European flagship Action for coLd ironING in ports

Maritime Fleet Adaptation

EALING Final Event

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Valencia, 30 November 2023

OBJECTIVES

Port to vessel compatibility for SSE adaptation

Study of several use cases/scenarios of vessels

Recommendations, for a harmonized technical, legal and regulatory framework on fleet electrification adaptation, leading to a final proposal to IMO

Study of the electrical standards and regulatory framework

Retrofit best practices identification

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Steps to meet the goal →

Recommendations, for a harmonized technical, legal and regulatory framework on fleet electrification adaptation, leading to a final proposal to IMO

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STEPS

EALING ACTIVITY 2 WORKSHOP

- More than 80 participants
- Organized by Circle and Hydrus with the contribution of the other EALING partners
  - *Project partners*
  - *Associations (CINEA, EU MoS, DG MOVE, EMSA, ECSA)*
  - *Shipping Lines representatives*

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STEPS - ACTIVITY 2 WORKSHOP

- ✓ The involvement of all the maritime industry stakeholders in the SSE adaptation is crucial - cooperation between ports and shipping sector is vital for the effective implementation of SSE
- ✓ Lack of existing infrastructure in EU ports is a discouraging factor for the shipping sector
- ✓ SSE is important to be included in new tax regulations (tax exemption for electricity provided at berth)
- ✓ Challenges for Shipping sector: various standardization requirements regarding the connection specs / frequency difference between Europe and United States / high OPEX and CAPEX

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STEPS

REPRESENTATION IN EVENTS

- Baltic Ports Workshop

10 September 2021

- Sea Future Event 2021

30 September 2021

- EALING Mid-Term Event

29 April 2022

- Posidonia 2022

7 June 2022

- EALING SSE Solution Providers Workshop

20 July 2022

- IEEE monthly technical workshop

26 October 2023

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STEPS - REPRESENTATION IN EVENTS

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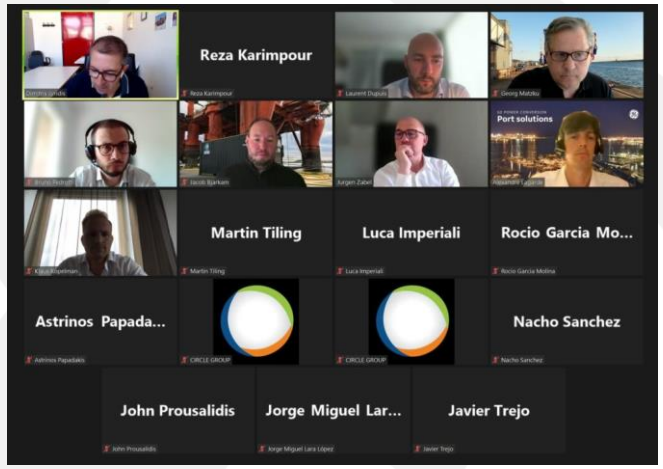

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STEPS

QUESTIONNAIRES

- Addressed to **Shipping Lines**
  - *Shipping lines visiting the Ports of the consortium contacted*
  - *More than 100 contacts*
  - *18 Shipping Lines responded*
- Addressed to **Classification Societies** and **Flag Registries**
  - *IACS members and Flags representing visiting Shipping Lines contacted*
  - *4 Classes - 2 Flags responded*

