The rise of LNG in Greece and Eastern Mediterranean

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NOCs/IOCs Strategic Goals

- **Maintain and upgrading their role** in the liberalised competitive domestic and international markets.

- ***Increase the natural gas penetration in the energy market by developing infrastructure projects and by supplying natural gas to regional markets.***

- **Become key players in the broader region** – expand trading activities through participation in international infrastructure projects.

- Maintain and continuously improve the competitive and sufficiently **diversified natural gas supply portfolio**.

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I. Need for LNG and LNG infrastructure

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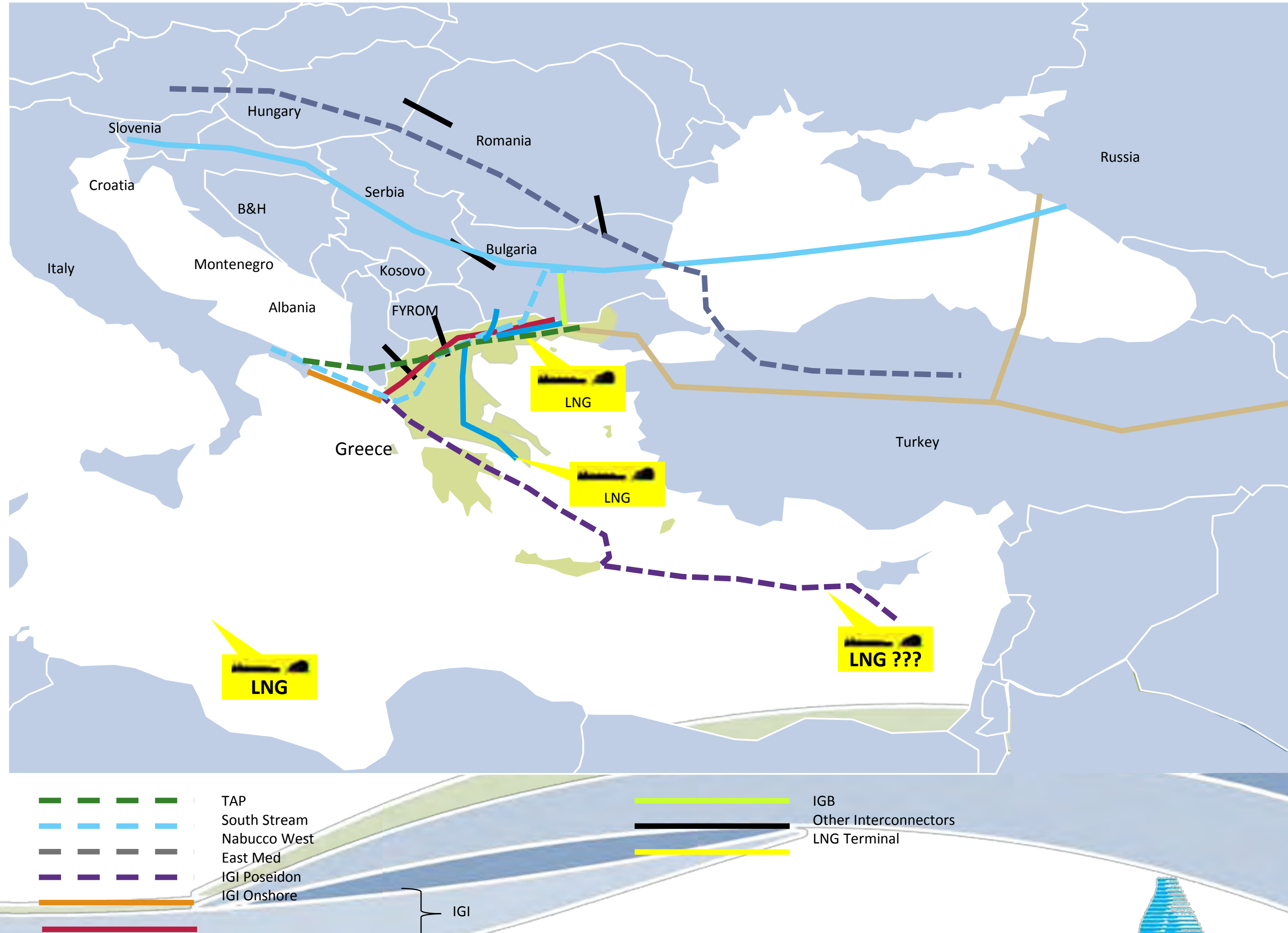
East Med Energy Projects

East Mediterranean gas will play an important role as the EU incorporates this newly found source into it's energy policy.

