POSEIDON MED II LNG BUNKERING PROJECT

Creating a safe passage for LNG bunkering in the Eastern Mediterranean

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Safety of LNG supply at port areas

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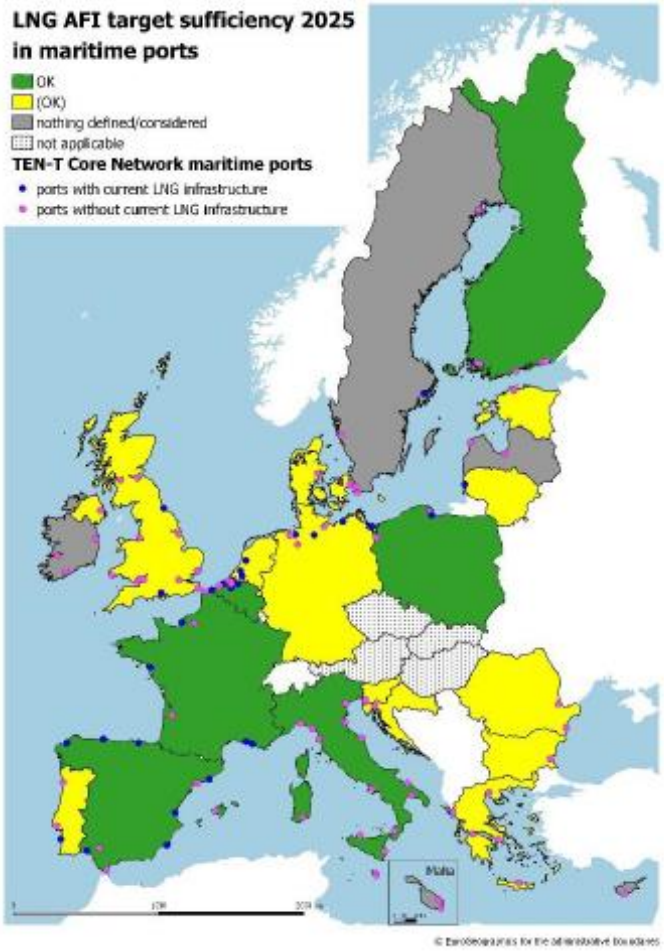
Safety

De-risking roadmap towards LNG as fuel

Training

Regulations

LNG as fuel comes to life



(Source: EC Report on the Assessment of NPFs

- **Operational**: Bilbao (STS), Barcelona (TTS, STS), Gibraltar (STS), Marseille (TTS, STS), Le Havre (TTS), Zeebrugge (all), Antwerp (TTS), Rotterdam (all), Amsterdam (TTS, STS), Hamburg (TTS, LTS), Gothenburg (STS), Klaipeda (all), Stockholm (STS, LTS), Valencia (TTS)
- **Planned**: Dunkerque, Isle of Grain
- **Bunker Vessels** in: Barcelona, Algeciras, Huelva Zeebrugge, Rotterdam, Amsterdam, Sardinia, Hamburg

(Source: SEA/LNG Bunker Navigator)

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Guidance for safe LNG bunkering installations

HAZID **HAZOP** **QRA** **Exclusion Zones** **Navigation Simulations**

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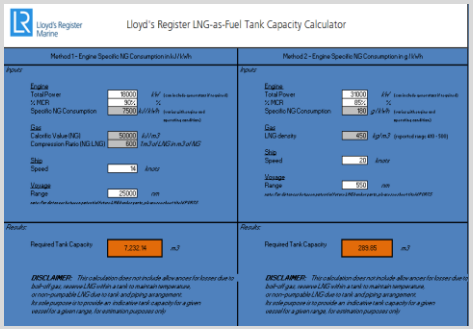
HAZard IDentification