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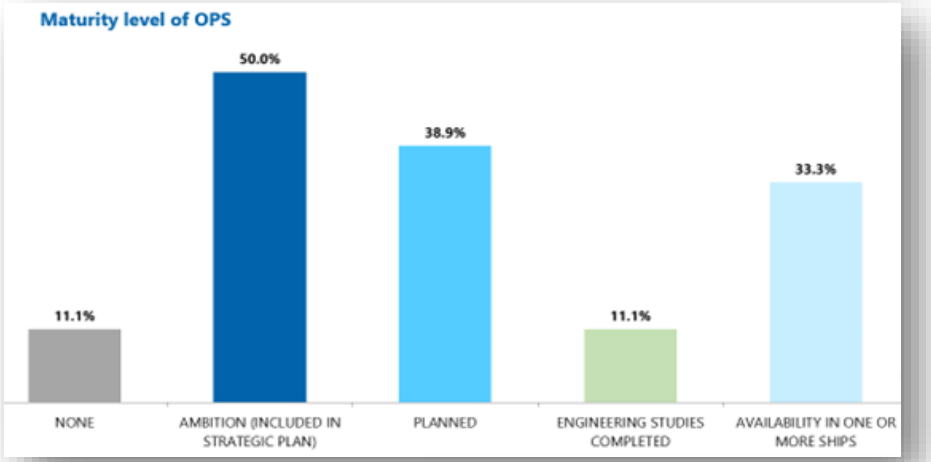
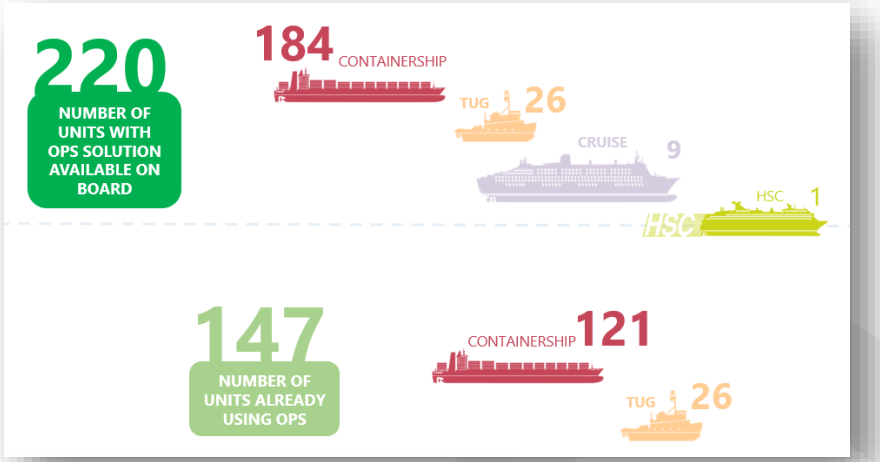
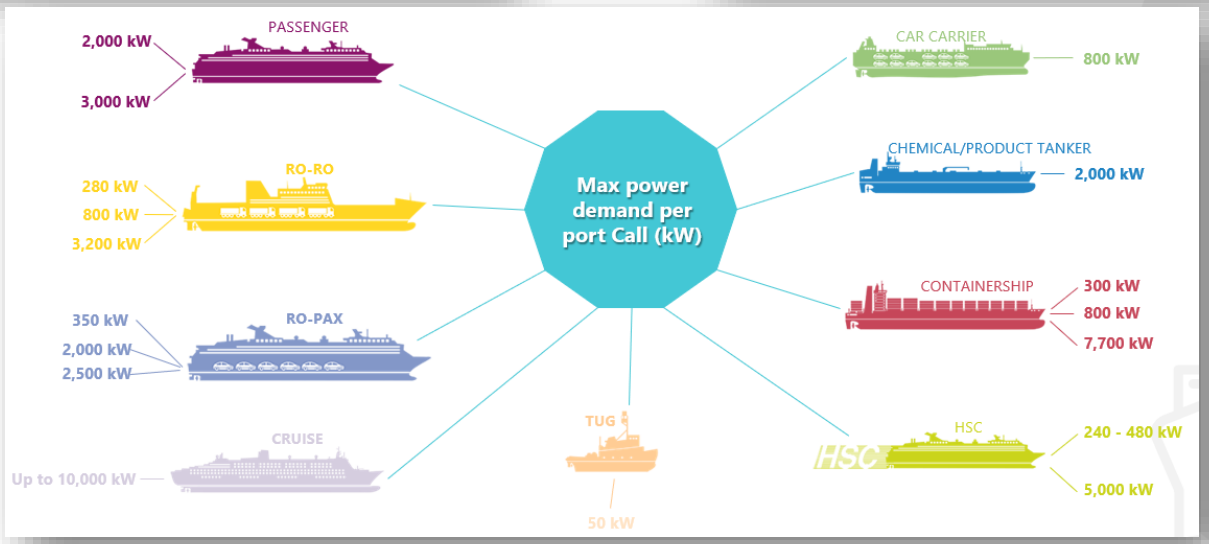
STEPS - QUESTIONNAIRES







