
Empowering
the Future.
Solutions for Greener Ports
Port Energy Center
Webinar State of Port Electrification in Europe
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Empowering the future

Our purpose is designing a smarter future for a better life.

We do it by developing and delivering integrated solutions in the fields of energy, mobility, and environment, shaping the future of our cities, with digital connectivity always present.

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Always keeping in mind our legacy:

70 years of technological innovation.

1948
↓
Beginning of the Efacec Project
Electro-Moderna, ACEC – Ateliers de Constructions Électriques and CUF – Companhia União Fabril

1983
↓
Kick-off Automation operations

1987
↓
Start up of Transports operations
+
Beginning of Internatio-nalization post exit of ACEC

2005
↓
Kick-off Renewables operations

2009
↓
Start up of Power Transformers operations on Effingham plant
November
+
Launch of the EEM project

2015
↓
New shareholder structure
+
New Corporate Bodies elected

2016
↓
Start of the Transfor-mation Plan 2020 and its implemen-tation

2018
↓
Inauguration of Electric Mobility's new facilities
↓
70 years

Now towards tomorrow.

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Our World

Efacec has a global footprint with offices and sites in 11 countries and sales in over 80 countries

Sites and offices worldwide (2018)

Headquarters

Manufacturing Units and Branches

Countries where Efacec records sales

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Our World

3 Segments, 8 Business Units

PRODUCTS

TRANSFORMERS

- **Power Transformers:**
  - Shell
  - Core
- **Mobile Substations**
- **Distribution Transformers**

AUTOMATION

- **Energy Management Systems**
- **Distribution Dispatch Systems**
- **Command & Control systems**
- **Application:**
  - Electrical power grids
  - Utilities
  - Transportation
  - Cities
  - Industry

SWITCHGEAR

- **Primary Distribution**
- **Secondary Distribution**
- **Compact Substations**
- **High and Medium Voltage Switchgear**
- **Application:**
  - Electric power grids
  - Electric distribution systems and Industry
  - Infrastructure systems

SERVICE

- **Vertically integrated services to:**
  - Industrial facilities
  - Hydroelectric power plants
  - Thermoelectric power plants
  - Small hydro power plants
  - Cogeneration
  - Wind farms
  - Substations
  - Transformer stations

SYSTEMS

ENERGY

- **Production, Transportation & Distribution**
- **Integrated offer of Maintenance and Technical Assistance**

ENVIRONMENT

- **Effluent treatment stations**
- **Water treatment plants**
- **Pumping for irrigation and supply stations**
- **Cogeneration/Combined Cycle/Conventional Thermal Plants** (Coal/Oil)
- **Distributed control systems**

TRANSPORTATION

- **Integrated power, signaling and telecom solutions for Railways, Metro, Light rail and Road segments**

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ELECTRIC MOBILITY

ELECTRIC MOBILITY

- **Full range of charging** solutions to Electric Vehicles
  - Private Chargers | Public Chargers
  - Quick Charging | Buses Charging
- **Integration of cars, motorcycles and buses in management systems** for efficient use of electric grid infrastructure

What's going on with the energy in the world?

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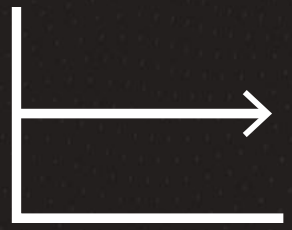
Power supply requirements

"Sustainable Development Goals" by UN
"Clean Energy for all Europeans Package" by EU

Digital Industrial Transformation

Availability



Reliability

Green

Clean and secure power supply are critical

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To sum up, organizations' needs