Explore safe bunkering solutions

Bunkering scenarios

- **Multi-criteria risk assessment** for potential bunkering locations

Fuel capacity



- Assess **current** & **future** bunkering fuel capacity

On-site surveys

- **Site** evaluation examining data, parameters

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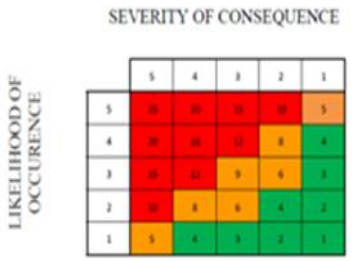
HAZard Operability

- Examine LNG bunkering hazards
- Identify operability problems & consequences
- Provide recommendations on measures & safeguards
- Identify potential failure mode scenarios & Emergency Response
- Update Safety Action Register

Ensure bunkering operations

Hazard	Cause	Consequence	Risk Ranking S	L	RR	Effective Safeguards	Recommendations	Responsibility	Action Taken
						2. LNG loading rate at loading station is 100 m3/hr	20. Terminal Designer based on previous experience to provide information on terminal loading areas and finalize truck loading plan lay-out	Tractebel	
							20. It is recommended that truck traffic into terminal and through loading bays should follow one directional flow to eliminate potential traffic accidents. Design to update plan lay-outs to include.	Tractebel	
							21. Project to provide typical truck system P&ID in order to be used by HAZOP of bunkering and loading truck operations	DESFA	
ring Truck Loading	2. Leakage, non-proper isolation	1. Fire, electrical discharges	4	2	8	1. Compliance with NFPA 59A requirements	21. Design of LNG truck loading system lay-out needs to provide a) appropriate emergency isolation of the loading system via ESDI b) emergency drainage of truck bay for the removal of large spills in an open drain	Tractebel	



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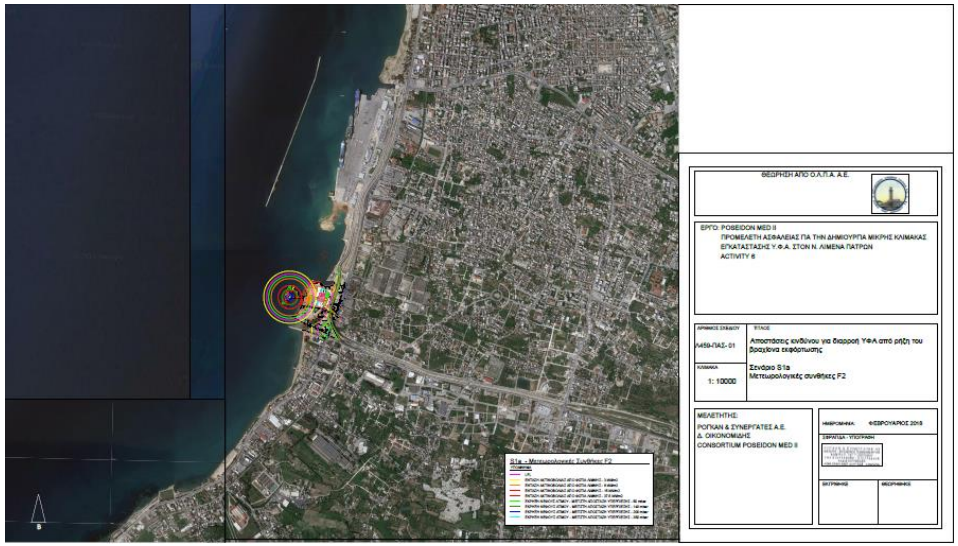
Qualitative Risk Assessment (QRA)

- ✓ Verify/quantify potential MAH associated with design, systems, ops at concept level
- ✓ Identify drawbacks, regulatory non-compliances,
- ✓ Provide recommendations

