PSW POWER & AUTOMATION

Shore power to X

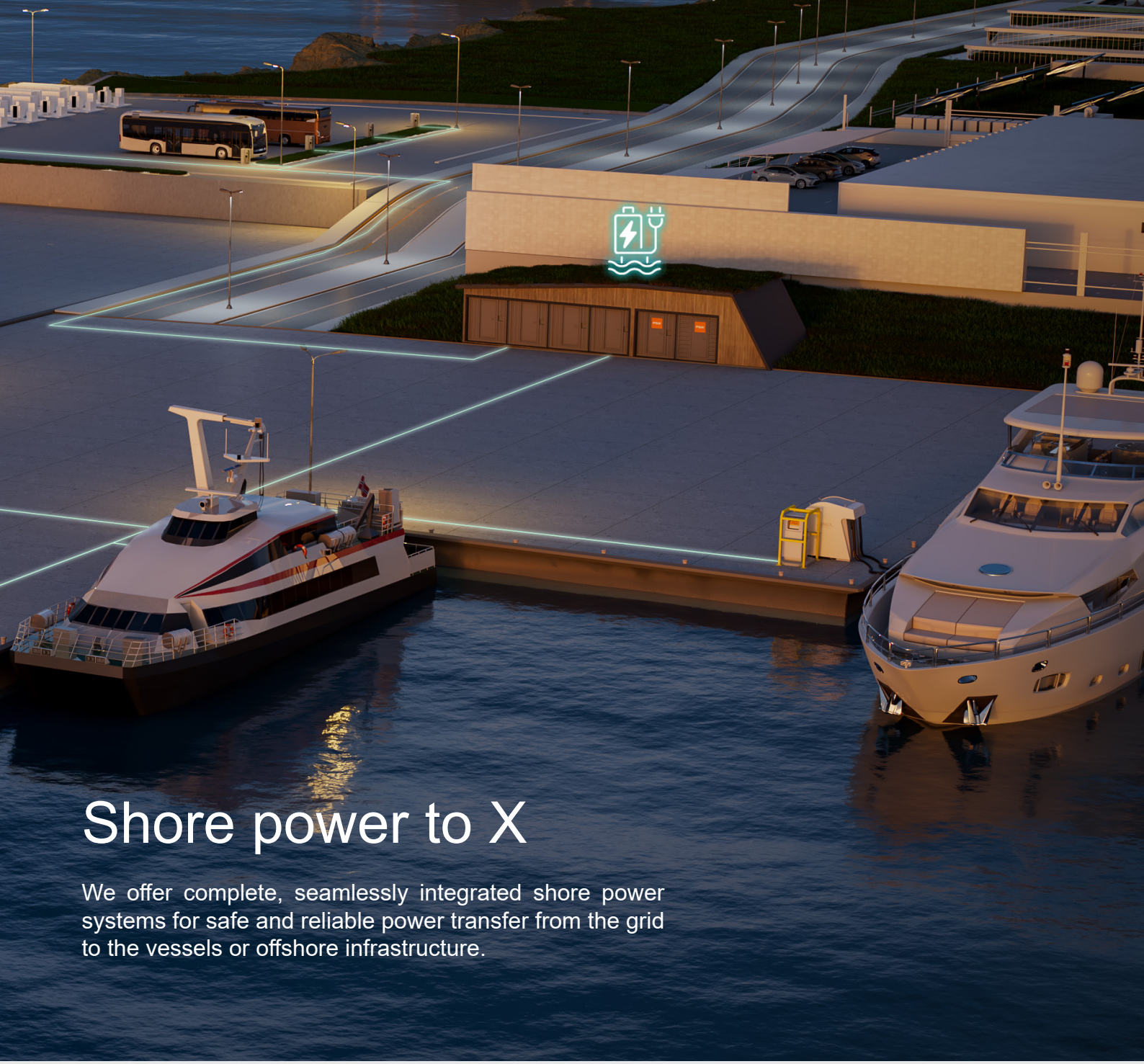
An energy hub

What is X?

