



EDAMS
Technology

EDAMS Control Centre (ECC)



EDAMS Control Centre

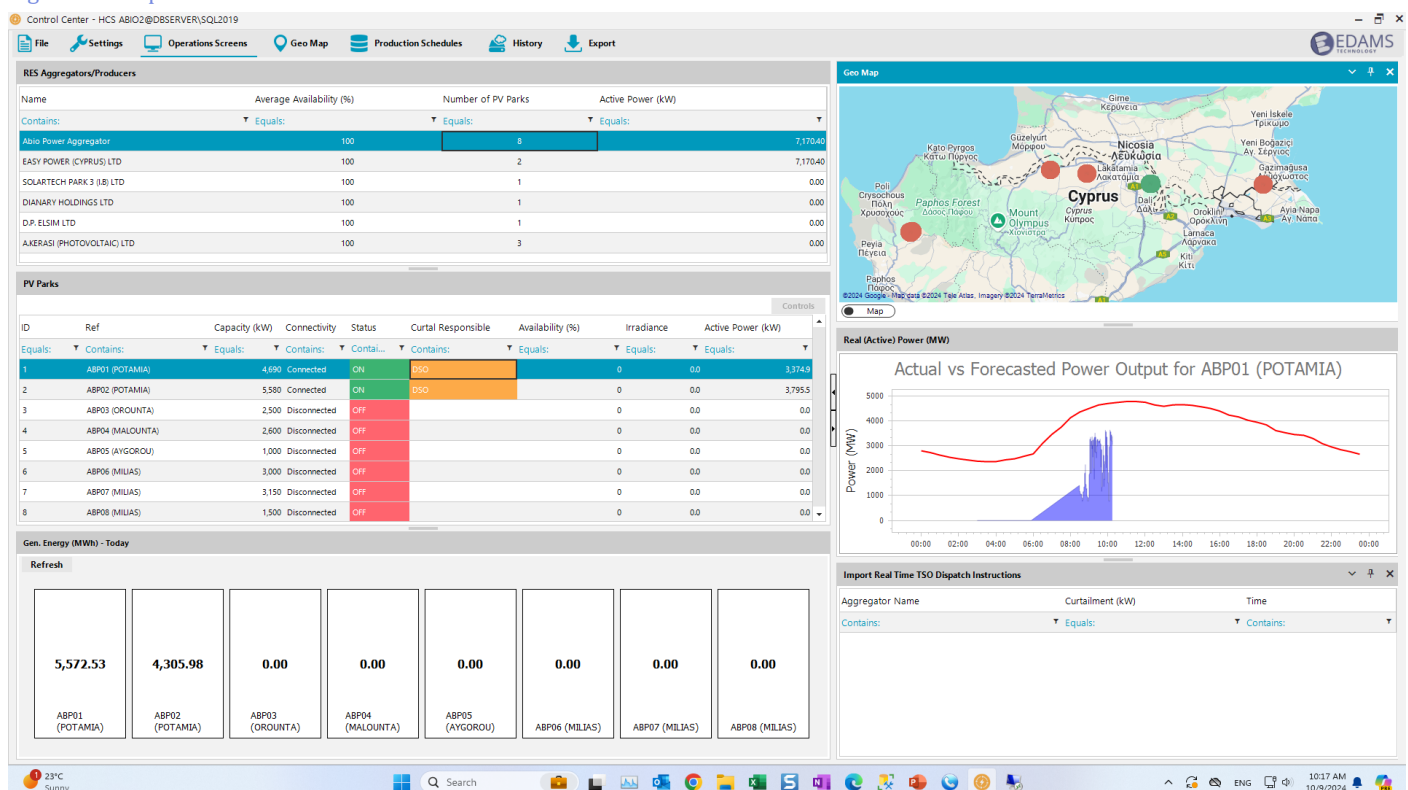
Cost Optimal Real time production control of Solar Parks

The EDAMS Control Centre offers an all-encompassing solution for monitoring and controlling park production. The software provides real-time monitoring capabilities, enabling seamless oversight of PV park outputs and manual intervention as needed. Through a sophisticated Park Communication Algorithm, the system automates production curtailment according to optimal requirements, ensuring efficiency every step of the way. The ECC monitors park production as well as allowing manual intervention when required. Additionally, a suitable Park Communication algorithm exists that allows for automated park production curtailment based on the optimal requirements. The software comes in two versions, with the second version suitable for parks that participate in the electricity market. In such a case a PPP (Park Production Program) is generated by the EMOS software as the cost optimal production schedule for the park daily. The required production output of a park may fluctuate throughout the trading day due to various events, including breakdowns, direct interventions by the Distributor System Operator (DSO), and real-time instructions for curtailment from the Transmission System Operator (TSO). Consequently, the Control Centre software automatically regenerates the production program for each park in real-time, based on a pre-set interval, in alignment with the cost-optimal conditions for the Energy trader managing the park. The integration of the Battery Energy Storage System (BESS) on PV Park's side into the Control Center is also currently under development.

