



Small Scale LNG implementation across Mediterranean Sea

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«Greece as Southeastern Europe &
East Med Energy Gas Hub» Conference
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RINA

AGENDA

- RINA at glance
- Footprint on Natural Gas & LNG markets
- Footprint on Small Scale LNG in the Mediterranean
- Final Remarks

RINA at glance



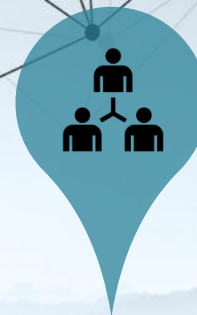
448 Mil.€
2016
turnover
(cons.)



170+
Offices



65+
Countries



4000+
Colleagues

RINA at glance

ENERGY
turnover 2017
200 mln (exp.)



MARINE



CERTIFICATION



**TRANSPORT &
INFRASTRUCTURES**



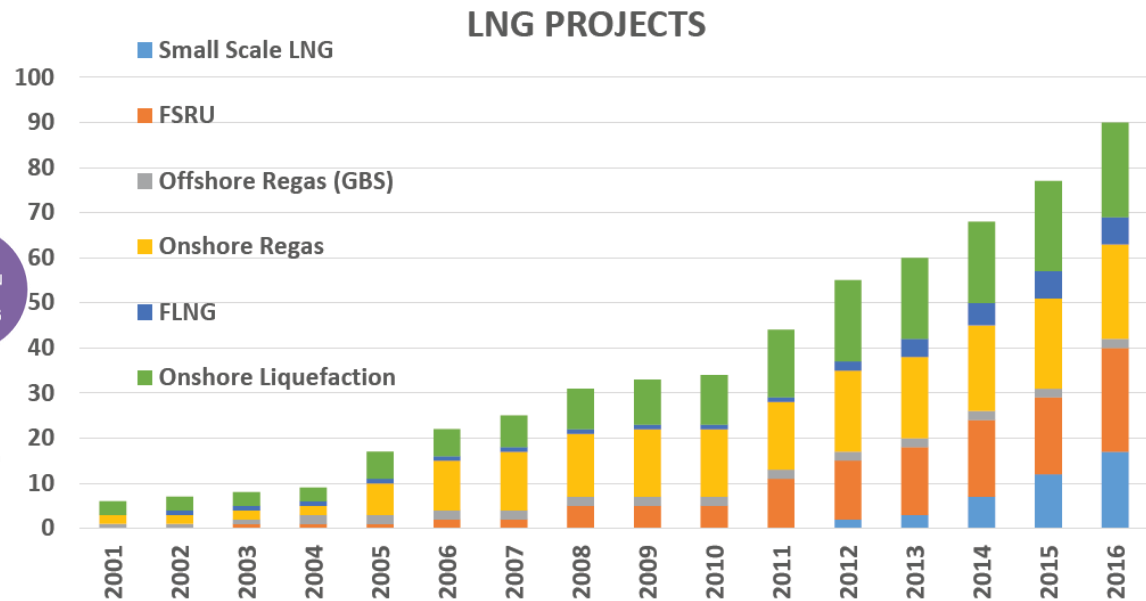
**IFIs &
INVESTORS**



SERVING ALL TYPE OF INDUSTRIES

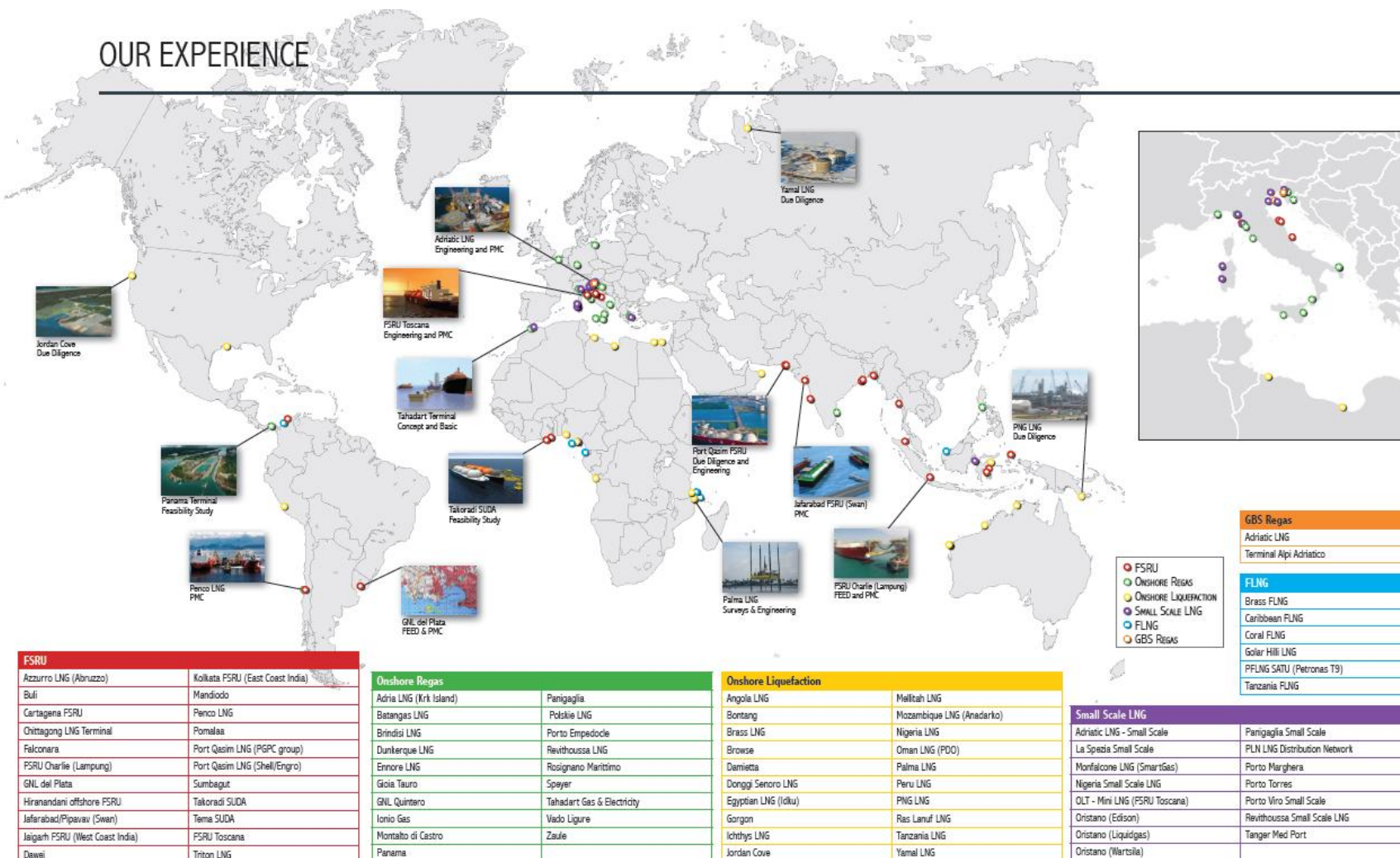
LNG Track Record

- Unrivalled experience & broad service portfolio



Project Show Case

OUR EXPERIENCE



Small Scale LNG in the Mediterranean

- Feasibility studies for LNG distribution from existing terminals
 - Panigaglia on-shore Terminal
 - Revithoussa on-shore Terminal
 - Porto Levante GBS
 - FSRU Livorno