PSW Power & Automation focus on improving return of investment for our customers has resulted in a new and innovative solution. The Shore power to X solution integrates grid balancing batteries, solar, hydrogen, DC fast charging and AC shore power into one infrastructure solution.

Megawatt charging solution

We offer an integrated charging solution combining a Battery Energy Storage System (BESS) with a smart energy management system. This coordinated approach optimizes energy supply, storage, and consumption—enhancing grid flexibility while ensuring reliable and efficient charging for Zero Emission high-speed vessels.



Shore power to X

We offer complete, seamlessly integrated shore power systems for safe and reliable power transfer from the grid to the vessels or offshore infrastructure.

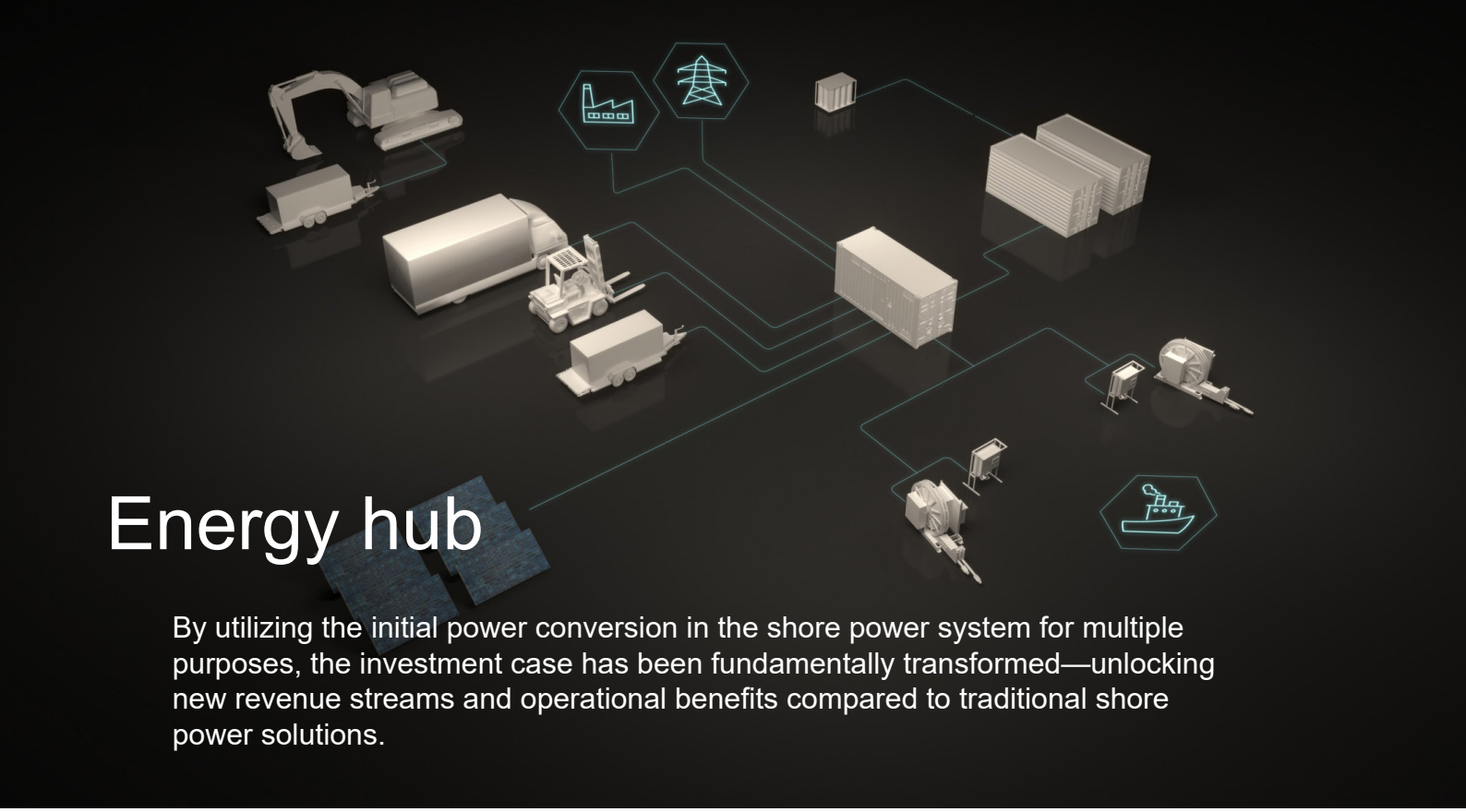
Utilize existing infrastructure

The initial AC/DC conversion in conventional shore power systems is identical to that used in grid-scale Battery Energy Storage Systems (BESS). By integrating this shared infrastructure, the BESS can operate alongside the shore power system, providing grid services such as balancing and frequency regulation.

These services generate substantial revenue, making BESS a strong standalone investment. In fact, the income from grid services can offset up to 50% of the total shore power facility costs, significantly enhancing the overall business case.

Emergency power supply

The Shore power to X solution also offers emergency power functionality. When equipped with an integrated Battery Energy Storage System (BESS), it can operate as an Uninterruptible Power Supply (UPS), providing backup power to the local port grid or Distribution System Operator (DSO) during grid outages.



Energy hub

By utilizing the initial power conversion in the shore power system for multiple purposes, the investment case has been fundamentally transformed—unlocking new revenue streams and operational benefits compared to traditional shore power solutions.

Regional services

These services ensure a layered approach to grid stability, with BESS playing a vital role in providing fast, flexible, and sustainable energy balancing.

- FFR (Fast Frequency Reserve).