ECC Operations Screen

ECC is a crucial, high-demand/load system designed to provide users with direct access and control, offering a clear overview of all necessary data and components. Through the Operations screen, users gain a comprehensive view of PV parks and RES aggregators/producers, delivering valuable insights for effective monitoring and decision-making.

Figure 1: Sample Dashboard from EDAMS Solar Parks – Control Centre software.



Users can monitor PV Parks' production and relevant variables while having control functionalities such as production curtailment. Initial access allows users to easily view RES Aggregators', total energy production, and the number of PV Parks each aggregator represents. Key information on individual PV Parks is displayed, including total installed capacity, operational performance, connectivity status, active power production, and RES Injection Forecast.

The operational status, whether under curtailment, is clearly indicated, along with the responsible entity (DSO, TSO, or user). Crucial parameters like availability or communication status are prominently highlighted.

In the operation interface, user can find the list of RES Aggregators/Producers and below the list of all PV plants, each accompanied by the following variables:

- 🔍 **Capacity (kW):** Represents the installed Capacity of the PV plant.
- 🔍 **Connectivity:** Shows if there is connection with the PV plant selected (Connected/Disconnected)
- 🔍 **Active/Inactive:** Indicates the current status of the PV plant.
- 🔍 **Status:** Provides information on curtailment status.
- 🔍 **Responsible Operator:** Specifies the person responsible for applied curtailment.
- 🔍 **Availability (%):** Deviation Irradiance/1000 (w/m²) in % and power/capacity.
- 🔍 **Active Power (kW):** Displays the actual production value of the PV plant.
- 🔍 **Reactive Power (kVA):** Displays the reactive power of the PV plant.
- 🔍 **Irradiance (kW/m²):** Shows the irradiance value of the PV Array Plane

Through graphical representations on the operations screen the following values for each park are shown:

- 🔍 **Actual Production (kW):** Displays the production value of the PV plant.
- 🔍 **Irradiance (kW/m²):** Shows the irradiance curve of the PV Array Plane
- 🔍 **TSO Dispatch Instruction (Z14):** Shows the curve the PV park (of the aggregator where the instruction received) must follow.
- 🔍 **PPP (Market Schedule + Maximum Allowed Deviation):** The current system generates this graph, per park from the Market Schedule+MAD.
- 🔍 **PPP (Market Schedule):** Introduce a new graph generated from the Market Schedule alone for viewing/ comparison purposes.
- 🔍 **PPP (Indicative Dispatch Schedule):** Introduce a new graph generated from the Indicative Dispatch Schedule for viewing/ comparison purposes.

Finally a Google map shows the locations of each PV Park with an indication of the status (e.g., ON, Off, Under Curtailment).

ECC GEO Map Screen

The GEO Map Screen provides the exact location of each PV park along with comprehensive asset information. Live measurements are available, including production, capacity, battery status, availability, irradiance, and details about the responsible curtailment entity. A filtering feature is also included, allowing users to select and zoom in on specific PV parks.

