Electrifying ports
Shore Power
Zero emission solution for ports

Denmark April 2021

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Schneider Electric

Life Is On | Schneider Electric

Schneider Electric provides energy and automation digital solutions for efficiency and sustainability

Key figures for 2020

5% of revenues devoted to R&D

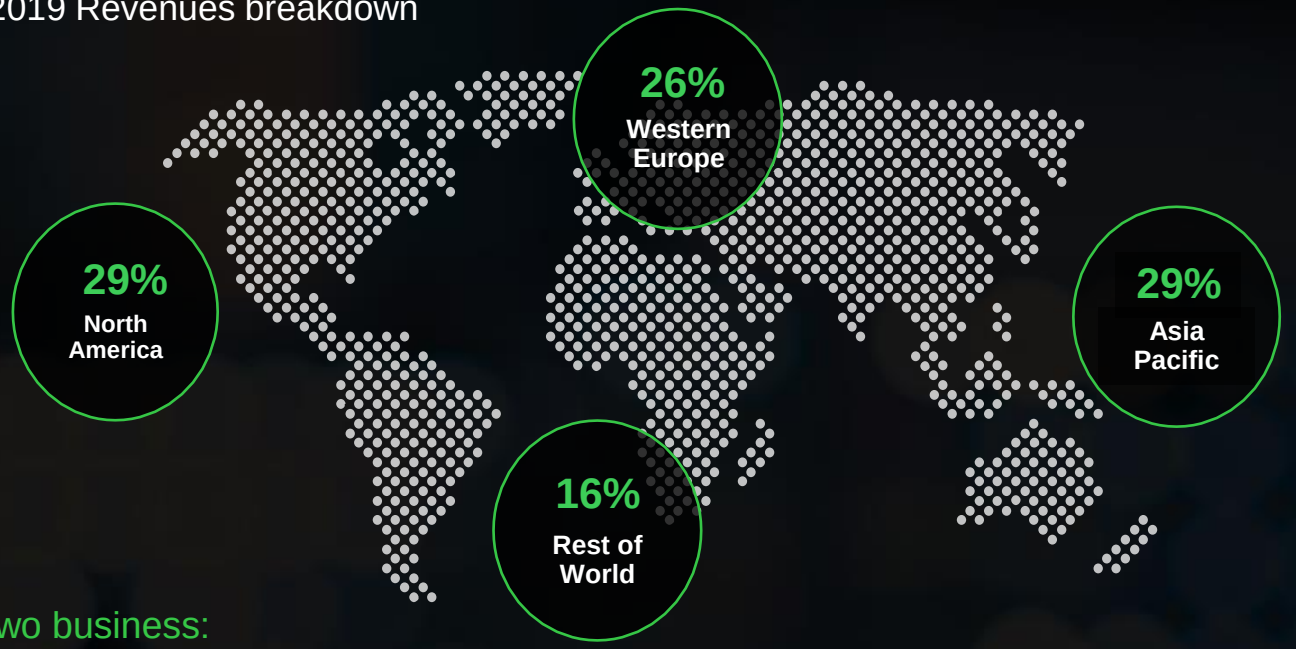
€25.2 billion
2020 revenues

41%
of revenues in new economies

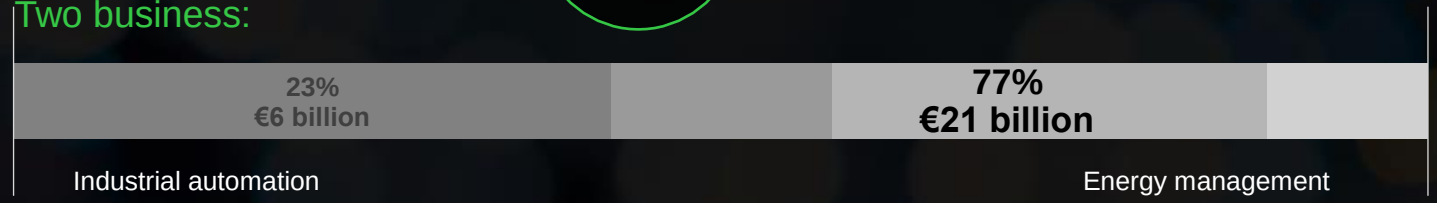
135,000+
Employees in over 100 countries

A well-balanced global presence

2019 Revenues breakdown



Two business:



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The most local of global companies