- FCR (Frequency Containment Reserve
- aFRR (Automatic Frequency Restoration Reserve).
- mFRR (manual Frequency Restoration Reserve).

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Local market services

- LongFlex - Availability-based contracts with varying durations, allowing participants to reserve capacity for longer periods.
- ShortFlex -Hourly activation products that provide short-term flexibility based on immediate grid needs.
- MaxUsage - Capped power products that limit electricity consumption over specific durations to prevent grid overload.

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- Optimization of energy distribution.
- Reduction of strain on the grid.
- Creation of financial incentives for participants.

Integrated energy control system

Real-Time Energy Management

The software continuously monitors energy production, consumption, and storage levels. It dynamically balances supply and demand by prioritizing the most efficient and sustainable energy sources.

Source Optimization

Maximizes the use of solar energy when available, reducing reliance on grid.

Battery

Charges during periods of excess generation or low-cost grid power and discharges during peak demand or outages. In addition to providing grid balancing services to the TSO and DSO.

Hydrogen

Activates fuel cells when solar and battery resources are insufficient or when long-duration backup is needed.

Grid Interaction & Islanding

The system can operate in both grid-connected and islanded modes. In case of grid failure, it seamlessly transitions to island mode, using batteries and hydrogen to maintain uninterrupted power.

Predictive Control & Forecasting

Using weather forecasts and historical data, the software predicts solar generation and load demand, enabling proactive energy scheduling and storage management.

Emergency Power Coordination

In critical situations, the system can prioritize essential loads and even enable reverse power flow from docked vessels to support the local grid or community infrastructure.

User Interface & Reporting

A user-friendly dashboard provides real-time insights, performance analytics, and system health monitoring, supporting both operational decisions and long-term planning.