Figure 2: GEO Map screen – PV Park exact location

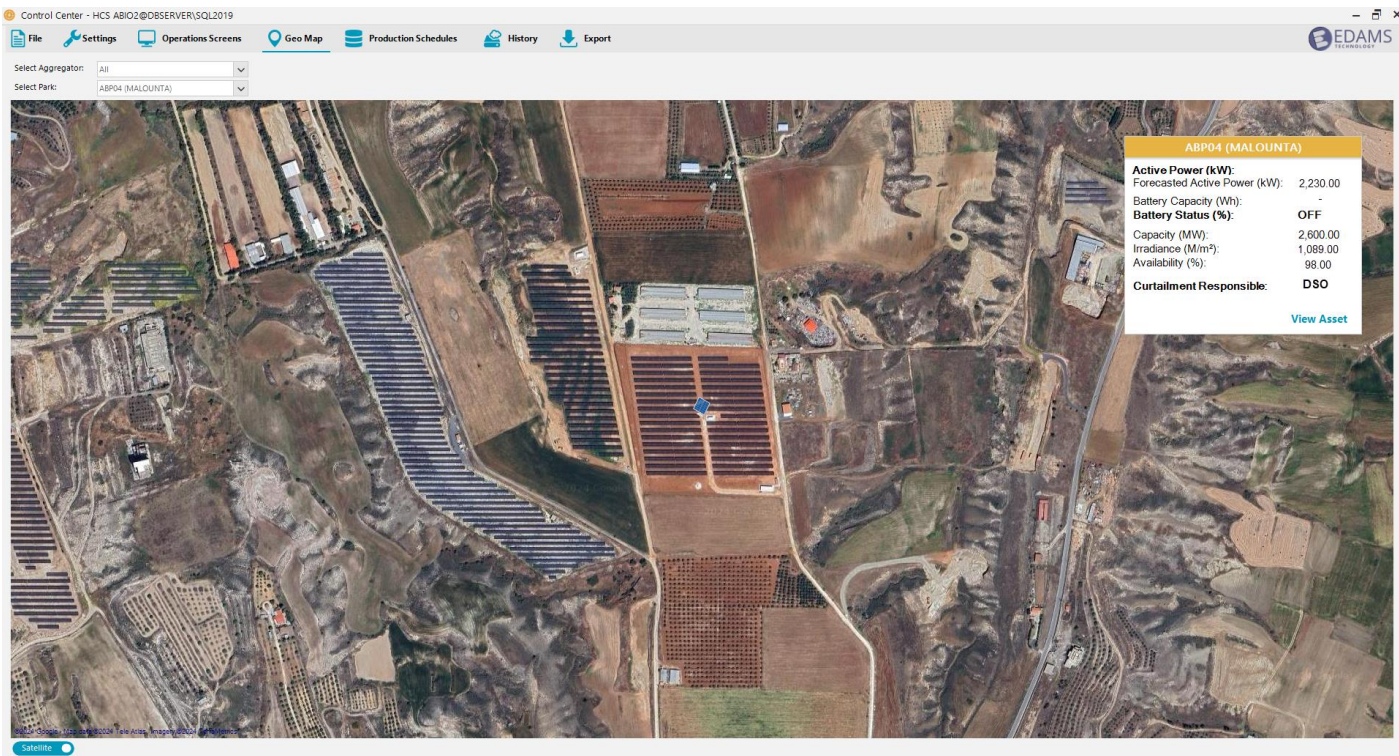
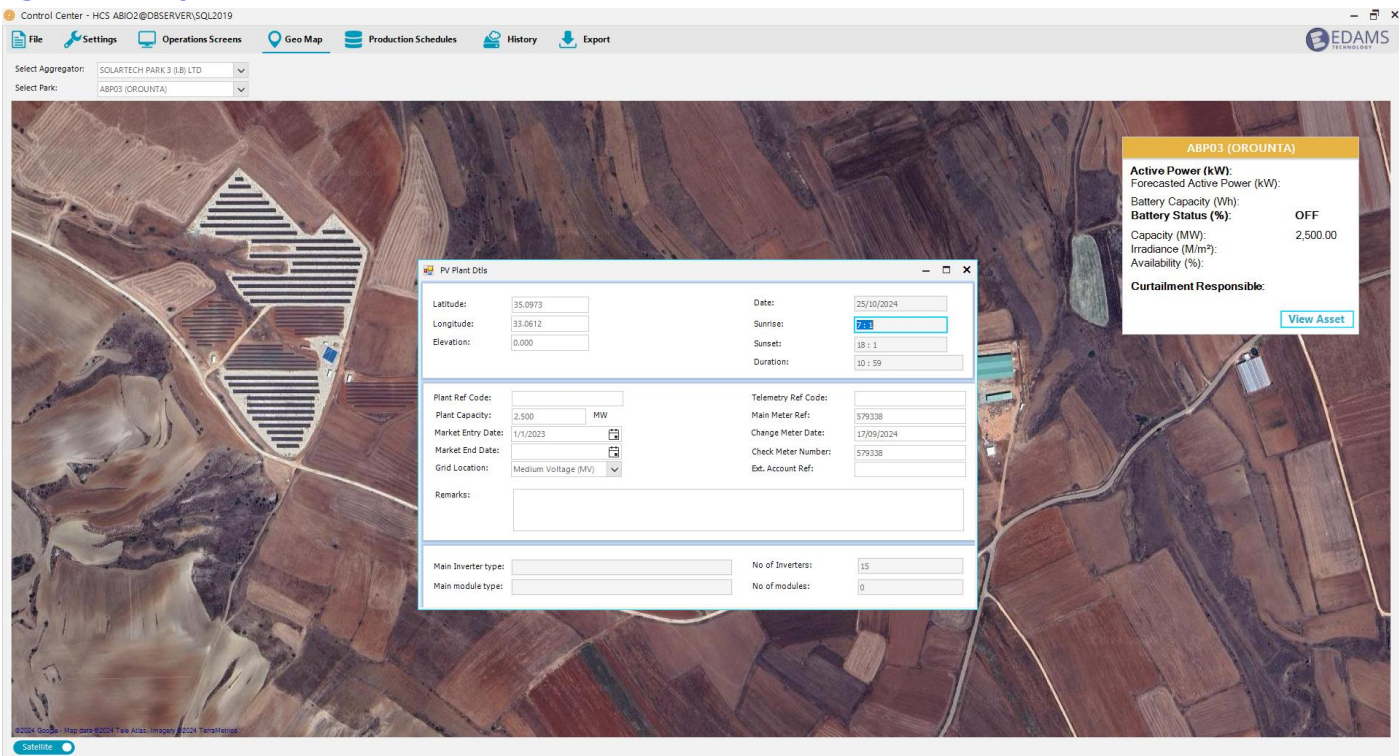


