GREEN OS
Monitoring and Control for Solar Plant

‣ Asset Optimization

Overview

» Neptun Green OS allows for full optimization of Solar Photovoltaic Assets

» System allows for real-time of essential data and events

» Includes functionality for automated analytics of real and historical data

» Provides tools for maintenance planning and automation

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‣ Value

Real-time Monitoring
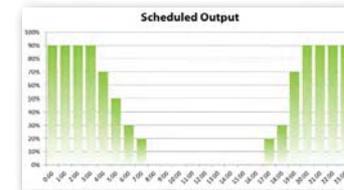

» **Centralized control of all solar facilities**

» **Standardized interface for inverter and substation systems**

» **Custom control algorithms for available optimization**

» **Streamlined operation reduces necessary operator training**

» **Integration compatible with all major industrial protocols**

Automated Analytics

» **Automated analysis of asset performance highlights improvement areas**

» **Centralized data storage for all assets**

» **Configurable custom alarms reduces monitoring requirements**

» **Track contractual requirements constantly**

Maintenance Planning

» **Tools for maintenance tracking and scheduling**

» **Track maintenance and performance metrics**

» **Track component failure rate and warranty status**

» **Reduce manpower requirements to manage contractors or perform maintenance**

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‣ Key Functionality

NEPTUN Green OS

General Function	Data Connection	Solar Applications	Substation Applications
Real-time monitoring	OPC DA/XML	Fleet mgt (multi array)	Single line diagram
Alarm	DNP 3.0	Inverter operation	AGC/AVQC interface
Real-time trending	MODBUS	Management report	Device operation
Historical data archive	IEC60870-101	Integrated analytics	Breaker block logic
Custom controls	IEC60870-104	Downtime mgt	
Reporting	SQL/XML	Built-in CMS	
		Multiple OEM support	

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‣ Real-time Monitoring

Overview

» Fleet level production statistics

» Summary of inverter status

» Ambient conditions at facilities

» Customer-specified variables

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Fleet and Assets

» Fleet level production statistics
» Summary of inverter status
» Ambient conditions at facilities
» Customer-specified variables
» Compare the generation of a farm by day, month, year and lifetime
» Display real time active power, theoretical active power and irradiance of solar farm.
» Ability to customize data trends and alerts for specified thresholds
» Centralized overview for easy monitoring
» Inverter monitoring for detailed equipment status, alarm information, and real-time power for all inverters of one solar farm
» Data list of inverters shows detailed information for all the inverters in a solar farm. High-efficient data analysis tool for remote monitoring

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Inverter Overview

» Provides alarms, status, power, voltage and current data
» Remote inverter control commands
» Remote setpoint adjustments
» Remote view of historical data including alarms and status
» Overview of inverter performance via efficiency and power contrast

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⇥ Real-time Monitoring

Substation Overview

» Allows supervisory control of the collection system and grid interconnection equipment
» Control reactive power, voltage and frequency control for larger farms

Data Source List		
Name▲	Value	Units
Analog 1	464	
Analog 2	368	
Analog 3	335	
Input 1	1	
Input 2	1	
Input 3	1	
Input 4	1	
Output 1	0	
Output 2	1	
Output 3	0	
Output 4	1	
Output 5	0	
Output 6	1	

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Management Reporting

» Solar Efficiency Curve shows the ratio of the electrical output of a solar cell.

» Automatic calculation of the solar cell conversion efficiency can be used to compare and find the worst performing cells.

» Lifetime conversion efficiency data is stored and displayed.

» Daily and monthly reports can be generated and exported into Word/Excel for any data items being collected in system

Bar Chart

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⇢ Automated Analytics

Outlier Alerting

»   Deviations from the efficiency curve
»   Inverter availability
»   Medium term output v. Irradiance for planning of cleaning
»   Long term peak output v. Irradiance for degradation monitoring and warranty claims

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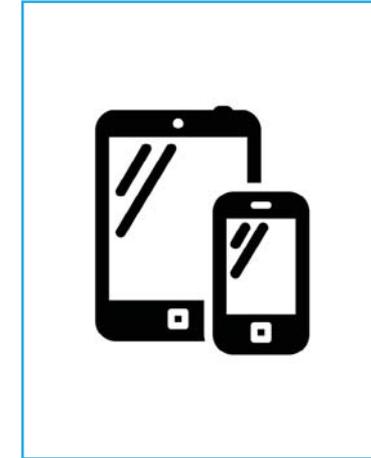L   I   G   H   T

‣ Maintenance Planning

Management Simplified

» Visual monitoring of maintenance work flow
» Management and optimization of work flow for internal labor and contractors
» Feedback of work order data to business analytics and reports within Envision system
» Reduces manpower burden of tracking and scheduling maintenance
» Simplified interfaces for smaller facilities are available

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‣ Maintenance Planning

Mobile Applications

» Real-time monitoring the PV station, makes unattended PV stations more manageable

» Decrease fault response time and fault processing time 10%-20% by receiving timely alarm message via mobile

» Smart dispatch maintenance personnel based on the location information provided by mobile GPS

» Remotely confirm field operations with central control room via mobile

» Mobile inspection tools for PV assets

System Value

» **Reduced OPEX**: Reporting and management tools reduces the number and skill level requirements for employees

» **Performance Management**: Quicker identification of performance issues reduces lost revenue

» **External Integration**: Open platform allows customers to import or export data with other systems to maximize asset control

» **Common Control System**: Allows for streamlined control center operation and reduced training demands for employees

» **Data Integrity**: Provides a standardized data repository for all of a customer's assets. Real-time alerts can be configured to monitor data quality

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About Neptun Light, Inc.

Neptun Light is a leader in the manufacture of energy efficient retrofit products and light fixtures in the fields of LED, Induction, and Solar technology. We boast a highly diversified product portfolio of indoor and outdoor products. Additionally, our products span a wide range of commercial, industrial, government, and utility infrastructure applications. Neptun Light achieves its level of success through timely development of new technology that caters to a constantly evolving marketplace. Among Neptun Light's core values are continuous innovation, high quality products, a focus on energy conservation, and an uncompromised commitment to customer service.

NEPTUN LIGHT, INC.
13950 Business Center Drive
Lake Forest, IL 60045 USA
Phone: 847.735.8330
Fax: 847.735.8330

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