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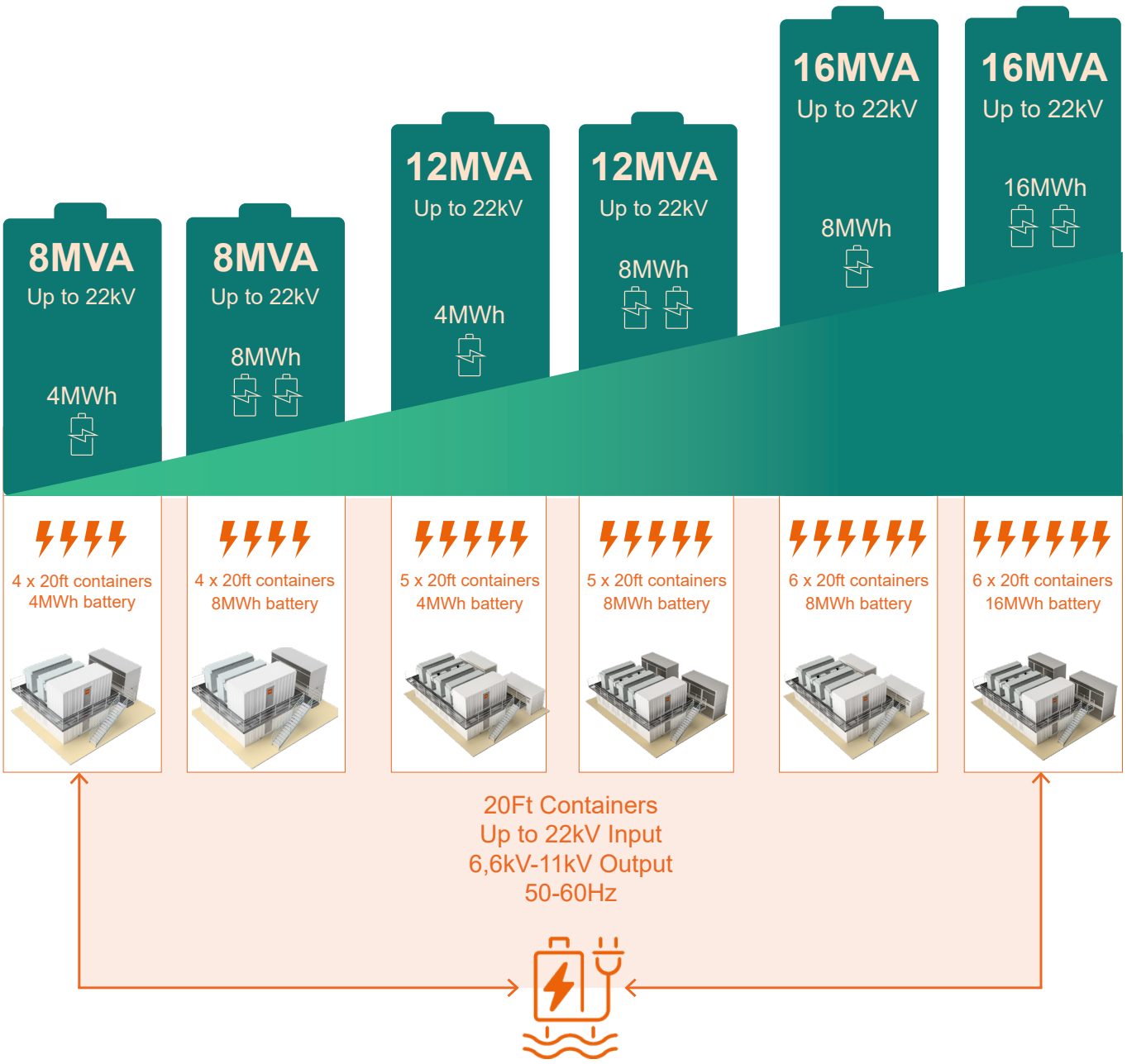
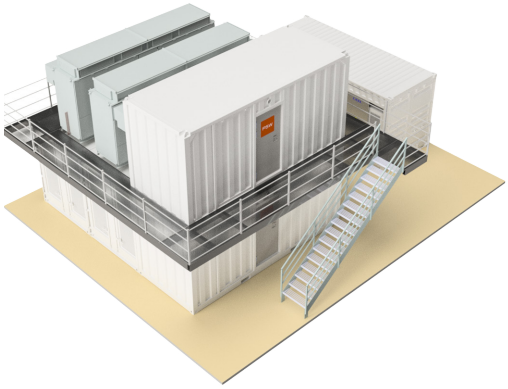
Shore power to X solutions



