How Hierarchical Visualization Works for Microgrids

From the Edge to the Cloud

Distributed Generation, Centralized Management

With more and more solar power stations being built and operated, the equipment and protocols are becoming inevitably more complex. So how to integrate multiple power stations and manage them has become a key question for owners and operators. It takes a lot of human resources to ensure equipment is properly maintained by patrolling, checking and cleaning solar panels, so an automated hierarchical visualization and reporting solution could fulfill a lot of managerial demands.

It’s All in The Details

To ensure the smooth operation of the power stations, Advantech Solar Power Management System provides multiple protocol support to monitor equipment status, data accuracy and connections. Furthermore, data auto restores after network reconnection to ensure the data accuracy. Furthermore, the GIS integrated system empowers users to monitor all sites with video for security purposes.

Future: Unmanned Station

With the well managed system, the power stations can be expected to be unmanned or decrease human power fee to lowest. Also, the vision of dispatching the generated power as smart grids can be realized.
Introduction

Due to the technological progress of the solar power industry, more and more solar power plants are being built and put into operation around the world. New power plant owners and grid companies have concerns about how to ensure the security and long-term operation of the data required from the photovoltaic generators, how to get an overview of the maintenance operation, and how to meet the needs of grid companies. A unified monitoring and control system can integrate inverters and equipment from different manufacturers, categories and types, so that the monitoring and control system can be unified. The three fundamental requirements of an ideal monitoring and management system are as follows:

1. System adaptability: Each power plant is unique, and the vendors may only be capable of providing software or hardware. This may lead to the system configuration issues between the hardware and software. Trouble may also happen after integration has finished. What owners and operators need is to have vendors to provide a total yet reliable solution for the operation, including data acquisition, transmission and even a cloud solution. Also, different user-level access for system integrators, investors and owners, who need different access regarding power station operation.

2. Efficient technical service: With more and more power stations deployed under one project, the project owners want a reliable and professional service to ensure the smooth operation, as well as a quick response for constructing and running the power plant.

3. Technical support and service: Due to the scale or specialty of the project, some of the vendors may only be capable of providing software or hardware. This may bring trouble when system conflicts occur after integration has finished. What owners and operators need is to have vendors to provide a total yet reliable solution for the operation, including data acquisition, transmission and even a cloud solution. Also, different user-level access for system integrators, investors and owners, who need different access regarding power station operation.

Flexible and Modularized Solution: A fully integrated SPMS solution will not only meet the needs for future expansion, but also meet the needs for future expansion. The SPMS solution can also meet the needs for future expansion.

Technical Support and Service: Deep technical support and service is required to ensure the smooth operation, as well as a quick response for constructing and running the power plant. The SPMS solution can also meet the needs for future expansion.

Operations Management: The SPMS solution will not only meet the needs for future expansion, but also meet the needs for future expansion. The SPMS solution can also meet the needs for future expansion.

System Customization: Customization of monitoring software and system report

SPMS Historical Data

SPMS Software Features

- Data Collection & Transmission
- Data Archive & Analysis
- Data Visualization

SPMS Mobile App

- Web Access
- Mobile Operations
- System Management
- Configuration

Smart Alarm

- Customized settings of alarm threshold
- One-key alarm dismiss functionality
- Various sound / visual effects of alarm settings
- Alarms with SMS, email or APP

Mobile APP

- Supports Android and iOS
- Overview of groups / station level power generation- overview KPIs
- Finger-print login available (iPhone only)
- Real-time display of plant / equipment level operation status
- Quick abnormal event query

Intelligent Power Generation Analysis

- Multi-dimensional analysis of power generation data
- Multi-granularity report statistic by day, month and year
- Data can be exported in .xls format

SPMS Hardware Features

- Gateway with 2 x LAN, 4 x COM Ports
- TI Cortex A8 Industrial Communication ECU-1251
- Windows Server 2008 R2, WebAccess & IONOS, Unlimited tags

SPMS Solution Ready Platform Package

- Easy integration with third party software and secondary development
- Customization of power station equipment information
- Easy integration with third party software and secondary development

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- Customization of power station equipment information
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Key Features

Hierarchical Visualization

- Hierarchical visualization of Group / Power Station KPIs
- Real-time monitoring of string / inverter / meter and another equipment operating parameters
- Integrated display with web map service

Operations Management

- Supports Web GIS
- Auto report delivery service
- Manually record for knowledge base
- Auto record device history
- Access rights setting by user level

System Customization

- Customization of monitoring software and system report
- Customization of power station equipment information
- Easy integration with third party software and secondary development

Software Architecture and Key Design Features

Intelligent Power Generation Analysis

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Key Advantages / Features

- System stability guaranteed by seamless integration
- Precise and effective data acquisition
- Hierarchical visualization & complete management

SPMS Hardware Features

- Gateway with 2 x LAN, 4 x COM Ports
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Due to the technological progress of the solar power industry, more and more solar power plants are being set up all over the world. New power plant owners and grid companies have concerns about how to ensure the security and long-term use of the data required from the photovoltaic generation, how to get an overview of the entire maintenance operation, and how to meet health and safety requirements of governmental agencies. A unified monitoring management system can integrate inverters and equipment from different manufacturers, categories and types, so that the monitoring and control system can be unified. The three fundamental requirements of an ideal monitoring and management system are as follows.