Existing LNG terminal in Revithousa Island off shore Athens

A planned Floating Storage and Regasification Unit (FSRU) in Northern Greece will allow LNG to flow to Europe.



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II. LNG as Marine Fuel

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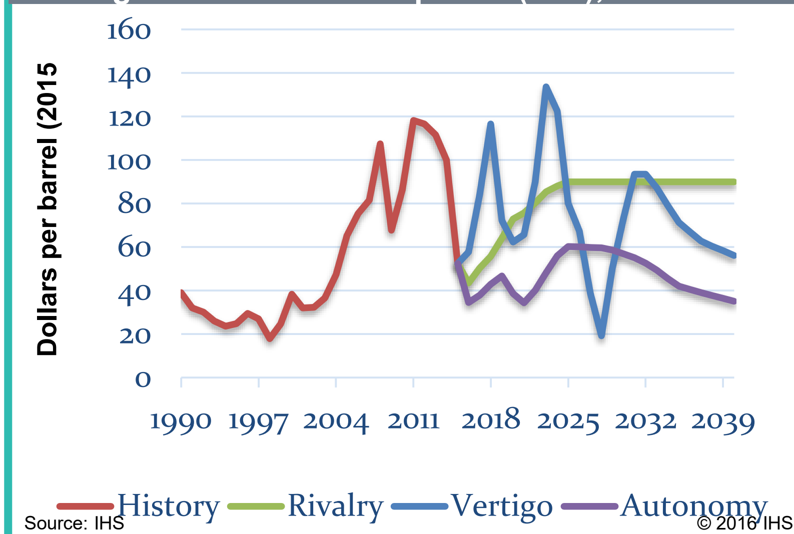
Key Considerations

- Recent decision of IMO will speed up developments
- LNG competition with Low Sulphur Bunker Fuels and EGCS (scrubbers) but:
  - Competition depends on oil price level and LNG decoupling
  - LNG can offer compliance with potential future environmental regulation (NOx, PM, COx)
  - Conversion Investments payback often < 5 years
  - LNG could be the most beneficial option for:
    - Smaller vessels
    - New builds
    - Vessels operating on fixed routes (e.g. Container vessels, Ferries, Cruise ships)
- Other issues also matter (safety, reliability)