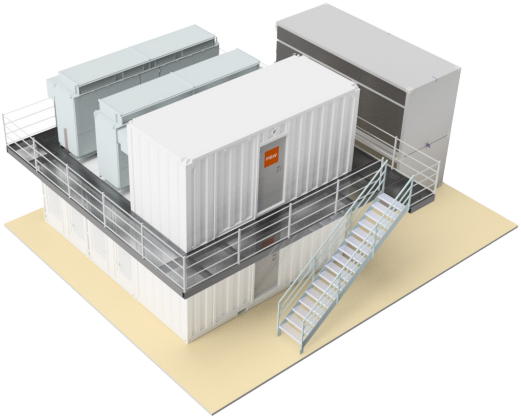
Module overview



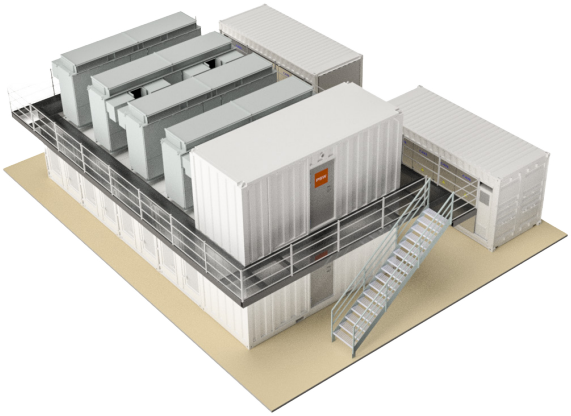
4MWh

8MVA

20Ft Containers
Up to 22kV Input
6,6kV-11kV Output
50-60Hz



8MWh



4MWh

12MVA

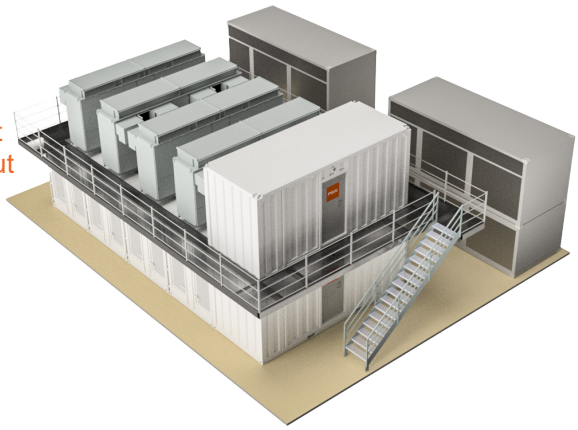
20Ft Containers
Up to 22kV Input
6,6kV-11kV Output
50-60Hz

8MWh

8MWh

16MVA

20Ft Containers
Up to 22kV Input
6,6kV-11kV Output
50-60Hz



16MWh

Marine Megawatt Charging System

We offer an integrated charging solution combining a Battery Energy Storage System (BESS) with a smart energy management system. This coordinated approach optimizes energy supply, storage, and consumption—enhancing grid flexibility while ensuring reliable and efficient charging for Zero Emission vessels.

Grid capacity is the bottleneck
- but it doesn`t have to be.