- Feasibility/FEED design and permitting for new small scale LNG projects
 - Oristano and P. Torres (Sardinia)
 - Genoa and La Spezia (Tyrrenian)
 - Marghera and Monfalcone (Adriatic)
- Participation to European round tables (COSTA, GAINN-IT)
 - Analysis for alternative fuel infrastructures
 - Definition of national framework policy
 - Preliminary risk assessment for bunkering operations



Small Scale LNG in the Mediterranean

SMALL SCALE LNG IN THE MEDITERRANEAN

Italy, Panigaglia LNG Terminal Start-up: 1971 www.gnlitalia.it <i>large-scale facility on-shore</i>	
	
MAXIMUM HOURLY CAPACITY current: 427.000 m³(N)/h by 2022: 915.000 m³(N)/h	NOMINAL ANNUAL CAPACITY current: 3,40 billion m³(N)/year by 2022: 8,00 billion m³(N)/year
LNG STORAGE CAPACITY current: 100.000 m³ LNG by 2022: 240.000 m³ LNG	
NUMBER OF TANKS current: 2 by 2022: 4	
MAX. SHIP CLASS SIZE RECEIVABLE current: 70.000 m³ LNG by 2022: 140.000 m³ LNG	
NUMBER OF JETTIES current: 1	
MINIMUM SEA DEPTH ALONGSIDE current: 10,0 m by 2022: 14,0 m	
MAXIMUM SEND OUT PRESSURE current: 70 bar	
TPA REGIME Regulated	

