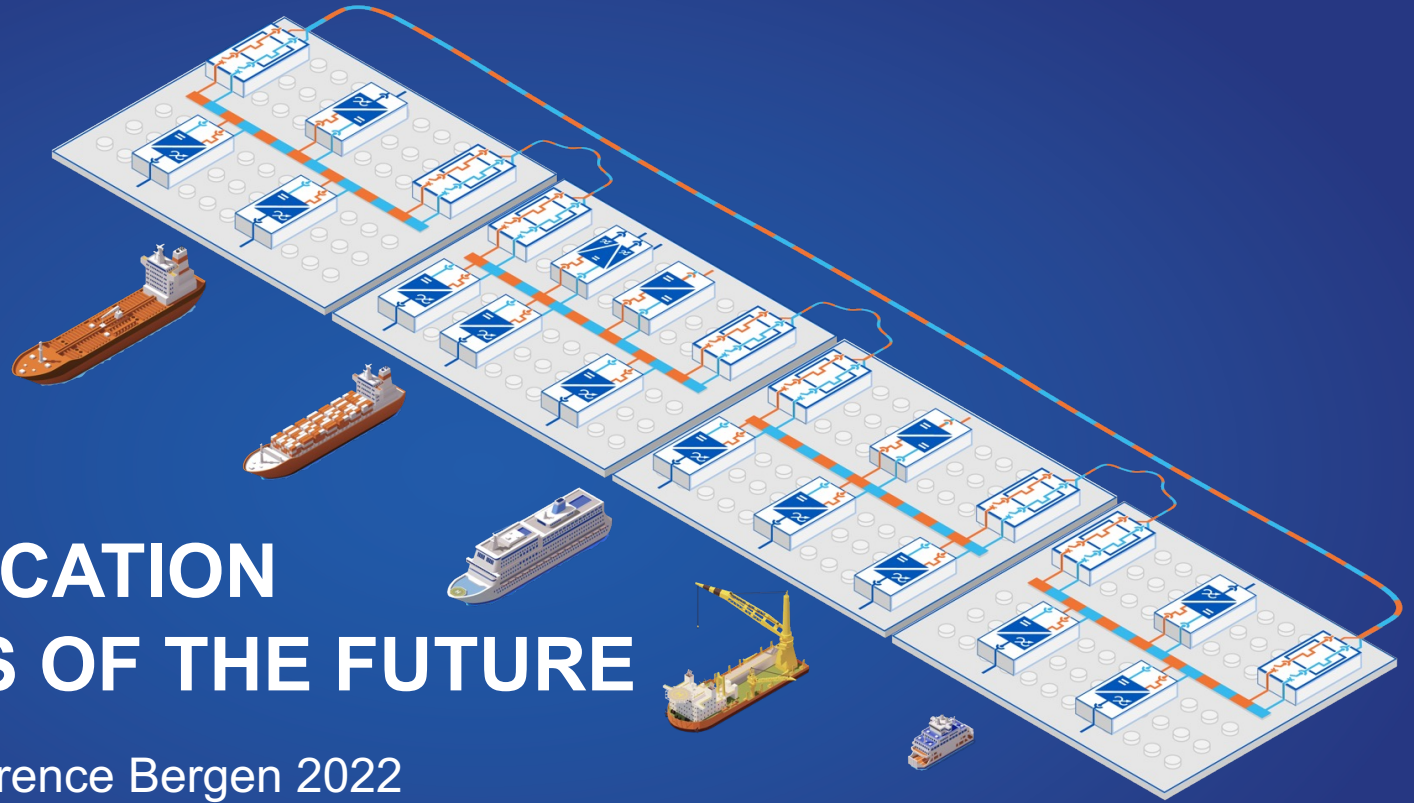


YASKAWA



ELECTRIFICATION AND SHIPS OF THE FUTURE

Digital Ship Conference Bergen 2022

Asbjørn Halsebakke
Manager Technical Solutions Marine

November 10, 2022

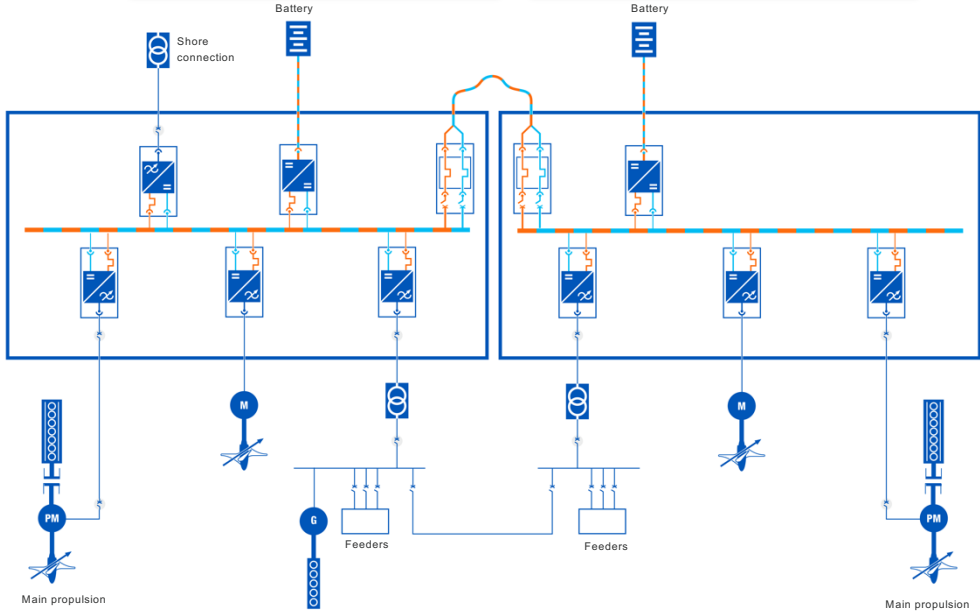
