

# Shore Side Electricity



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Task force harbours - Communication Package  
Rev 2 - 24/08/2015

# Executive summary

- ◆ Shore side electricity is the **only** solution to cut all **port** emissions, noise and vibrations from ships
- ◆ Shore side electricity is a globally standardized solution already implemented in hundreds of ships and berths. Global interoperability is guaranteed by available International Standards.
- ◆ Alternative solutions are only partially capable to lower ship emissions, (LNG, scrubber, catalytic reducer), however they do not affect noise and vibration.
- ◆ New built ships are equipped with provision for shore side electricity as well as green field ports.
- ◆ Shore side electricity is already mandatory in US West Coast and developing in Asian countries. The European Union published the “Alternative Fuel Infrastructure” Directive, which has now to be integrated into National policies

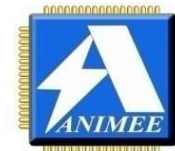


# T&D Europe & its national associations

Shore side electricity requires products and solutions that are already available in Europe.

European manufacturers are represented by their national associations and combined within the T&D Europe umbrella.

T&D Europe account for a production worth over €25 billion, and employ over 200,000 people in Europe



# What is shore side electricity ?

- ◆ Ships can shut down their engines while berthed and plug into an onshore power source
- ◆ The ship's power load is transferred to the shoreside power supply without disruption to onboard services
- ◆ Emissions to the local surroundings are eliminated
- ◆ Tip: Shore side electricity is also known as: Shore Connection, Shore-to-ship Power, Cold ironing, Onshore power supply, Alternative Maritime Power, etc.





# How much does a ship at berth pollute?

If all seagoing and inland ships in European harbours would use SSE by 2020 for covering their energy demand at berth, they would consume 3,543 GWh annually, which is approximately 0.1% to the electricity consumption in Europe as a whole in 2012. Furthermore, SSE offers the potential to mitigate 800,000 tons of CO<sub>2</sub> emissions. (Source Ecofys study)



A cruise vessel (12 MW) emits during 8 hours



1.2 t NO <sub>x</sub>	equivalent to	10 000 cars
30 kg PM*	equivalent to	6 000 cars

\*Particulate Matter

in transit Paris - Berlin

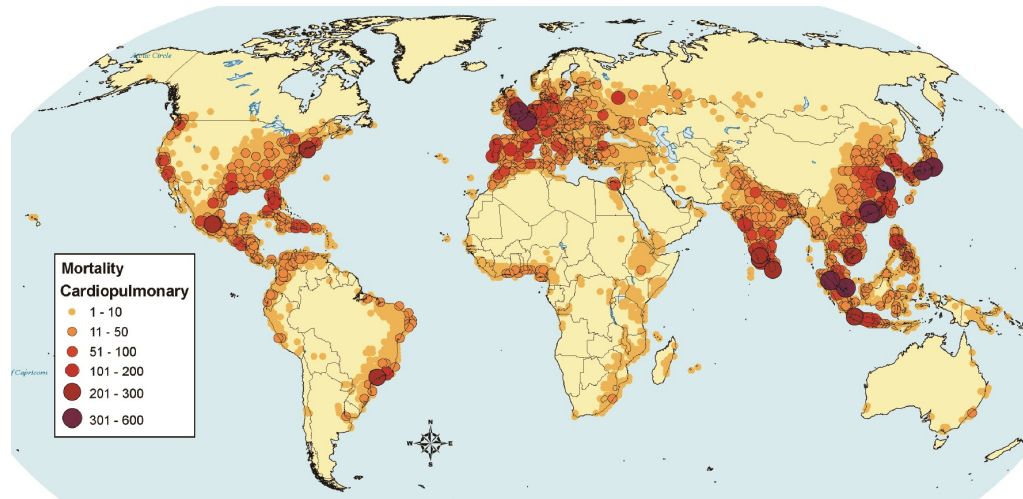


# Mortality from CO, SO<sub>x</sub>, NO<sub>x</sub> and PM generated by shipping

- ◆ Annually mortalities in EU increase from 49.500 (2000) to estimated 53.400 (2020)
- ◆ 50.000+ premature deaths annually in EU
- ◆ Health costs in EU increase from 58.4 bn Euros/year (2000) to estimated 64.1 bn Euros/year (2020)