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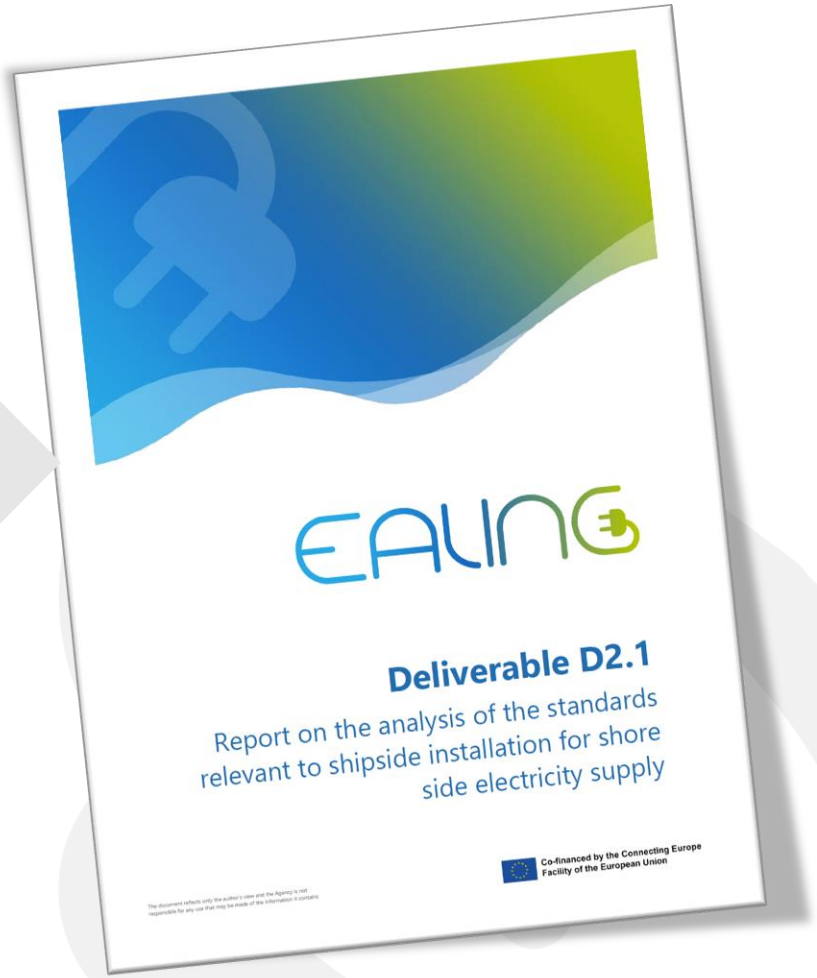
STEPS

REPORT

- Analysis of the standards relevant to shipside installation for shore side electricity supply
    - *Regulatory framework analysis*
    - *Technical/Operational guidelines*
    - *Challenges (lack of information, technical difficulties, overlaps)*



STEPS

CASE STUDIES

- 5 different ship types selected based on:
  - *Activity 2 Questionnaires*
  - *TEN-T EU participating ports in EALING Project*
  - *Regulations Review*
  - *EU Thetis MRV*

- Engineering assessment of SSE adaptation performed
  - *Applicable standards*
  - *Vessels' requirements identification*
  - *Feasibility study*

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STEPS – CASE STUDIES

a/a	Vessel type	Capacity	Power requirement (based on ELA)	Distribution system	Frequency
1	Cruise Ship	140,000 GT	>1 MVA	11 kV	60 Hz
2	RoPax	18,600 GT	>1 MVA	380 V	50 Hz
3	Containership	10,000 TEU	>1 MVA	6.6 kV	60 Hz
4	Bulk Carrier	87,000 DWT	<1 MVA	440 V	60 Hz
5	Tanker	50,000 DWT	>1 MVA	440 V	60 Hz

