Electrification in ports and vessels: Towards sustainable sea mobility

Roadmap & Strategies for the ports’ and islands’ transition through Electrification

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The Magic Cases of Orkney and Samso

- Electricity from Wind and Tidal Turbines
- Excess energy is used to produce hydrogen
- Fuel cells provide electricity on demand for ships and activity within Kirkwall Harbour.
- By-product heat is piped to community buildings
An endless opportunity for synergies

**Potential:** More than 100 Short Sea Shipping connections in Greece – 30% under 5nm

- More than 150 vessels operate these routes
- Huge potential for Green Hybrid Technologies
- 5GW of RES installed in GR
- Projection for more than 12GW by 2025
- Marine transportation as a consumer of excessive RES electricity
Renewables Prospect

The vision for cheaper and clean electricity

Most Aegean Islands are not connected to the mainland grid and thus rely on polluting and costly-inefficient diesel generation

- Cost of Electricity can be 3-27 times more than System Marginal Price
  - Santorini 0.2 €/KWh – Ikaria 0.4 €/KWh *
  - Donousa: 1.34 €/KWh*
  - Cost for Non-Connected Islands, approx. € 800 Mil/year

While :

Levelized Cost of Energy for Renewables:

- Wind: 2.8-5.5 cents €/KWh
- Utility Scale PV: 3.1-6.2 cents €/KWh
- Fuel Cells: 8.9-13.2 cents €/KWh
The elemed project

First Cohesion Fund project in Motorways of the Sea

3 Member States – Participating Ports:
- Piraeus – Killini (Greece)
- Lemesos (Cyprus)
- Koper (Slovenia)

Cross-european maritime network and macro-regional strategies for Adriatic-Ionian Seas
The Vision of Elemed Project

To reduce emissions in the vicinity of populated areas where it matters the most

Snapshot from NOx Emissions Simulation for a berthed vessel at the Port of Killini

Emissions Reduction Potential from the adaptation of cold ironing
The case of Killini Port

The first cold ironing installation in the East-Med Area

- Serving the Zakynthos and Kefalonia Islands
- Port Installation for 2-4 Shore Connections Projected
- Real life application – crash test for similar port works
- Record time permitting process

Pilot installation: 1 berth supplying one Ro-Pax vessel with approx. 500kVA needs during port stay
The case of Killini Port

Snapshot from the near future

- 4 cold ironing positions and 1 electric bunkering station
- Studies for PV and Vertical Wind turbines integration
- Energy from renewables to berthed vessels
- Surplus RES energy to energy storage system
Electrification in Ships & Ports

Elemed Proposal:
3 Pillar Proposal: Policy, Financial Incentives, Technical Requirements

Policy recommendations
- Ports supplying electricity for cold-ironing services (Eleftherios Venizelos Model)
- Support of renewable energy integration
- Simplification of permit procedure for installation & use of electric power within ports

National Policy Framework for Alternative Fuels
Integration of Elemed Proposal

Recommendations on Funding/Financing
- Inclusion of electric power in the marine fuels category and application special taxation measures
- Design an efficient regulatory environment to ensure sustainable provision of Public Private Partnerships (PPPs), involving local insular communities
- Build an equivalent funding environment attracting investments in hybrid shipping for isolated insular routes
Ship & Port Electrification Combined

Prospects and Benefits
Snapshot from Piraeus Terminal

- More than 500,000 population in proximity to port
- Huge direct benefits from the adaptation of Cold Ironing
- 98% Elimination of NOx and PM

Electro-mobility at sea

- Battery Prices are dropping fast & New ultra density ESS will be on the market soon
- Estimated Electricity cost for an electric ferry 1cent/€ per PAX per Nautical Mile
- A Radical Technology Uptake Program to follow after 2020
Global State of Play in Hybrid Vessels

Today

- Under Construction
- In Service
LR and Hybrid Ship Technology

- LR has an extensive - nearly 20-year - experience of battery installations on board ships and yachts
- Integrated approach to the acceptance of battery installations

Hybrid Fleet Around the Globe

- 44% Passenger/Ro-Ro
- 12% Yachts
- 20% Tugs
- 10% Research Vessels
- 7% Offshore Support Vessels
- 5% Car Carriers
- 2% Other

35+ LR Vessels in service
Hybrid Ferries

Prominent Examples from LR Experience

Scandlines Prins Richard – 2.6MWh

Victoria of Wight – 1.1MWh

CalMac Hallaig – 500 kWh

BCFerries Hybrid Concept – 1.5 MWh

Teso Texelsroom – 900kWh

Tycho Brahe – 4160kWh
Hybrid Vessel Design

- Twin Screw/Twin Hull Ro-Pax
- LOA 84.4m
- 1000 Pax
- Service Speed: 17 kts
- All Electric Configuration
- Top Tier Deck allocated for solar panels

- Projected battery Needs 5MWh @ 17kts
- Projected Installation 8MWh
- DC power distribution for space and performance optimization
- 50% CO2 reduction, NOx, SOx & PM elimination
Wind & Sun to Propeller:

Shaping a sustainable future
Snapshot from a sustainable insular ecosystem

New Energy and Transportation Markets

- Potential for the islands to meet more of their own energy demands
- Enhanced Electro-mobility
- Drastic improvement in power availability and Grid Reliability
- Improved environmental conditions and GHG reduction
- Direct financial benefits in an emissions and noise free environment
Thank you

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