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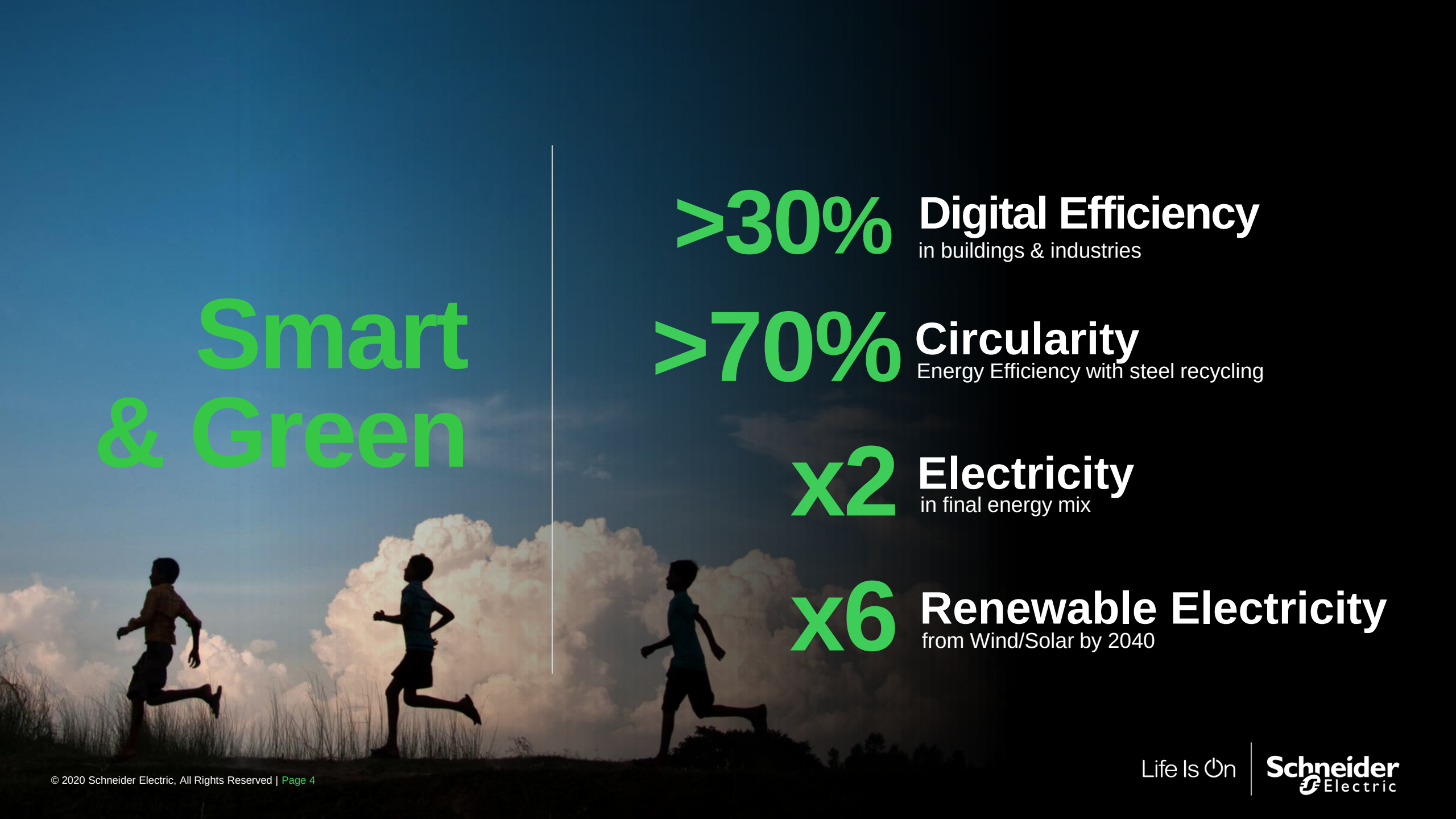
Smart & Green

>30% **Digital Efficiency**
in buildings & industries

>70% **Circularity**
Energy Efficiency with steel recycling

x2 **Electricity**
in final energy mix

x6 **Renewable Electricity**
from Wind/Solar by 2040



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Paris-based company worth €70bn now seen as world's most sustainable company on Global 100 index

▲ Schneider Electric has risen from 29th to No 1 in the Global 100 index of sustainable businesses. Photograph: Charles Platiau/Reuters

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COVID-19 has not changed the real priorities

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Content

- Electifying trends
- Shore Power system

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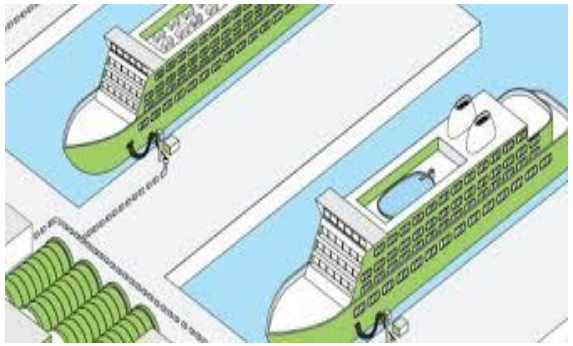
Renewable / E-Mobility / Elektrify



Electrifying port
Shorepower in port + vessels

Electrical Vechicle / charging station

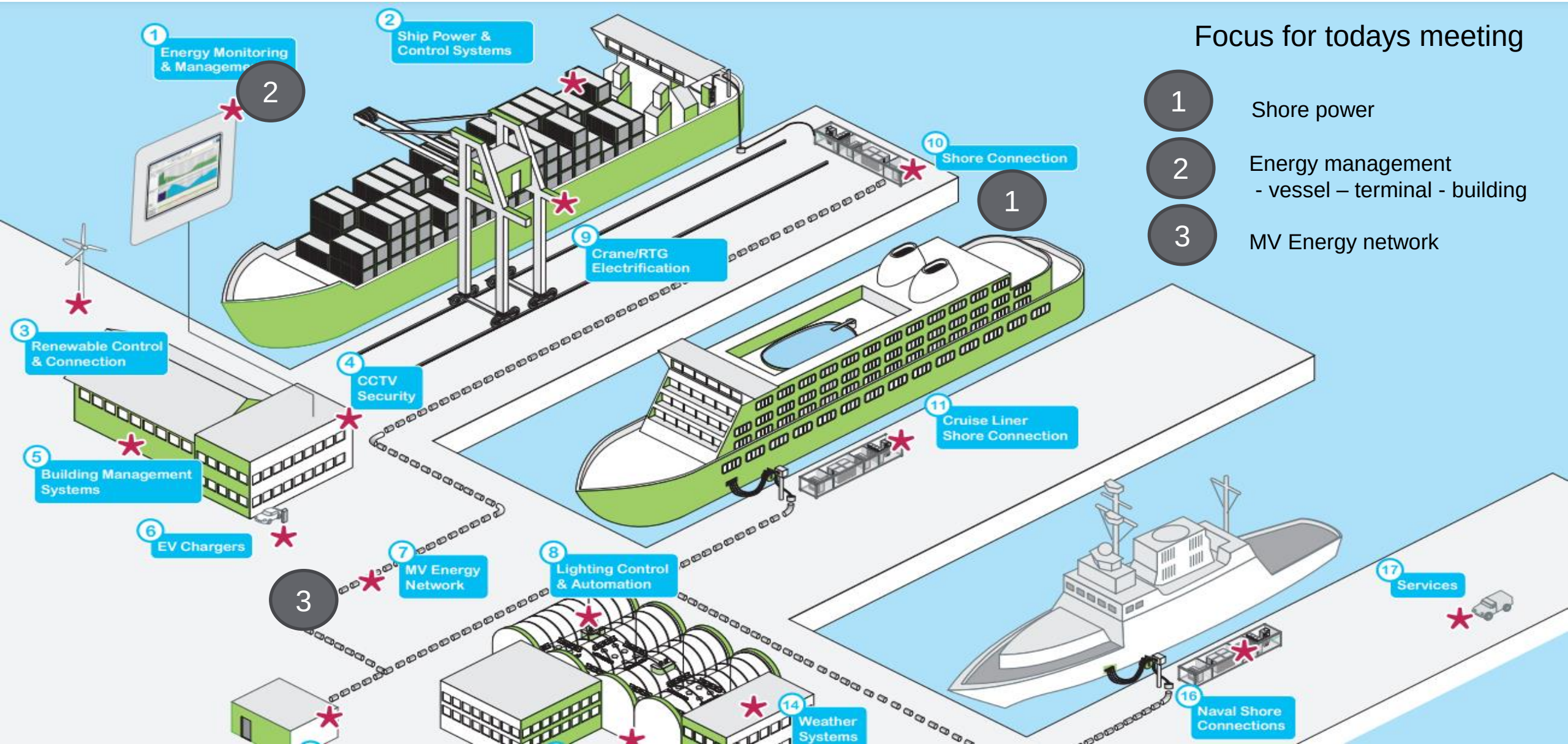
Solar farms
6,2GW to be installed in DK < 2030

