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The Archipelago -LNG project - The Technological, Economic and Environmental Challenges on the Greek Islands

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*Ports Maritime Transport & Insularity
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Contents

1.The idea behind the project – Consortium - Objectives

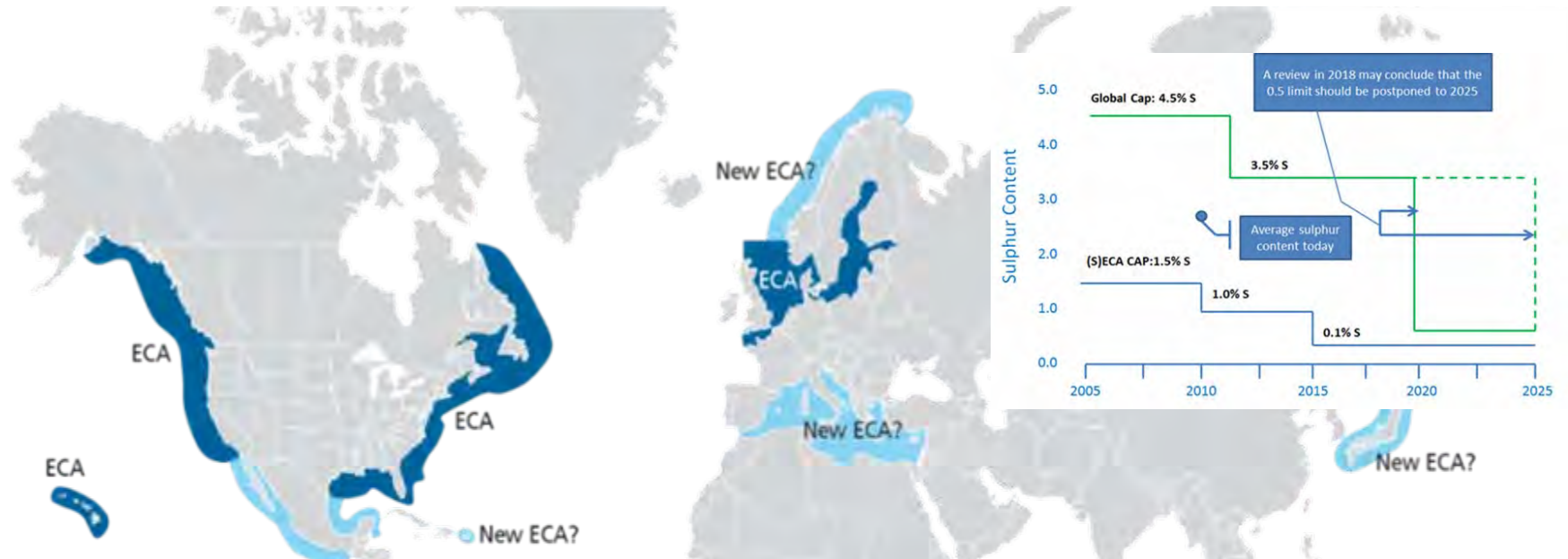
2.Main Results

3.Achievements and Obstacles

4.Prospects for the promotion of project objectives



Regulatory Framework – ECA



IMO Marpol Annex VI – 2008 amendments

➤ ECA (Emission Control Areas) (North Sea, Balkan Sea, English Channel) : 0.1% sulphur content since 1/1/2015

➤ In all European waters : 0.5% sulphur content by 2020

Mediterranean Sea is considered as a future ECA

- Existing
- Possible future ECA



LNG as marine fuel

- ✓ Environmental-friendly
 - ✓ Safe, proven, available technology
 - ✓ Lower OPEX costs than alternative options (Scrubber+HFO)
 - ✓ Clean fuel, no need for after-treatment
-
- ✓ LNG vs HFO - Diesel
 - ✓ 100% lower SOx emissions
 - ✓ 15-25% lower CO2 emissions
 - ✓ 90% lower Nox emissions
 - ✓ Less expensive fuel (-10% vs HFO, - 50% vs diesel)



Consortium

Partners

- ✓ South Aegean Region - Coordinator
- ✓ DEPA S.A.
- ✓ CERTH
- ✓ SEAJETS Maritime Company