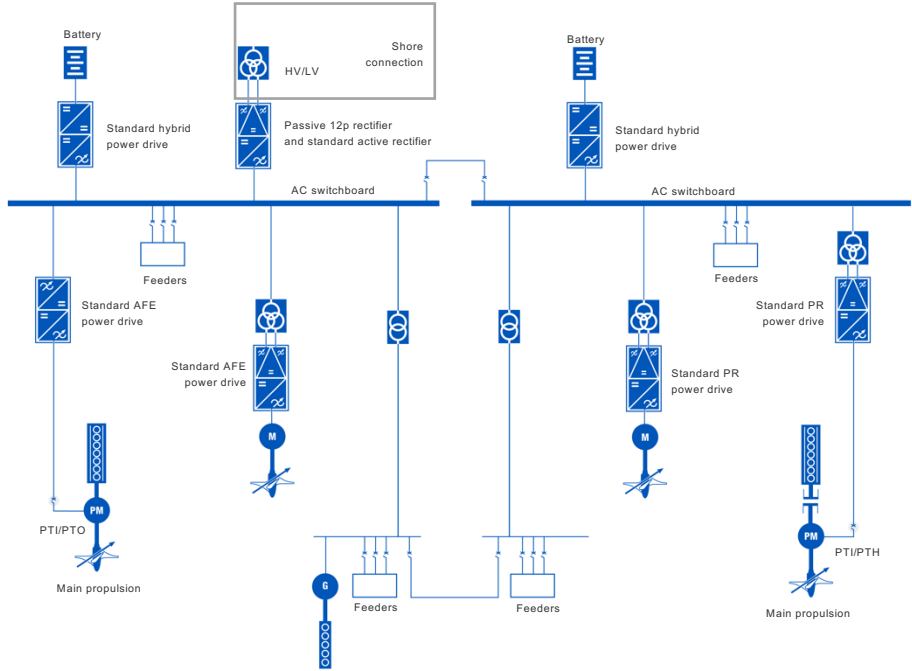
AC VS DC SYSTEM

AC

DC

Same performance with fewer components – better efficiency

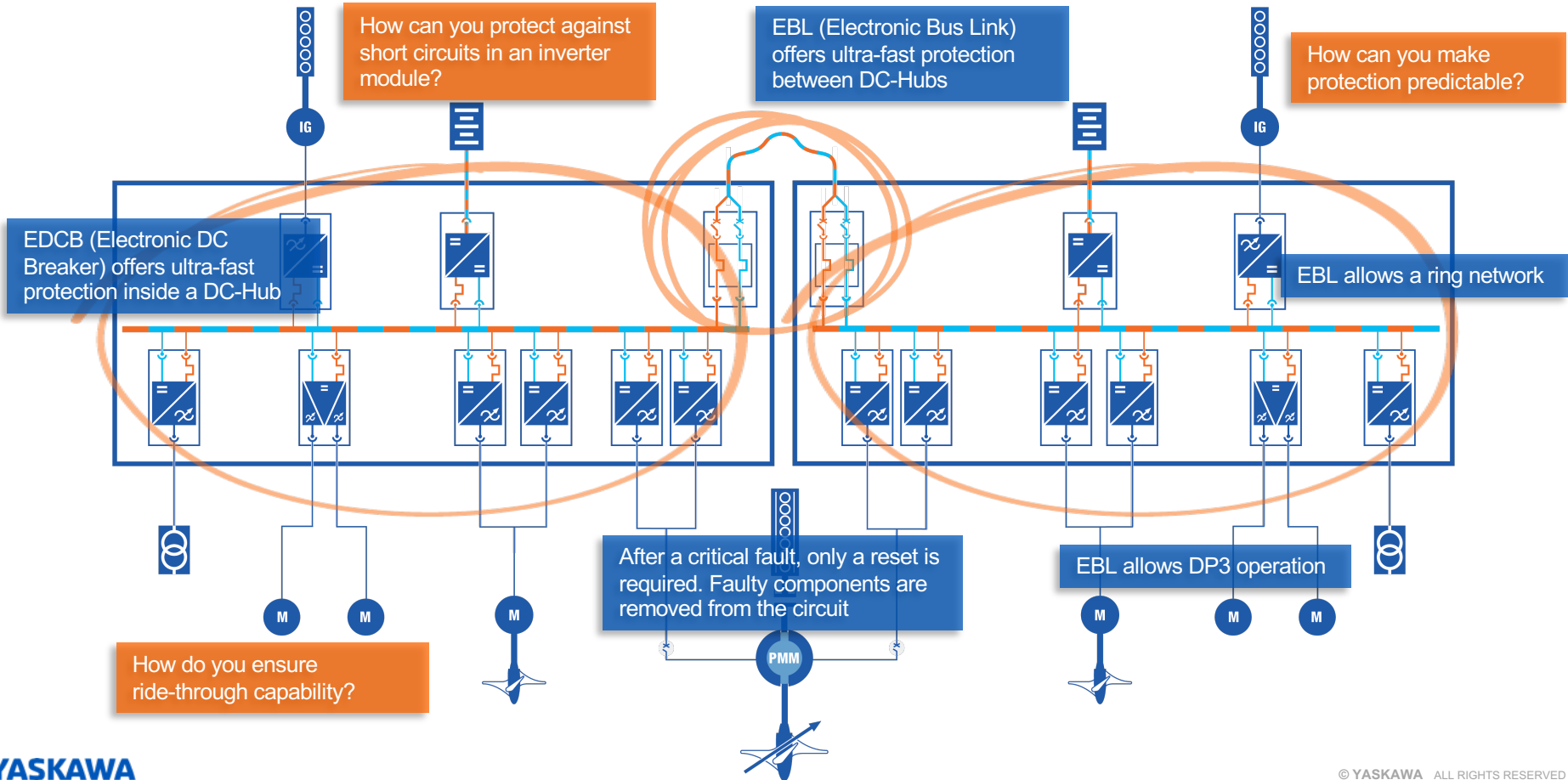
Increased reliability with ultra-fast protection concept and ring network