Reduce Costs/Diversify Revenue Streams

Availability Reliability Supply

CO_2 Reduction

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eHUB
Digital Energy-Hub
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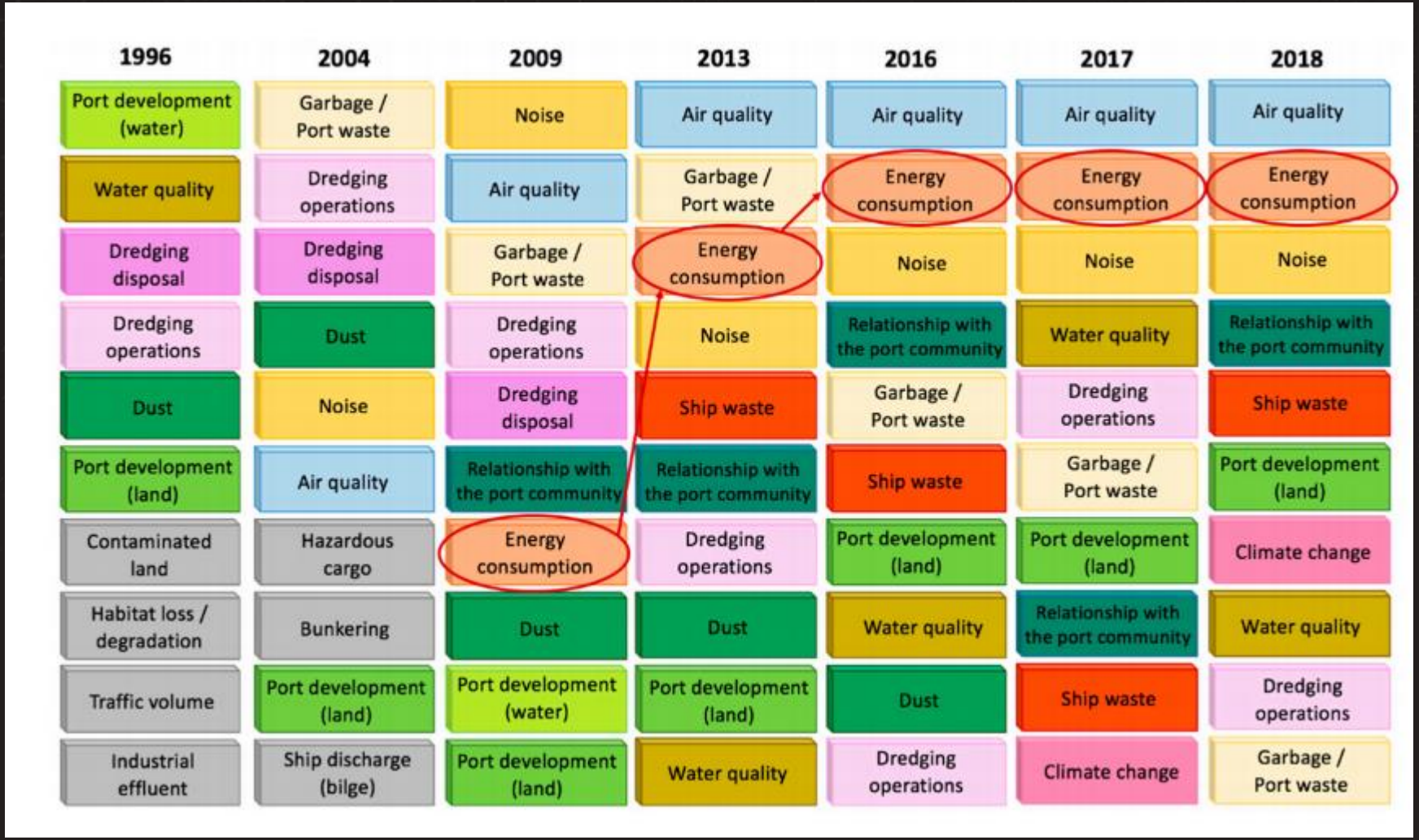
Management System
+ User Interface
Smart Building with
Demand Side Management
Micro-Wind
Generation
Self-Sustainable
Public Lighting
Photovoltaic
Generation
Digital Substation
+ Storage System
EV Conductive Charging
(DC & AC)
EV Inductive Charging
(Wireless)

Shipping industry produces nearly 4% of the global CO2, 10-15% of global nitrous oxides (NOx) and 4-6% of global sulfur oxides (SOx).

Several ports are near heavily populated cities and can cause negative impact on the surrounding communities.

25% of the European Ports surveyed reported more than 50% of traffic volume related with energy commodities



1996	2004	2009	2013	2016	2017	2018
Port development (water)	Garbage / Port waste	Noise	Air quality	Air quality	Air quality	Air quality
Water quality	Dredging operations	Air quality	Garbage / Port waste	Energy consumption	Energy consumption	Energy consumption
Dredging disposal	Dredging disposal	Garbage / Port waste	Energy consumption	Noise	Noise	Noise
Dredging operations	Dust	Dredging operations	Noise	Relationship with the port community	Water quality	Relationship with the port community
Dust	Noise	Dredging disposal	Ship waste	Garbage / Port waste	Dredging operations	Ship waste
Port development (land)	Air quality	Relationship with the port community	Relationship with the port community	Ship waste	Garbage / Port waste	Port development (land)
Contaminated land	Hazardous cargo	Energy consumption	Dredging operations	Port development (land)	Port development (land)	Climate change
Habitat loss / degradation	Bunkering	Dust	Dust	Water quality	Relationship with the port community	Water quality
Traffic volume	Port development (land)	Port development (water)	Port development (land)	Dust	Ship waste	Dredging operations
Industrial effluent	Ship discharge (bilge)	Port development (land)	Water quality	Dredging operations	Climate change	Garbage / Port waste

Top ten environmental priorities – Energy Efficiency in European Ports, 2019 [1]

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Pathways to achieve greener ports?

