EDL supply, with a 63A, three-phase circuit breaker.</p> <p>The AC terminal(s) of the on-grid inverter(s) shall be connected to the Connection Point as specified in Annex 6.</p> <p>The contractor shall route communication cables between the on-grid inverter(s), the fuel-saving controller, and the diesel generator in accordance with Annex 6.</p> <p>The contractor shall install a new earthing system for the PV system.</p>
<p><b>Al Ezz - Brih</b></p> <p><i>Coordinates: 33.717755, 35.654838</i></p>	<p>Installation of Hybrid PV System with Storage</p>	<p>PV system size: 12 kWp</p> <p>Hybrid inverter power rating: <math>\geq 12</math> kW, three-phase</p> <p>Battery bank capacity: 15 kWh</p>	<p><b>Building Height:</b> ~ 4m</p> <p><b>PV Panels Location:</b> Rooftop</p> <p><b>Connection Point Location:</b> Ground Floor</p> <p><b>PV Panels to Inverter Location distance:</b> ~ 30m</p> <p><b>Inverter to Connection Point distance:</b> ~ 10m</p> <p>PV panels shall be installed on an elevated steel structure at roof level.</p>

			<p>The hybrid inverter and battery bank shall be installed inside an independent room adjacent to the Connection Point, while ensuring that the connected loads do not cause damage to the system.</p> <p>Contractor shall install a new earthing system for the PV system.</p>
<p><b>Verdant Fields – Ain w Zain</b></p> <p><i>Coordinates: 33.673905, 35.633902</i></p>	<p>Installation of Hybrid PV System with Storage</p>	<p>PV system size: 6 kWp</p> <p>Hybrid inverter power rating: <math>\geq 6</math> kW, single-phase</p> <p>Battery bank capacity: 10 kWh</p>	<p><b>PV Panels Location:</b> Ground Level  <b>Inverter Location:</b> Outdoor prefabricated room, to be installed by Contractor  <b>Connection Point Location:</b> A new connection point shall be established next to the inverter (there is no electric network in place)</p> <p>PV panels shall be installed on an elevated steel structure at roof level.</p> <p>Contractor shall install a new prefabricated room for the hybrid inverter and battery bank, as per Annex 6.</p> <p>Contractor shall install a new earthing system for the PV system.</p>

			Given the remote location of the site, the Owner shall provide support for transportation to the site.
<b>Maroun's Garden - Wadi El Dier</b>  <i>Coordinates: 33.684672, 35.524316</i>	Installation of Hybrid PV System with Storage	PV system size: 4.8 kWp  Hybrid inverter power rating: $\geq 5$ kW, single-phase  Battery bank capacity: 15 kWh	<b>Building Height:</b> ~ 8m <b>PV Panels Location:</b> Building Rooftop <b>Inverter Room Location:</b> Inside the staircase, where an existing inverter is also located <b>PV Panels to Inverter Location distance:</b> ~ 20m <b>Inverter to Connection Point distance:</b> Same Location  The new PV panels shall be installed adjacent to an existing elevated steel structure installed on rooftop.  Hybrid inverter and battery bank to be installed inside the staircase next to existing components.  The contractor shall connect the new inverter to a dedicated electrical panel board feeding the equipment of the facility, ensuring that the electrical panel board and protection devices are aligned with Annex 6.  Contractor shall install a new earthing system for the PV system.

<p><b>Al Yasmine Dairy – Kfarfakoud</b></p> <p><i>Coordinates: 33.701516, 35.535371</i></p>	<p>Upgrade of Existing PV System</p>	<p>Existing system:</p> <ul style="list-style-type: none"> <li>• 14 x 545 Wp PV Panels</li> <li>• 1 x 8 kW Voltronic inverter</li> <li>• 2 x 12.5 kWh felicity lithium batteries</li> </ul> <p>New components to be added:</p> <ul style="list-style-type: none"> <li>• 3.6 kWp total PV array power</li> <li>• 1 x 8 kW inverter, compatible with the existing</li> </ul>	<p><b>Building Height:</b> ~ 8m</p> <p><b>PV Panels Location:</b> Building Rooftop</p> <p><b>Inverter Room Location:</b> Under the stairs, where the existing inverter is located</p> <p><b>PV Panels to Inverter Location distance:</b> ~ 20m</p> <p><b>Inverter to Connection Point distance:</b> Same Location</p> <p>The new PV panels shall be installed adjacent to the existing structure.</p> <p>The new inverter shall be connected in parallel to the existing inverter.</p> <p>The contractor shall upgrade the existing panel board and protection devices in accordance with Annex 6.</p> <p>Contractor shall install a new earthing system for the PV system.</p>
<p><b>Safa Chicken – Jdeidet El Chouf</b></p> <p><i>Coordinates: 33.660044, 35.605200</i></p>	<p>Installation of On-grid PV System</p>	<p>PV system size: 40 kWp</p> <p>On-grid inverter(s) power rating: ≥40 kW, three-phase</p>	<p><b>PV Panels Location:</b> TOT Rooftop</p> <p><b>Inverter Location:</b> New prefabricated room, to be installed next to the Generators</p> <p><b>PV Panels to Inverter distance:</b> ~ 50m</p>