Figure 3: GEO Map screen – Asset Characteristics



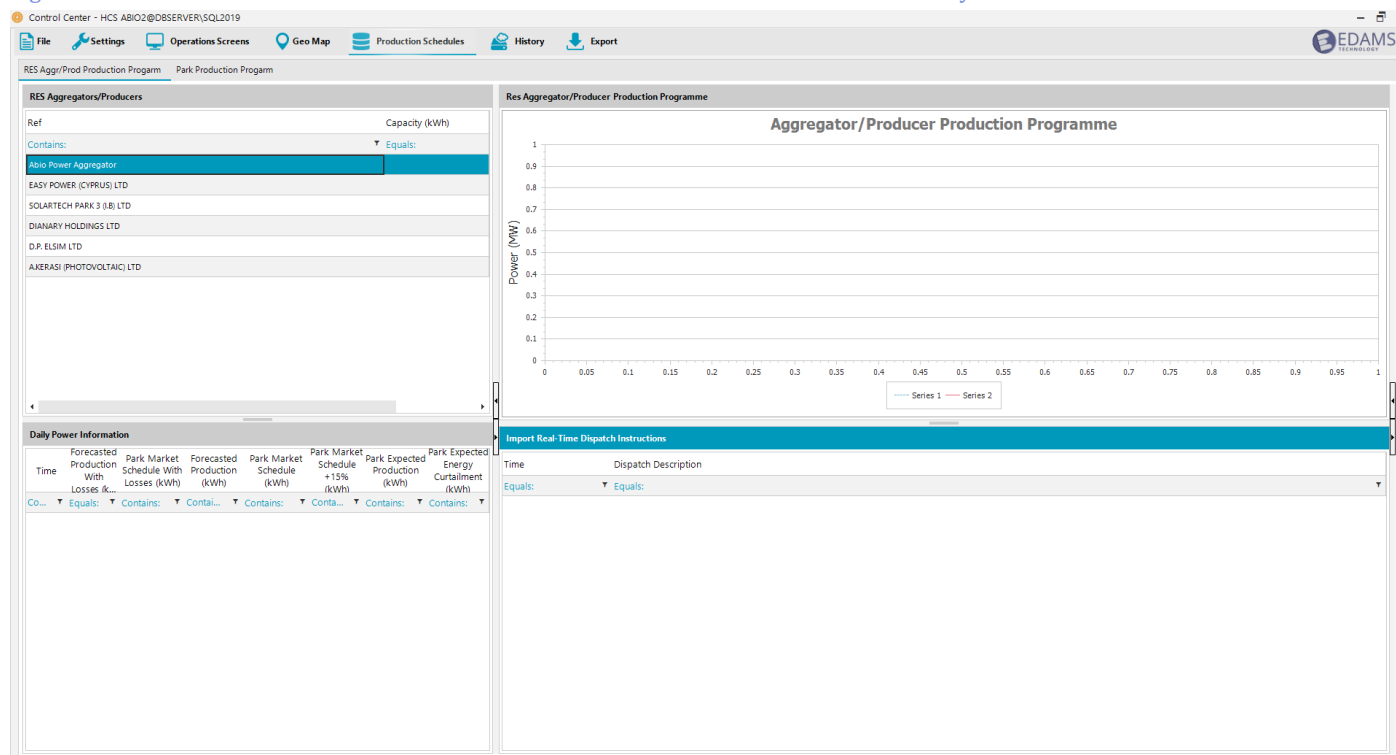
ECC Production Schedule Screen

The Production schedule screen offers user's go-to hub for understanding each PV plant's and RES Aggregator's production plan as well as Battery charge and discharge schedule. This program, generated from the EMOS software, is loaded automatically to the control center a day prior. On the Trading Day (D-Day), the PPP is regenerated based on changes received.