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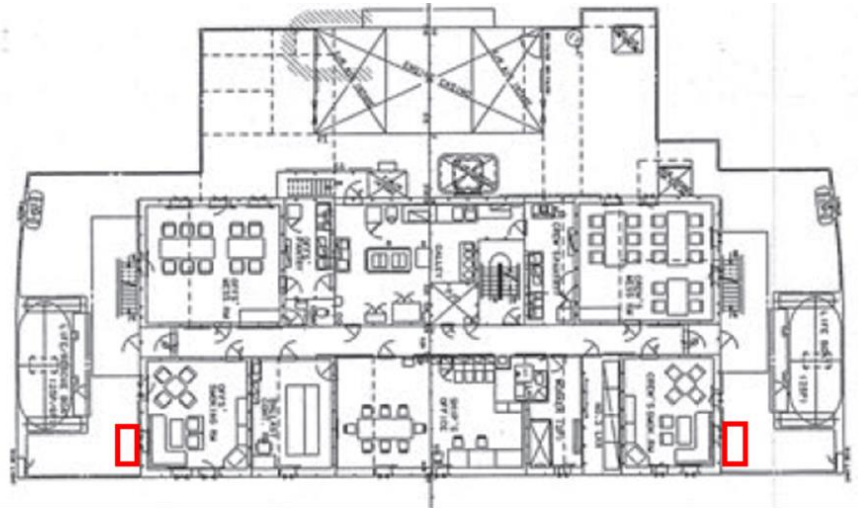
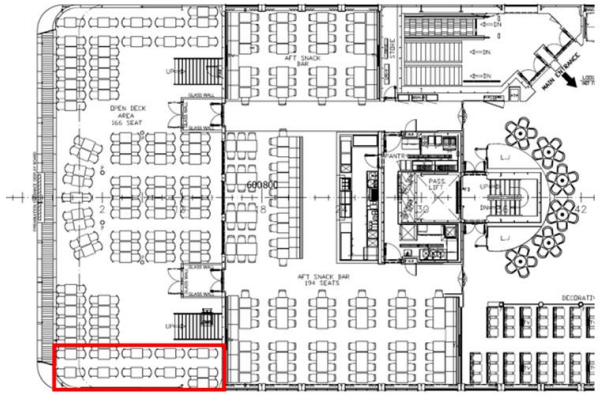
STEPS – CASE STUDIES



Proposed arrangement for the socket boxes



Receiving point possible installation space

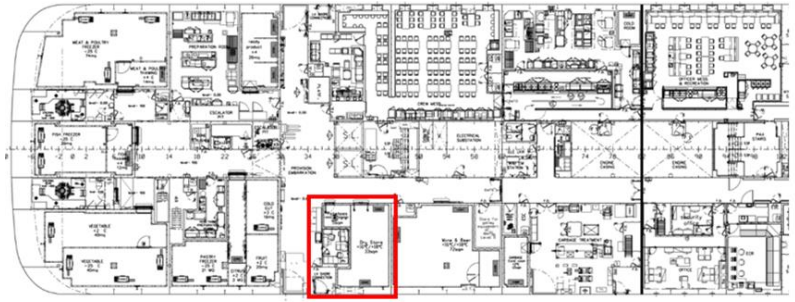
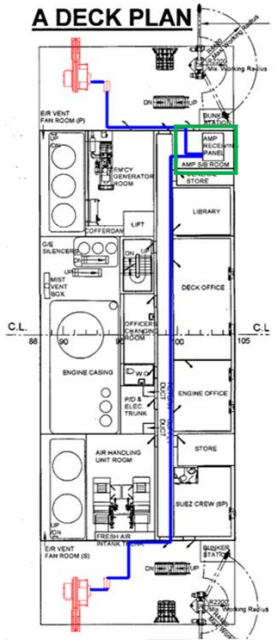