		Fuel saving controller	<p>The PV panels shall be installed on the existing TOT rooftop of the building.</p> <p>The AC terminal of the on-grid inverter(s) shall be connected to the Connection Point.</p> <p>The contractor shall install a fuel saving controller to manage PV injection into the Connection Point.</p> <p>The contractor shall install a new earthing system for the PV system.</p>
<p><b>Mushroom Micro-enterprise - Jehliyah</b> <i>Coordinates: 33.669193, 35.523184</i></p>	Upgrade of Existing PV System	<p>Existing system:</p> <ul style="list-style-type: none"> <li>• 12 x 300 Wp PV Panels</li> <li>• 1 x 6.2 kW Anern inverters</li> <li>• 4 x 240 Ah, 12V tubular batteries</li> </ul> <p>New components to be added:</p> <ul style="list-style-type: none"> <li>• 4.8 kWp total PV array power</li> <li>• 15 kWh lithium battery bank</li> </ul>	<p><b>PV Panels Location:</b> TOT rooftop (~ 3.2m in height)</p> <p><b>Inverter Location:</b> Inside the Electrical Room</p> <p><b>PV Panels to Inverter distance:</b> ~ 20m</p> <p><b>Inverter to Connection Point distance:</b> Same location</p> <p>Contractor shall safely disconnect the existing PV panels and hand them over to the owner's custody.</p> <p>Contractor shall dismantle the existing structure and install the new PV panels on a new PV structure, ensuring proper</p>

			<p>orientation and adequate reinforcement.</p> <p>Contractor shall safely disconnect the existing tubular batteries and replace them with a new lithium battery bank.</p> <p>Contractor shall install the existing inverter and the new lithium battery bank inside the electrical room, ensuring proper operation and compatibility between the inverter and the battery bank.</p> <p>Contractor shall upgrade the existing panel board, cables, and protection devices in accordance with Annex 6.</p> <p>Contractor shall install a new earthing system for the PV system.</p>
<p><b>United Company for Corporation and Development – Semqanieh</b></p> <p><i>Coordinates: 33.674470, 35.576296</i></p>	<p>Installation of On-grid PV System</p>	<p>PV system size: 40 kWp</p> <p>On-grid inverter power rating: ≥40 kW, three-phase</p> <p>Fuel saving controller</p>	<p><b>PV Panels Location:</b> TOT Rooftop</p> <p><b>Inverter Location:</b> New prefabricated room, to be installed next to the Generators</p> <p><b>PV Panels to Inverter distance:</b> ~ 50m</p> <p><b>PV Panels to Connection Point distance:</b> ~ 50m</p>

			<p>The PV panels shall be installed on the existing TOT rooftop of the building.</p> <p>The AC terminal of the on-grid inverter(s) shall be connected to the Connection Point.</p> <p>The contractor shall install a fuel saving controller to manage PV injection into the Connection Point.</p> <p>The contractor shall install a new earthing system for the PV system.</p>
<p><b>La Belle Blanche – Semqanieh</b></p> <p><i>Coordinates: 33.622363, 35.589468</i></p>	<p>Upgrade of Existing PV System</p>	<p>Existing system:</p> <ul style="list-style-type: none"> <li>• 14 x 610 Wp PV Panels</li> <li>• 5.5 kW inverter</li> <li>• 15 kWh lithium battery bank</li> </ul> <p>New components to be added:</p> <ul style="list-style-type: none"> <li>• 14 PV Panels, compatible with the existing</li> <li>• ≥20 kW single-phase hybrid inverter</li> <li>• 15 kWh lithium battery bank,</li> </ul>	<p><b>Building Height:</b> ~ 5m</p> <p><b>PV Panels Location:</b> Hangar rooftop</p> <p><b>Inverter Location:</b> Room inside the hangar, Ground level (same location as the existing inverter)</p> <p><b>PV Panels to Inverter distance:</b> ~ 20m</p> <p><b>Inverter to Connection Point distance:</b> Same location</p> <p>The contractor shall connect the new PV panels to the same array as the existing panels.</p> <p>The new PV panels shall be installed on the hangar rooftop adjacent to the existing PV panels, noting that</p>