Mitigate negative impact



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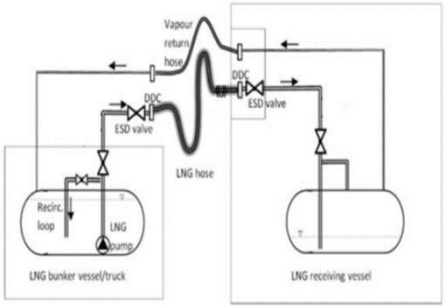
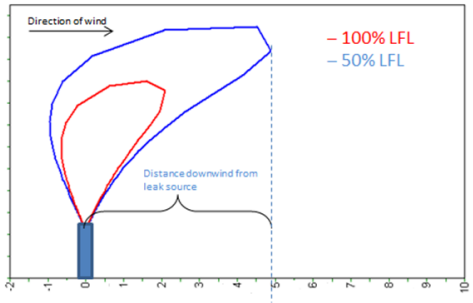
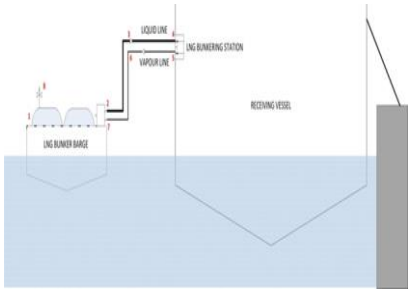
Exclusion zones







Δράση/Λειτουργία	Τοποθεσία	Ελάχιστή απόσταση ασφαλείαςζώνης αποκλεισμού (m)
Ανεφοδιασμός Πλοίο σε πλοίο (Ship to Ship Transfer)	Σταθμός της Φορτηγίδας ανεφοδιασμού ΥΦΑ Μάνικες μεταφοράς ΥΦΑ (συμπεριλαμβανομένων οποιωνδήποτε γερανών χειρισμού ΥΦΑ – ΥΦΑ μάνικα που να είναι 3 μέτρα ή υψηλότερα από το επίπεδο του εδάφους) Σταθμός ανεφοδιασμού πλοίου υποδοχής	11.5
Ανεφοδιασμός από φορτηγό σε πλοίο (Truck to Ship Transfer)	Σταθμός ανεφοδιασμού φορτηγού ΥΦΑ και μάνικα κοντά στο επίπεδο του εδάφους	27

Likelihood of Ignition

Consequence Analysis Techniques

Simultaneous Operations

Exclusion Zones

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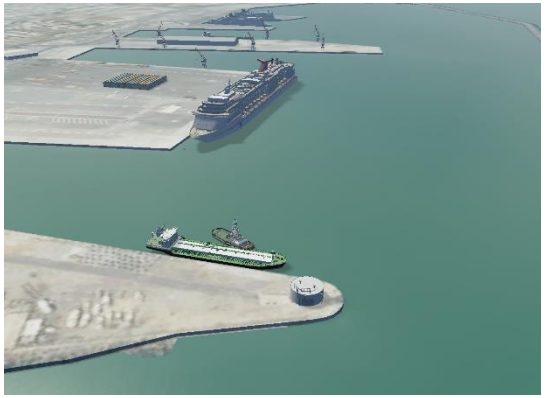
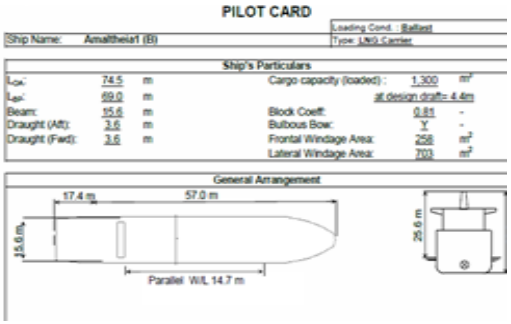
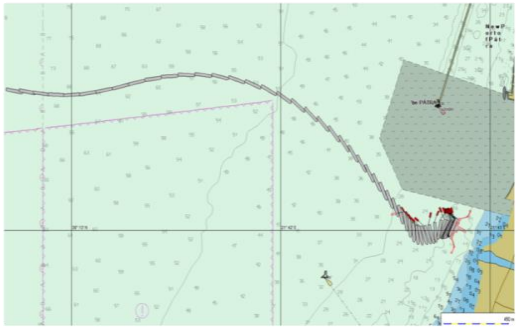
Navigation Simulations