Figure 55 - Plan view of the Deck A of the cruise ship, showing the location of the space to be refitted for SSE equipment installation



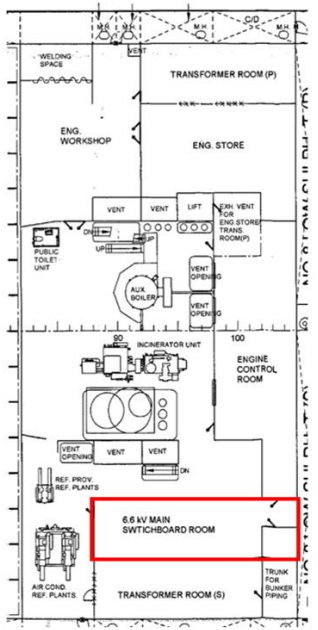


Figure 93 Plan view of the A deck in the accommodation area

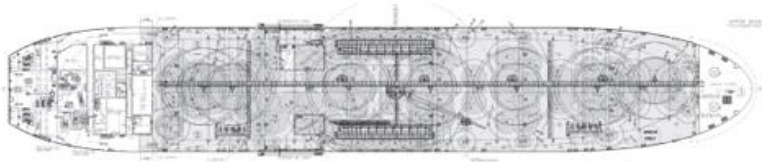


Figure 94 Plan view of the upper deck, showing the dangerous areas marked with grey color

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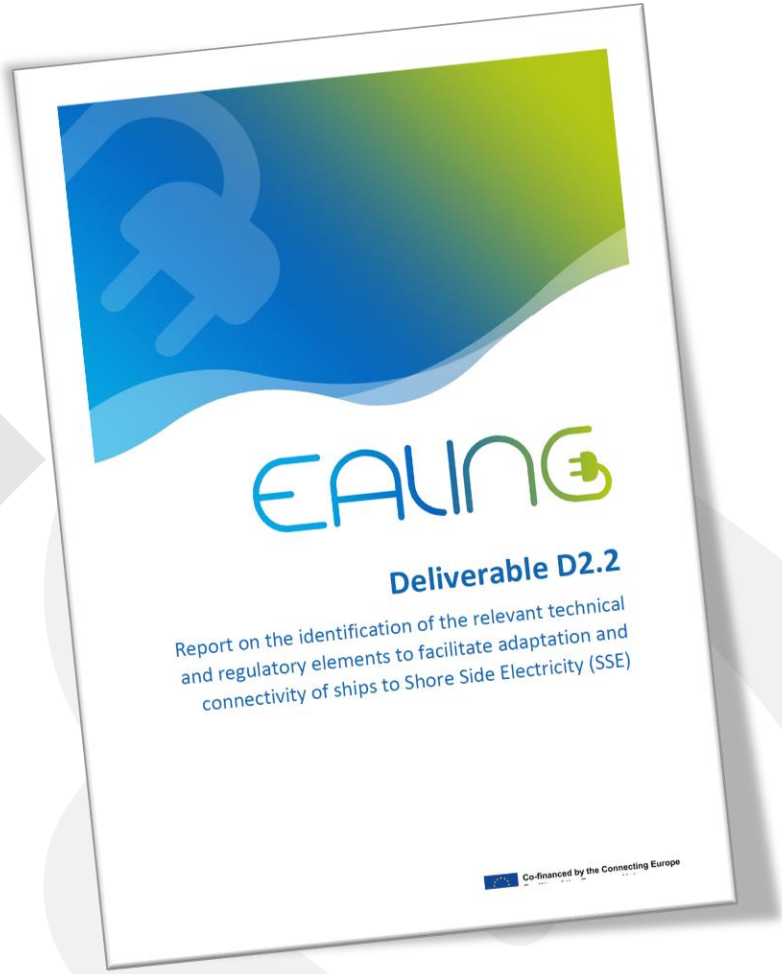
STEPS

REPORT

- Identification of the relevant technical and regulatory elements to facilitate adaptation and connectivity of ships to Shore Side Electricity (SSE)
  - *Case studies selection and analysis*
  - *Preliminary implementation plan*
  - *Regulatory and technical recommendations*