Oil and Gas Prices

Average annual crude oil prices (real), 1990–2040

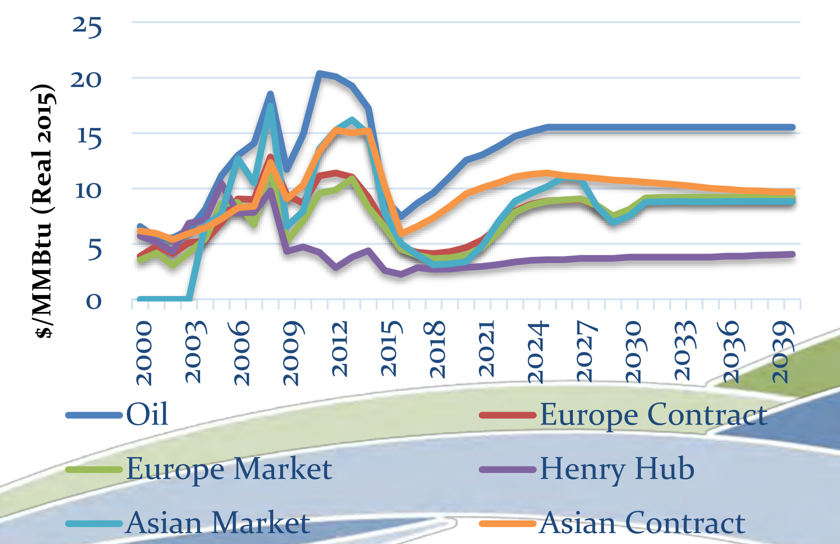


Source: IHS © 2016 IHS

Increased decoupling of oil and gas prices

LNG globally commoditized

Comparative gas prices (Real), 2000-2040



Source: IHS

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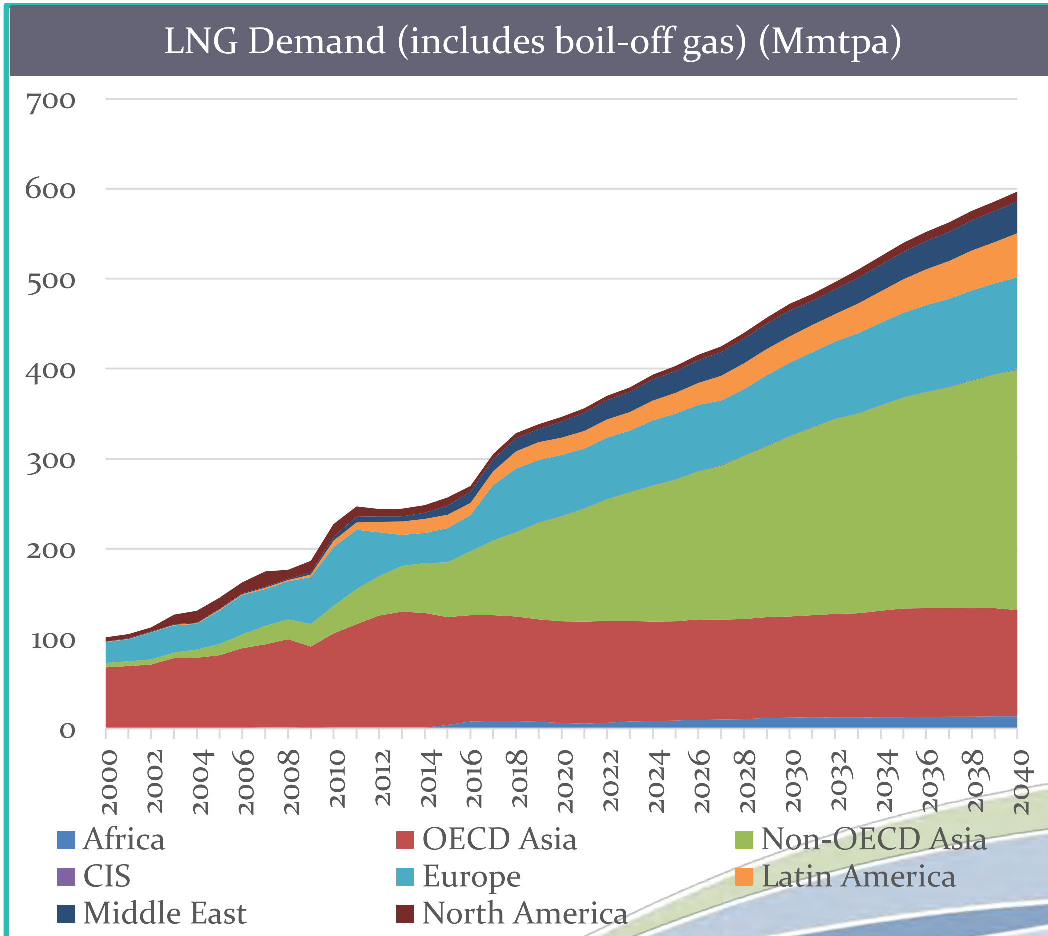
Global LNG Demand