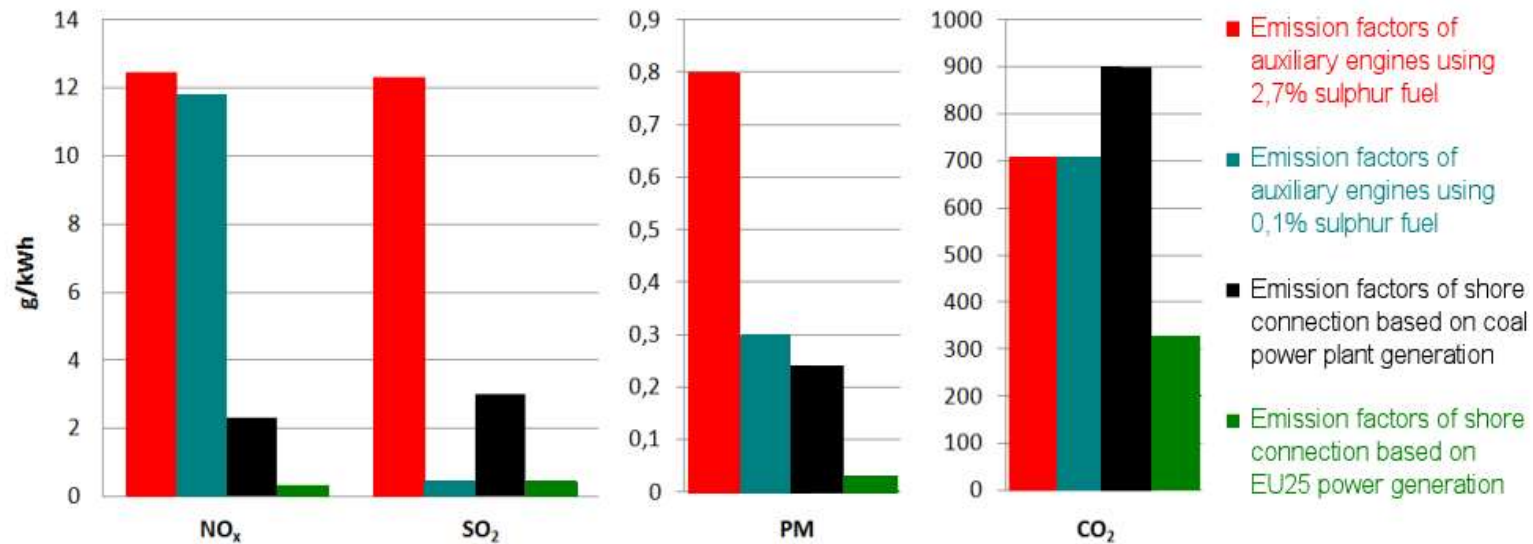
Source: J. Brandt et al., 2011: Assessment of Health-Cost Externalities of Air Pollution at the National Level using the EVA Model System, CEEH Scientific Report No 3, Centre for Energy, Environment and Health Report series, March 2011, pp. 98.

[http://www.ceeh.dk/CEEH\\_Reports/Report\\_3/CEEH\\_Scientific\\_Report3.pdf](http://www.ceeh.dk/CEEH_Reports/Report_3/CEEH_Scientific_Report3.pdf)



# Environmental benefits

- ◆ Locally  
Zero emission - noise - vibration in the port
- ◆ Globally



Source: ENTEC Study 2005 / Schneider

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# Additional benefits of shore side electricity

In addition to the clear advantages from the environmental aspects, shore side electricity brings additional societal benefits:

- ◆ Port area could be requalified and made more accessible to other businesses enabling urban development.
- ◆ Electrical network improvements for SSE guarantees a more reliable and resilient electrical infrastructure to the city.
- ◆ SSE could be very well integrated with urban mobility, and the power available could be used for electric cars and buses, further improving the environmental benefits of SSE
- ◆ Electricity is cheaper in the majority of Countries, making even stronger the case economically



