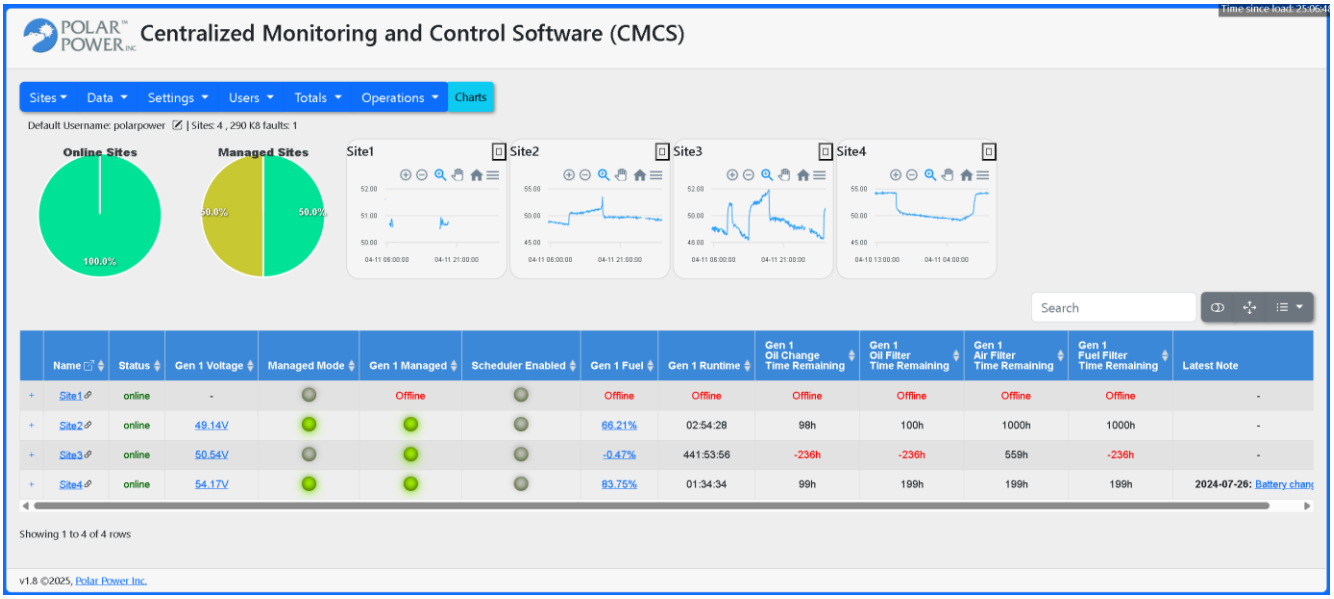
# Remote CMCS

## Centralized Master Control System

## Overview

Polar's CMCS (Centralized Remote Control and Monitoring) Software provides the means to collect data and alarm information from a few sites to thousands of sites. The CMCS polls the data from each SUPRA MCS (Master Control System) in the field. It can function as a complete NOC center or provide API data/alarms into an established NOC. Increasing the monitoring aspects of the site and having it convenient greatly improves the site maintenance and reliability.




The SUPRA MCS controller monitors and controls the Supra 250, while monitoring other devices on the site, including the battery BMS, solar MPPT, site temperatures, etc. The SUPRA MCS is an industrial computer operating on Linux.

The CMCS interfaces with all SUPRA MCS's installed on each site then captures the data locally and presents the data, alarms, and analytics to a dashboard to view.

Existing NOC Centers can send API requests to the SUPRA MCS's at the sites, thereby greatly increasing its ability to site monitor.

This solution is different from the competition for many reasons, including the changing of performance settings, diagnostics, direct access to the SUPRA MCS, manage Remote Software Updates, and more. CRMCS does not require an IOT platform and can be directly integrated into the company's server. Data retrieved by the NOC can be stored locally or in the IOT.

Polar Power provides a usable interface that can perform most common functions. The interface can be easily updated to include additional features and information. Data retrieved by the CMCS can be stored locally or in the IOT. Source code is supplied to enable modifications to the interface and to direct the data output to the desired source.

## Capabilities and Use-Cases

The CMCS can monitor multiple sites concurrently. It gathers real-time snapshots of most data linked to the SUPRA MCS (figures. 1 - 4).

The included sample interface features a sortable and customizable information table and an expanded view of all data.

The API which powers the CMCS can access most of the settings and information inside the SUPRA MCS, including adding, editing, and disabling user accounts, as well as setting Alert Triggers and working with Digital I/O (GPIO) devices.

### The following are specific uses of the NOC and API software.

- Multi-generator sites
- Centralized bulk user administration
- Real-time performance monitoring
- Real-time fault/alert management
- Remote updating of SUPRA MCS software
- Remotely Backup, Export, and Restore data
- Remotely download configuration file(s)
- Remotely trigger a system reboot

## Future Development

Development focus is on converting all existing functions of the SUPRA MCS software to API-compatible formats. Upon completion, a 3rd party application will be able to change all system settings and activate all live controls. Customers will be able to fully integrate Polar Power devices into their own custom software solutions.