Here are some key Features for the PPP Tab:

- 🔍 **Interactive PV Park Selection:** Choose a PV park below to load its Production Program Profile (PPP) and visualize insightful data on park-level production through dynamic graphs on the right.
- 🔍 **Visual Insights with 3 Detailed Graphs:**
 - **PPP (Market Schedule + Maximum Allowed Deviation):** View each park's market schedule with added deviation data, auto-generated by the system.
 - **PPP (Market Schedule Only):** Access a new graph for direct market schedule comparisons.
 - **PPP (Indicative Dispatch Schedule):** A fresh perspective on production based on the dispatch schedule for further analysis.
- 🔍 **Real-Time Dispatch Table:** Stay informed and in control with a table displaying real-time dispatch instructions from the TSO, updating every minute to reflect the latest changes.
- 🔍 **Aggregator Overview:** Easily access a list of all aggregators, including their total capacity and represented PV parks. Selecting an aggregator reveals its detailed production program in the table below.
- 🔍 **Consistent Data Presentation:** On the right side of the portal, you'll find the same detailed graphs and tables to provide a clear and cohesive view of all the data.

Figure 4: Production Schedule screen – Park Production Schedule – Market Schedule – Battery Schedule



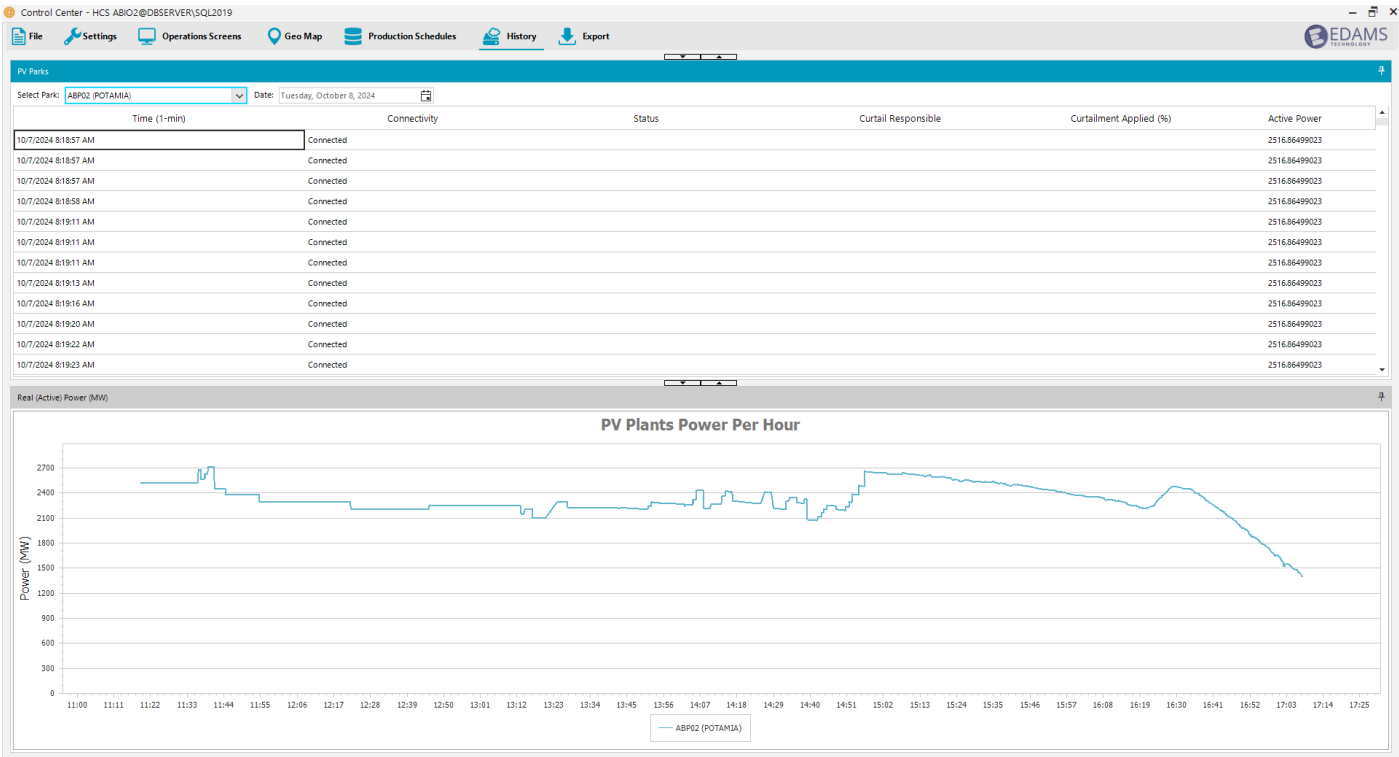
The MS tab provides the same information, but at the aggregator level. The BS tab is currently under development because the formal legislation has not yet been released.