LNG Demand growth under all scenarios

Non-OECD Asia is the main growth market

Europe remains the residual market

LNG demand as transportation fuel grows in importance

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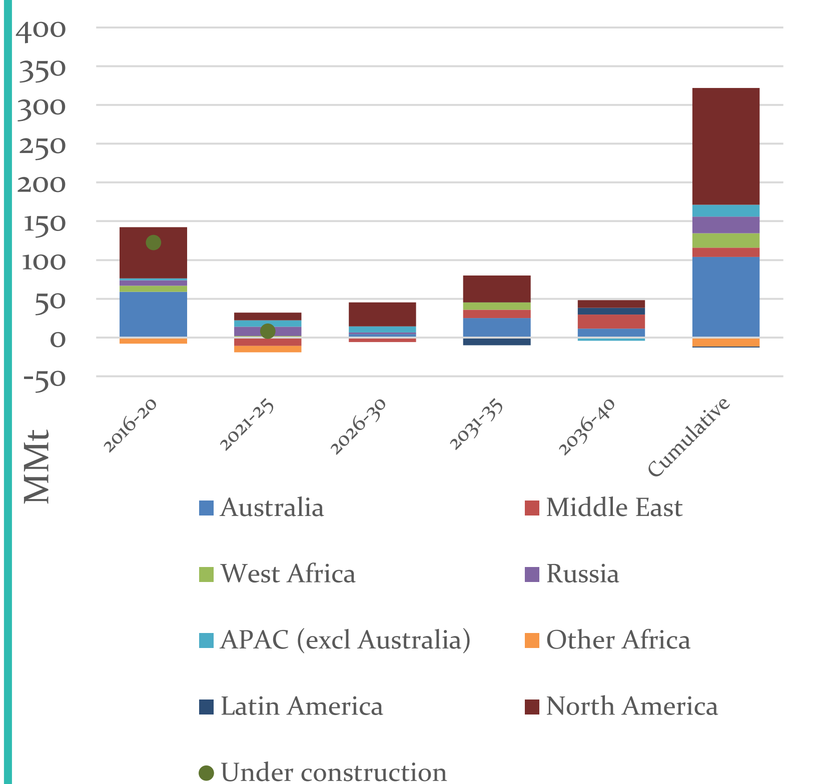
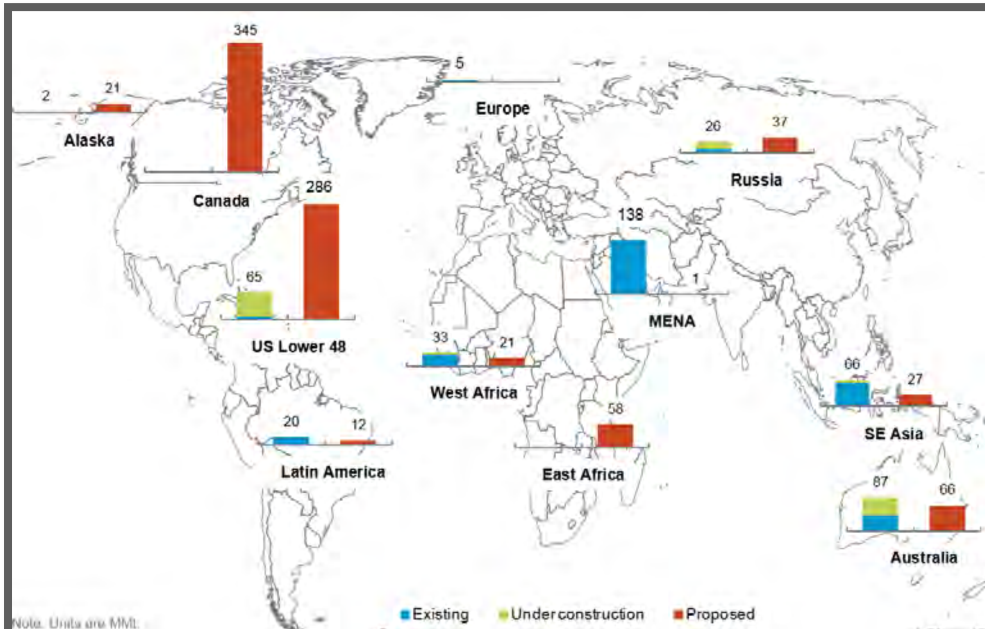
Global LNG Supply