Windfarms
Increase 60MW until 2030

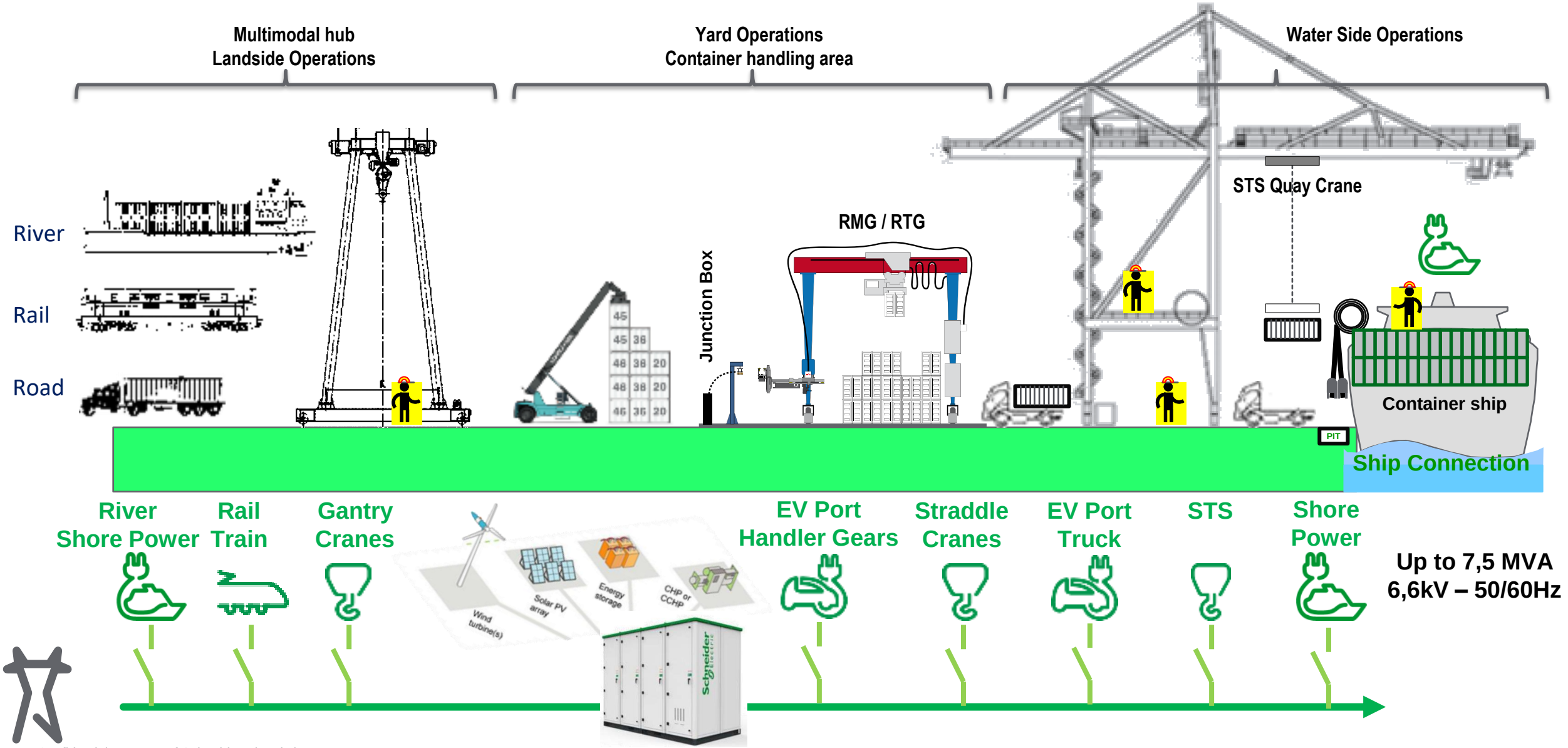
KVV og Heatspumps
Electrical kettle

Utilitites

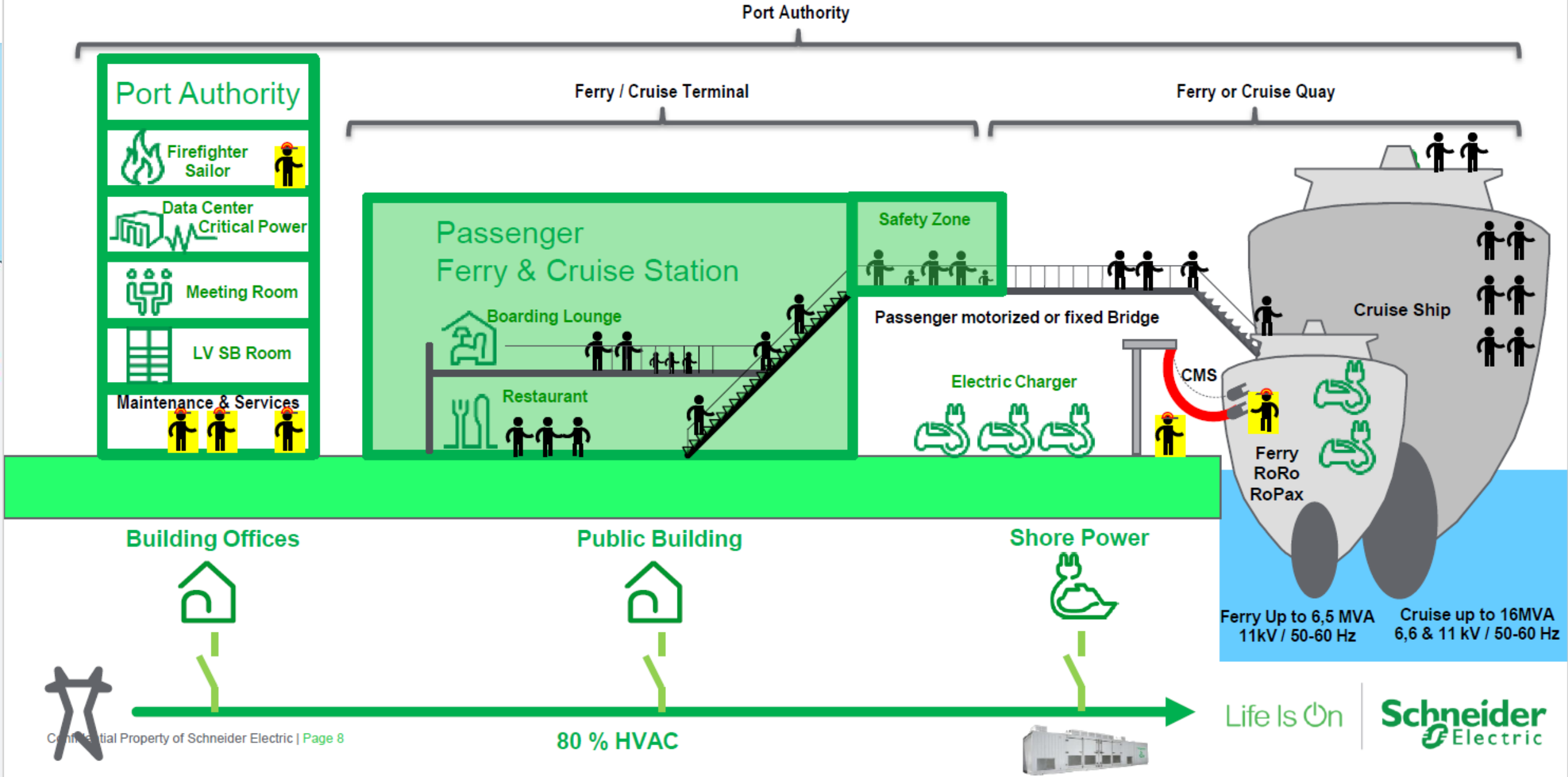
Port services



