



POWER MANAGEMENT

GREECE
ISOLATED GRID, POWER &
ENERGY MANAGEMENT

CASE STUDY

Advanced Power Management
Control, Protection & Monitoring
SOLUTIONS



92 Kifissou Av.
Athens GR 10443



www.maseurope.com



info@maseurope.com



POWER MANAGEMENT

The Problem

Greece has hundreds of inhabited islands most of which are not connected to the main grid due to their distance from mainland. Although most of the islands have a power facility operating locally covering their power needs, some islands also provide power to nearby smaller islands. In such cases one power production plant provides power to two or more nearby islands. An exception is the Kos – Kalimnos grid where both islands have a local power plant. Kos as a larger island has an installed base of a little over 100MW with four 2-stroke units, one 4-stroke unit and one Gas turbine unit. Kalimnos power station is considerably smaller with an installed base of 4-stroke engines.

The problem with the Kos-Kalimnos complex is that the Kalimnos power plant does not have the capacity to support its local grid so imported power is needed from Kos. In addition, the capacity of the interconnection cable does not support the total local demand so, although considerably more expensive to run, the Kalimnos power plant cannot be completely shut-down.

Due to the plant size difference, but also due to the grid's capacity, maintaining nominal frequency and voltage in both Kos and Kalimnos was a difficult task which fell on the operators and was coordinated by phone. Power instability was a frequent event and power failures were difficult to restore.

Considering the above the PPC called for a solution through an open tender that will: Ensure power quality through stable voltage and frequency. Provide the means to coordinate the operation of the two power plants so as to ensure power stability. Ability to control the power flow of the interconnection and allow the two plants to smoothly disconnect and reconnect without the danger of blackouts on either end.

The Solution

MAS's proven Power Management Systems combined with its powerful SCADA system was chosen by the PPC as the best solution. Leveraging on its 50 years of specialised know-how MAS was the only company that was able to provide a technical robust and functionally complete solution.





POWER MANAGEMENT

The solution comprised of upgrading the existing unit control systems and adding a latest technology power management layer with an advanced cross-grid SCADA monitoring system. This multi million investment was executed in several steps without disturbing the power production and included:

I. The upgrade of all unit control system with new latest technology governing and AVR system that provided fast and precise frequency / power and voltage control. For older units the complete local control panel was replaced with new digital systems with Woodward controls and extended HMI systems.

II. A new control layer was added to provide isochronous power management capabilities. An advanced Woodward PMS system provides automatic frequency & voltage control, active and reactive load sharing and responds to power fluctuation ensuring power stability. In addition, automatic and seamless synchronisation of one grid with the other is supported.

III. An advanced and independent power balancing system to automatically manage power shortage situation ensuring that neither plant will go to a blackout in the event of a failure at the interconnection cable. Monitoring several parameters including unit load, spinning reserves, calculated mechanical momentum, grid frequency & voltage, etc. the system is capable to determine if a power disturbance can be safely recovered by the PMS or if load shedding is needed. If load shedding is decided then distribution lines to be dropped are decided based on several parameters including size, priority and load importance.

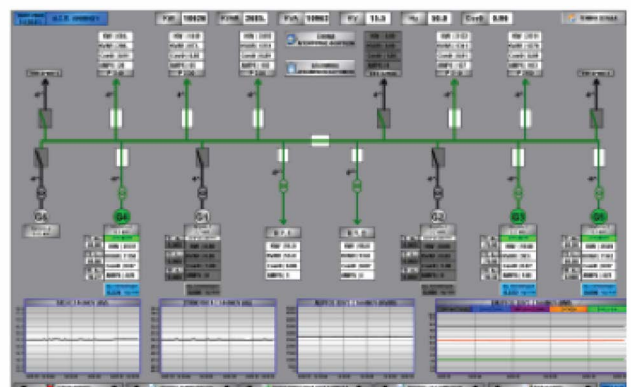
IV. A new SCADA system monitoring thousands of parameters and providing upper level control capabilities and unified management of both sub-grids. The two stations were connected by a high bandwidth microwave dish providing the on-line exchange of operational information. Operators at both ends are aware of the counter-plant activities and are able to manage operation accordingly. Several automatic operations are provided where the plants unit operations are automatically adjusted to stabilise overall grid demands.