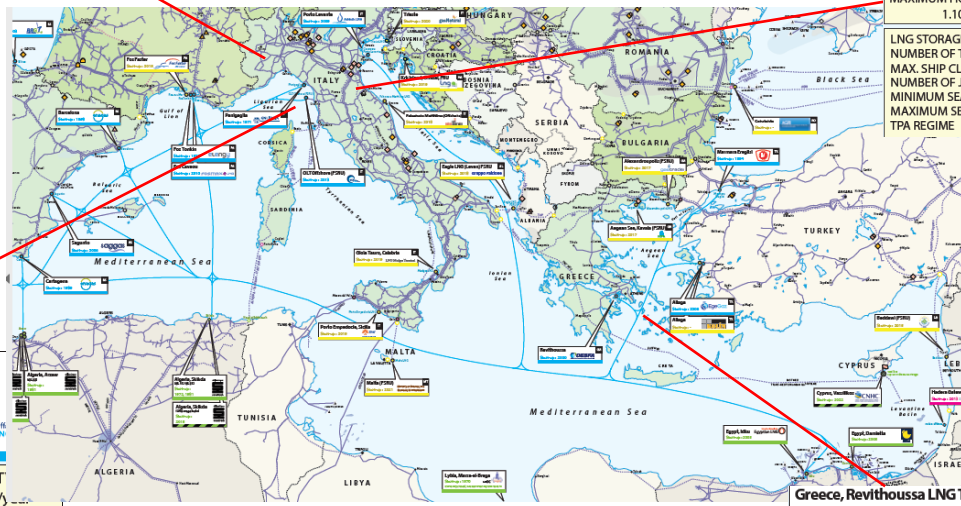
LNG export via small scale carriers and trucks

LNG export via small scale carriers

Italy, Porto Levante LNG Terminal Start-up: 2009 www.adriaticlng.com <i>large-scale facility off-shore</i>	
	
MAXIMUM HOURLY CAPACITY 1.100.000 m³(N)/h	NOMINAL ANNUAL CAPACITY 7,56 billion m³(N)/year
LNG STORAGE CAPACITY 250.000 m³ LNG	
NUMBER OF TANKS 2	
MAX. SHIP CLASS SIZE RECEIVABLE 152.000 m³ LNG	
NUMBER OF JETTIES 1	
MINIMUM SEA DEPTH ALONGSIDE 27 m	
MAXIMUM SEND OUT PRESSURE 70 bar	
TPA REGIME Hybrid	

Italy, FSRU OLT Offshore LNG Toscana Start-up: 2013 www.oltoffshore.it <i>FSRU</i>	
	
MAXIMUM HOURLY CAPACITY 592.465 m³(N)/h	NOMINAL ANNUAL CAPACITY 3,75 billion m³(N)/year
LNG STORAGE CAPACITY 135.000 m³ LNG	
NUMBER OF TANKS 4	
MAX. SHIP CLASS SIZE RECEIVABLE 155.000 m³ LNG	
NUMBER OF JETTIES 1	
MINIMUM SEA DEPTH ALONGSIDE 25 m	
MAXIMUM SEND OUT PRESSURE 80 bar	
TPA REGIME Exempted	

LNG export via small scale carriers



Greece, Revithoussa LNG Terminal Start-up: 2000 www.desfa.gr <i>large-scale facility on-shore</i>	
	
MAXIMUM HOURLY CAPACITY current: 570.000 m³(N)/h by 2016: 798.000 m³(N)/h	NOMINAL ANNUAL CAPACITY current: 5,00 billion m³(N)/year by 2016: 7,00 billion m³(N)/year
LNG STORAGE CAPACITY current: 130.000 m³ LNG by 2016: 225.000 m³ LNG	
NUMBER OF TANKS current: 2 by 2016: 3	
MAX. SHIP CLASS SIZE RECEIVABLE current: *135.000 m³ LNG by 2016: 260.000 m³ LNG	
NUMBER OF JETTIES 1	
MINIMUM SEA DEPTH ALONGSIDE 12,7 m	
MAXIMUM SEND OUT PRESSURE 64 bar	
TPA REGIME Regulated	