		compatible with the existing	<p>around 10 can be installed on the existing PV structure.</p> <p>The new lithium battery bank shall be installed in parallel with the existing.</p> <p>The contractor shall safely disconnect the existing inverter and replace it with the new hybrid inverter, ensuring proper operation and compatibility between the inverter and the battery bank.</p> <p>The contractor shall upgrade the existing panel board and protection devices to be aligned with Annex 6.</p> <p>The contractor shall install a new earthing system for the PV system.</p>
<p><b>Lifeline Hydroponics – Boutme</b></p> <p><i>Coordinates: 33.6643542, 35.6220458</i></p>	<p>Installation of Hybrid PV System with Storage</p>	<p>PV system size: 20.4 kWp</p> <p>Hybrid inverter(s) power rating: 30 kW, three-phase</p> <p>Battery bank capacity: 15 kWh</p>	<p><b>PV Panels Location:</b> Unbuilt land, facing the facility</p> <p><b>Connection Point Location:</b> Basement of building facing the facility</p> <p><b>Inverter Location:</b> Electrical room</p> <p><b>PV Panels to Inverter distance:</b> ~ 50m</p> <p>PV panels shall be installed on an elevated steel structure on unbuilt land, taking into consideration any</p>



			<p>potential shading from nearby buildings or trees.</p> <p>Contractor shall install the new inverter and battery bank next to the Connection Point.</p> <p>Contractor shall install a new earthing system for the PV system.</p> <p>Given the remote location of the site, the Owner shall provide support for transportation to the site.</p>
<p><b>Parmaison – Deir El Qamar</b></p> <p><i>Coordinates: 33.699423, 35.565159</i></p>	<p>Installation of Hybrid PV System with Storage</p>	<p>PV system size: 3 kWp</p> <p>Hybrid inverter power rating: <math>\geq 5</math> kW, single-phase</p> <p>Battery bank capacity: 5 kWh</p>	<p><b>PV Panels Location:</b> Pergola (3-meters high from ground level)</p> <p><b>Connection Point Location:</b> Inside the apartment (basement level)</p> <p><b>Inverter Location:</b> Inside the apartment (basement level)</p> <p><b>Inverter to Connection Point distance:</b> ~ 30m</p> <p><b>PV Panels to Inverter Room distance:</b> ~ 30m</p> <p>PV panels shall be installed on the existing pergola structure at ground level, subject to adequate reinforcement by the Contractor.</p> <p>Contractor shall install a new earthing system for the PV system.</p>

<b>Turath w Mouneh – Bater</b>  <i>Coordinates: 33.603698, 35.620086</i>	Installation of Hybrid PV System with Storage	PV system size: 3 kWp  Hybrid inverter power rating: $\geq 5$ kW, single-phase  Battery bank capacity: 5 kWh	<b>Building Height:</b> ~ 12m <b>PV Panels Location:</b> Building Rooftop <b>Connection Point Location:</b> Under the stairs (ground level) <b>Inverter Location:</b> Same location <b>PV Panels to Inverter Room distance:</b> ~ 30m  PV panels shall be installed on an elevated steel structure at rooftop level.  Contractor shall install a new earthing system for the PV system.
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4. The REEE measures to be implemented at the MSME sites in Zahle region are as follows (refer to Annex 7 for site photos):