The project was awarded to MAS on a turn-key basis and included Engineering, Development, Procurement, Construction, Installation, Commissioning and Training. After the provisional acceptance MAS maintained also an active operational involvement for one year. Finally, correct planning and project management ensure that no service interruption was experienced by consumers.

The Result

The new system not only solved the initial problems but also improved the overall operations of each power plant as well as the overall quality of service to consumers.

New unit control systems allow for better and more stable control of the production. The Power Management layer maintains even loads thought all running units while allowing and considering the optimal and most economical operational scenario for load distribution.



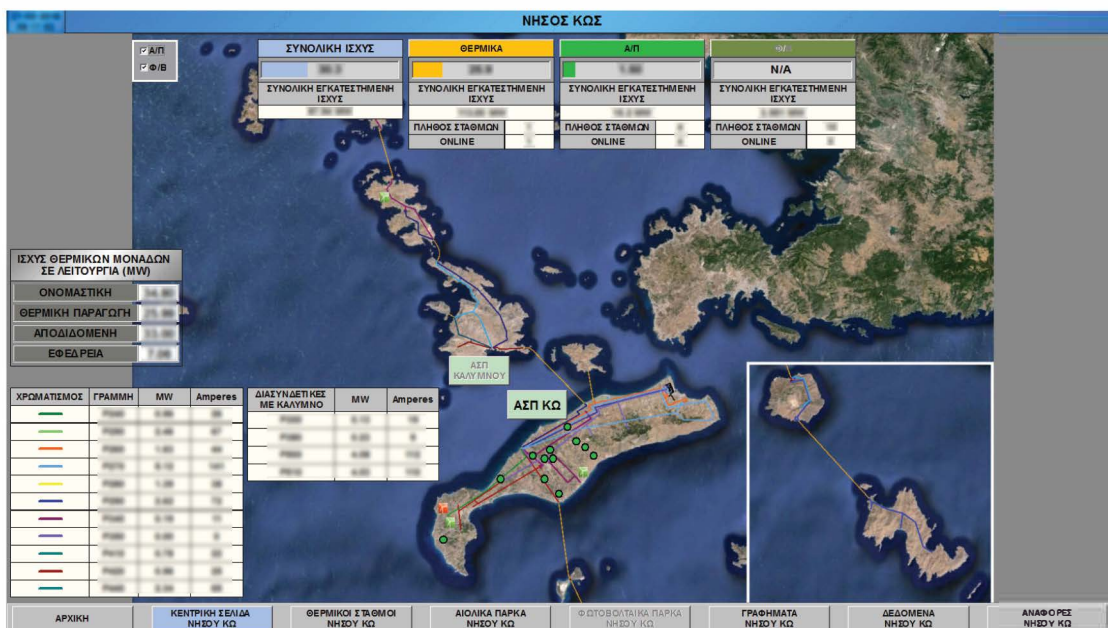


POWER MANAGEMENT

The Result

While all the underlining systems do most of the operational jobs in the background, operators are able to monitor the overall result through the unified SCADA system and plan ahead important production tasks while responding and resolving ongoing minor issues. Overall the new system managed to:

- I. Resolved completely all issues with power quality & grid stability.
- II. Offer total control on the power from and to each sub-grid utilising all units in the grid as these contribute actively in maintaining nominal frequency and voltage. As such more economical operation was achieved by base-loading Kos more efficient units and using Kalimnos units to cover power fluctuations.
- III. Provide advance protection from power disruptions but also easy and fast recovery from such events.
- IV. Deliver an overall new way of operating the plants with a new and unified SCADA control system, where overall grid management is performed, as opposed to the independent operation of two separate power plants.
- V. Allow both plants to operate unified but also independently respond in the unlikely event of an interconnection failure.



MAS SA is one of the few engineering companies in Europe specializing in the **upgrade, design, development and installation of advanced power management control, protection and monitoring systems.**

Covering a wide area of expertise for over **50 years**, we **provide solutions for complex problems** both in the Industry of **Maritime**, as well as **Land brownfield projects** (Power, Oil & Gas and Heavy Industry).

For any further information please contact us via email at info@maseurope.com