ULSTEIN®

ULSTEIN PMS™

– POWERED BY X-CONNECT™

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Prepare your ship for a digital future

New technologies can radically improve the efficiency of how a ship is operated. The future is about embracing these possibilities, developing products for safer and more efficient operations.

This is at the core of product development in X-CONNECT. With our effort on offering products and systems that utilize digital possibilities, you can offer ship intelligence that make your business smarter, safer and greener.

Prepare your ship with solutions utilizing digital opportunities.

1 Power Management System

The ship's Power Management System (PMS) is responsible for handling the electrical power system and distribution of power onboard the ship. The PMS performs simple tasks such as opening and closing circuit breakers, starting and stopping diesel generators (or other power sources) as well as more advanced and crucial tasks. Such crucial tasks can be synchronization of power sources to the bus tie, synchronization of sections, blackout prevention and blackout handling.

A well functioning PMS ensures safe and fuel efficient operations and has a natural place on all modern ships.

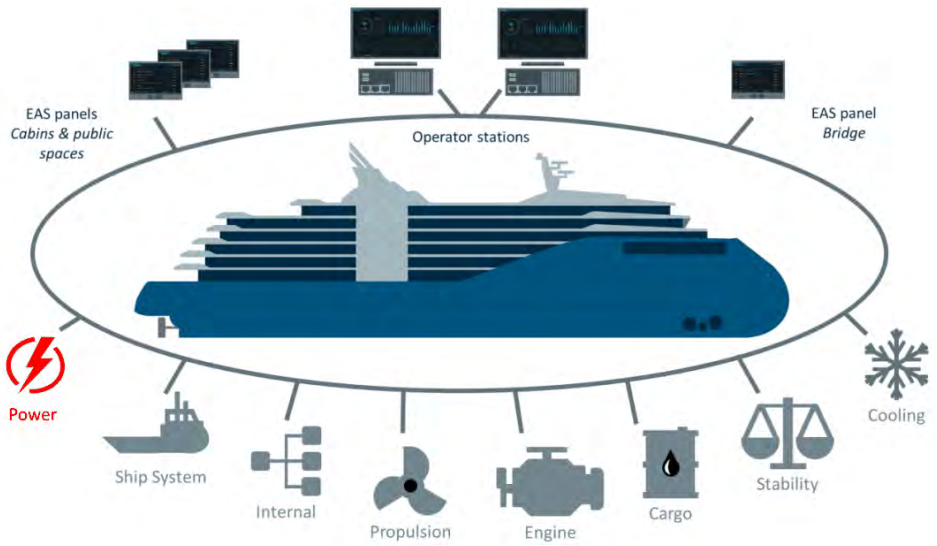

Figure 1: A well functioning PMS is imperative for safety and fuel efficiency on board

2 ULSTEIN PMS™

Advanced functionality – easy operation. ULSTEIN PMS™ is the advanced ship power management system built and configured on the universal user friendly automation platform X-CONNECT™. ULSTEIN PMS™ has the same modern and intuitive graphical user interface (GUI) as other products build and configured on X-CONNECT™ and provides an intuitive system overview and full control of the important components in the ship's electrical system. The GUI comes with both a day palette (Figure 2) and dusk palette (Figure 3) to always give the operator the best possible user experience. This, and the combination of a wide range of standardized and configurable functionality, and high flexibility and scaleability, makes the ULSTEIN PMS™ an excellent choice for controlling your ship's power system.

Key benefits of the ULSTEIN PMS™:

- Power supply in accordance with demand
- Modern user friendly interface

- Range of standardized and configurable functionality
- Highly scaleable
- Supports almost any power system architecture
- Supports system segmentation
- Efficient delivery and excellent reliability in operation
- Can be delivered standalone or integrated with other X-CONNECT-product

Figure 2: ULSTEIN PMS™ day palette

Figure 3: ULSTEIN PMS™ dusk palette

2.1 Modern and friendly interface

As for the other products built on X-CONNECT™ the ULSTEIN PMS™ has a clean GUI with good overview of all the components (Figure 3). The most common operations can be done from this view, and the operator can easily access a popover window (Figure 4) with more advanced functionality by clicking on a component's settings.