Final recommendations for a harmonized technical, legal and regulatory framework on fleet SSE adaptation

FINAL RECOMMENDATIONS

REGULATORY / OPERATIONAL

A designated person-in-charge should be assigned both at the shipping company and onboard the vessel.
Harmonized training programs and qualification certificates are required, along with the inclusion of SSE procedures and safety measures in the Standards of Training, Certification and Watchkeeping.
A ship- specific SSE operational manual, including an Emergency Response Plan should be established.
Specific commissioning, startup etc., checklists should be provided in the Annex of the IMO guidelines to facilitate both ship and port operators. Existing checklists, like the ones used by the Port of Los Angeles, that are publicly available can be used as valuable input.
Publication of Guidelines and Lessons Learnt from the ports and vessels with SSE experience could accelerate the wide adoption in EU.
Designer Training - Personnel involved in equipment design and operations planning must be trained to carefully adhere to accepted standards and guidelines and comply with the regulatory codes.

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FINAL RECOMMENDATIONS

REGULATORY / OPERATIONAL

Development of an internet-based EU ports SSE information platform (port name, number of berths, types of vessels berthing, availability and power characteristics of SSE provided at each berth, etc.)

Harmonized training programs and qualification certificates are required, along with the inclusion of SSE procedures and safety measures in the Standards of Training, Certification and Watchkeeping.

Additional information would be needed and could be collected in Thetis MRV database, such as the total time spent at berth, and the total fuel consumption as well as the fuel type while at berth. These two variables would allow a direct estimation of power and energy needs to properly size the future SSE systems at ports.

Expansion of the Thetis MRV public database. The addition in the database of the energy consumption (KWhs) while at dock and the respective hours the vessel was at dock would indicate the ship side actual power requirements.

It needs to be further clarified, whether in the case of 1MVA installed at port IEC/IEEE 80005 -1 or IEC/IEEE 80005 -3 is applicable, thus the expected voltage provided by the port.

The IEC standards need to limit or define the available voltage options from ashore.

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FINAL RECOMMENDATIONS

TECHNICAL

By installing the voltage transformer as close as possible to the MSB, the negative effects of voltage drop, power loss, and voltage regulation issues in the LV power cables can be minimized.

The position of the receiving point should be strategically determined to facilitate efficient cable routing and minimize power losses, the voltage drop and the required cables length, as well as to reduce the impact in the existing ship arrangement and operations. The positioning of equipment in the upper deck area should not cause interference with the mooring equipment.

To provide flexibility regarding the position of the vessel while at dock two receiving points, one for the port and one for the starboard side, are recommended to be installed.

Frequency conversion needs to take place at port, so that the proper frequency level is provided to the ships.

Major issue is that different voltage levels may apply in general in the ships for either LVSC or HVSC. Ideally, the voltage corrections (e.g., 400V ⍰ 440V) should be carried out at port during the frequency conversion, so that a tap changer can be avoided at the onboard transformer.

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FINAL RECOMMENDATIONS

TECHNICAL

To ensure compatibility in the shore-to-ship interface (incoming panels), sizing from the shore side for a pre-determined voltage level could be considered as an option, especially for the case of LVSC.
Plug/socket power rating specification to be the same in the shore side and the ship side to ensure compatibility.
Separate ELA condition for SSE to be established.
The synchronization or load transfer procedure, crucial for the safe and efficient operation of shore equipment installation onboard ships should be documented as a step-by-step checklist for the vessel operators.
The important parameters that affect the energy consumption for each type of vessel need to be further documented. E.g., in the case of container vessels, there is a direct relationship between the power demand and the number of connected reefers. Therefore, it is important to carefully consider the power capacity the ship's electrical system will require when it carries the reefer containers. In this sense, it would highly facilitate the connection indicating to the port the number of reefers onboard and the power required per reefer in advance.
Impact to vessel's lightweight to be assessed.

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Thanks!

EALING
European flagship Action for coLd ironING in ports

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Discover more at

www.ealingproject.eu

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