Container Terminal / Main consumers



Ferry & Cruise Terminal



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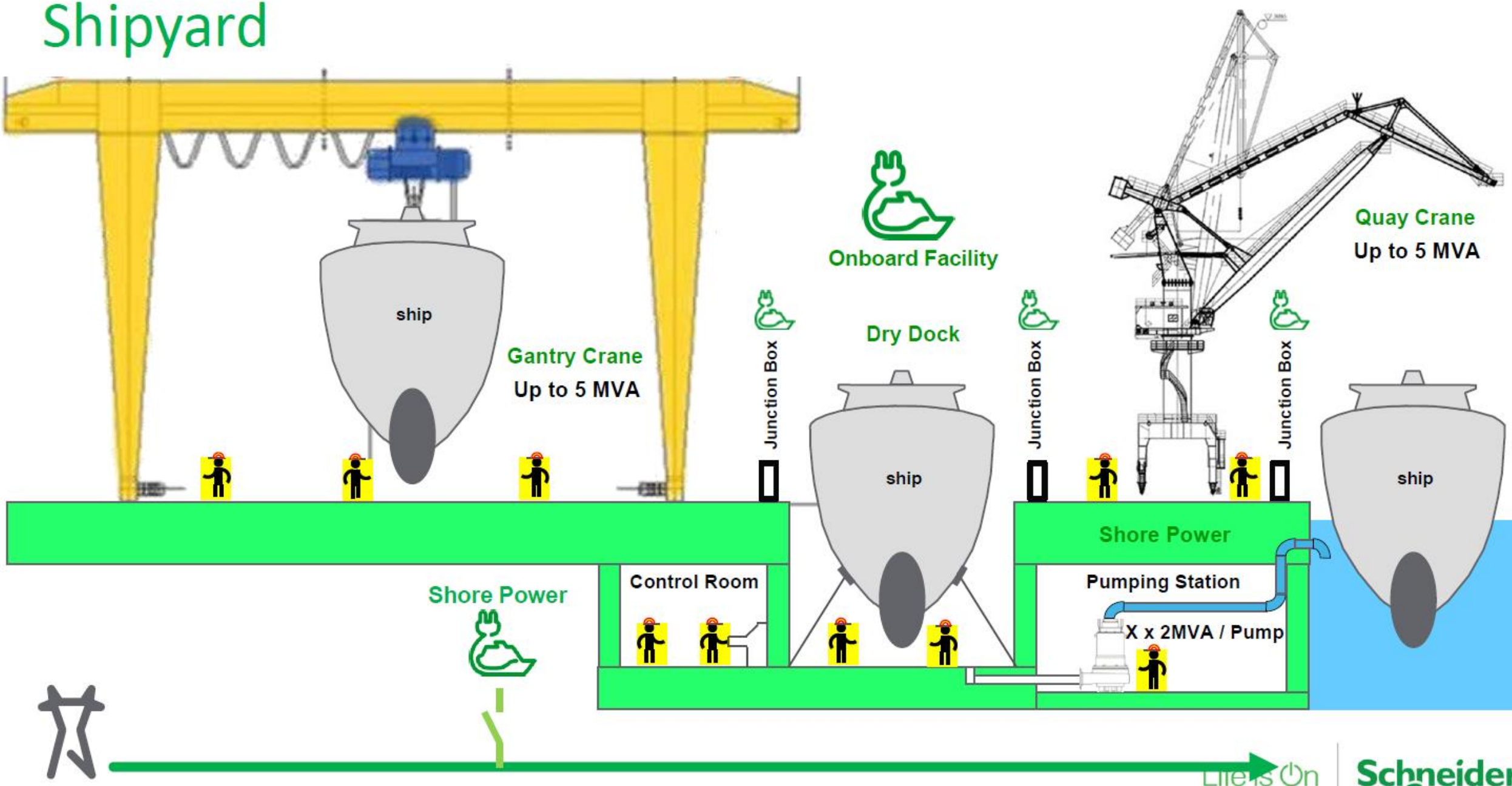
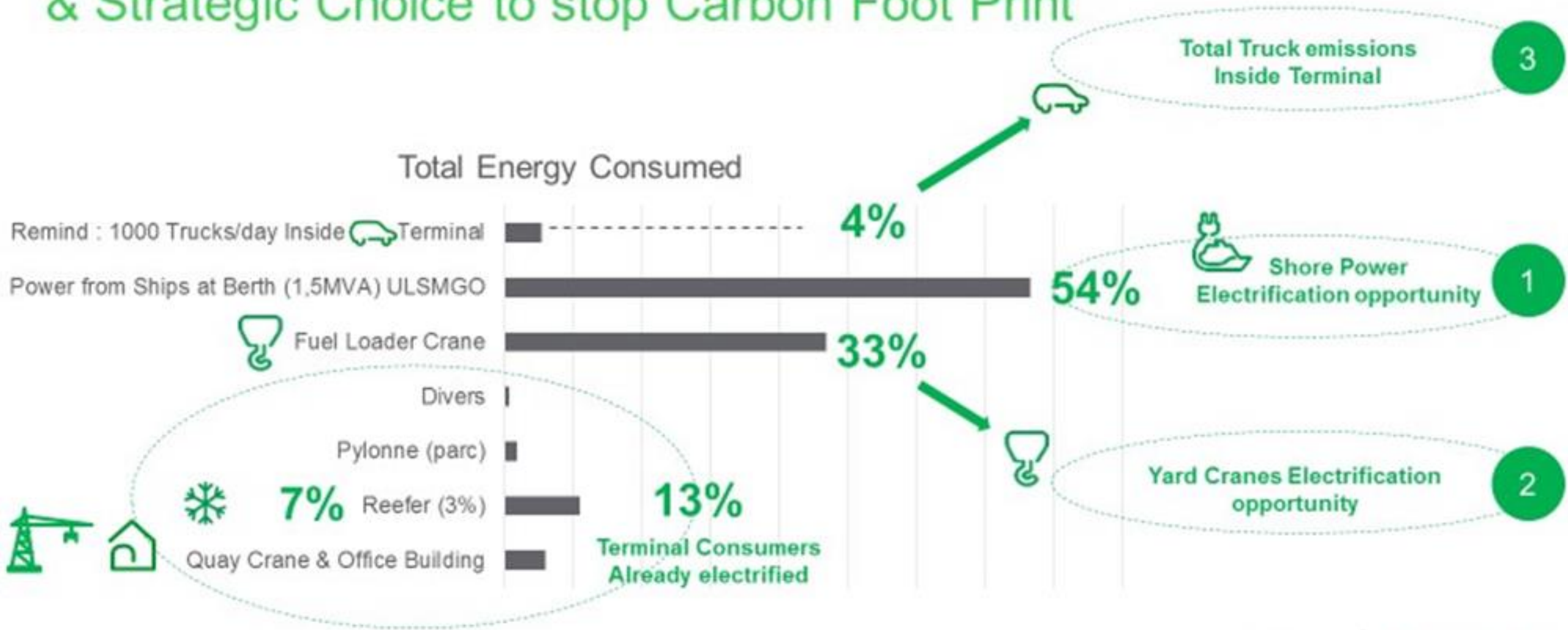
Shipyard