The main components in ULSTEIN PMS™ are power sources, power loads, circuit breakers and power plants. Power sources can be diesel generators, batteries or shore connections. Power loads are heavy power consumers, for example a big thruster. Circuit breakers are separating the components from each other. Power plants are sections (groups) of power sources and power loads.

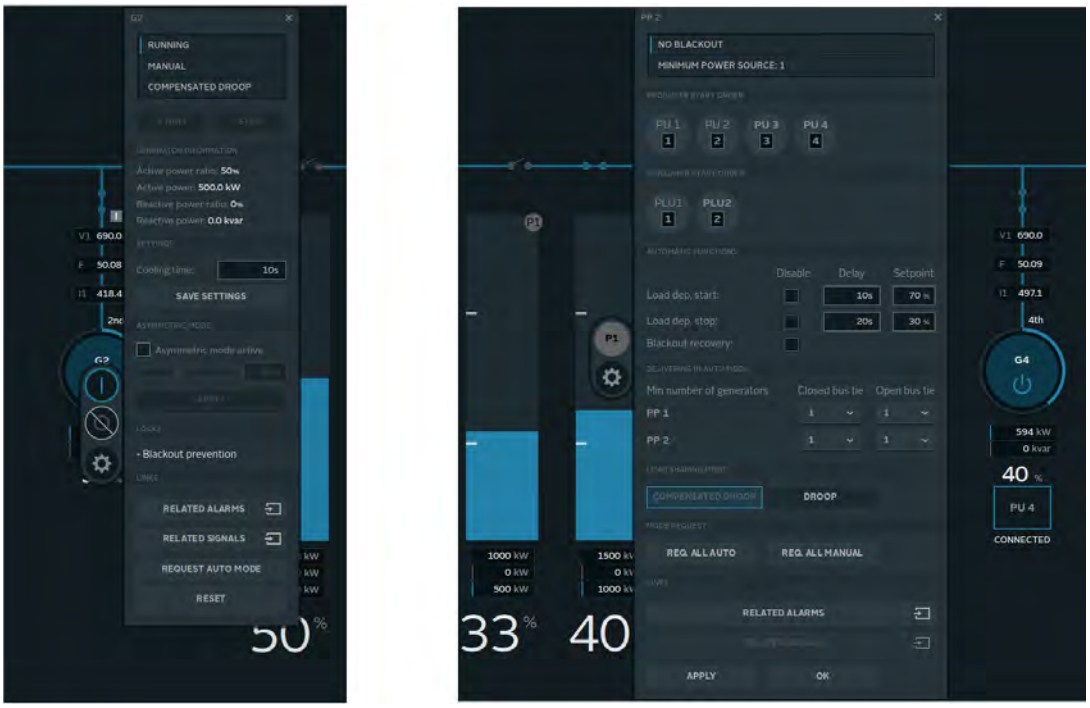

Figure 4: Popover windows with settings for diesel generator and power plant

2.2 Single line mimic

A single line mimic is available in ULSTEIN PMS™ to give the operator a complete overview of the power system onboard the ship. An example of this is shown in Figure 5. The PMS components can be operated also from this mimic.