Table 4: REEE Measures – MSME Sites – Zahle Region

Site	Type of Solution	Description	Notes:
<b>Sleiman Samaha Nursery – Niha</b>  <i>Coordinates:</i> 33.8129325, 35.8604620	Upgrade of PV System Storage	<p>Existing system:</p> <ul style="list-style-type: none"> <li>• ~ 43.2 kWp total PV array power</li> <li>• 50 kW Deye inverter</li> <li>• 30 x 240 Ah, 12V tubular batteries</li> </ul> <p>New components to be added:</p> <ul style="list-style-type: none"> <li>• 100 kWh lithium battery bank</li> </ul>	<p><b>Connection Point Location:</b> Electrical Room</p> <p><b>Inverter Location:</b> Same location</p> <p>Contractor shall safely disconnect the existing gel batteries and replace them with a new lithium battery bank.</p> <p>Contractor shall upgrade the existing panel board and protection devices in accordance with Annex 6.</p>
<b>Plant It – Terbol</b>  <i>Coordinates:</i> 33.8044308, 35.9624070	Installation of Solar Pumping System	<p>PV system size: 18 kWp</p> <p>Total power rating of variable frequency drive: <math>\geq 15</math> kW</p> <p>New irrigation pump size: 15 HP</p>	<p>PV panels to be installed on empty terrain owned by the MSME.</p> <p>Solar pumping inverter to be installed under the PV structure in a protective enclosure, as per Annex 6.</p> <p>PV system to be enclosed within a fenced area with limited access, as per Annex 6.</p> <p>The contractor shall install a new earthing system for the PV system.</p>

<p><b>Alfa Co Trade – Terbol</b></p> <p><i>Coordinates:</i> 33.828051, 33.9778505</p>	<p>Installation of On-grid PV System</p>	<p>PV system size: 30 kWp</p> <p>On-grid inverter(s) power rating: <math>\geq 30</math> kW, three-phase</p> <p>Fuel saving controller</p>	<p>The PV panels shall be installed on the TOT rooftop of the facility.</p> <p>The new on-grid photovoltaic system shall be exclusively connected to the generators' electrical network and shall supply only the dedicated machinery at the facility. The existing on-grid PV system connected to the EDZ network shall remain unchanged and is explicitly excluded from the scope of this project.</p> <p>The AC terminal of the on-grid inverter(s) shall be connected to the Connection Point, which consists of electrical panel board(s) dedicated to machinery currently supplied by 100 kVA or 250 kVA diesel generators.</p> <p>The contractor shall install a fuel saving controller to manage PV injection into the Connection Point.</p> <p>The contractor shall install a new earthing system for the PV system.</p>
<p><b>Everest – Niha</b></p> <p><i>Coordinates:</i> 33.890620, 35.983790</p>	<p>Upgrade of Existing PV System</p>	<p>Existing system:</p> <ul style="list-style-type: none"> <li>• ~ 21.85 kWp total PV array power</li> <li>• 2x12 kW, three-phase Deye inverters (not installed)</li> </ul>	<p><b>Building Height:</b> 7.5 meters</p> <p><b>Connection Point Location:</b> Electrical Room, Ground Level</p> <p><b>Inverter Location:</b> Same Location</p> <p><b>PV Panels to Inverter distance:</b> ~ 30m</p>

		<ul style="list-style-type: none"> <li>• 5 kWh Deye lithium battery bank (not installed)</li> </ul> <p>New components to be added:</p> <ul style="list-style-type: none"> <li>• 13 kWp total PV array power</li> <li>• 12 kW, three-phase hybrid inverter, compatible with the existing</li> <li>• 3 x 5 kWh lithium batteries, compatible with the existing</li> <li>• Variable Frequency Drives (VFDs) for the existing cold room compressors, sized as follows: <ul style="list-style-type: none"> <li>- ≥ 15 kW (2 nos.)</li> <li>- ≥ 20 kW (1 nos.)</li> <li>- ≥ 12 kW (1 nos.)</li> </ul> </li> </ul>	<p>Contractor shall install the new PV panels on an elevated steel structure at roof level and connect them to the new inverter.</p> <p>Contractor shall install the new inverter and battery bank in parallel with the existing inverters and battery banks.</p> <p>Contractor shall install a new VFD for each cold room compressor (total of four).</p> <p>Contractor shall upgrade the electrical panel boards and protective devices in accordance with Annex 6.</p> <p>Contractor shall also install a new earthing system for the PV system.</p>
<p><b>Jam and Leaf – Riyaq</b></p> <p><i>Coordinates:</i> 33.8536502, 36.0235386</p>	<p>Upgrade of Existing PV System</p>	<p>Existing system:</p> <ul style="list-style-type: none"> <li>• 12 x 545 Wp PV Panels</li> <li>• 5.5 kW inverter</li> <li>• 8 x 250 Ah, 12V tubular batteries</li> </ul> <p>New components to be added:</p>	<p><b>Building Height:</b> ~ 10m  <b>PV Panels Location:</b> Rooftop  <b>Inverter Location:</b> Building Entrance  <b>PV Panels to Inverter distance:</b> ~ 20m  <b>Inverter to Connection Point distance:</b> Same location</p> <p>The new PV panels shall be ground-mounted on the building rooftop next to the existing PV panels.</p>