773 000 TEU Container Terminal Energy balance & Strategic Choice to stop Carbon Foot Print



Smart buildings & warehouses

Building management system

Security systems

Smart charging

Energy monitoring

Cybersecure

Occupancy and comfort analytics

Integration

Fire prevention systems

Asset tracking

Smart parking

Wayfinding

Userfriendly

A digital architecture enables digital transformation along transportation infrastructure value chain

EcoStruxure™ Innovation At Every Level

Design & build phase | **Operate & maintain phase**

Design and build		Control		Operate		Maintain	
Electrical systems Engineering & design	**Smart electrical distribution**	**Facility & energy mgt.**	**Integrated infrastructure mgt.**	**Transportation process automation**	**Remote centralized operation**	**Integrated command & control**	**Asset performance**
Plan & schedule operations which adapt to increase capacity		Monitor & control operations to ensure safety & performance		Ensure efficient & profitable operations within operating constraints and regulatory norms		Anticipate maintenance to minimize downtime, extend asset lifetime and ensure best customer experience	

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EcoStruxure™ for Transportation

- IoT-enabled, open and interoperable architecture that allows country critical mobility infrastructure business to seamlessly connect, collect, analyze, and act on data in real-time, from design to maintenance
- EcoStruxure is THE digital platform that delivers safe, efficient and reliable operations for exceptional customer experience in rail, airports, roads and ports

EcoStruxure™ Innovation At Every Level for Transportation

	Airports	Railway and Metro	Road Tunnels	Ports
Apps, Analytics & Services	**AVEVA software** Planning & Operations; Asset Performance Monitoring & Control	**Ecostruxure** Augmented Operator Advisor	**EcoStruxure** Building Advisor; **EcoStruxure** IT Advisor	**EcoStruxure** Asset Advisor; **EcoStruxure** Power Advisor; **EcoStruxure** Microgrid Advisor; **EcoStruxure** Resource Advisor
Edge Control	**Modicon** M580	Energy and Infrastructure Management	**EcoStruxure** Security Expert; **EcoStruxure** Facility Expert; **EcoStruxure** Building Operation; **EcoStruxure** Building Expert; **EcoStruxure** IT Operation; **EcoStruxure** IT Expert	**EcoStruxure** Substation Operation; **EcoStruxure** Microgrid Operation; EcoStruxure Power Monitoring Expert
Connected Products	**Harmony** Advanced Man-Machine Interface	**Altivar** Variable speed drives and soft starters; **EcoStruxure** Data Center solutions; **Galaxy** Uninterruptable 3-Phase Power for IT and Industrial applications	**Set** Series Comprehensive, robust portfolio of power distribution and motor control centers; **Smart X** Controllers, valves, and actuators	**PowerLogic** Power Quality, Control, Protection, Uptime & Efficiency; **Pact Series** World Class Breakers & Switches; ShoreBoX™