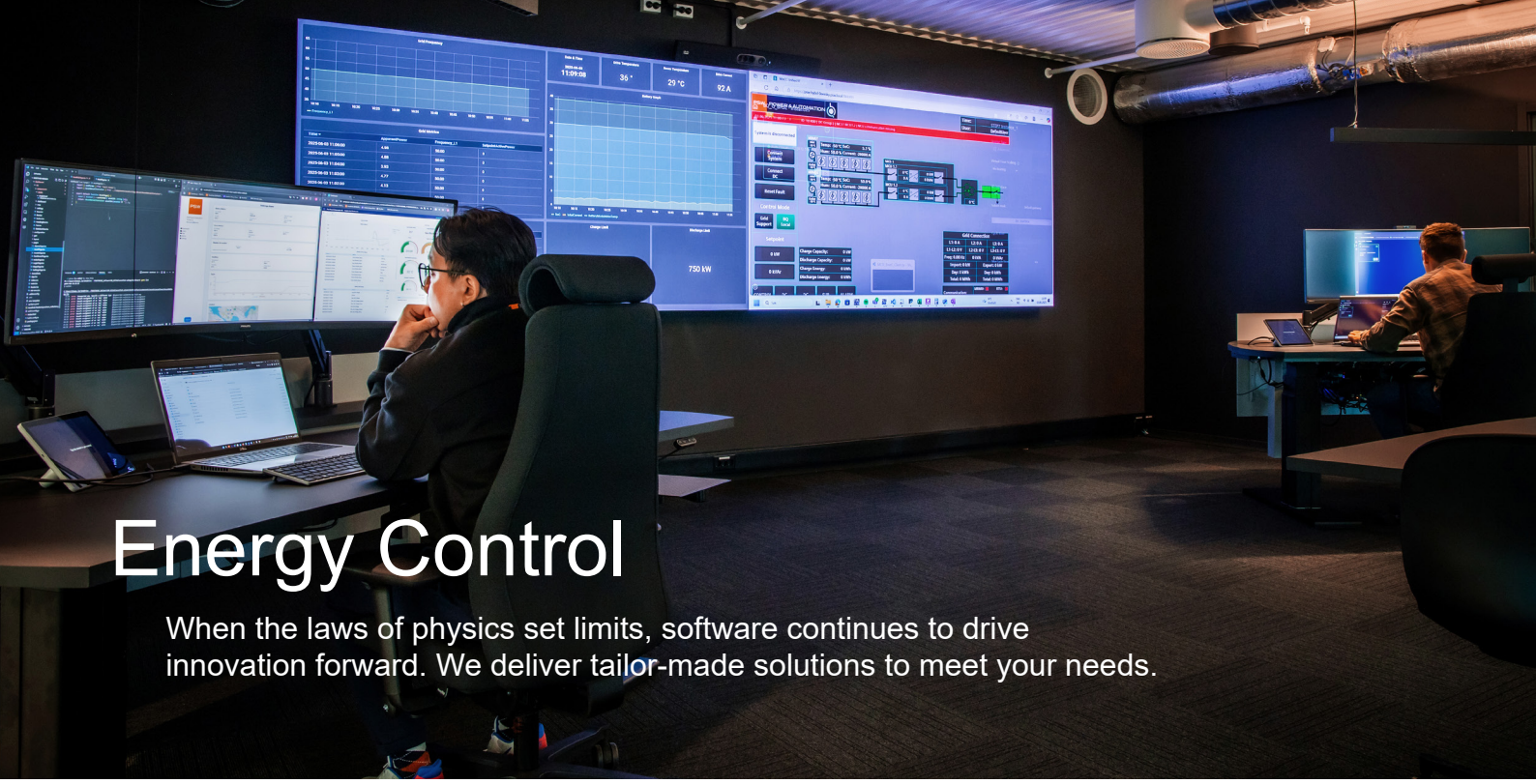
Power the transition
Solve grid limitations with BESS

Battery Energy Storage Systems (BESS) provide the missing link in marine electrification. By leveraging the available grid connection to charge onshore batteries, BESS enables the seamless transfer of combined grid and stored energy to vessels during charging.

This approach not only overcomes the challenge of limited grid capacity but also accelerates the transition to electrified marine operations. At the same time, it eliminates the need for costly grid reinforcements and infrastructure buildouts, delivering a smarter, more sustainable path forward.

Key benefits for the charging infrastructure:

- Immediate relief from grid constraints - deploy charging stations faster.
- Peak shaving & load balancing – reduce peak demand and stabilize the local grid.
- Sustainable – accelerated electrification.



Energy Control

When the laws of physics set limits, software continues to drive innovation forward. We deliver tailor-made solutions to meet your needs.

Energy Management System

Our Energy Management System can integrate individual entities or large complex systems, all depending on the energy infrastructure. Essentially, EMS provides safe and reliable operation in all modes while balancing energy produced, stored, and consumed.

With its data insight, the EMS fulfills the operational requirements and primary objectives of the designed energy system, enabling limited or prioritized power transfer to charging units, peak-shaving, reducing demand from a weak grid or to keep energy tariffs low.

For systems with energy production and storage, the EMS, with the help of its market insight, can act accordingly to leverage the best economic beneficial outcome between store, trade, or use.

When price arbitration and/or balancing services are a secondary endeavor and preserving battery life for its primary objectives is key, the EMS monitors and regulates the secondary activities (through communication with the AMS), ensuring that the use of batteries does not exceed given thresholds that will compromise their life, thus securing the batteries for its primary purposes and maximizing its lifetime for an optimal return on the investment.

