The Hybrid Power Station (HPS) described in paper 10712 has a contracted power of 400kW while it combines a Wind Turbine (WT) of 800kW, 2 x $NaNiCl_2$ Prototype BESS 400kW / 1440 kWh (each) and a PV plant of 160kWp. The WT and the BESS are installed in the Northern part of the island, while the PV lies approximately 6km to the South East in the mainland of Tilos.

The daily Power Command schedule issued by the DSO (HEDNO) defines the daily production mix of Kos-Kalymnos NII system and needs to be followed at an hourly basis from all production units of the NII system, including Tilos HPS. The daily Power Command Schedule sets the Steady State Operation of the HPS. Power and energy control algorithms integrated in the HPS SCADA – EMS optimally allocate the set-point. Moreover, fast response alterations in the Steady State output of the HPS can be imposed by the DSO, whenever real time constraints of the NII system are violated (technical minimum restrictions of thermal units, dynamic limitation of operating wind turbines). The real time constraints which typically last a few minutes lead to the Transient Response Operation of the HPS (lasting a few minutes). When in Transient Response Operation the HPS BESS is able to flexibly adapt (~200ms – 500ms) to the output alterations imposed. Finally, during major faults of the submarine interconnection cable between Tilos and the rest NII system or under test conditions the HPS can operate in Island Operation mode in parallel with the local diesel genset.

In order to ensure the optimal operation of the HPS in all operation modes the fast response of each component and their compliance to internal control is crucial. For that purpose, the SCADA – EMS implements the internal energy management algorithm of the HPS to ensure the operation of the station. Except from the DER production units of the HPS , namely the WT, the BESS and the PV, various other components communicate in real time with the SCADA – EMS which include the MV Circuit Breakers within MV cubicles and the overhead DSO lines, the Power Meters located at the MV connection points of each component, the local Tilos diesel genset, the Production Forecast Server, the two Weather Stations , the required servers of DSO (located locally and in the island of Kos) and Tilos load power analyzers. All the communication signals received affect the HPS internal energy management algorithms and are necessary for its optimal operation.

System data network is based on Industrial Ethernet, which has the bandwidth to undertake a very large data transfer volume at fast rates which is required for the operation of the HPS as a flexible unit. It is worth noting that the SCADA – EMS fetches data from the database for the WT and the PV farm every 5 seconds and for the BESS inverters every 500msec so that the HPS' real time operation is rapidly monitored and thus controlled. Moreover, a star type network topology has been applied which allows to every device to be connected at the same time at the server (no poling) ensuring the optimal availability. In more detail, ADSL and VDSL telecommunication lines, together with a network of antennas for connecting the control room with the remote telecommunication points, were installed for the remote RES monitoring. In addition, an installed PLC controls signals from the MV equipment of WT and BESS inverters, while accordingly, the installation of fiber and control cabling is also implemented.