Safe **manoeuvre** | Safe **passage** | **Tugs** circulation | **Emergency** Procedures

- Feeder vessel & barge for berthing alongside
- LNG barge & feeder vessels
- Number & size of tugs required for transit & berthing
- The ability to transfer bunker LNG from the terminal using LNG feeder/barge







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Risk assessment to LNG trucks routes

Examine Revithoussa - Piraeus Port route with respects to road type & exposed population

Estimate LNG release likelihood:

- crash impact
- fire
- containment failure

Identify safeguards to minimize likelihood / impact

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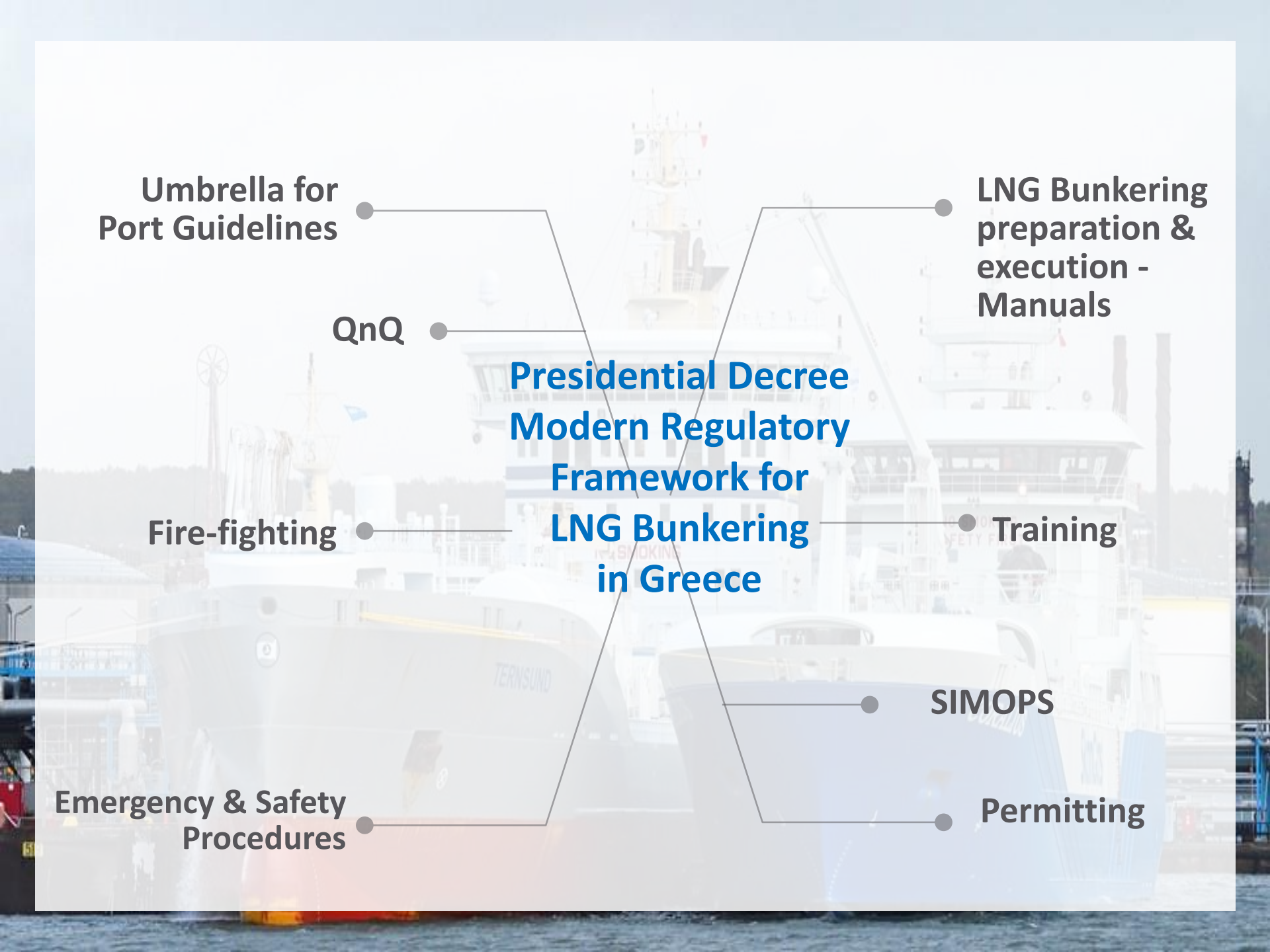
Umbrella for Port Guidelines
QnQ
Fire-fighting
Emergency & Safety Procedures
Presidential Decree Modern Regulatory Framework for LNG Bunkering in Greece
LNG Bunkering preparation & execution - Manuals
Training
SIMOPS
Permitting