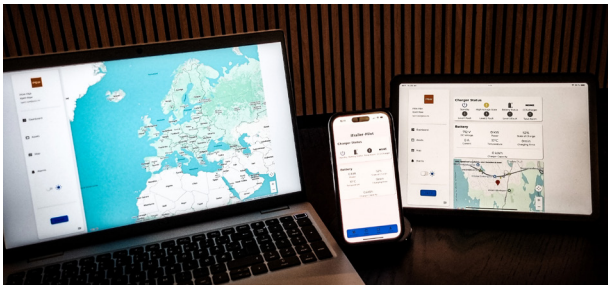
Asset Hub

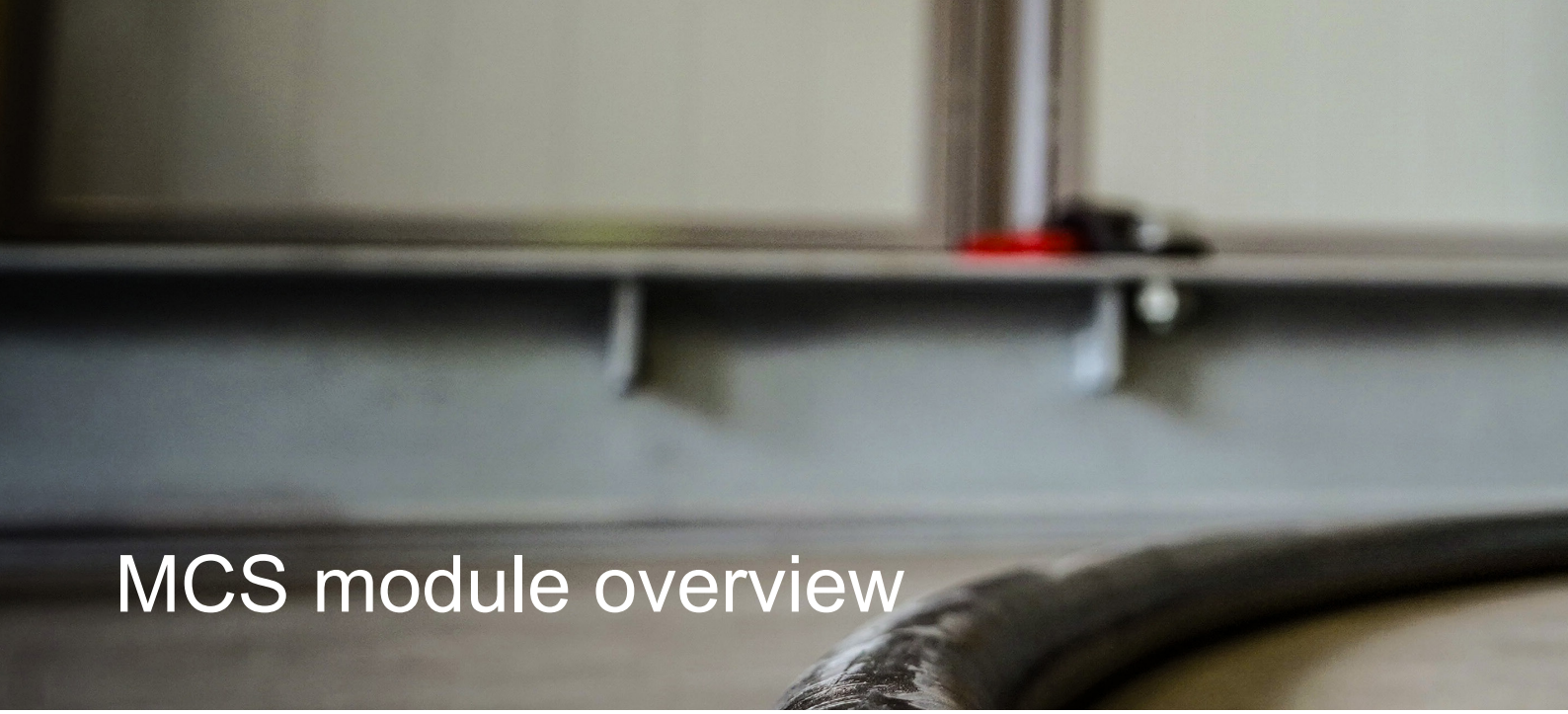
Asset Hub is an asset dashboard customised for your asset collection. This user interface displays key figures for asset status and health, and for some applications, market data and revenue are visualized to give a total overview.