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Pathways to achieve greener ports

- Alternative sources of energy to docked ships
- Upgrade port equipment for clean fuels or electricity
- EV charging stations for cars, buses and trucks
- Intermodal: Expand the port railway network
- IoT and Big Data for efficient decision making
- Digitalization of the logistics process

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Port Energy Center

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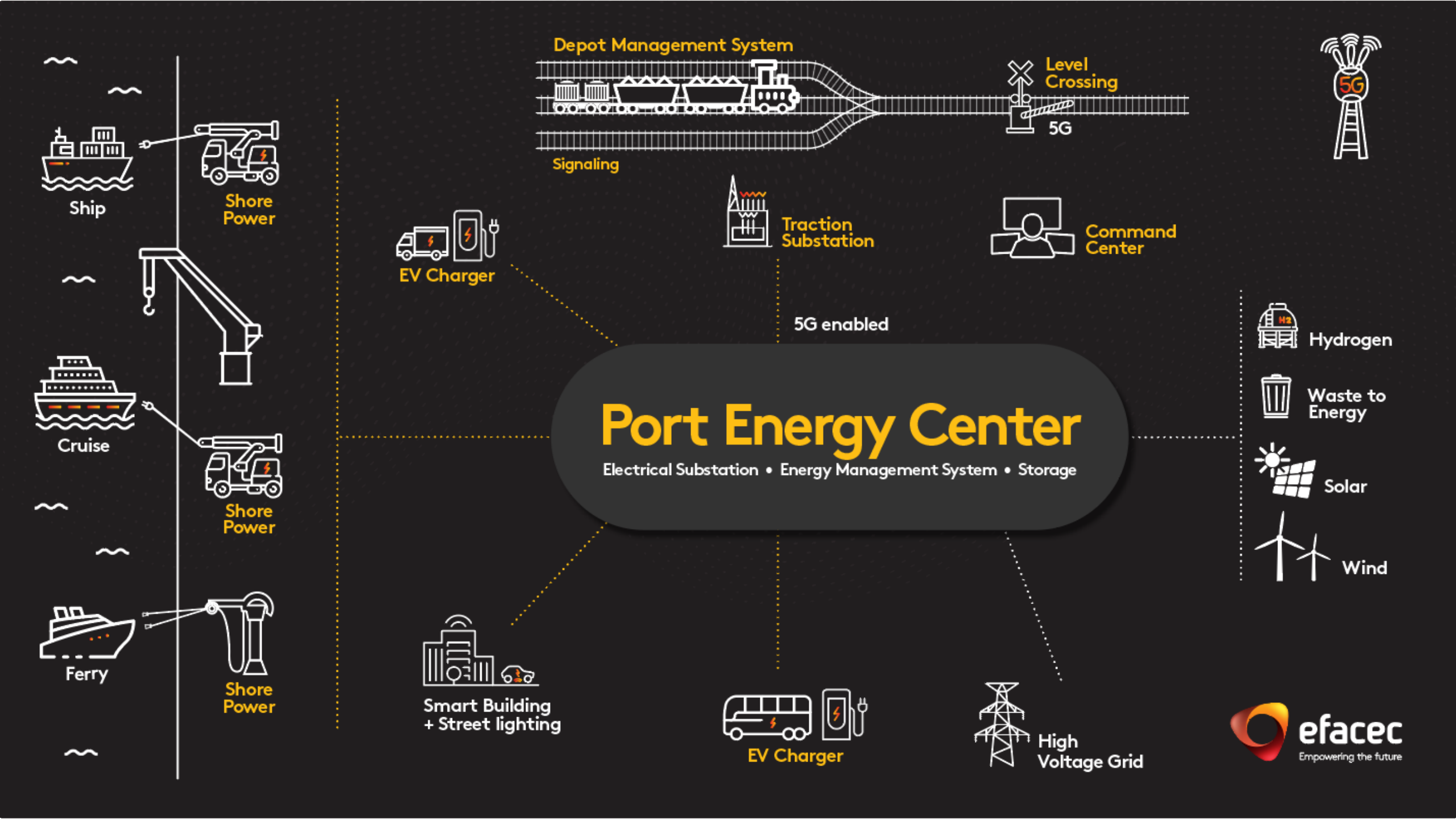
Depot Management System
Level Crossing
5G
Signaling
5G
Ship
Shore Power
EV Charger
Traction Substation
Command Center
5G enabled
Hydrogen
Waste to Energy
Solar
Wind
Port Energy Center
Electrical Substation • Energy Management System • Storage
Cruise
Shore Power
Ferry
Shore Power
Smart Building + Street lighting
EV Charger
High Voltage Grid
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Port Energy Center

