Shore-to-ship power
Opportunities and challenges
Smart ports
Main trends

Electrification
- Minimize energy consumption
- Reduce pollution to the absolute minimum
- Integrate E-mobility (cars, vessels, trucks)

Automation
- Add more capacity
- Ensure smooth operations
- Optimize operational costs

Digitalization
- Becoming market leaders / pioneer
- Smart asset management
- Real time monitoring

Ports want to be...

1
Competitive

2
Efficient

3
Green
Shore-to-ship power: opportunities and challenges
Spot the differences?

Air quality, energy consumption and noise ranked top three priorities for three years in a row. What about 2019?
Shore-to-ship power: opportunities and challenges
Spot the differences!

Historical Emission Control Area

Future Emission Control Area

Will a Mediterranean ECA be in place in 2023 ???
Shore-to-ship power: opportunities and challenges
Spot the differences!

Road, rail and «blue» e-mobility is now reality!
Shore-to-ship power: opportunities and challenges
Emissions from vessels during port stay

Facts

Auxiliary engines run by ships in port produce a large quantity of pollutants:
- $SO_x$ – Sulphur Oxide Emissions
- $NO_x$ – Nitrogen Oxide Emissions
- $CO_2$ – Carbon Dioxide Emissions
- Particle discharge

Auxiliary engines run by ships in port significantly increase:
- Noise levels
- Vibration
Shore-to-ship power: opportunities and challenges
Ports are becoming a sustainable transportation hubs
Shore-to-ship power: opportunities and challenges
Who shall move first?

Shore-side infrastructure or vessel-side facility?  Chicken or egg?
Shore-to-ship power: opportunities and challenges

Stakeholders map

Port authority — Ship-owners

Terminal Operators

Technology providers

Electricity distribution company

Local communities

Grid operators

International policy makers

National / Regional Governments — Non governmental organization

Sustainability is a common goal!
### Shore-to-ship power and smart ports
**Economical and environmental benefits**

<table>
<thead>
<tr>
<th>Shore-to-ship power benefits</th>
<th>Impact on stakeholders</th>
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</thead>
<tbody>
<tr>
<td>No polluting emissions at port</td>
<td>Reduced health problems/costs</td>
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<tr>
<td>No noise and vibrations from auxiliary engines</td>
<td>Improved public image</td>
</tr>
<tr>
<td>Low operating costs for ship owners</td>
<td>Green ports and green operators</td>
</tr>
</tbody>
</table>

- **Impact on stakeholders**
  - Reduced health problems/costs
  - Clean air = happier citizens
  - Improved public image
  - Gain aesthetic credits
  - Green ports and green operators
  - Cost savings for ship owners
  - Reduction of negative externalities
  - Enhanced reputation

**Smart Port Vision**

<table>
<thead>
<tr>
<th>Overall port development</th>
<th>Positive impact on tourism/commerce</th>
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Shore-to-ship power: opportunities and challenges
Stronger, smarter, greener port electrical grid

<table>
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<th>Energy supply</th>
<th>Energy demand</th>
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<tr>
<td>Increasing energy production</td>
<td>Increasing power consumption</td>
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<td>Integration of renewables</td>
<td>Smart port grids</td>
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<tr>
<td>Distributed generation</td>
<td>Shore-to-ship power and e-vessels</td>
</tr>
</tbody>
</table>

Port electrical grid

- Aging infrastructure
- Changing regulations grid code compliance
- Port grid reinforcement
- Reversible power flow

Sustainability is a common goal: electrification is the key to energy efficiency and sustainability!
Shore-to-ship power: opportunities and challenges
Stronger, smarter, greener port electrical grid

Both types of load and methods of generating are changing

Generation
New energy sources:
- High variability
- Low predictability
- Local production

Connect safely and reliably

Consumption
New loads:
- Highly distributed and variable (EV charging)
- Shore-to-ship power

Limiting environmental impact is a key priority
Shore-to-ship power: opportunities and challenges
Which segment to target first?

- Sea freight
- Cruise
- Ferries
Shore-to-ship power: opportunities and challenges
Removing barriers for shore-to-ship power large scale implementation

Technology
Making sure that technology is readily available, reducing time to market

OPEX/CAPEX optimization
Tailor-made smart port solutions

Customization
One size does not fit all!

A to Z
Full support from inception phase to end-of-life.

Increasing number of ports with shore connection facilities

Global Presence
Full alignment with global IEC standard to allow best interoperability
Shore-to-ship power: opportunities and challenges
Centralized or distributed solutions?

- **HIGH**
  - Flexibility
  - Modularity
  - CAPEX
  - OPEX
  - Layout

- **LOW**
Shore-to-ship power: opportunities and challenges
Defining port needs to make sure that we achieve the best Return on Investment

Needs assessment
Clarify your needs together with experts:
- Power at HV S/S
- Average power per vessel
- Number of vessels to be connected simultaneously
- Space availability
- Installation requirements

Project inception
Joint definition of:
- Best tailored solution for specific port needs
- OPEX-CAPEX optimization
- Maximize utilization factor of the facility

Project execution
Minimize the time to market:
- Turn-key implementation (greenfield)
- Engineered package supply (brownfield)
  - Clear division of works / responsibilities

Service
Support during operation:
- Achieving the highest levels of system availability
- Structured maintenance planning
- System lifecycle extension

Defining a custom solution according to any port needs!
**Conclusion**

Key take-aways

**Sustainability**
Sustainable development in ports relies on achieving the optimum balance of costs and benefits.

**Customization**
One size does not fit all, so each project must be analyzed specifically to ensure CAPEX / OPEX optimization.

**Technology**
Technology providers are playing a key role in removing barriers towards the large-scale implementation of shore-to-ship power and port electrification solutions.

Ports are becoming ...

1. Electrified
2. Efficient
3. Sustainable