Incremental liquefaction capacity



Source: IHS, July 2016

In a low oil price environment large projects at risk



Global liquefaction capacity dominated by North America and Australia

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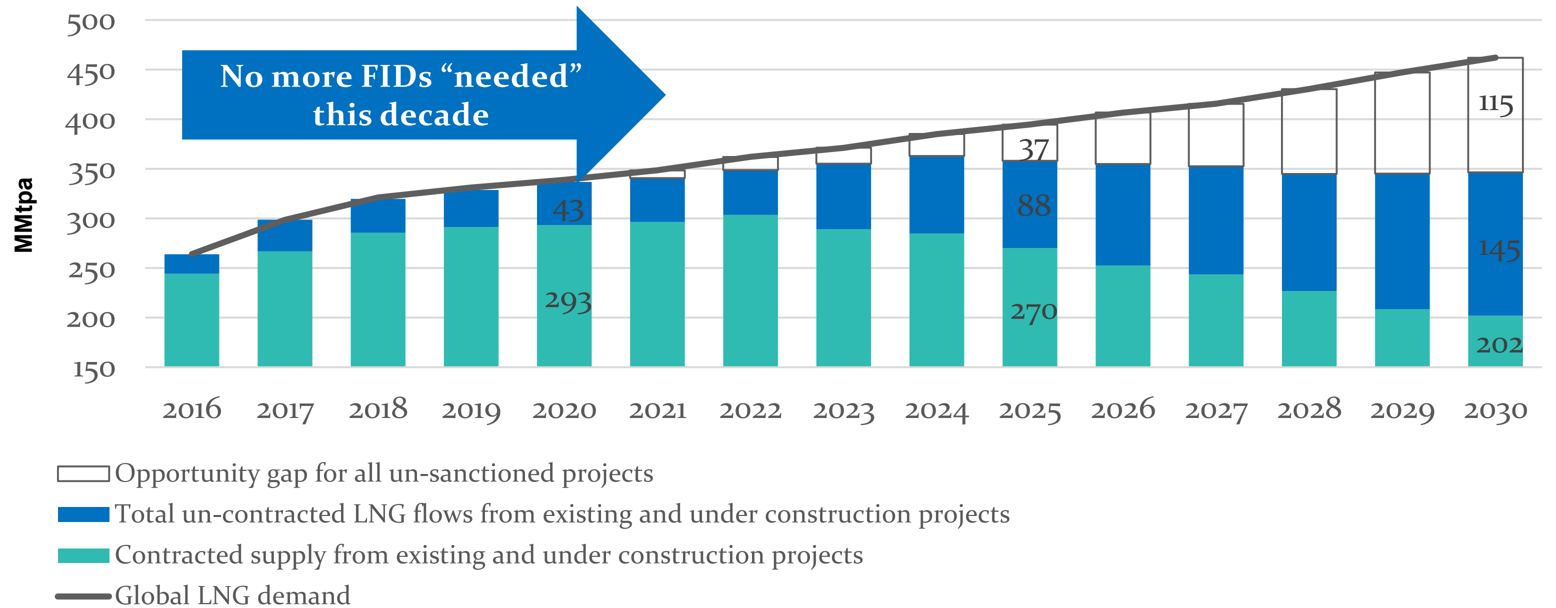
Supply – Demand Balance

Contracted supply and viable un-contracted supply versus global LNG demand



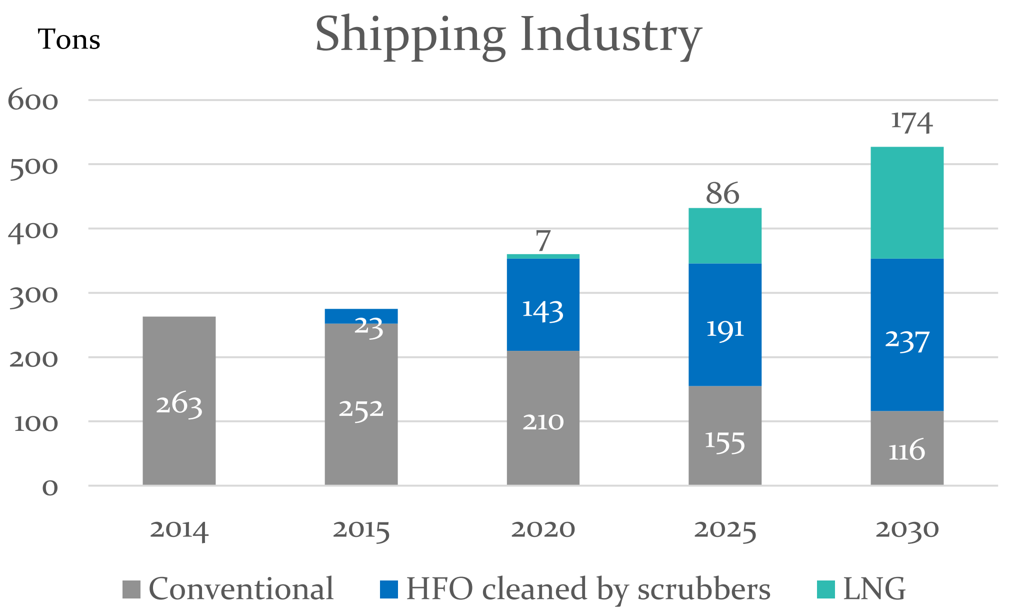
Note: MMtpa = Million metric tons per annum of LNG. Does not include market-driven underutilization from global projects

Buyers market

Reduced capacity utilization 80%-90% vs. 88% (in the period of 2000-2016)

LNG Demand for Bunkering

LNG Consumption as a bunker fuel



Source: BCG analysis

Different views often diverging. Drivers that could speed up the demand:

1. New environmental regulations
2. Availability and cost of ownership for other bunker fuels
3. Optimization of the SSLNG supply chain

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III. Small Scale LNG in Greece