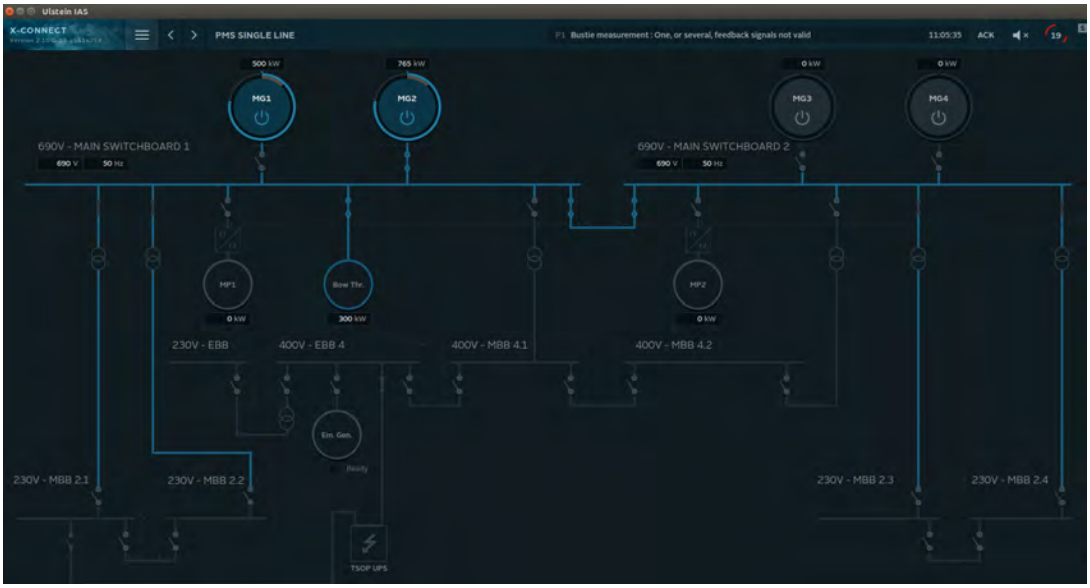

Figure 5: ULSTEIN PMS™ single line

2.3 Battery energy management system

Battery energy management systems can be integrated in the ULSTEIN PMS™with functionality such as peak shaving and spinning reserve. This heavily reduces the load on the shipboard power system and enhances operational safety and efficiency. When having sudden load peaks the battery will take the unexpected extra load instead of a diesel generator. This functionality is usually referred to as peak shaving. In some cases only one diesel generator is needed to provide enough power for the current load, but two diesel generators are running to prevent a blackout from happening if one generator goes down. In this case a battery can work as a spinning reserve instead of the second diesel generator and deliver the power needed before a new generator is started – fuel and equipment saved.

Different energy management system modes can be integrated in ULSTEIN PMS™ and the operator can easily switch between them in the GUI. Figure 6 shows a battery symbol in the PMS GUI together with the popover windows for the battery and the mode selector.

2.4 Easy and safe operations

Some examples of ULSTEIN PMS™ functionality that makes operation easier and more safe:

Example 1: Closing a circuit breaker between two power plants

When the operator is closing the circuit breaker between two plants the ULSTEIN PMS™ will synchronize the two power plants so their frequencies are within acceptable margins to be connected, then close the circuit breaker.