End-to-end Cybersecurity

Cloud and/or On Premise

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EcoStruxure for Ports

Build a collaborative Port environment for **safe, efficient,** and **sustainable** operation, for best traveler and trade experience

1. Renewable Energy source integration

Provide local energy to more electrified loads, with renewable energy sources and a microgrid controller to improve energy resilience goal

2. Efficient energy management

Protect your brand reputation, profitability and activity continuity with reliable and intelligent power distribution

3. Port sustainability actions

Ensure best traveler experience by reducing emission pollution in the port, electrifying loads

- **100%** resilient energy for critical infrastructure
- **15%** savings in electric utility costs
- **1200** tons of CO2 emission reduction

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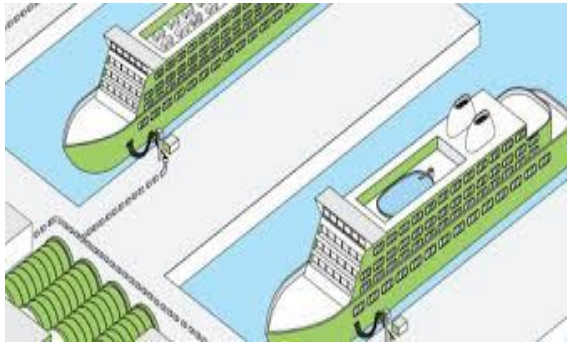
Renewable / E-Mobility / Elektrify



Shorepower in port + vessels

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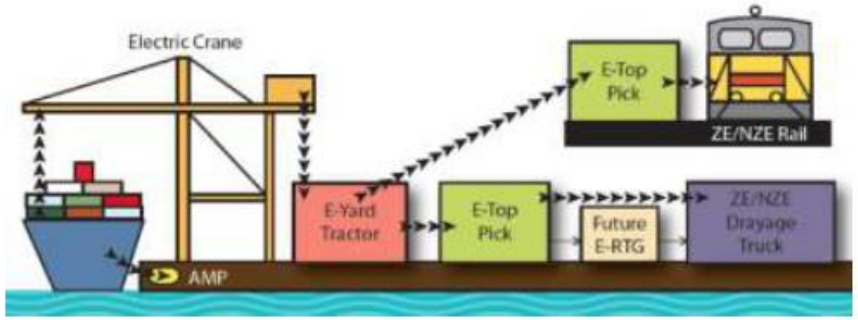
Utilitites

WBCT Port of Los Angeles | 125kW

Diesel (current)

WAVE

- 12 **WAVE 125 kW** wireless chargers will be deployed at the Port of Los Angeles
- Ten Class-8 Yard Trucks
- Maintains Same Duty Cycle as Diesel
- Smaller footpoint than diesel
- Battery Energy Storage



WAVE
Wireless Advanced Vehicle Electrification

Six smart wallmounted chargers sold to Scandlines - Rødby

Smart Wallbox

En omkostningseffektiv løsning til parkeringsfaciliteter, boligkomplekser og offentlig parkering

- Forbindelse til Ethernet, Wi-Fi og GPRS modem er tilbehør
- Kompatibel med 3. part back end. (OCPP 1,5 eller OCPP 1,6) (**O**pen **C**harge **P**oint **P**rotocol)
- RFID kortlæser eller nøgle
- Integreret energimåling
- Energistyring
- Kommunikation via Modbus

Content

- Transportation trends
- Shore Power system

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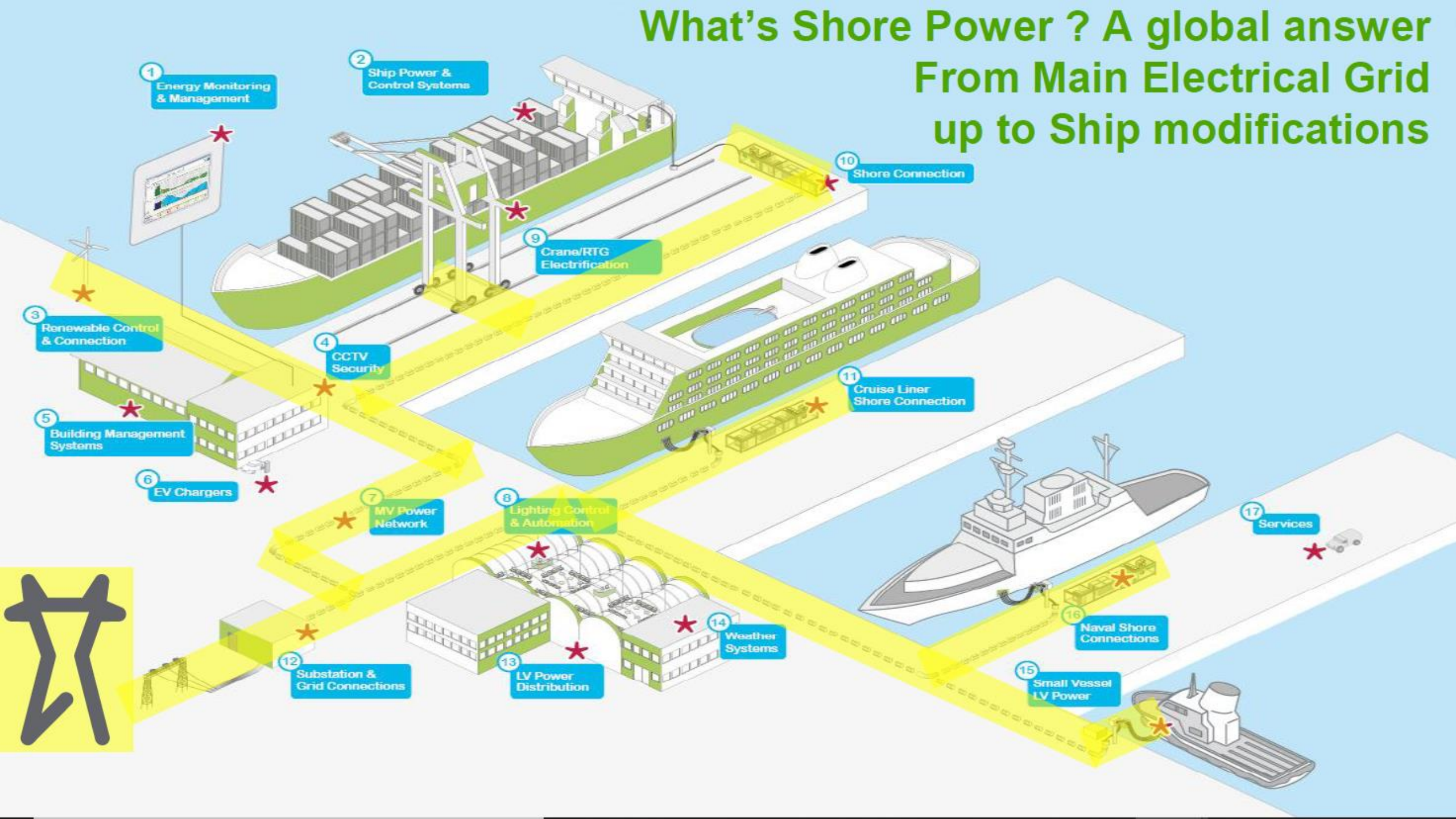
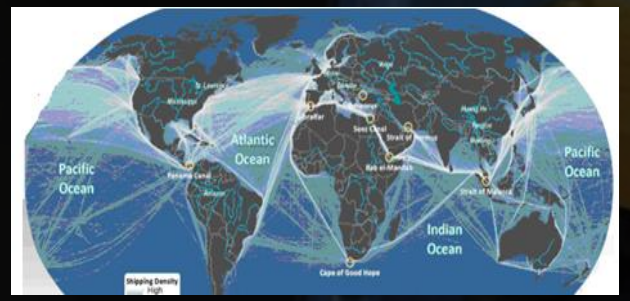
What's Shore Power ? A global answer From Main Electrical Grid up to Ship modifications