LNG export via small scale carriers and trucks

Small Scale project - Panigaglia LNG Terminal

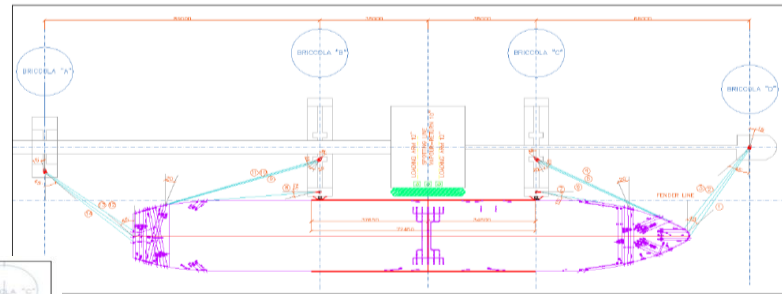
- LNG distribution via small carriers and trucks
 - Small scale carriers between 1,000 and 20,000 cm



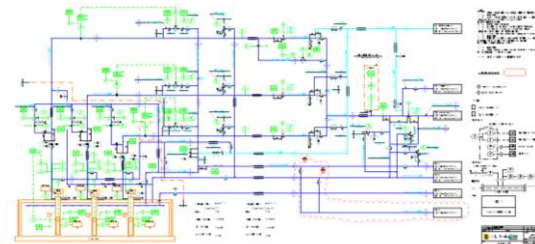
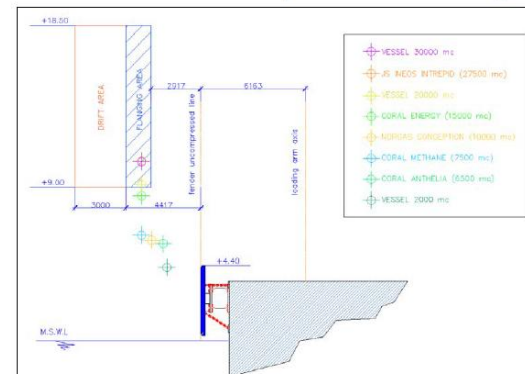
- Increase storage capacity from actual 100,000 cm to 240,000 cm by 2022
- Double ship size from actual 70,000 cm by 2022

Small Scale project - Panigaglia LNG Terminal

- Compliance of existing mooring system for different sizes of carriers (fenders, mooring hooks, etc.)

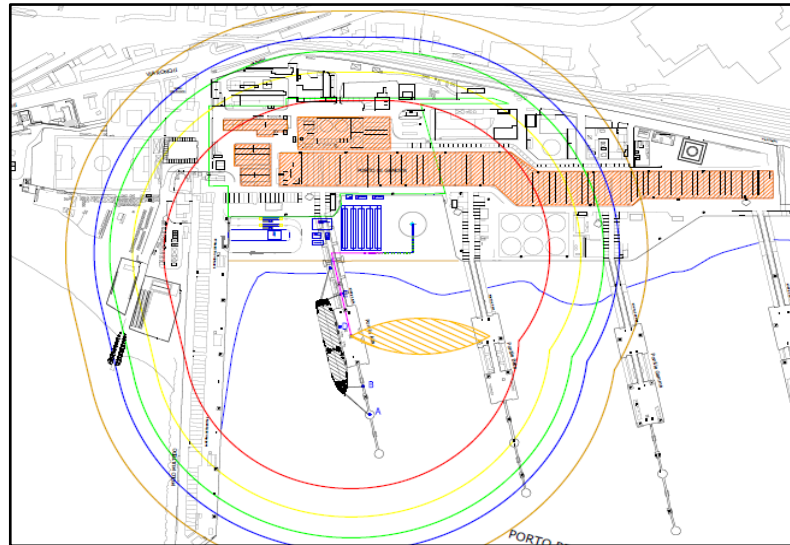


- Compliance of existing LNG transfer system for different sizes of carriers
- Assessment of main changes in process piping systems