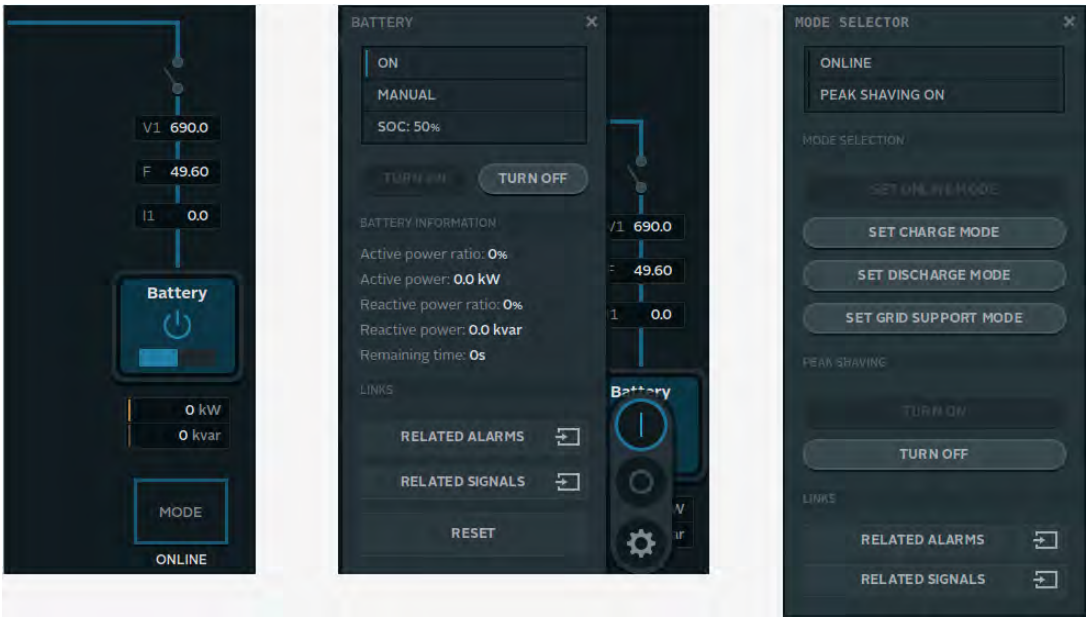

Figure 6: Battery GUI symbol, battery and mode selector popover windows

Example 2: Auto start and stop of power sources

The ULSTEIN PMS™ can operate automatically by starting and stopping power sources dependent on limits set by the operator. Examples of this can be that the PMS is to start up a new power source if the load on a power plant reaches 85%, and shut down a delivering power source if the load decreases below 30%.

Example 3: Blackout prevention

Interlocking – disable the possibility to open a closed bus tie breaker if opening it will cause one of the power plants to be without power as in Figure 7. Cause of interlock is shown in the popover window. Interlock is removed when both power plants have power sources delivering.

Example 4: Blackout recovery

If a blackout occurs ULSTEIN PMS™ will automatically start up the power sources available and close the necessary circuit breakers to get the power plant online again. This is signalled clearly to the operator in the GUI, as can be seen in Figure 8

Figure 7: Circuit breaker is blocked from opening to prevent blackout

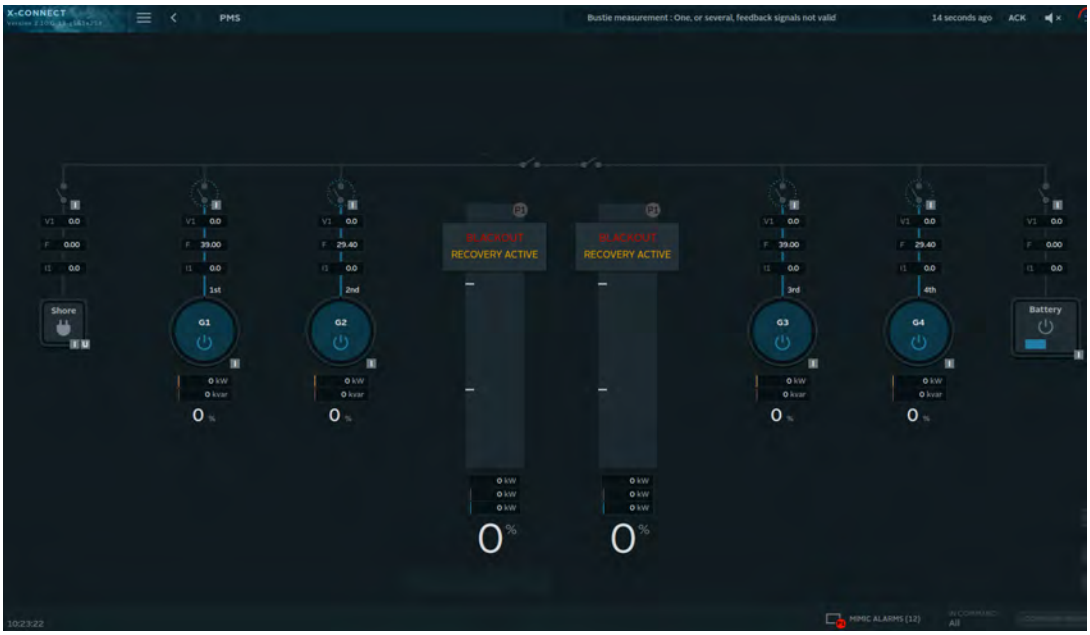

Figure 8: ULSTEIN PMS™ is performing blackout recovery

2.5 Configuration and fault handling

As all other products built on X-Connect™ the ULSTEIN PMS™ is configured using the X-Connect Studio™ and is fully configurable. It supports most combinations of power sources, power loads and circuit breakers which makes it suitable for a range of different installations – all from small fishing vessels to big cruise ships.

The fault handling mechanism in ULSTEIN PMS™ is extremely flexible. As can be seen in Figure 9 a set of custom fault handling actions can be configured for different faults. These actions can be triggered by both changes in signals or alarms and with different conditions fulfilled. In the example in Figure 9 the generator will be shut down only if the disconnect action is unsuccessfully executed.