Manuals & Checklists

- Port regulations & Management systems
- Risk Assessment Procedures
- Emergency, Licensing & Authorization Procedures
- Responsibilities & Roles
- In English/ Review process

Before the Bunkering

During the Bunkering

After the Bunkering

SIMOPs

Vessel Receiving Manual	Vessel Supplying Manual	Port Manual
ΕΠΥΦΑ	ΕΤΥΦΑ	ΕΛΑΥΦΑ

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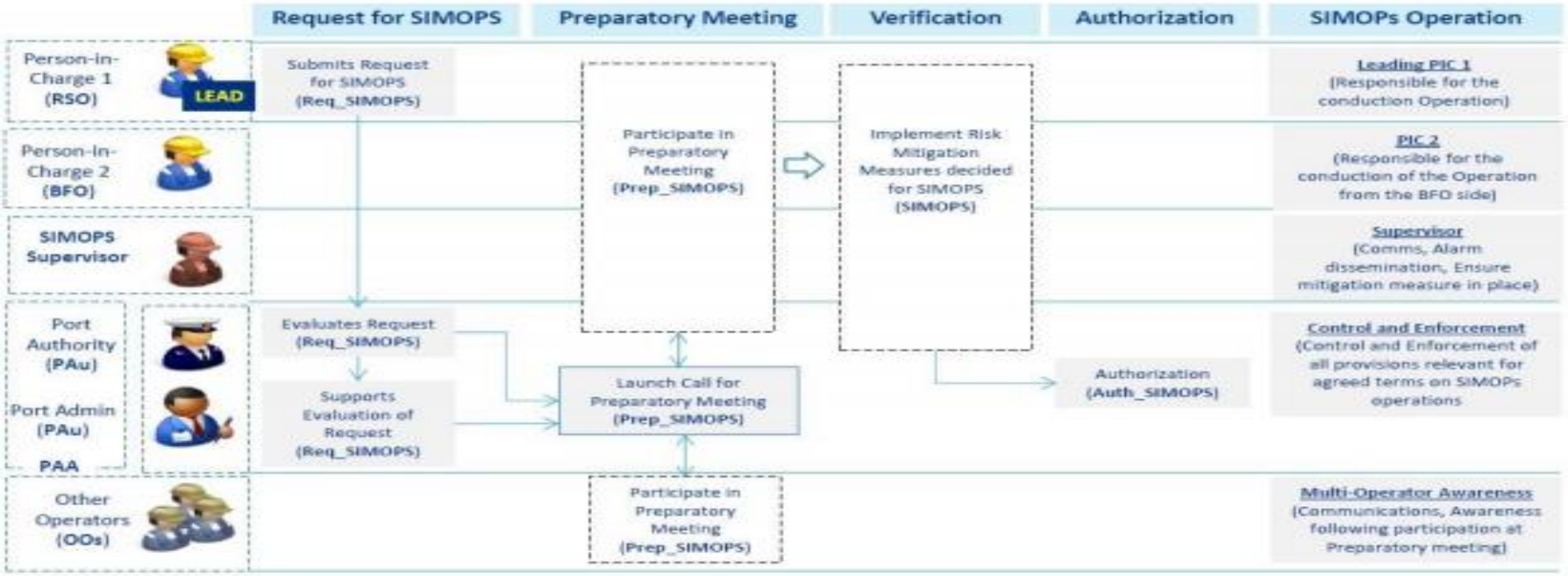
SIMOPS: Simultaneous Operations