Shore Power Business drivers

Air quality, Energy Efficiency and Climate change



Maritime traffic growth

+

Ship emission,
Dominant source of pollution
in ports and cities

+

WPCI
GNDE
ECOPORTS
ALLIANCE TO SAVE ENERGY
GreenPort CONGRESS
CLINTON CLIMATE INITIATIVE
GSTASIA

COP 21 impact,
Green new Deal for Europe
and communities pressure

=

Political decision to invest in green port infrastructure

Date	SOx Limit in Fuel (% m/m)			Average Nox Limit in Fuel (g/kWh)
	MARPOL ANNEXE VI		EU maritime fuel sulphur directive (2005/33/EC)	MARPOL ANNEXE VI
	High sea & berth	SECA	Berth	High sea & berth
2009	4,5%	1,5%	1,5%	11,8
2010				
2010, Juny		1,0%	0,1%	
2011				9,6
2012	3,5%			
2015		0,1%		
2016				2,3
2020	0,5%			

2020 new IMO regulation on
Low Sulfur fuel at berth

+

$

Increase in Low Sulfur
fuel price

+

IEC
ISO

Availability of International
Standard for Shore Power

=

Ship Liners decision to invest in Onboard Shore Power

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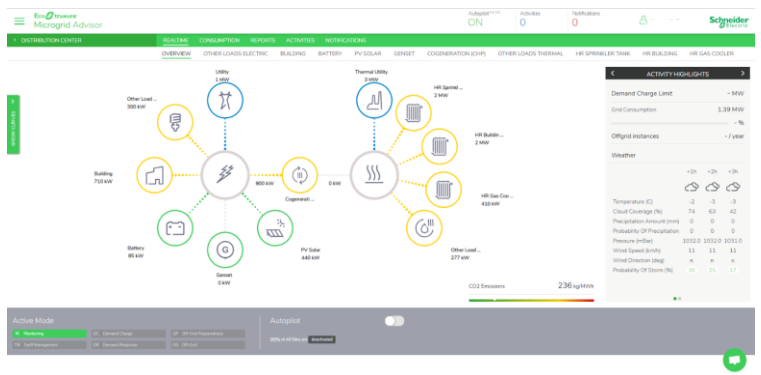
What is Shore Power system ?

A standardized interface to connect ships at berth from local grid to on-board installation