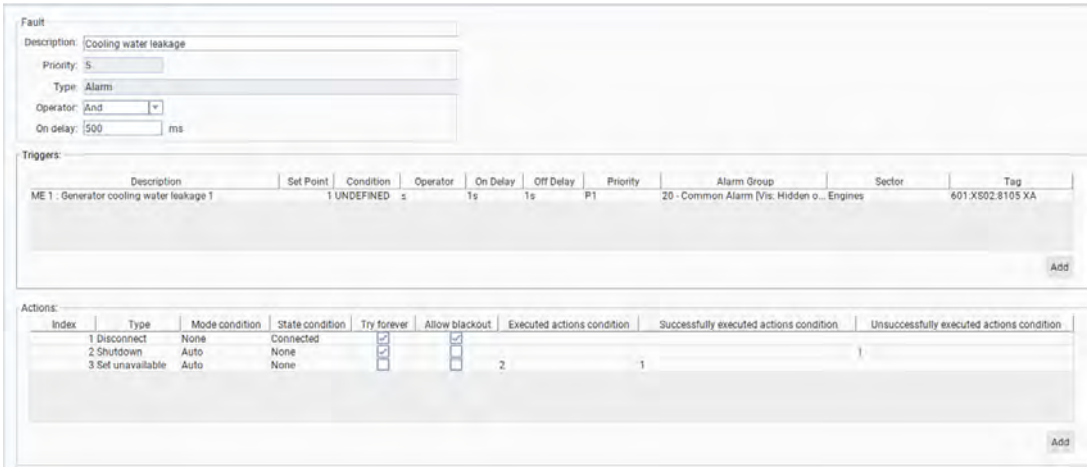

Figure 9: Configuration of fault handling

2.6 Mode manager / mode selection

The mode manager is an all purpose component and can be used to setup modes in various types of systems. The mechanism is very flexible and can be used to execute a number of different sequences, from closing bus-ties to adjusting limits for load dependent start. The pre-defined modes are configured using the X-Connect Studio™ and can easily be tailored to fit various types of vessels and operations. This provides substantial benefits for the PMS as it can be setup to adjust the various plant settings and its units to a given state with one click of a button. This will reduce the amount of manual clicking and adjustments of the various units' state and settings, hence also reducing the risk of human errors.

The mode is activated using the apply button on the symbol as shown in Figure 10, or in the detailed popover as shown in Figure 11.

Figure 10: PMS mode symbol

In the detailed view in Figure 11 it is easy to get an overview of what actions will be executed when the apply button is clicked and what conditions are required for the mode to be "active". The example in Figure 11 illustrates a pre-defined mode used to optimize and use the battery in an efficient manner, where the battery is connected and the generators are only started if the battery needs charging. Another example could be a "high-power" mode where all generators are powered up and the bus-ties are open.

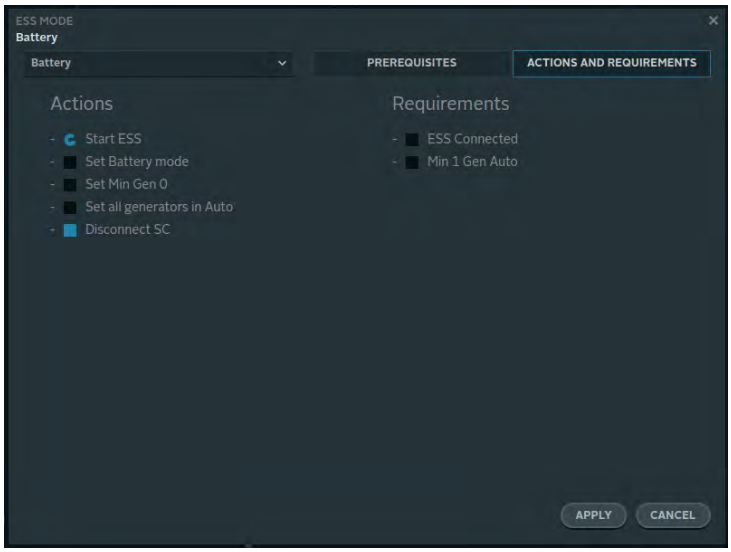

Figure 11: PMS mode overview

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