1. **Energy Management System**
2. Energy Storage
3. Power Supply and Distribution

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1. Energy Management System

Forecasting tools:

- Anticipate energy needs from EV distribution fleet and vessels, considering the energy resource required and grid location;
- Advanced forecasting tools for PV generation and energy storage availability;

Multi-vector and multicarrier energy management:

- Digital twins of the multiple resources and grid;
- Cross-sector representation (electricity, biofuels, heat/cold);
- Operation considering multi-vector constraints and requirements;

Multiple interfaces with different stakeholders:

- Local flexibility services for the DSO (congestion management, voltage control, reactive support, reverse power flow management, etc.);
- Ancillary services provision (frequency control, regulation reserve, etc.) for additional revenue streams through energy retailer/aggregator;

Operation tools for decarbonization:

- Optimization of global energy costs, weighted by the carbon footprint, and considering available distributed resources in the port;
- Maximizing ROI of distributed assets through multiple service performance to different actors (grid operators, markets);
- B2B green energy credits exchange within the Port Community;

Port Energy Center

1. Energy Management System
2. **Energy Storage**
3. Power Supply and Distribution

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2. Energy Storage

Distributed Architecture:

- Different energy storage systems designed for the different applications in the port;
- Electrical energy costs reduction; Peak-shaving; Grid Services: Local services to the DSO; Power System Ancillary Service;
- Backup Power;

Energy Storage technologies and circular economy:

- Second-life EV batteries for grid purposes:
- Circularity achieved by defining plans for usage of light and heavy EVs batteries for re-purposing in the future, further increasing decarbonization and resources usage;
- Combination of battery technologies to diversity application scope: power driven applications and energy driven applications.

Port Energy Center

1. Energy Management System
2. Energy Storage
3. **Power Supply and Distribution**

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3. Power Supply and Distribution

Electrical Substation:

- Connection to local grid;
- Interface with multiple energy sources (renewables, …);
- Power supply and energy management of Port Community;

MV network:

- Power distribution to Port Community:
  - Port Cranes and others cargo handling equipment for more efficient consumption;
  - EV charging stations;
  - Port Stakeholders;
  - Shore Power;
  - Traction Power for railway;

Shore Power:

- Power supply for docked ships;
- Voltage and frequency converter 50Hz/60Hz;
- Cable management for ship connection;

Renewable Energy

Hydrogen

Waste to Energy

Solar

Wind

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Power generation complementary installations:

Design and Project, Supply, Erection and Commissioning)

- hydroelectric power plants
- wind power
- biomass
- waves
- solar and photovoltaic energy
- fuel cells
- Hydrogen

EV Chargers

EV Charger

EV Charger

EV Charger

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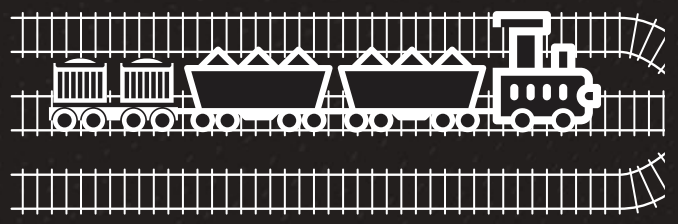
EV Charging Stations:

- Smart Charging (Cars, Buses, Trucks)
- Vehicle-to-Grid (V2G) and Vehicle-to-X (V2X)

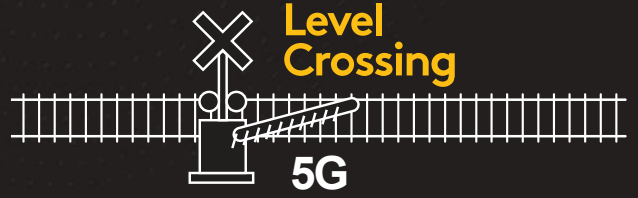
Energy Efficiency Hub:

- Integration with solar and battery storage systems for depo and fleet/port equipment management