1. **System Adoptability**
   - Due to the scale or specialty of the project, some of the vendors may only be capable of providing software or hardware. This may bring trouble when the system conflicts between the hardware and software. Trouble may also happen after integration has finished. What owners and operators need is to have vendors to provide a total reliable solution for the operation, including data acquisition, transmission, publishing, and even a cloud solution. Also, different user level access for system integrators, investors and owner, who need different access regarding power station operation.

2. **Technical Support and Service**
   - Most of solar power plants would last 20 years and more. Under a project owner, the project owner wants a reliable and professional service to ensure the smooth operation, as well as a quick response for constructing new power station sites. Furthermore, advanced technical training is also needed to keep staff and engineers up to speed to help optimize the operation.

3. **Flexible and Modularized Solution**
   - Due to the diversity of power station sites, it is necessary to have a flexible solution which covers data acquisition, transmission and analytics. For integrated monitoring and management system, it can also meet the needs for future expansion.

### Introduction

**Software Architecture and Key Design Features**

- **Smart Alarm**
  - Customized settings of alarm threshold
  - One-key alarm dismiss functionality
  - Remotely sound/visual effects of alarm settings
  - Alarms with SMS, email or APP

- **Mobile APP**
  - Supports Android and iOS
  - Overview of groups/station level power generation overall KPIs
  - Fingerprint login available (iPhone only)
  - Real-time display of plant/equipment level operation status
  - Quick abnormal event query

- **Intelligent Power Generation Analysis**
  - Multi-dimensional analysis of power generation data
  - Multi-granularity report statistics by “day”, “month”, “year”
  - Multi-dimensional analysis of power generation data

- **System Customization**
  - Easy integration with third party software and secondary development
  - Supports Web GIS
  - Supports multiple protocols and transmission networks
  - Remote maintenance and upgrade

### Key Features

- **Hierarchical Visualization**
  - Hierarchical visualization of Group / Power Station KPIs
  - Real-time monitoring of string / inverter / meter and other equipment operating parameters
  - Integrated display with web map service

- **Operations Management**
  - Supports Web GIS
  - Auto report delivery service
  - Manually record for knowledge base
  - Auto record history
  - Access rights setting by user level

- **System Adoption**
  - Data Gateway
  - Data Logger
  - Access Control

### Technical Features

- **Mobile App**
  - Quick abnormal event query
  - Real-time display of plant/equipment level operation status
  - Fingerprint login available (iPhone only)
  - Overview of group/station level power generation overall KPIs

- **Intelligent Power Generation Analysis**
  - Multi-dimensional analysis of power generation data
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- **System Customization**
  - Easy integration with third party software and secondary development
  - Supports Web GIS
  - Supports multiple protocols and transmission networks
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### Solution-Ready-Platform Package

- **ECU-745A**
  - EG-1850-3 Certified Power Automation Computer, INTEL I7-3630QM, 4GB RAM, 500GB SATA HDD, Windows Server 2012 R2, WebAccess 8.1.FP3, Unlimited tags

- **ECU-1251**
  - A total remote monitoring and control system (Solar Power Management System) can be broken down into group / station / equipment / monitor / generation levels. It allows simple queries and reporting, multi-dimensional analysis or data mining.

- **SPMS (Solar Power Management System)**
  - Supports Android and iOS
  - Overview of groups/station level power generation overall KPIs
  - Fingerprint login available (iPhone only)
  - Real-time display of plant/equipment level operation status
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- **SPMS Data Gateway**
  - Supports multiple protocols and transmission networks
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- **Remote Data Gateway**
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- Customization of device names and data report
- Customization of power station equipment information
- Easy integration with third party software and secondary development

Flexible and Modularized Solution

A flexible and modularized system is desired not only because it can shorten the construction and integration period, but also satisfy the type and scale of distributed solar power stations. A well-designed system can also meet the needs for future expansion.

Technical Support and Service

When more and more power stations are deployed under one project and scale of distributed solar power stations. A well-designed system can also meet the needs for future expansion.

Technical Support and Service

Due to the technological progress of the solar power industry, more and more solar power plants are planning to be built and put into operation around the world. New solar power plant owners and grid companies have concerns about how to ensure the accuracy and long-term storage of the data required from the photovoltaic generators, how to get an overview of the real-time operation, and how to meet reliable and safety requirements of gridconnected agencies. A unified monitoring management system can integrate inverters and equipment from different manufacturers, categories and types, so that the monitoring and control system can be unified. The three fundamental requirements of an ideal monitoring and management system are as follows.

System Adaptability

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Future: Unmanned Station

With the well managed system, the power stations can be expected to be unmanned or decrease human power fee to lowest. Also, the vision of dispatching the generated power as smart grids can be realized.

Ordering Configuration Table

<table>
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<tr>
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<tbody>
<tr>
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Order in 3 Easy Steps

1. Go Online Store
2. Add to Cart
3. Confirm Order

Ordering Table

Table 1: Ordering Configuration Table

| SRP-ESP315 Distributed Solar Power Station Monitoring and Management Solution |
| Application Software: SPMS Browser-based solar power monitoring and management software |
| Application Server: ECU-4784 | Gateway: ECU-1251 x 10 |
| OS: Preinstalled Windows 2008 R2 | Gateway: ECU-1251 x 10 |
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Software Utility Table

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Logging in to Advantech Online Store

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