Active Participation and Support (Steering Committee):

- ✓ Ministry of Environment and Energy (YPEN),
- ✓ Norwegian – German classification society (DNV GL Maritime),
- ✓ Hellenic Shortsea Shipowners Association (HSSA)
- ✓ Greek-German Assembly (DGV)



Objectives

- ✓ Identifying the key technical and economic framework of the small scale LNG as marine fuel supply chain in the South Aegean Region (bunkering, LNG engines retrofit, shipyards readiness for LNG retrofit services)

- ✓ Making recommendations of a legislative nature to the Greek Authorities with regard to both the technical and financial aspects of the LNG supply chain in the island regions, using as a reference the region of South Aegean.



Milestones

- ✓ Profiling of the operating characteristics of the South Aegean ports, Syros shipyard and the vessels of Seajets company
- ✓ LNG maritime market Research and Forecasting
- ✓ Selection of ports and ships for detailed technical studies concept and selection of the optimal LNG supply chain
- ✓ Feasibility and environmental evaluation of the LNG supply chain and LNG combustion in the shipping sector in the South Aegean Region
- ✓ Definition of the necessary regulations (Ministerial decisions, etc.) and recommendations related to safety, techniques, operational and educational aspects of the LNG maritime supply chain



Contents

1.The idea behind the project – Consortium - Objectives

2.Main Results

3.Achievements and Obstacles

4.Prospects for the promotion of project objectives



LNG Bunkering

- ✓ **Truck-To-Ship** (up to 500m³ daily)

From Truck Loading Station in Revithousa (end 2017)



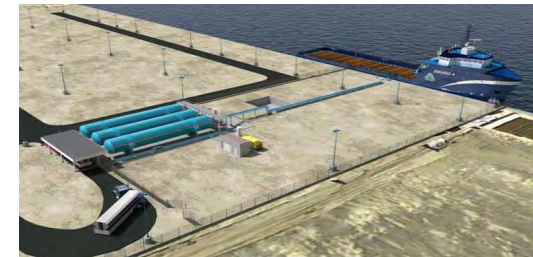
- ✓ **Ship-To-Ship** (from 500 m³ up to 6,500 m³ daily)

Bunkering barges from Revithousa directly to ship



- ✓ **Pipeline-To-Ship** (from 6,500 m³ daily)

By trucks or bunkering vessels to a interim storage facility in the ports





Ports

- ✓ Limited refueling capabilities from stable facility within the port limits
- ✓ Need for the examination of different supply refueling methods (Ship-To-Ship, Truck-To-Ship, portable tank transfer)
- ✓ Based on the evaluation of the examined ports, Piraeus and Heraklion ports have been selected for detailed technical retrofit studies as the basis for the LNG supply chain.



Shipyards

Necessary works and additions, such as:

- ✓ Technical equipment (additional type C tank, up to 100 m³)
- ✓ Staff training
- ✓ Security measures
- ✓ Information Tools (IT Tools)



Vessels

Study for the basic facilities and operations for the RO-PAX vessel of SEAJETS maritime company which connects Crete and Cyclades during the touristic season (Ship TERA JET)

- ✓ The engines are capable for retrofit
- ✓ High diesel fuel consumption due to operation of the two turbines
- ✓ Combined retrofit of part of the engine set (2 instead of 4) which maintains the existing profile of operation
- ✓ Ensuring reduced economic and environmental costs



Movement of vessels in the Aegean area

Winter (local and transit routes)
12/2014 – 02/2015



Summer (local and transit routes)
04/2014 – 09/2014



Summer (local routes)
04/2014 – 09/2014





Vessels – Economic factors for LNG retrofit

- ✓ Reduced maintenance costs (less damages, smaller storage tanks due to higher energy density)
- ✓ Conversion budget (from €3 to 10million €)
- ✓ Depreciation of investment (6-10 years)

Investment Cost Effectiveness Factors

- ✓ Number of engines for retrofit
- ✓ Volume of installed tanks
- ✓ Type of retrofit or replacement of the existing engine
- ✓ Operation profile (winter - summer)
- ✓ Future development of the LNG - MDO price



Environmental Impact

Comparison with HFO (without the possibility of post-treatment of exhaust gases)

