Data Solution for Solar Energy Application
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About Morningstar...
- Located in **Newtown, PA USA**
- Over **four million sold** since 1993
- Sold in over 100 countries, for mission-critical applications
  - Residential and rural electrification
  - Commercial
  - Industrial including telecom, oil & gas, security
  - Mobile, marine, agricultural, much more…
- The “**charging experts,”** with the widest and most diversified product line
- And the **lowest hardware failure rate in the industry**
Overview of Morningstar Solar Applications

- Remote
- Not connected to an electric grid
- No utility company

- Rural Electrification
- Mobile
- Oil & Gas
- Telecommunications
- Remote Monitoring
- Traffic
- Lighting
- Railroad
Oil and Gas

Power for oilfield automation, measurement (RTU’s), methane injection points.
Telecommunications

- Cellular Base Stations, wireless backhaul links, LMR and VSAT infrastructure.
Small Houses and Rural Electrification

• Largest, most ambitious rural electrification project in solar history
• Project will bring access to electricity to nearly one million Peruvians
• Includes over 200,000 DC Energy Boxes 3,000 integrated power systems for community centers
Products and technologies
The “heart and brains of a solar electric system”

- Converts PV panel voltages to proper output for battery
- Prevents overcharging
- Provides load management, lighting control
- The right controller can **extend battery life**
- The wrong controller can **quickly kill batteries**

**Charge controller**

**DC load system example (no inverter)**

**DC loads:**
- Lighting
- Consumer electronics products (charging)
- Telecommunications system components
- Security system components
- Traffic control systems
- Networking systems
- Converts PV panel voltages to proper output for battery
- Prevents overcharging
- The right controller can **extend battery life**
- The wrong controller can **quickly kill batteries**

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**The “heart and brains of a solar electric system”**

- **AC load system example** (inverter present to convert DC to AC)

**AC Loads:**
- Lights
- Computers
- Fans
- Medical equipment
- Radio/TV
- Surveillance cameras
- Other industrial/commercial loads

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**Inverter**
The Leader in Solar Controllers

PWM Charge Controllers
- ProStar
- TriStar

MPPT Charge Controllers
- SunSaver MPPT
- ProStar MPPT
- TriStar MPPT
- TriStar MPPT 600V

Inverters
- SureSine inverter
- MultiWave inverter/charger

Accessories
- Ethernet MeterBus Converter EMC-1
Data Solution for Solar Applications…
Challenges to remotely monitor solar power sources

- Power for Wireless ISP Infrastructure is a common off-grid application requiring both network traffic and power to be monitored together.

- What monitoring can help us achieve:
  - Measurement of true load consumption in the field
  - Detection and root cause of network outages
  - Ensuring sufficient power at the site to in order to prevent deep battery discharge.
    - Measurement of current system status as well as historical data
    - Ensure system resiliency during low periods of production (winter)
  - Detect anomalies or negative trends during operation that could indicate pending battery failure
Bringing it all together with Zabbix monitoring solution

- Remotely monitoring a Morningstar EMC-1 adapter’s IP connection through the Zabbix monitoring platform provides several advantages:
  - Compatible with any packet based network transport
  - Lightweight in terms of bandwidth and overhead
  - Enables use of existing network monitoring infrastructure
Monitor Morningstar solar systems with Zabbix

- **Native** Morningstar SNMP support
- **Performance visibility** of solar-powered systems. Easily scaled for large deployments.
- **Dedicated templates** for supported Morningstar devices
- Accelerate troubleshooting with **time-series data correlation**
- **At a glance dashboard** status of all Morningstar devices on the network
- **Advanced and custom alerts** triggered by power system events

![Monitoring Dashboard for Morningstar devices](image1)

![View at a glance health status of Morningstar devices](image2)
### Advantages with Zabbix Monitoring Solution

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<th>Zabbix</th>
<th>Morningstar LiveView</th>
<th>Morningstar MSView</th>
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<tr>
<td><strong>User Interface</strong></td>
<td>PC-based software or Cloud-based Website</td>
<td>HTML webpage</td>
<td>PC-based software</td>
</tr>
<tr>
<td><strong># of connected devices</strong></td>
<td>Unlimited</td>
<td>one at a time</td>
<td>~ 12 at a time</td>
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<tr>
<td><strong>Data Protocol</strong></td>
<td>SNMP, Modbus</td>
<td>HTTP</td>
<td>Modbus IP or Serial</td>
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<tr>
<td><strong>Real-time data display</strong></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<td><strong>Remote Email Alerts</strong></td>
<td>✔</td>
<td>✗</td>
<td>✗</td>
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<td><strong>Custom alarm/fault notifications</strong></td>
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<td>Only TS-MPPT-60</td>
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<tr>
<td>Feature</td>
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<tr>
<td>Data storage capacity</td>
<td>Unlimited Cloud Storage OR limited</td>
<td>Limited by MS device internal memory capacity</td>
<td>Store Internal Log File downloads on PC</td>
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<tr>
<td></td>
<td>local server storage capacity</td>
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<td></td>
</tr>
<tr>
<td>Custom logged data interval</td>
<td>✓</td>
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<tr>
<td>Download logged data</td>
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<tr>
<td>Multiple site management</td>
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<tr>
<td>All-site monitoring at a glance</td>
<td>✓</td>
<td></td>
<td></td>
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<tr>
<td>Report generation</td>
<td>✓</td>
<td></td>
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</tr>
</tbody>
</table>
• Morningstar is the global leader to provide solar charge controllers

• Zabbix is a leading provider of monitoring software for networks

• As solar equipment is often used to provide power for remote network infrastructure, integrating data from the network components and power systems into a centralized NMS provides an essential management tool to optimize system health and increase network uptime

• Zabbix adds custom configuration options and valuable data analytics to ensure full system visibility