Flexibility to add components to existing system

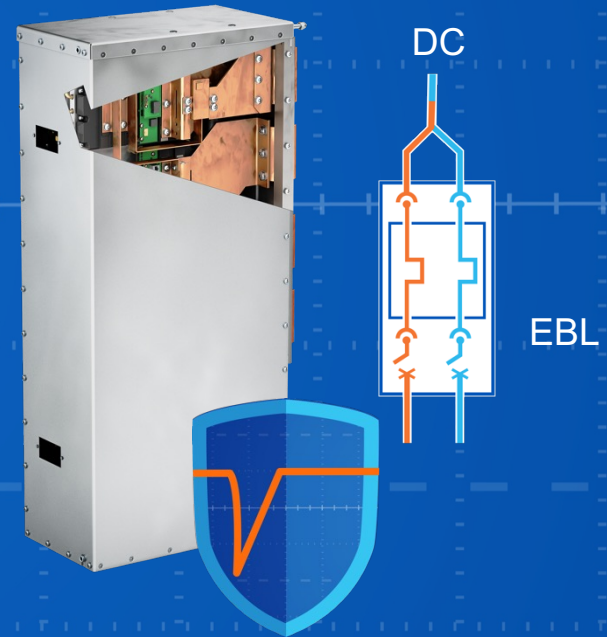
DC-Hub connects several consumers and sources to the same DC link

THE SWITCH DC-HUB PROTECTION CONCEPT



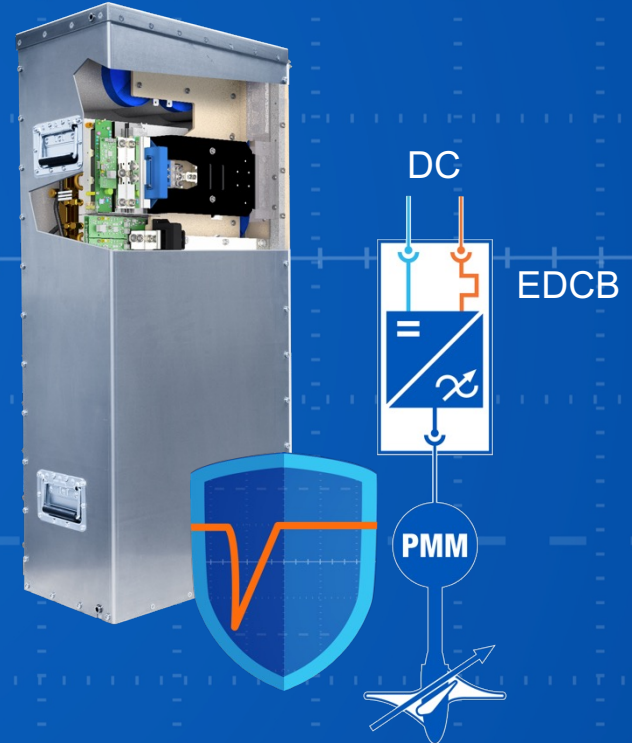
ELECTRONIC BUS LINK – EBL

- Connects The Switch DC-Hubs together
- Detects and disconnects critical faults within 10 microseconds
- Allows a ring network
- Improves redundancy while enabling fuel savings
- Tested and approved by DNV for DP3 operations