# Applicable Global Standards

## Shore-to-ship power standards

- IEC / ISO / IEEE 80005-1, High Voltage shore side electricity
- IEC / ISO / IEEE 80005-2, Communication Protocol
- IEC / ISO / IEEE 80005-3, Low Voltage shore side electricity



## Power ratings

- Medium voltage : up to 20MVA per vessel
- Low voltage : typical < 1MVA

# Current status Onshore

- ◆ **ONSHORE:** This technology is already available in 97 berths worldwide:
  - 24 in US
  - 64 in Europe
  - 9 in Asia

Source: M.Sc. thesis realized by Mathilde De Keukeleire at the Université catholique de Louvain, supported by Schneider Electric, June 2012.



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# Current status Onboard

- ◆ Major shipping lines have started retrofitting their ships. All new cruise ships and all container ships bigger than 6000 TEU are already equipped with provision for SSE.

CONTAINER		FERRY / RORO	BULK & TANKER	CRUISE
NYK APL Maersk ICL K-line MOL Evergreen	CMA CGM MSC Hapag Lloyd China shipping OOCL Matson navigation Yang Ming	Color line Stena line DFDS Cobelfret Viking line Wagenborg shipping Scandlines Allendia Rederi	HOSCO Pohang Iron & Steel BP	Disney Cruise Holland America Norwegian Cruise Line Princess Cruise Costa Cruise MSC Cruise Amet cruise



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# Regulations & Fundings on SSE



# Worldwide benchmark of SSE regulations

International Maritime Organization: SSE make ships compliant with MARPOL 6 MO NoX, and SoX regulation

Environmental ship index: Vessels equipped with SSE system get port fees reduction in ESI member ports

Canada  
Shore Power Technology for Ports (SPTP) program

\$27.2 million funding will be available from April 1, 2013 to December 31, 2015

DAFI Directive  
SSE should be implemented by 2015

Sweden  
Germany  
Reduction of electricity tax rates for use of SSE (under Directive 2003/96/EC)

CALIFORNIA (CARB)

« In 2014 shipping lines for container and cruise ships must have 50% of their fleet plugging into shore-side power, and must reduce total at-berth emissions by 50% (70% in 2017, 80% in 2020)»

Spain  
Port fees reduction for shipowners equipped with SSE

CHINA (MoT of China)

« Shore Connection should be included in project planification, design and construction for new container, bulk, cruise and ropax terminals »

# European funding for Shore Side Electricity projects : CEF

- TEN T = TransEuropeanNetwork - Transport
- 1<sup>st</sup> TEN T program ended in 2013. New TEN T program is covering 2014 -2020, under new name: **CEF (Connecting Europe Facility)**
- Funding program aiming at improving European transport infrastructures, managed by the European Commission
- What to get the CEF money ?
  - Ports/operator have to answer TEN T Call for project
  - 2015 call ended in Feb. Next call for project planned in Feb 2016

[http://ec.europa.eu/transport/themes/infrastructure/ten-t-guidelines/project-funding/cef\\_en.htm](http://ec.europa.eu/transport/themes/infrastructure/ten-t-guidelines/project-funding/cef_en.htm)



# European funding for Shore Side Electricity projects : CEF

- 3 subsections dedicated to maritime industry with different aims and funds
  - Innovation (need to prove innovative aspects)
  - Motorways of The Sea (MoS) (at least 2 ports need to be involved)
  - Infrastructure development
- 2 types of fundings :
  - Research (up to 50% fundings)
  - Deployment (up to 20% fundings)
  - =>Funding rates for Eastern European countries is higher: up to 85%
- Funds also available for private ports/operators
- Direct reference to SSE within CEF regulation:

## Article 25

3. Projects of **common interest for motorways of the sea** in the trans-European transport network may also include activities that have wider benefits and are not linked to specific ports, such as **services and actions to guarantee the seamless mobility of persons and goods in particular in the most remote, outermost and insular regions<sup>[5]</sup>**, activities for improving environmental performance, **such as the provision of shore side electricity or emission scrubbers that would help ships meet stricter emission levels<sup>[6]</sup>**, making available facilities for ice-breaking, activities ensuring year-round navigability, dredging operations, alternative fuelling facilities, as well as the optimisation of processes, procedures and the human element, ICT platforms and information systems, including traffic management and electronic reporting systems.