With the high levels of past and ongoing data collection AI can be applied to a great number of tasks including:

### Trouble shooting

Site problems down to the component levels within the generator, battery banks, solar MPPT controls, Solar PV modules, circuit breaker status, site maintenance and other accessories.

### AI Optimization

Energy usage by analyzing patterns and suggesting adjustments to improve efficiency and extend the lifespan of batteries. Polar DC gensets offer the most efficient generators for powering a site. These gensets are programmable and can be further optimized by AI.

### Preventative AI analytics

Identify specific issues, such as malfunctioning components or connectivity problems, and provide actionable insights for quick resolution. Receive notice well in advance of a potential issue. This gives enough time to get replacement parts to a site.

### AI predictive maintenance

By leveraging machine learning algorithms, AI can predict potential failures before they occur, enabling proactive maintenance and reducing downtime.

### AI analysis of faults

Use AI to determine when and why a fault occurred. Integration with remote access tools allows technicians to diagnose and address issues without physically visiting the site.

## Security

Security is a primary consideration of Polar's development team. The API supports a user-specific API key and full logging of all actions. All queries are performed via secure HTTP/POST connections and gain permission from the Polar Power server. All communication between the CMCS and the Supra MCS units is secured by an encrypted HMAC signature to prevent unauthorized access to the private Supra MCS API. All data stored on the SUPRA MCS hardware is fully encrypted.