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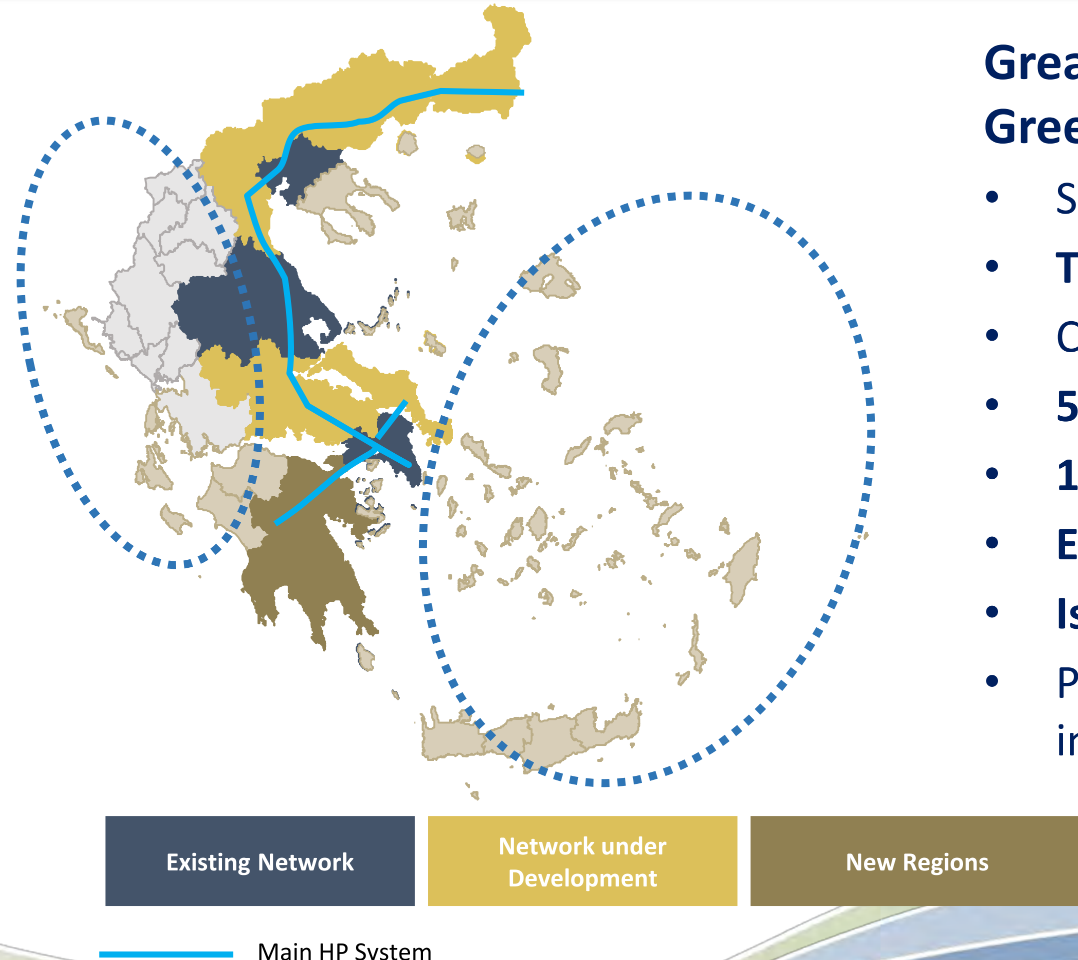
Small Scale LNG Project in Greece



Great opportunity for LNG in Greece:

- Strategic **geographical position**
- **Tradition in shipping** – World leader
- Connections with **162 ports**
- **53 Islands** (more than 1.000 inhabs)
- **111 ports**
- **Existing LNG Terminal** – Revithoussa
- **Island power production plants**
- Port hinterland with towns & industry/business consumers

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Small Scale LNG Market is Possible in the Area