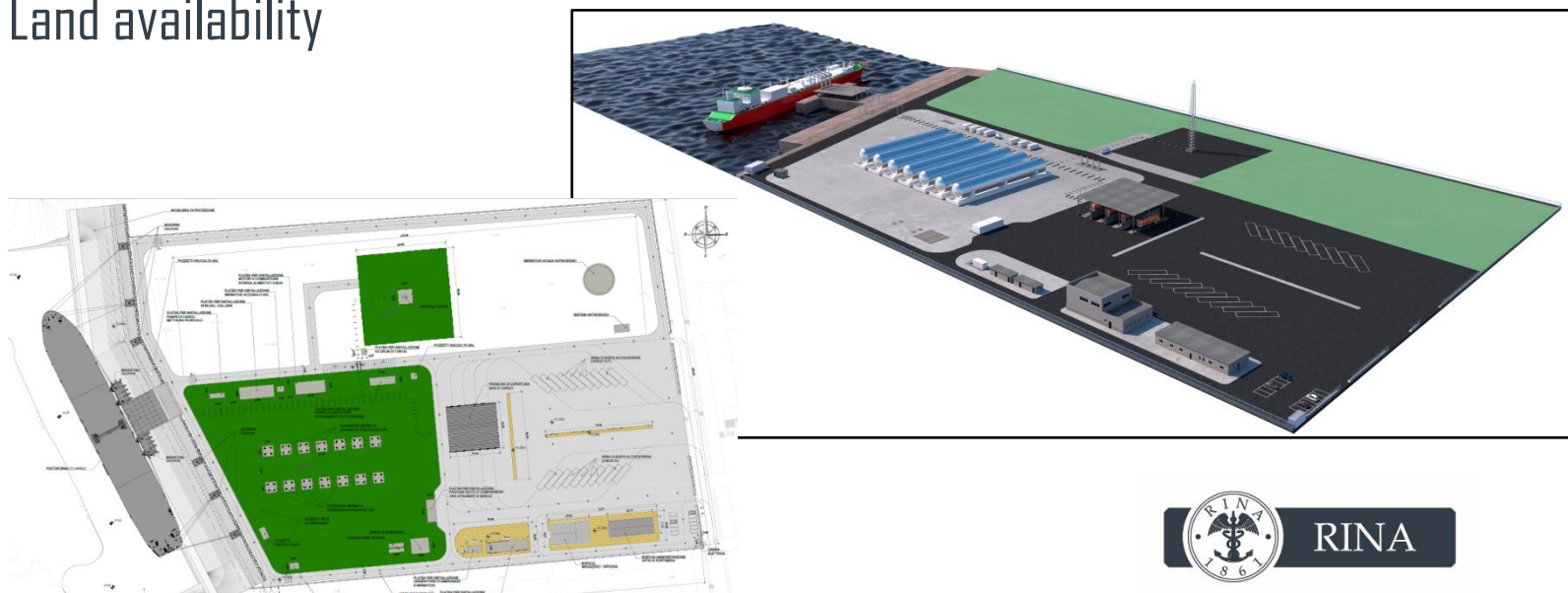
Small Scale project - Panigaglia LNG Terminal

- Analysis of regulations (Port Masterplan)
- Analysis of territorial and environmental constraints
- Assessment of technical feasibility:
 - Adequate sea depth
 - Maneuvering areas
 - Adequate land surface
- Preliminary Risk Analysis



Small Scale Storage Terminal in Sardinia

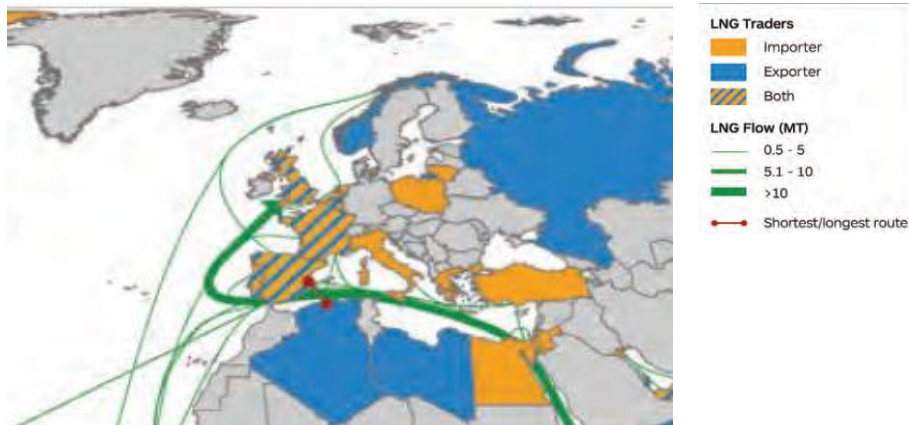
- Small scale storage Terminal in Oristano Port
 - 10,000 cm capacity
 - LNG supply via LNG carriers of max. capacity of 27,500 cm
 - LNG distribution through small scale carriers (1,000-2,000 cm) and trucks
 - BOG management and re-use feeding near-by industrial plants
- Port services availability (tugs, pilots, etc.)
- Land availability