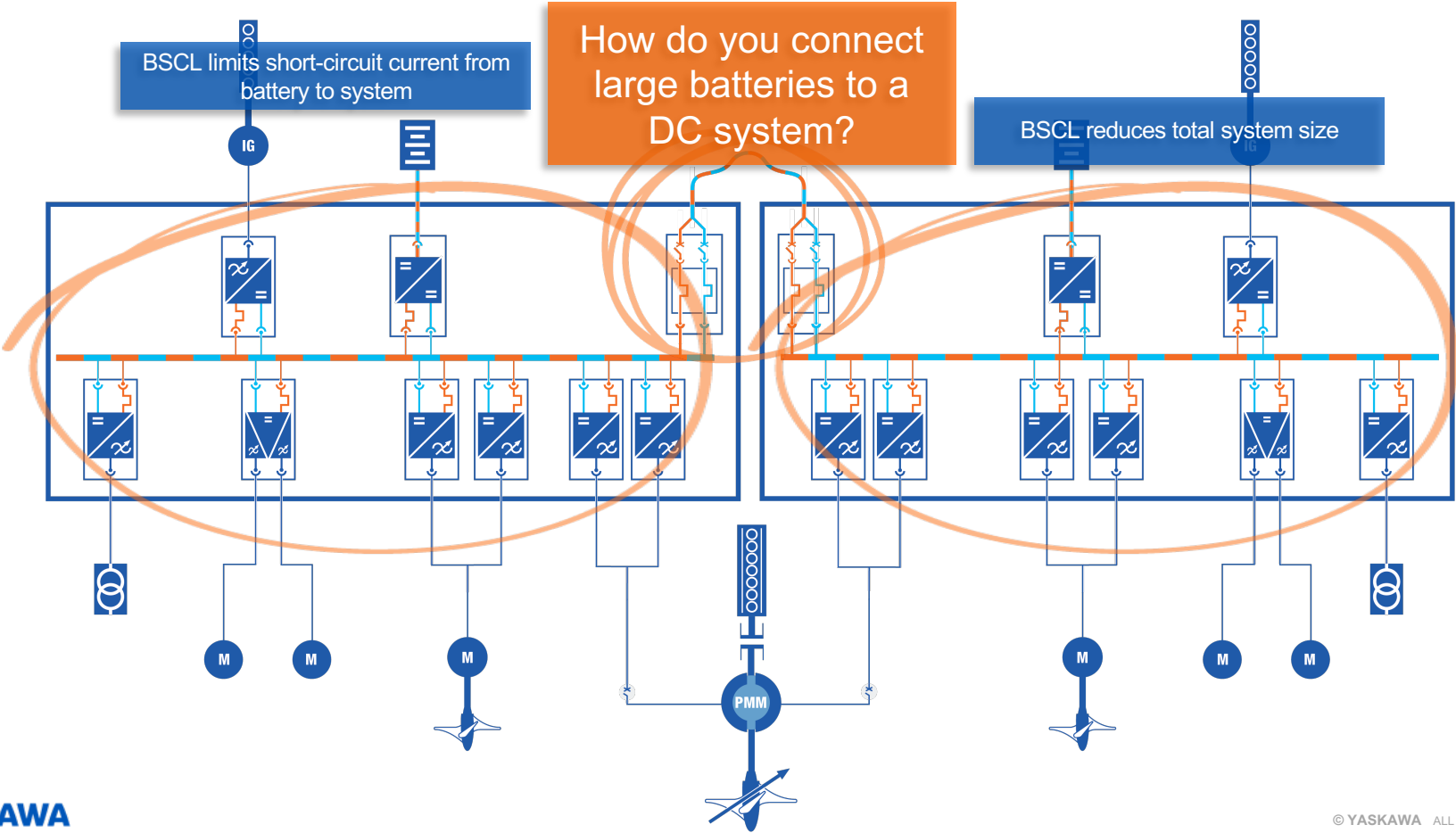


INTEGRATED ELECTRONIC DC BREAKER – EDCB

- Ultra-fast electronic fuse function
- Connects/disconnects power modules
- from the DC bus in 10 microseconds
- Pre-charges power modules
- Dampens oscillations on the DC bus
- Allows batteries to be added without exceeding short-circuit capacity