		<ul style="list-style-type: none"> <li>• 4 PV Panels, compatible with the existing</li> <li>• <math>\geq 8</math> kW, single-phase hybrid inverter</li> <li>• 15 kWh lithium battery bank</li> </ul>	<p>The Contractor shall connect each group of eight (8) PV modules to a dedicated inverter MPPT input and shall reinforce the existing PV mounting structure as required.</p> <p>The contractor shall safely disconnect the existing inverter and tubular batteries and replace them with the new hybrid inverter and the lithium battery bank.</p> <p>The contractor shall upgrade the existing panel board and protection devices to be aligned with Annex 6.</p> <p>The contractor shall install a new earthing system for the PV system.</p>
<p><b>Joury Dairy – Qob Elias</b></p> <p><i>Coordinates:</i> 33.7745610, 35.8785675</p>	<p>Installation of On-grid PV System</p>	<p>PV system size: 15 kWp</p> <p>On-grid inverter power rating: <math>\geq 15</math> kW, three-phase</p>	<p><b>Building Height:</b> ~ 5m</p> <p><b>PV Panels Location:</b> Rooftop of Adjacent Building</p> <p><b>Inverter Location:</b> Under the stairs of adjacent building, in a protective enclosure, as per Annex 6.</p> <p><b>Connection Point Location:</b> Inside the dairy building</p> <p><b>PV Panels to Inverter distance:</b> ~ 30m</p> <p><b>Inverter to Connection Point distance:</b> ~ 90m</p>

			<p>PV Panels shall be installed on an elevated steel structure at roof level of the building adjacent to the dairy.</p> <p>The AC terminal(s) of the on-grid inverter(s) shall be connected to the Connection Point as specified in Annex 6.</p> <p>The contractor shall install a control device to manage PV injection into the Connection Point.</p> <p>The contractor shall install a new earthing system for the PV system.</p>
<p><b>Cedars Dairy Farm – Qob Elias</b></p> <p><i>Coordinates:</i> 33.7601592, 35.8490964</p>	<p>Upgrade of Existing PV System</p>	<p>Existing system:</p> <ul style="list-style-type: none"> <li>• ~ 150 kWp total PV array power</li> <li>• 10 x 12 kW, three-phase Deye inverters</li> <li>• 200 kWh Deye lithium battery bank</li> </ul> <p>New components to be added:</p> <ul style="list-style-type: none"> <li>• ~ 30 kWp total PV array power</li> <li>• 2 x 12 kW, three-phase hybrid inverters, compatible with the existing</li> </ul>	<p><b>PV Panels Location:</b> Hangar Rooftop <b>Inverter Location:</b> Existing inverter room <b>Connection Point Location:</b> Same location <b>PV Panels to Inverter Room distance:</b> ~ 50m</p> <p>New PV panels shall be installed on the hangar's rooftop next to the existing PV structure.</p> <p>The new inverters shall be installed in parallel with the existing inverters.</p> <p>AC connections shall run between the new inverters and the existing totalizer</p>

			in the existing inverter room, which is already connected to the Connection Point.
<b>Eggs with Benefits – Karak</b>  <i>Coordinates:</i> 33.849427, 35.937031	Installation of On-grid PV System	PV system size: 10 kWp  On-grid inverter power rating: ≥10 kW, three-phase	<p><b>Building Height:</b> ~ 5m</p> <p><b>PV Panels Location:</b> Rooftop of one of the two hangars belonging to the enterprise.</p> <p><b>Connection Point Location:</b> To be established by Contractor inside the hangar under the PV panels</p> <p><b>PV Panels to Inverter distance:</b> ~ 30m</p> <p><b>Inverter to Connection Point distance:</b> next to the Connection Point</p> <p>PV panels shall be installed at the hangar rooftop, subject to adequate reinforcement by the Contractor.</p> <p>An electrical panel board (Connection Point) supplying electricity to the facility equipment located at both hangars shall be installed at one of the hangars where the PV panels are installed. The distance between the two hangars is approximately 70 m.</p> <p>The AC terminal(s) of the on-grid inverter(s) shall be connected to the Connection Point as specified in Annex 6.</p>



			<p>Contractor shall install a control device to manage PV injection into the Connection Point.</p> <p>Contractor shall install an energy meter on the load consumption side.</p> <p>Contractor shall install a new earthing system for the PV system.</p>
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