# Images and Screenshots

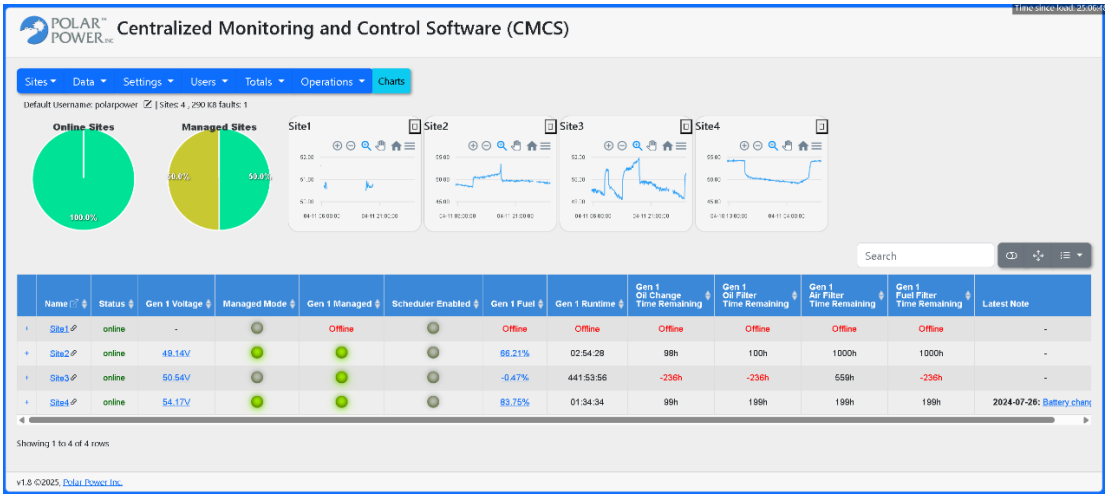



*Figure 1 The customized view and live data*

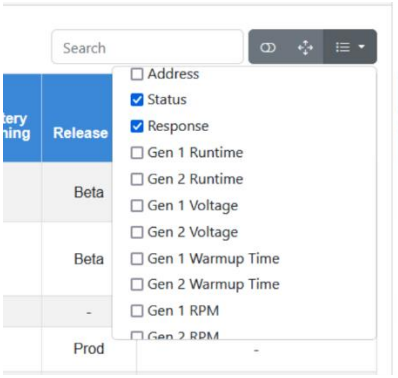



*Figure 2 Customizing the dashboard view columns*

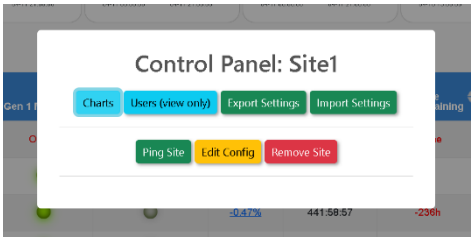



*Figure 3 Site Settings*

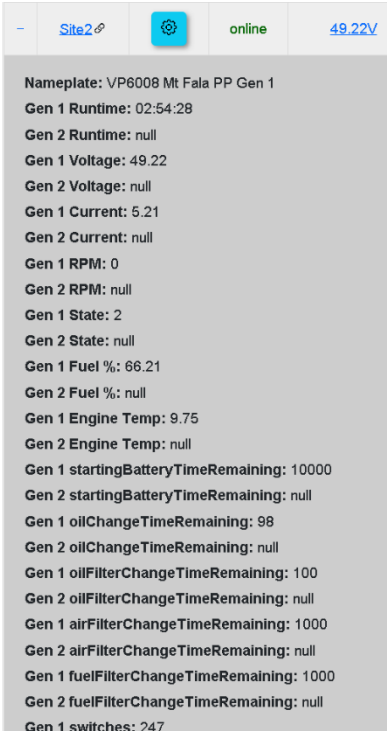



*Figure 4: Fetching all settings*

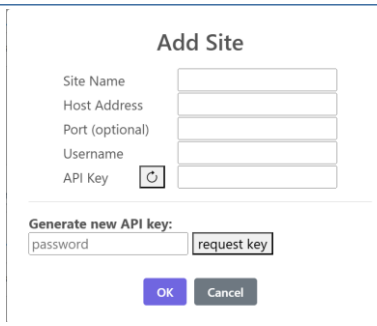



*Figure 5 Add a Site*

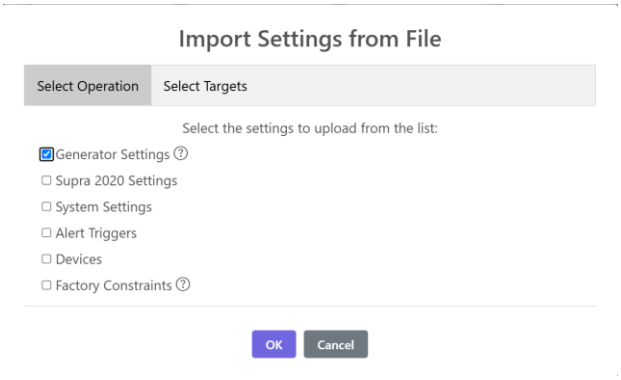



*Figure 6 Import System Settings*

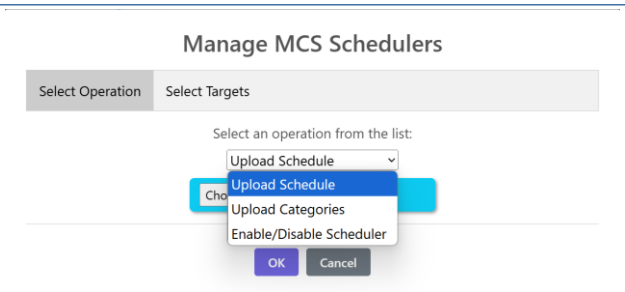



*Figure 7 Import Schedule Settings*

# Remote CMCS

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## Feature Summary

### Included Features

#### Network connectivity Status.

Specific description of online or cause of no connectivity.

#### Summary of unit(s) being managed by controller

Quickly view which sites are setup and being managed by the SUPRA MCS and which sites are configured properly for backup control.

#### Fetch live operational data from unit(s)

See any data that is available in the SUPRA MCS and connected 3rd party devices.

#### Access all system data

All data for Polar gensets and 3rd party devices is available when attached to the SUPRA MCS. This includes Fuel Level, Maintenance Interval, etc.

#### Directly connect to a site

Select any site and jump right to the SUPRA MCS control interface for advanced monitoring and control features, as well as historical plots ranging back years.

#### Configure custom dashboard to track operational data

Create live charts quickly for any combination of data. Pin the charts to the dashboard.

#### Export and Import Data

Data retrieved by the NOC Center is stored in memory. It can be exported for analysis and imported for quickly viewing a combination of charts with past data.

#### E-mail and Text Notifications

Define which users receive Maintenance, Warnings, Critical Alerts alert levels. Apply settings across all or selected sites.

#### View and Edit control settings

All system control settings can be viewed and modified from the Polar NOC Center. Quickly see all settings in a table and identify sites with incorrect settings. Change settings for any or all sites at once.

#### Clone Settings across sites

Select a site with the settings to be cloned and apply the settings to any or all the sites at once.

#### Backup and Restore unit data/settings

Backup and restore the entire SUPRA MCS database, or specific tables from the database, including Generator Settings, SUPRA MCS Settings, System Settings, Alert Triggers, Devices, and Factory Constraints.

#### Manage user accounts on all or selected unit(s)

Add, Modify, or Disable user accounts on any or all sites at once.

#### Manage scheduler

Enable or Disable the scheduler for any or all sites. Clone a complete schedule across any or all sites.

### Install updates to unit(s)

All SUPRA MCS software updates can be applied at any time to connected sites. Choose when to apply updates and always have the latest SUPRA MCS features and updates.

### Reboot unit(s)

SUPRA MCS units at any or all sites can be rebooted from the NOC Center.

### IOT not required

Uses API requests and responds with the data table. Data can be stored locally or sent to the IOT.

### Access diagnostic data (Know what's wrong before going to site)

See all data and make an informed decision on which test equipment or replacement system equipment will be needed before traveling to the site. Control settings can also be modified for immediate response to a component failure.

## Planned Features

### Ongoing development of new and requested features