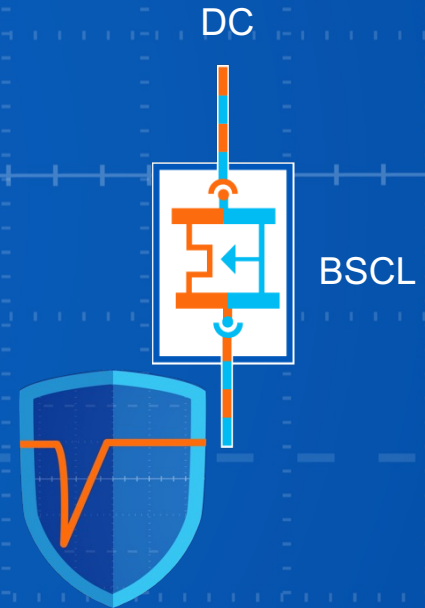
THE SWITCH DC-HUB PROTECTION CONCEPT



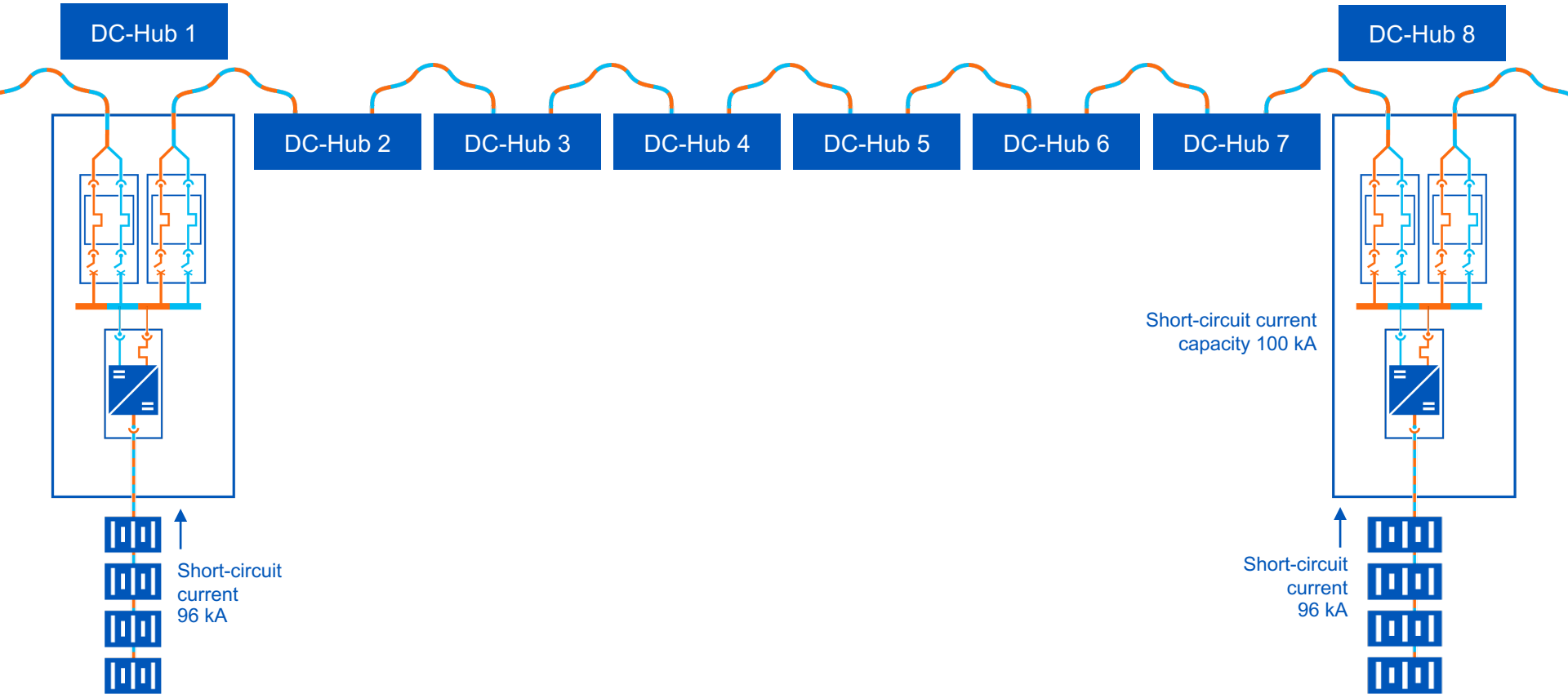
BREAKTHROUGH BLOCK #3 – PROTECTION ON THE INSIDE

BSCL

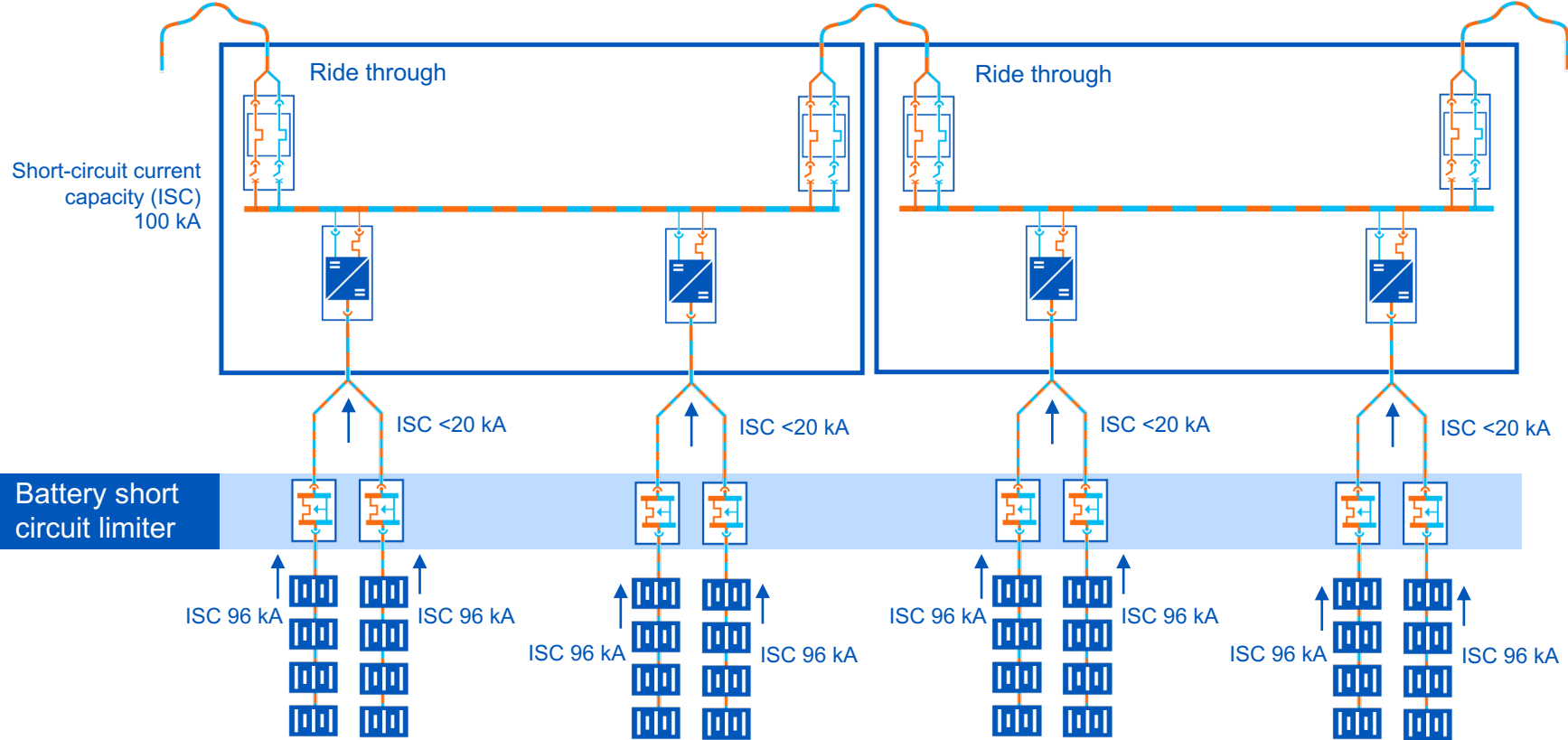
- Enables large batteries to be connected to existing electric systems
- Limits battery short-circuit current
- Reduces total system size
- Same technology as EDCB and EBL



SPLIT DC-HUB



DCDC CHOPPER & BSCL & SPLIT DC-HUB



YASKAWA ENVIRONMENTAL ENERGY

Yaskawa Environmental Energy provides The Switch electric machines and high-power converters to original equipment manufacturers (OEMs) and system integrators (SIs)

YASKAWA



1915
YASKAWA Electric Corporation
founded in Japan



14,500
Employees