	LNG	HFO with Scrubber	MGO with SCR
NOx	Reduction by 85% in comparison with HFO	Requires after-treatment (through SCR for NOx reduction up to 87%)	Reduction of 80% compared to HFO engines
SOx	Near zero Sox emissions	Near zero Sox emissions. There is no need for retrofit or change of the engine	Low Sox emissions. Low investment cost for retrofitting the engine.
PM	Near Zero	Significant reduction of particles emission	Reduced particles emission
CO2	Reduction up to 25%	No reduction	There is no reduction

- There is no sludge after LNG combustion



Regulation

European and international regulations

- ✓ High number of relevant legislation for LNG as marine fuel in Europe from either the central government or at local - regional level (eg port regulations)
- ✓ Existing Greek legislation - Oil Bunkering Regulation PD 293/1986 (Government Gazette A129)

Revision of the bunkering legislation

- ✓ Suggestions and additions required article by article based on best available European practices
- ✓ Continuous contact with the competent Ministries of Energy, Infrastructure and Marine



Contents

- 1.The idea behind the project – Consortium - Objectives
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- 3.Achievements and Obstacles**
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Achievements

- ✓ Completion of the project objectives within a year
- ✓ Participation of different bodies, organizations and companies for the study of a new innovative, environmental-friendly fuel and for the actions needed for the technical economic and legal harmonization of the country with EU regulations
- ✓ Dissemination to Public Authorities and organizations, maritime and shipping companies, shipyards, SMEs and large companies in the shipping sector
- ✓ Dissemination of the islands' needs in different forums for the use of alternative fuels along with other economic activities in the islands such as (apart from transport) tourism, electricity production, synergies with RES, and for the development of new jobs and specialization



Achievements

- ✓ High participation of stakeholders and authorities in the project events – over 200 participants in the workshop on 4 - 5 November in Athens
- ✓ The Archipelago-LNG became synonymous with the development of environmental-friendly alternative fuels in the South Aegean area, enhancing synergies and collaborations for new projects and new efforts.



Obstacles for the development of LNG as marine fuel in the area

- ✓ Matter of political stability and possible policy / administrative malfunctions
- ✓ Economic / Tax status and inadequate technical competence
- ✓ Low availability and inflexibility of the banking system as a lack of necessary financial incentives (subsidies, tax exemptions, etc.) in line with the European pollutant reduction directives
- ✓ Low-range plans for the LNG supply design of the existing installation in the Greek territory (planning for truck loading in a pilot stage by the end of 2017 - low expected export capability)
- ✓ Social acceptance



Contents

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- 2.Main Results
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Prospects for the promotion of project objectives

Development of new projects with studies and pilot projects relating to:

- ✓ Vessels
- ✓ Ports
- ✓ Fuel supply options
- ✓ Environmental Footprint
- ✓ Harmonization / implementation of the legal framework
- ✓ Awareness of administrative bodies, organizations and citizens
- ✓ Training of administrative bodies, technicians and professionals in the LNG supply chain



Prospects for the promotion of project objectives

Mobilization of the private sector

- ✓ Ship-owners
- ✓ Suppliers of machinery and fuel
- ✓ Small-Medium transport, energy and tourism companies
- ✓ Other SMEs (fuel industry, service facilities, shipyards, etc.)
- ✓ Banking sector



The Archipelago-LNG Project

Site: www.archipelago-lng.eu



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[Τύπος](#)

[Συνδέσεις](#)

[Η γωνιά των εταίρων](#)

[Φόρουμ](#)

[Επικοινωνία](#)





And the story continues..

Aiming to prepare a plan of infrastructure development in Eastern Mediterranean, so that LNG can be widely adopted as marine fuel for shipping operations.

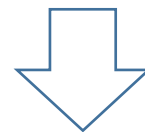


**POSEIDON
MED
LNG
BUNKERING
PROJECT**



Archipelago LNG

Aiming to identify the key technical, economic and legislative framework of the small scale LNG as marine fuel value chain in the South Aegean Region



POSEIDON MED II



26 Partners



Facilitate all necessary actions to achieve maturity, build strong cooperation among stakeholders, explore and enhance synergies





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Thank you for your attention!

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