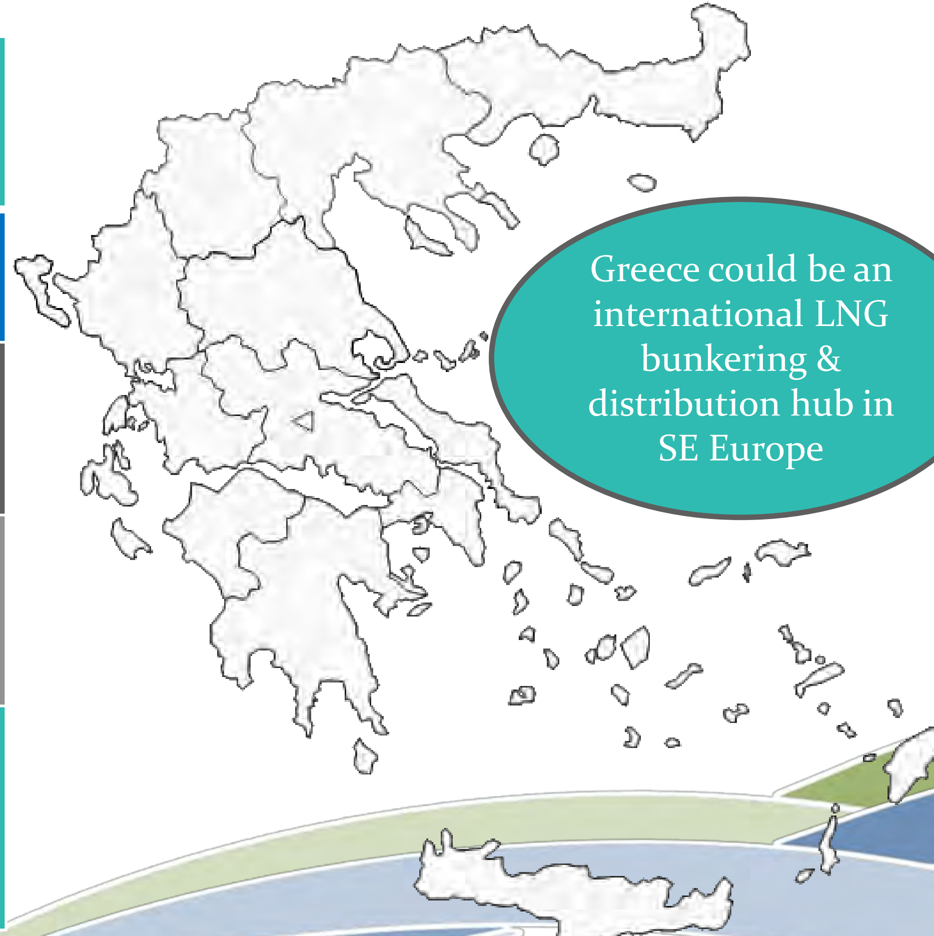
Tradition - Greece is a world leader in shipping

Strategic geographical position

Important internal short sea activity (53 Islands with population >1.000 - 111 ports)

Need for LNG for other uses (potential for gasification of remote areas)

Availability of LNG supply / infrastructure (LNG Terminal – Revithoussa)



Greece could be an international LNG bunkering & distribution hub in SE Europe

III.Poseidon Med II

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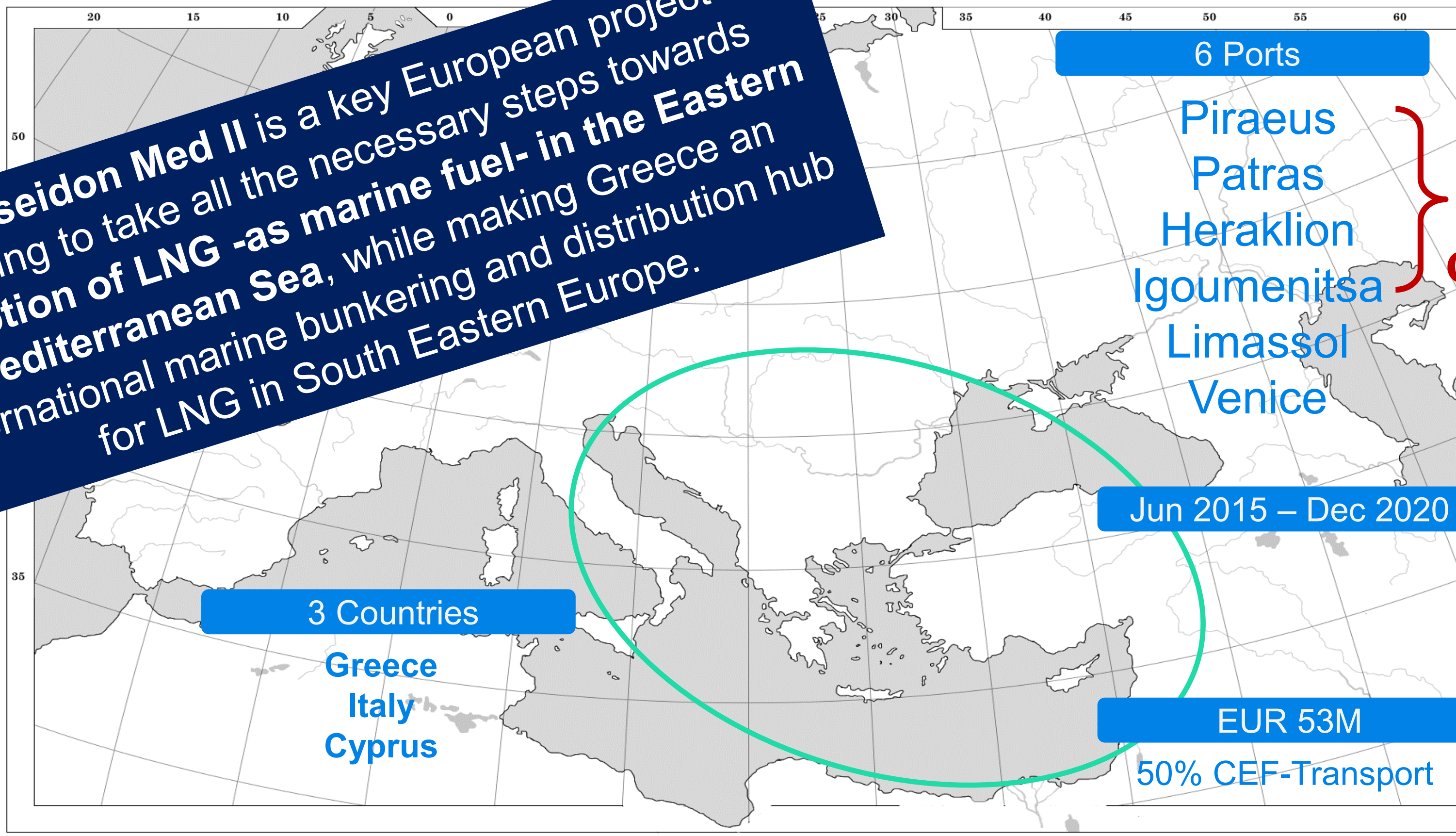
Poseidon Med II - Region of Action