ECC History Dashboard

Historical Data is presented through a dedicated Dashboard. The History dashboard offers a comprehensive view of past data, enabling users to analyze and extract insights for informed administrative decisions in the future.

Users can access this dashboard to view historical values specific to a particular plant. The dashboard is designed to display measurements at a specified time resolution (5-min), presenting historical data in a format illustrated below. This dashboard displays the production graph for today and for previous days as well, along with corresponding irradiance and other data.

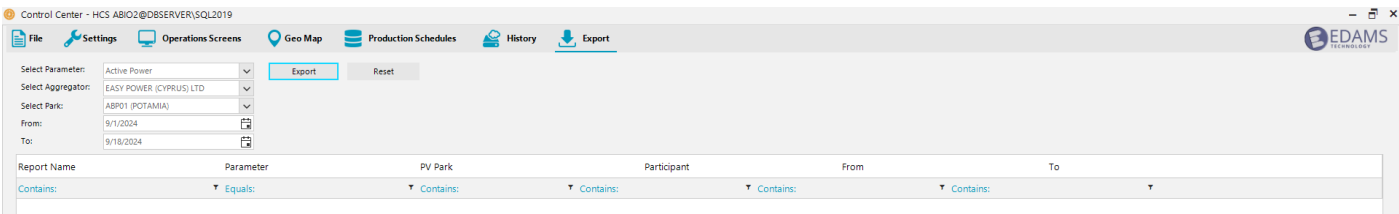
Figure 5: History Dashboard – Historical Data Representation



ECC Export

The Export UI includes an Export Data feature, allowing users to easily export filtered datasets for offline analysis and reporting. This feature enables users to select specific time ranges, aggregator, PV Parks, parameters, and time resolutions to tailor the export according to their unique requirements.

Figure 6: Export UI



EDAMS EMOS & Control Centre Integration

Cost Optimal Real time production control of Solar Parks

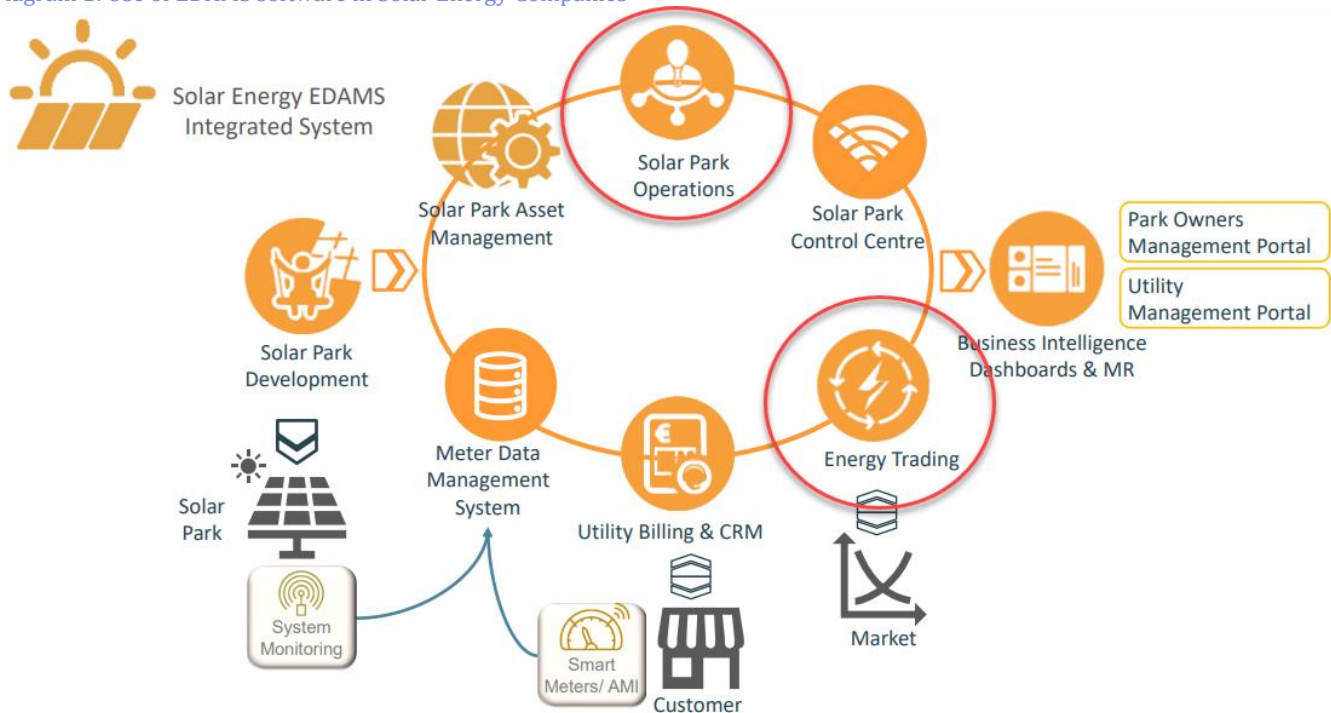
The EDAMS Solar software is modular, scalable, and affordable even by small operators, encompassing all required functionality as illustrated in the diagram below. The inherent integration of all the modules sharing one data model enables inter-departmental workflow and avoids data duplication.