Small Scale LNG in the Mediterranean

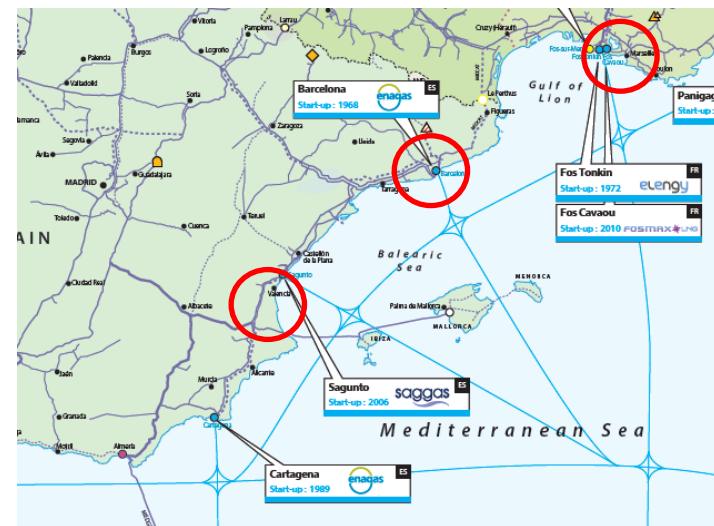
- No LNG Export Regas Terminal in operation in Central and Eastern Europe
- All LNG Export Terminals are in Western Mediterranean (Spain and France) with n. 4 LNG Export Terminals along about 1,000 km coastline close to major ports
- Need for small scale storage plants
 - Wide number of small ports
 - Need for LNG bunkering facilities in isle and tourist areas
- Few small scale carriers operating in the Mediterranean
- Need for national guidelines/training procedures for LNG bunkering in ports

Small Scale LNG in the Mediterranean



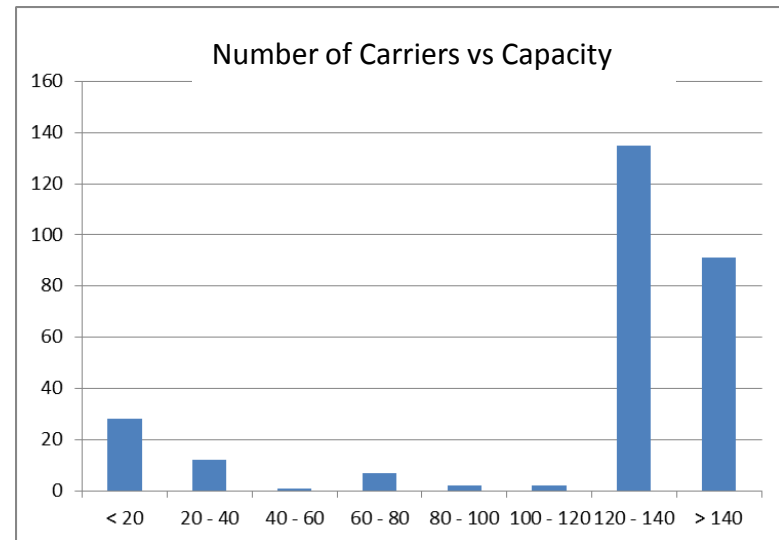
Terminal	Country	Re-export Start Year
FosMax LNG	France	2012
Cartagena	Spain	2011
Barcelona	Spain	2014
Sagunto	Spain	2013

- LNG Terminal close to/inside main ports (Valencia, Barcelona, Marseille)
- No Central and Eastern Mediterranean countries re-exporting LNG



Lack of Small Scale LNG Vessels in the Mediterranean

- Need for carriers of 20,000-30,000 cm for LNG supply
 - Less than 15 units operating (datum: January 2017)
 - Most of the small scale carriers operating in Far East
- Need for small scale carriers for bunkering (less than 3,500 cm)
 - Less than 10 units operating (datum: January 2017)



Development of Guidelines and Procedures for Ports

- Italian Ministry for Infrastructure and Transport is developing guidelines for bunkering operations (ferries and crusade) within the GAINN-IT
- Spanish Ministry is promoting the development of guidelines to homogenize:
 - LNG transfer operations
 - LNG carriers maneuvering and mooring
 - Safety procedures
- Need for port personnel training sessions

- LNG fastest growing as energy source will lead to small scale development
- Major LNG Terminals will be the main players for small scale distribution:
 - Possibility of implementing modifications to guarantee LNG export
 - Possibility of leasing/purchasing mid scale vessels (less than 30,000 cm)
- Proximity with French/Spanish ports might support growth in Central-Eastern Mediterranean



**THANKS
FOR YOUR
ATTENTION**

Q & A?



RINA