Poseidon Med II is a key European project aiming to take all the necessary steps towards **adoption of LNG -as marine fuel- in the Eastern Mediterranean Sea**, while making Greece an international marine bunkering and distribution hub for LNG in South Eastern Europe.



6 Ports

- Piraeus
- Patras
- Heraklion
- Igoumenitsa
- Limassol
- Venice

4 out of 5 Greek **Core Ports**

3 Countries

- **Greece**
- **Italy**
- **Cyprus**

Jun 2015 – Dec 2020

EUR 53M

50% CEF-Transport

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Activities

Project Organization	Coordination – Management – Dissemination Social & Public Consultation – Awareness
Ports & LNG Terminal Infrastructure	Environmental/Safety/Site Studies – Ports Master Plans updating Supporting/Preliminary/Detailed Design Studies – Tender documents
Vessels Infrastructure	Technical studies for selected vessels
Pilot case (Venice)	Executive Design and Construction of an Innovative LNG Vessel
Financial aspects	Installations Financial Assessment Financial Instruments for the Global Projects Investments
Regulatory framework	Adaptation of the Regulatory Framework
Sustainability-Synergies	Assessment of Efficient Supply Chain/Synergies Sustainable LNG Pricing Patterns

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Partners

Progress in 2016

Preliminary layout
of the truck loading station

Specifications for the design of the
LNG Feeder

Market research for other NG uses

Meetings with stakeholders to
explore synergies

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Plans for 2017

- Environmental Impact Assessment for all ports and Revithoussa
- Supporting (Baseline) Engineering studies
- LNG As Fuel on new building Designs
- Bunkering Vessel Designs
- Design of a Pilot Truck loading station on the island of Revithoussa LNG import terminal
- Sub-Milestone)Technical recommendations detailing quantity and quality measurements across the LNG bunkering supply and custody transfer chain

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Poseidon Med II – Key considerations

Well known Project in the market

Wide interest in the project from local and international players

Need for intense effort for adapting the required legislative framework

European & national support on investments for ship-owners & infrastructure developers

Attention to infrastructure permitting and public acceptance

Rapid development of LNG technology provides new options

Pilot case will boost the implementation of the necessary infrastructure

Signs that Cruise shipping could be a very promising market

Economic benefits for final users depending also on economies of scale

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Conclusions

- LNG: a fast growing fuel in a globally commoditized market, gradually delinked from oil
- A byers market in the short-medium term
- LNG for bunkering: The best choice especially for long term viewers
- Synergies between energy and shipping industries

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