This pamphlet section focuses on the integration between the following EDAMS Energy Market software solutions:

- 🔌 EMOS (Energy Market Operations System)
- 🔌 ECC (EDAMS Control Center).

It is designed for any entity—such as energy suppliers, RES aggregators, or RES producers—interested in participating in the Cyprus final energy market.

Diagram 1: Use of EDAMS software in Solar Energy Companies



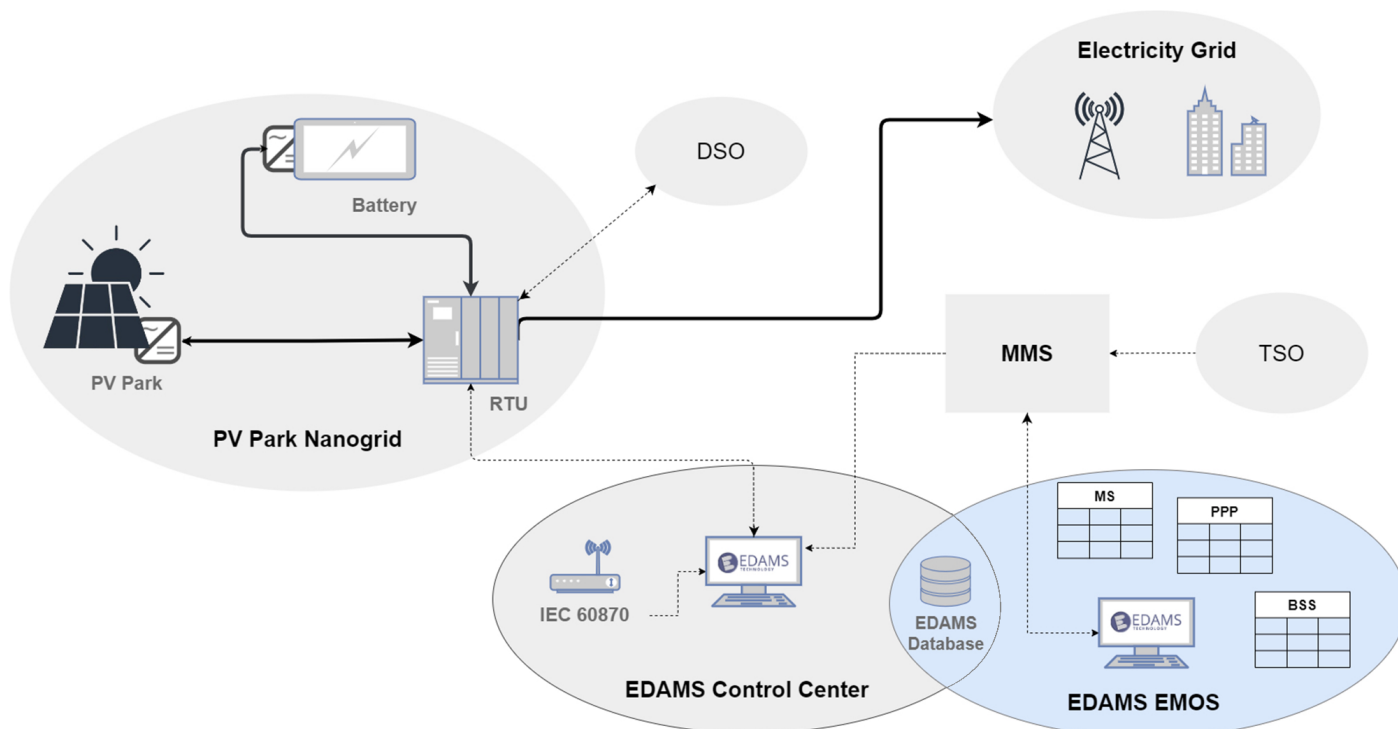
EDAMS EMOS (Energy Market Operations System) and ECC (EDAMS Control Center) form an integrated and complete energy management solution that efficiently manages dispersed energy generation and ensures seamless integration into the energy infrastructure. EMOS handles the management of PV production and load consumption, providing advanced forecasting tools for day-ahead and month-ahead planning. It balances production and consumption for the day-ahead market while supporting essential operations required for participation in the Cyprus energy market. These operations include submitting forward contract nominations to the MMS (Market Management System), physical delivery nominations, and reserve injection submissions.