## Article 26

2. Port operators **or the competent authority governing the port** shall **ensure that ports include equipment necessary to ensure the environmental performance of ships in ports, in particular electricity supply facilities as well as** reception facilities for ship generated waste and cargo residues in accordance with Directive 2000/59/EC of the European Parliament and of the Council of 27 November 2000 on port reception facilities for ship-generated waste and cargo residues **and with Directive 2012/.../EU on the sulphur content of marine fuels, and electricity supply facilities**

# European funding for Shore Side Electricity projects : Junker Plan

- **Junker Plan Objective:** Unlock €315 billion for the EU economy using only €21 billion in risk guarantees for investment projects.
- **Financing: European Fund for Strategic Investment (EFSI):** The money for guarantees will come from the EFSI, a joint venture between the EIB and the Commission as well as any Member States willing to contribute.
- **Submission of projects:** Member states, as well as other entities, may submit plans for projects at any time. Projects are evaluated according to the following criteria:
  - EU value added (projects in support of EU objectives)
  - **Economic viability and value** - prioritizing projects with high socio-economic returns
  - Projects that can start at latest within the **next three years**
  - The projects' potential for leverage of **other sources of funding**
  - Their **size and scalability** (e.g. the possibility to bundle smaller investments).
  - Commission wants to have projects chosen by mid-2015.



**Junker plan does not provide direct money but support with financial instrument**

**Electrification of Transport being part of the Junker Plan priority, Shore Connection projects can be eligible.**



# DAFI Directive: Recommendation for implementation in national policies





# 2 articles on Shore Side Electricity in DAFI

## Article 5

Member States shall ensure that the need for shore-side electricity supply for inland waterway vessels and sea-going ships in maritime and inland ports is assessed in their national policy frameworks.

Such shore-side electricity supply shall be installed as a priority in ports of the TEN-T Core Network, and in other ports, by 31 December 2025, unless there is no demand and the costs are disproportionate to the benefits, including environmental benefits.

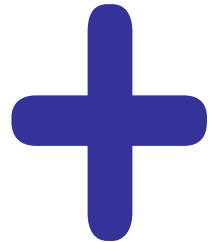
## Article 6

Member States shall ensure that shore-side electricity supply installations for maritime transport, deployed or renewed as from 18 November 2017, comply with the technical specifications set out in point 1.7 of Annex II.

## Annex II.1.7 Shore-side electricity supply sea-going ships

Shore-side electricity supply for seagoing ships, including the design, installation and testing of the systems, shall comply with the technical specifications of the IEC/ISO/IEEE 80005-1 standard.

# How DAFI impact the development of Shore Side Electricity in European ports ?



The deadline set a concrete target

The standard guarantee a ww compatibility

Technology neutrality (especially with LNG) is preserved



The lack of precision of the wording links the effective deployment of SSE to subjective criteria

# T&D recommendations

- Within the National policy Framework, **prioritize SSE implementations** in :
  - **Berths for sea-going vessels** (container, cruise, ferries/ro-ro): biggest polluter at berth
  - **Berths where environmental benefits of SSE will be the highest** (berths located close to urban areas, welcoming vessels staying at berth for a long period of time)
- Include health costs linked to ships emissions in the costs/benefits calculation
- Stimulate the shipliners demand through active policies
  - Port fees reduction for ships retrofitted with SSE
  - Electricity detaxation for ships using SSE
  - Prioritize shore side electricity through Ten-T projects.

