Micro Grids

Harnessing & Managing Multiple Energy Resources
Big Grids

Serve the Entire Country or Region
Micro Grids

Serve tactical communities
Smart Micro Grids

Why should micro grids be “smart?”

Who threw that?
Smart Micro Grids

Should manage energy sources and loads 24/7

Sources
Smart Micro Grids

Should manage energy sources and loads 24/7
Smart Micro Grids

Should manage energy sources and loads 24/7

Sources

Energy Management

Loads

Energy Monitoring System

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**Smart Micro Grids**

*Should provide interactive monitoring & control*

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**Energy Monitor System**

<table>
<thead>
<tr>
<th>SYSTEM IDENTIFICATION</th>
<th>SYSTEM STATUS</th>
<th>SECURITY CAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location: 2002 N 3rd Unit B</td>
<td>Current Load: 32.6kWh</td>
<td>![Security Cam Image]</td>
</tr>
<tr>
<td>Unit Number: 0001</td>
<td>Solar Gain: 29.6kWh</td>
<td></td>
</tr>
<tr>
<td>Serial Number: CBP0000001</td>
<td>Temp: 54°F</td>
<td></td>
</tr>
<tr>
<td>Current date: 01/03/2009</td>
<td>24 hr Faults: 24 hr</td>
<td></td>
</tr>
<tr>
<td>Current time: 05:54:41</td>
<td>Peak Status: 56%</td>
<td></td>
</tr>
<tr>
<td>Network IP address: 192.168.0.101</td>
<td>St of Chg: 0%</td>
<td></td>
</tr>
</tbody>
</table>

**LOAD AND ENERGY CONTROL**

<table>
<thead>
<tr>
<th>#1</th>
<th>#2</th>
<th>#3</th>
<th>#4</th>
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</thead>
<tbody>
<tr>
<td>Hold ON/OFF Frame</td>
<td>Hold ON/OFF Frame</td>
<td>Hold ON/OFF Frame</td>
<td>Hold ON/OFF Frame</td>
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<tr>
<td><strong>ON</strong></td>
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</tr>
</tbody>
</table>

**UNIT BATTERY STATUS: St of Chg.**

- Battery 1: 12.5Vdc, 100%
- Battery 2: 12.4Vdc, 89%
- Battery 3: 12.2Vdc, 88%
- Battery 4: 12.3Vdc, 87%
- Battery 5: 12.5Vdc, 86%
- Battery 6: 12.1Vdc, 85%
- Battery 7: 12.2Vdc, 84%
- Battery 8: 12.1Vdc, 83%

---

*From HQ*

*From the field*
Smart Micro Grids

Should communicate status/problems
Smart Micro Grids

Should prioritize power distribution
Smart Micro Grids

Should employ advanced system security techniques
High priority load

Low priority load

Tactical area grid

Regional grid, if available

Diesel genset

Solar
High priority load

Low priority load

Monitor loads

Central monitor

Tactical area grid

Regional grid, if available

Diesel genset

Solar

NEST Smart MicroGrid
Patent Pending

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**NEST Smart MicroGrid**

*Patent Pending*

Tactical area grid

Central monitor

Monitor loads

Monitor sources

High priority load

Low priority load

Diesel genset

Solar

Current / voltage sensors

Regional grid, if available

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**NEST Smart MicroGrid**

*Patent Pending*

**MOM**

**Master Onsite Monitor**

- Intranet or internet access
- Command and Control Server
- Remote Monitoring Devices
- AGM battery

**EMMA-AC**

**EMMA-DG**

**EMMA-AG**

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NEST Smart MicroGrid

Patent Pending

EMMA

Energy MicroGrid Monitoring Apparatus
NEST Smart MicroGrid

Patent Pending

SOLIS™ Energy Management & Communications
NEST Smart MicroGrid
Patent Pending

MOM-Master Onsite Monitor
EMMA-Energy MicroGrid Monitoring Apparatus
SOLIS™-software and communications