The solution is completed with the integration of the EDAMS Control Center (ECC), an advanced monitoring and control system. ECC not only provides real-time measurements of critical variables from PV parks but also automatically responds to instructions from the Transmission System Operator (TSO) or curtailment commands from the Distribution System Operator (DSO). The relationship between the

two systems is crucial for ensuring smooth market participation, as illustrated in the diagram. EMOS generates the Park Production Program (PPP), Market Schedule (MS), and Battery Schedule (BS), which are stored in a shared database directly accessible by the ECC. A key feature of this system is the common database, which eliminates the need for data transmission between EMOS and ECC.

During the trading day of the market, ECC uses the data generated by EMOS to follow the PPP and MS, applying necessary curtailments or issuing charge and discharge commands to the PV park's battery when needed. ECC must be connected directly to the RTU (Remote Terminal Unit) of each PV park.

Diagram 2: Relationship between EMOS and ECC & other components



The RTU acts as a central connection point for the park's inverter, battery inverter, DSO, ECC, and the electricity grid. The production output of a PV park may fluctuate throughout the trading day due to unforeseen events such as breakdowns, DSO interventions, or curtailment instructions from the TSO. In such cases, ECC is responsible for tracking and managing these controls, locking any DSO actions on the specific PV park. If ECC receives a TSO instruction through the MMS at the aggregator level, it ensures proper execution of the instruction across all relevant parks, preventing penalties.

By coordinating both systems, ECC guarantees that suppliers, aggregators, and producers can participate effectively in the energy market, avoiding fines and maintaining real-time awareness of the operational status of each PV park. This integrated approach ensures compliance with grid operators while delivering reliable, real-time performance and control.

Deployment and Services

The EDAMS Solar software is modular and scalable allowing Operators to utilize only the required modules. The EDAMS Solar software is offered as a SAAS (Software as a service), giving the option to the Customer to host the software on its premises or on Cloud. In both cases an annual fee applies, payable in advance. Cloud services are charged extra.

- The annual fee entitles the Customer to free remote support as well as free upgrades.
- An initial fee is charged to allow for data conversion, system configuration and training.
- Additional support/ consulting is charged extra based on manpower rates (if required).
- Both annual fees and initial fees vary per Customer size, with commercial software charges being a function of sales (GWH/year sales) and technical software charges being a function of Solar Park Capacity (MW). In this manner the software is affordable by Operators of all sizes.
- The number of users for the software is unlimited.

The EDAMS Solar Software modules/ packages applicable for Suppliers include:

- Billing & CRM for Energy Sector
- Customer Portal & Mobile app
- Energy Transitional Market Model (a monthly market trading model)
- Energy Market Operational system (Supplier) (a daily market trading model)
- Business Intelligence-Dashboards (Supplier)

The EDAMS Solar Software modules/ packages applicable for Producers include:

- Solar Park Asset & Maintenance Management
- Solar Park Operations
- Solar Park Control Centre
- Solar Park Control Centre (with Market interface)
- Energy Market Operational system (Producer) (a daily market trading model)
- Business Intelligence-Dashboards (Producer)
- PV Park Development (Licensing) software

EDAMS GIS & EDAMS MDMS systems are supplied at no extra charge with all relevant software.

Contact Us

Cyprus

249 Strovolos Avenue,
Strovolos 2049,
Nicosia, Cyprus
Dr. Petros Kolovopoulos
petros@edams.com
Tel: +357 22 478 500
OR at info@edams.com

South Africa

371 Rivonia Boulevard,
Rivonia 2191,
Sandton, South Africa
Ms. Mapula Aphane
mapula@edams.co.za
Tel: +27 11 234 9404

USA

1115 Beasley Way,
Sonoma,
CA 95476, USA
Dr. Volkmar Kunerth
volkmar@edams.com
Tel: + 1 (650) 814 3266



A Division of
HYDRO - COMP
Utilities Information Technology