€3.7 billion
Business volume
per year



Drives Motion Controls



Robotics



Environmental Energy

Yaskawa Environmental Energy / The Switch



~200 employees
150 Finland
30 Norway
20 China



Main focus on wind, marine
and turbo product families



2006
The Switch founded as a merger of
Rotatek, Veriteco and Youtility



2008
The Switch and Goldwind announce
the first deal for serial converter deliveries.
The Switch triples sales and staff



2013
The Switch enters the marine market
with PM technology



2014
Yaskawa acquires The Switch
in Finland



2016
The Switch acquires
Wärtsilä's Norway-based
marine power drive business



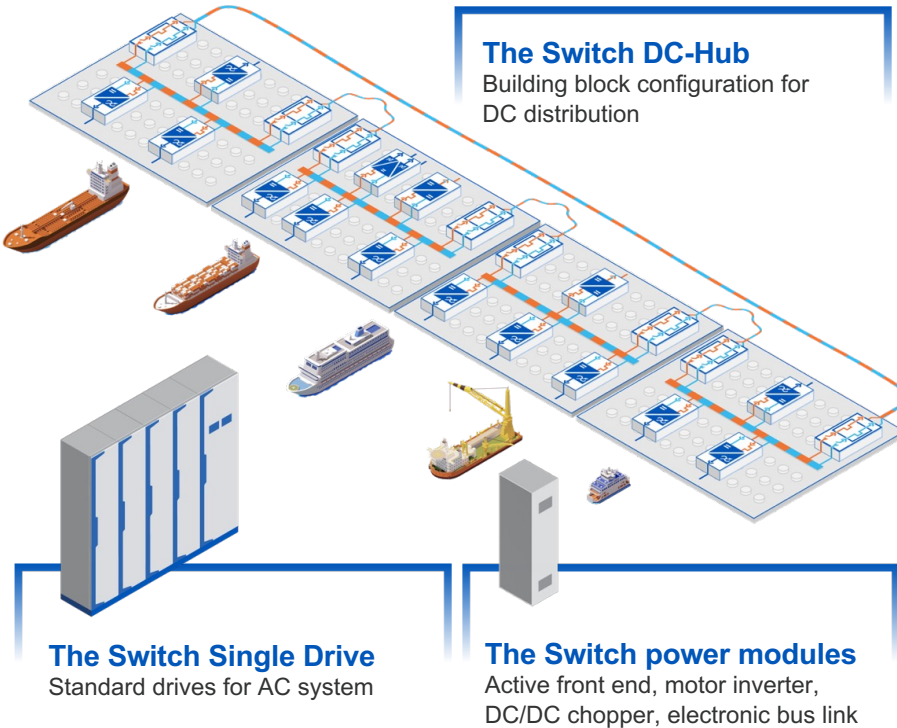
2018
The Switch becomes
Yaskawa Environmental Energy