Other solutions for greener ports



Signaling



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Signaling and Rail Safety Systems

- The signaling solution for:
  - Terminus & Junctions Interlocking SIL4 Signaling Boxes
  - Traffic Light Priority & Point Control systems
  - SIL3/4 Signaling systems for Depot

- Level crossing (5 growth project)

Other solutions for greener ports

Command Center

Powered by 5G

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Management Systems

- Railway Depot Managment System
- Technical Supervision Systems
- Scada for Auxiliary systems;
- Telecomunications systems

In Summary…

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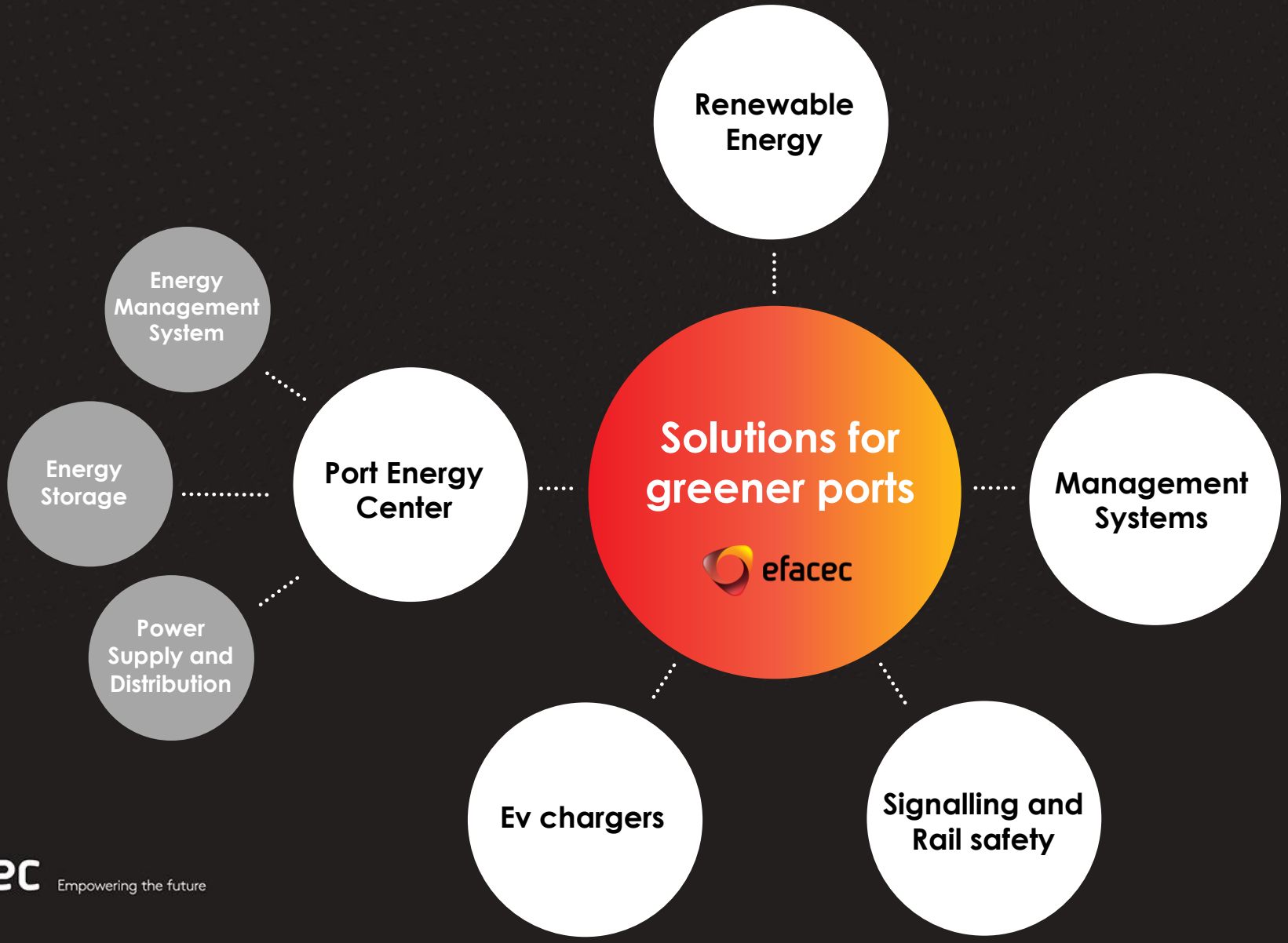
Solutions for greener ports by Efacec



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Thank you!
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