# Investment costs dimensioning criteria

Berth type	Typical power need	Frequency of the vessels	Typical investment for one berth
<b>Cruise</b>	10-20 MVA	60Hz: Need of frequency conversion technology	3-4 M€ *
<b>Container</b>	>15 000TEU : 7,5MVA 10 000 TEU: 5MVA 5000 TEU(Panamax): 3MVA	94%: 60Hz (Need of frequency conversion technology) 6%: 50Hz (No Need of frequency conversion technology)	1,5-2 M€ *
<b>Ferry / RoRo</b>	1-3MVA	70%: 60Hz (Need of frequency conversion technology) 30%: 50Hz (No Need of frequency conversion technology)	0,5 M€ *

\* Estimations used in Ecofys report par. 2.2



# Environmental benefits dimensioning criteria

Berth type	Time spent at berth	Energy need at berth	Proximity with urban/residential areas
<b>Cruise</b>	Very long period of time: 8 hours to 48 hours	Very high (up to 20 MVA of power need)	Most of the time, very close
<b>Container</b>	Long period of time 6 hours to 12 hours	High (up to 7,5MVA of power need)	Dependent on each port configuration
<b>Ferry / RoRo</b>	Short to medium period of time 1hour to 12 horus (ferry staying at berth during the night)	Medium (Up to 3MVA of power need)	Most of the time, very close

# Typical SSE implementation for cruise



Port of San Diego, 2010

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# Typical SSE implementation for Ferry/Roro



Stena Line terminal in Rotterdam 2012

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# Typical SEE implementation for containers



SSE cables from MAESK container ship (Maersk Line, 2014)



# Methodology example for assessing SSE in national policy framework

1: List sea going vessels TEN T ports among the state

2: Make a segmentation per berths type (Container / Ferry Roro / Cruise / Other)

3: Assess environmental benefit of implementing SSE for each berth based on the following criteria:

- Time spent at berth by the ships
- Energy consumption of the vessel
- Proximity of each berth with residential areas

4: Assess the cost of implementing SSE for each berth

5: Assess the health costs linked to ships at berth emissions

6: Prioritize investment in berths where costs are not disproportionate to the benefits including environmental benefits

# Shore side electricity

## MYTHS

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### Myths:

1. Chicken and Egg problem - ship owner or port to invest in S2SP ?
2. Few ships are prepared for shore to ship power

### Myths:

1. "There is no standard"
2. "Unproven technology"
3. "Not installed in Europe"
4. "Ship produce electricity cleaner than power plants on shore"

## CURRENT STATUS

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### Facts:

1. Public authorities have several instruments for promoting deployment
2. An increasing number of newly built ships are equipped with shore power

### Facts:

1. IEC/ISO/IEEE 80005-1 Standard is active
2. First S2SP installation back in 1999
3. Gothenburg, Rotterdam, Hamburg are only a few examples
4. Check country electricity mix vs diesel

# Shore side electricity - take away points

1. Noise reduction, harmful emission reduction and CO2 reduction may lead to commercial use of port areas and improve inhabitants health and well-being.
2. Less vibration makes life onboard cruise ships and in surrounding port areas much more comfortable
3. There is a business case for all parties: lowering operating costs on ships and providing additional services at ports
4. The additional SSE demand creates opportunities for local balancing of electricity networks
5. Connection of renewable energy resources in the form of wind and solar energy allow further emission reduction



# Shore side electricity - useful links and documents

1. Alternative fuel directive:  
[http://ec.europa.eu/transport/themes/urban/cpt/index\\_en.htm](http://ec.europa.eu/transport/themes/urban/cpt/index_en.htm)
2. Available financial package:  
[http://ec.europa.eu/transport/themes/infrastructure/ten-t-guidelines/project-funding/cef\\_en.htm](http://ec.europa.eu/transport/themes/infrastructure/ten-t-guidelines/project-funding/cef_en.htm)
3. Ecofys report: <http://www.ecofys.com/files/files/ecofys-2014-potential-for-shore-side-electricity-in-europe.pdf>
4. IEC/ISO/IEEE 80005 Utility Connection in Ports





Thank you for your attention