Layout and data-fields will vary and depend on the type of assets and application. This is adapted to best suit the user-case.

The scheduling table enables users to control the time and day of market participation. Alternatively, this can be handled from the AMS automatically.

The Asset Hub is web-based, so no software installation is required. If desired, an Asset Hub API is available for customers who wish to integrate this into their own systems.





MCS module overview

The product range for the MCS Chargers and additional battery packs is built on standard building blocks.

Our Megawatt Charging System (MCS) inverter voltage range is from 500-1500VDC and 1500-3000A outputs. Our Battery solution range is from 400kWh-9MWh in a building block.

MCS inverters

Low voltage MCS inverter

- Up to 4x1500A outputs or 2x3000A outputs
- Output voltage range 500-1500VDC
- AC input LV or MV with transformer
- Outdoor Inverter
- Air cooled system, no cooling liquids required
- Hermetically closed cabinet for the compartment with sensitive components (no dust, sand or rain inside)
- Ambient conditions -40°C up to 60°C, up to 5000m altitude (derating)
- Supply of up to 100% leading/lagging reactive power
- High efficiency

Low voltage Hybrid MCS inverter

- Up to 2x1500A outputs or 1x3000A output
- Output voltage range 500-1500VDC
- 2x1500A or 1x3000A battery connection
- AC input LV or MV with transformer
- Outdoor Inverter
- Air cooled system, no cooling liquids required
- Hermetically closed cabinet for the compartment with sensitive components (no dust, sand or rain inside)
- Ambient conditions -40°C up to 60°C, up to 5000m altitude (derating)
- Supply of up to 100% leading/lagging reactive power
- High efficiency

MCS charging towers

2 Plugs

- Up to 2x1500A or 1x3000A
- Output voltage range 500-1500VDC
- Liquid cooled MCS plugs

4 Plugs

- Up to 4x1500A or 2x3000A
- Output voltage range 500-1500VDC
- Liquid cooled MCS plugs

BQ-G Battery modules

1500VDC Battery cabinet

379kWh 1hr Application
407kWh 2hrs Application
705kWh 2hr Application

The battery cabinet is a modular fully integrated product, consisting of rechargeable lithium-ion batteries, with the characteristics of high energy density, long service life and high efficiency. The energy storage product is capable of various on-grid applications, such as frequency regulation, voltage regulation, arbitrage, peak shaving/valley filling, and demand response. Furthermore, the battery cabinet can be used for PV storage integration and wind storage integration. The system can also operate as a microgrid to support backup and islanded systems.

1500VDC Battery container

3,79MWh 1hr Application
4,07MWh 2hrs Application
6,25MWh 4hrs Application

The container is a modular fully integrated product, consisting of rechargeable lithium-ion batteries, with the characteristics of high energy density, long service life and high efficiency.

The energy storage product is capable of various on-grid applications, such as frequency regulation, voltage support, arbitrage, peak shaving/valley filling, and demand response. Furthermore the container can also be used in black start, backup energy, congestion management, microgrid or other off-grid scenarios.

1500VDC Battery container

9025kWh 2hrs Application

The container is a modular fully integrated product, consisting of rechargeable lithium-ion batteries, with the characteristics of high energy density, long service life and high efficiency.

The energy storage product is capable of various on-grid applications, such as frequency regulation, voltage support, arbitrage, peak shaving/valley filling, and demand response. Furthermore the container can also be used in black start, backup energy, congestion management, microgrid or other off-grid scenarios.

This product is delivered in two separate 20ft containers which are within road transport limitations and will be stacked together on site.

We are powered by the future

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