2020
Large Drive Test Center
ready for renewable energy testing

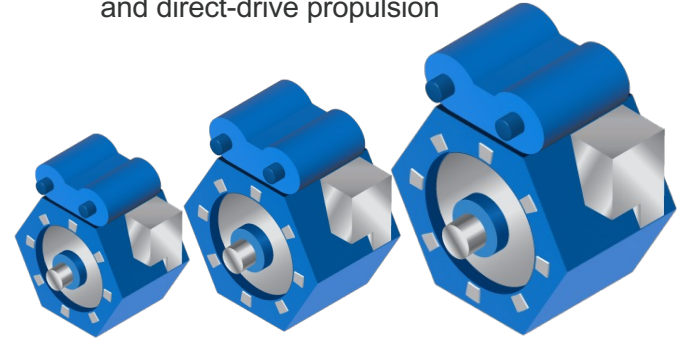
MARINE PORTFOLIO

The Switch marine products allow system integrators to build systems that lower emissions and fuel consumption while being future-flexible



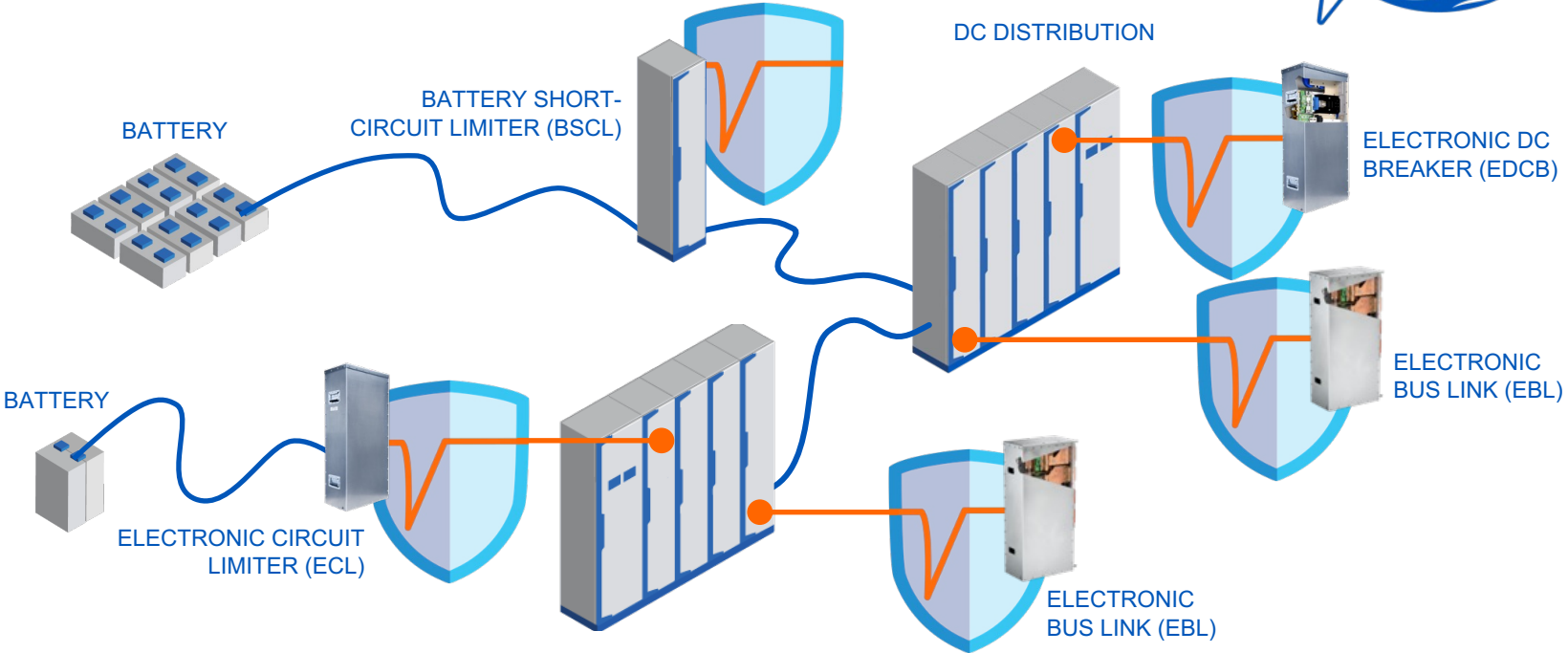
The Switch PMM

For direct-drive shaft generators and direct-drive propulsion

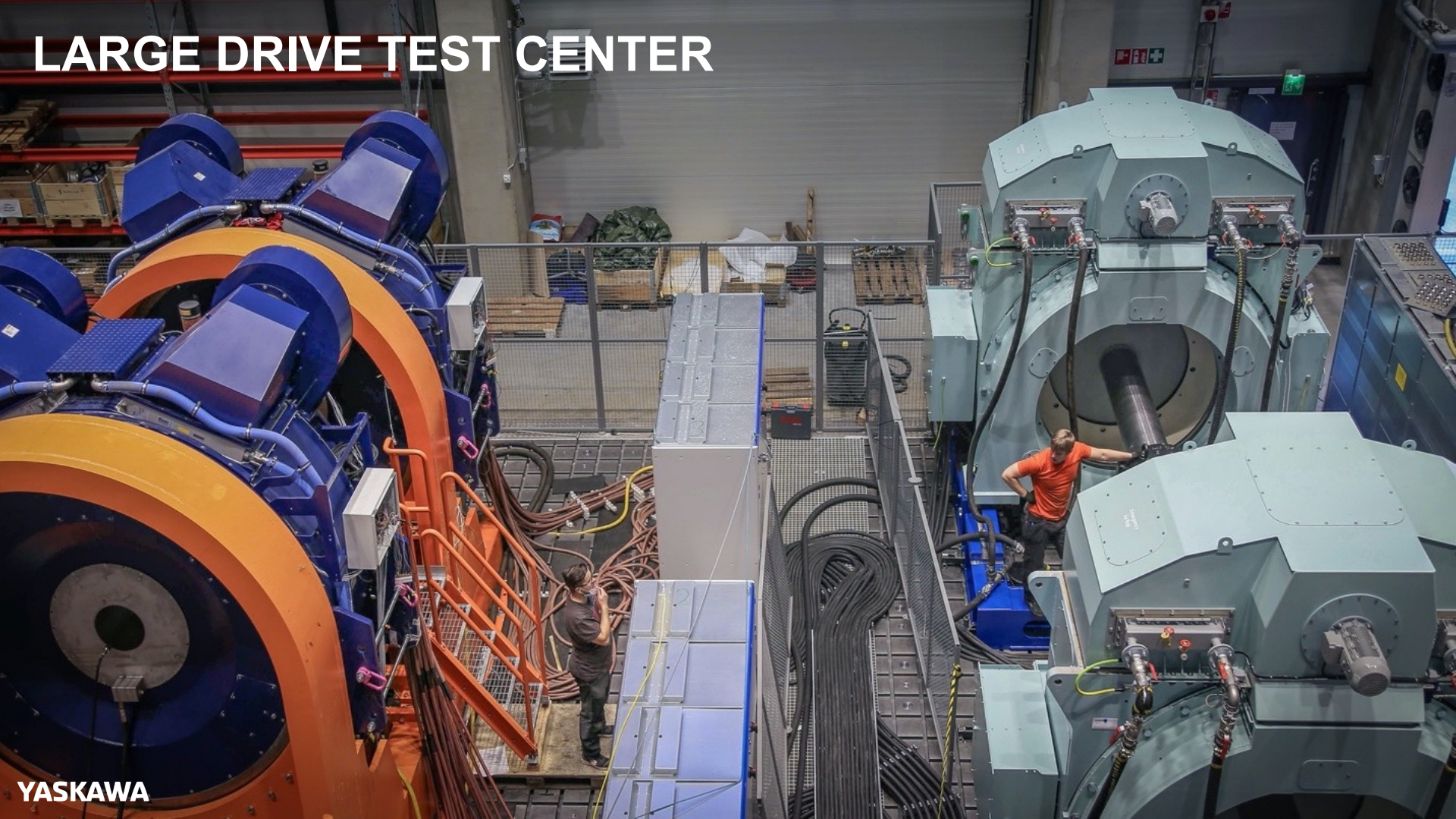


UNIQUE PROTECTION DEVICES

The Switch unique protection devices provide a smooth ride through the waves



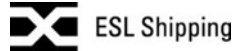
LARGE DRIVE TEST CENTER



YASKAWA

MARINE REFERENCES

Over 1,400 marine drives and 150 machines delivered for marine



CONCLUSION

- The The Switch DC-Hub allows you to easily use energy from other applications
- EBL allows you to connect several DC-Hubs in a ring configuration
- Introducing BSCL allows you to safely connect large battery systems in a space-saving way
- Over 1,400 marine drives and 150 marine permanent magnet machines in operation
- Proven experience with permanent magnet machines and marine drives
- Future flexible – enabling you to be ready for new electric energy sources and loads

Why DC is the answer to future ship needs

REGISTER FOR FREE

NOVEMBER 16, 2022 at 16:00 EET



**MASTERING DC DISTRIBUTION:
PART 1 OF 3**

Teemu Heikkilä
Head of Product Line, Drives

Asbjørn Halsebakke
Manager, Technical
Solutions Marine



Thank you!



Asbjørn Halsebakke

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