A new load integrated into green port infrastructure



EcostruXure Microgrid Advisor

DNO

Wind

Solar

Green Port

Storage

Gaz production

Without Frequency conversion

With Frequency conversion

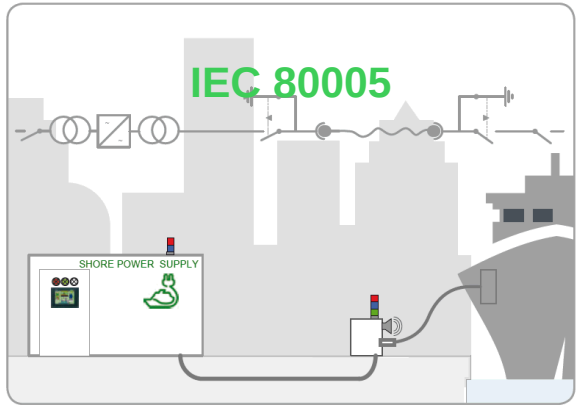
Schneider Electric

Billing

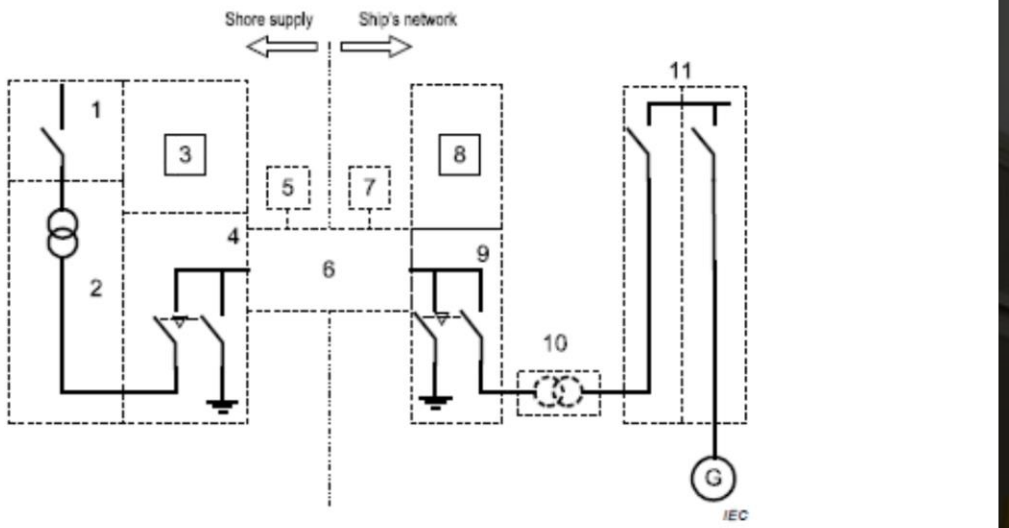
Diagnostic

Maintenance

Measure Monitoring Control



IEC80005-1&3: general requirements



Key

1	Shore supply system	7	Control ship
2	Shore-side transformer	8	On-board protection relaying
3	Shore-side protection relaying	9	On-board shore connection switchboard
4	Shore-side circuit-breaker and earth switch	10	On-board transformer (where applicable)
5	Control shore	11	On-board receiving switchboard
6	Shore-to-ship connection and interface equipment		

Figure 1 – Block diagram of a typical described HVSC system arrangement

Shore to ship voltage

IEC 80005-1

Type of ship	Max. power	Voltage	Nr. of cables
Cruise ships	20 MVA	6,6 or 11 kV	4
Container ships	7.2 MVA	6,6 kV	2
Ferry, Cargo	6.5 MVA	11 kV	1

IEC 80005-3

Type of ship	Max. power	Voltage	Nr. of cables
Any	1.5 MVA	690 V	Up to 4
	1 MVA	440 V	Up to 4
	1 MVA	400V	Up to 5

Schneider Electric has built strong references the last 10 years

In all ports segments

Industrial and trade ports

Solid Goods	Liquid Goods	Containers
		
Minerals, cereals	Oil & Gas	Merchandise
Conveyors	Pipes, pumping	Cranes
Industrial logistics	Infra connecting off-shore (FSU) & on-shore installations	Trade logistics
Rail connection		Rail / road connect°

Vehicles and passengers ports

Ro-Ro / Ferries	Cruise
	
Vehicles	Passengers
No loading means (only gangways)	
Simple vehicles logistics	Passenger logistics
Road connection	

Military ports / naval bases

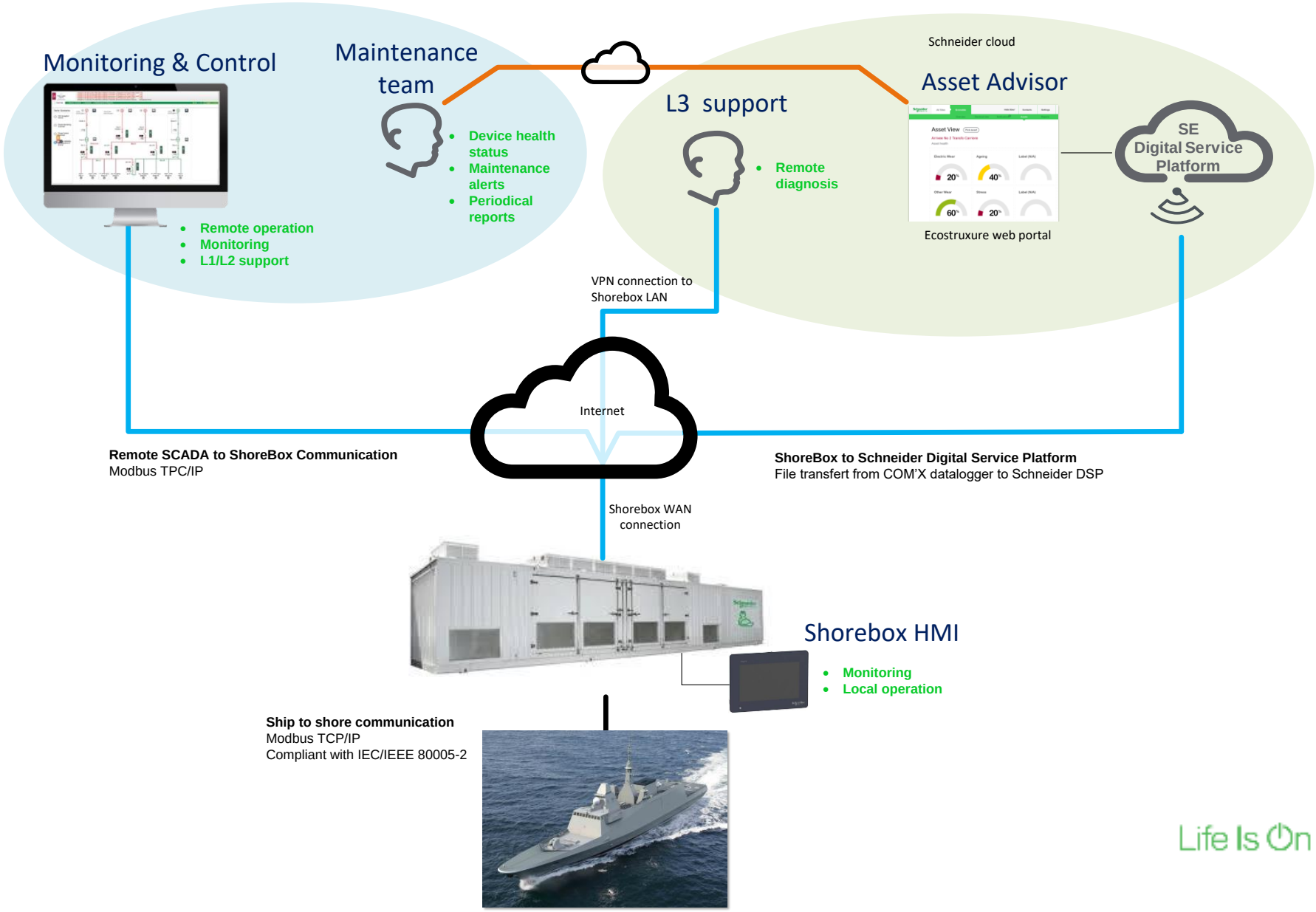
Navy ships, submarines

Military specific logistics & loading means

Shore POWER

Note: Fishing and yachting habors not included

ShoreBoX is easy to operate and maintain



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