- 2+ operations occurring (one LNG bunkering)
- SIMOPs protocol into Port & Vessel manuals
- Submit request for SIMOPS
- Verification Risk Assessment procedures
- Security, Safety & Hazard Zones
- Pre-operation coordination (port, vessel, PIC)
- SIMOPS execution

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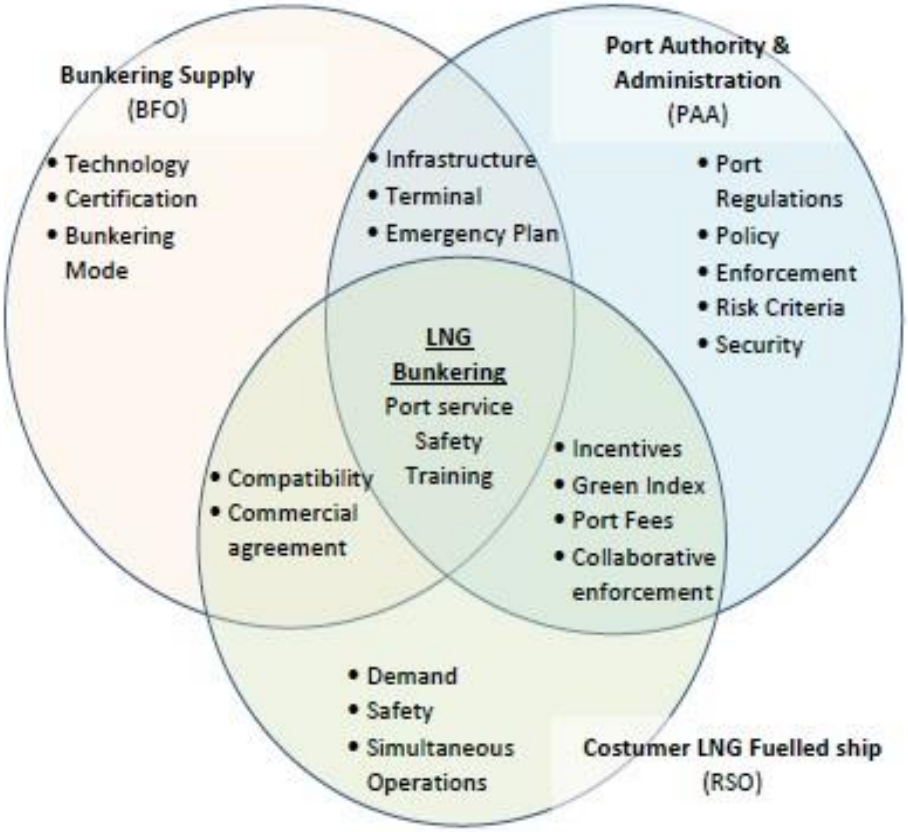
Training & Competencies



- Port personnel
- Truck personnel
- Infrastructure personnel
- Vessels crew

(Source: EMSA LNG Bunkering Guidelines for Ports 2017)

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Training: Modules

Basic

Basic knowledge on
- LNG properties, supply chain
- LNG risks
- LNG storage, distribution
- LNG bunkering equipment
- Regulations & procedures
- Emergency & risk mitigation

Advanced

Familiarization on
- LNG properties & supply chain
- LNG risks
- LNG storage & distribution
- LNG bunkering equipment
- Regulations & procedures
- Emergency & risk mitigation

Practical approach
- Simulations
- On site training

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Key take aways

- LNG as marine fuel framework now mature
- Safety & Training requirements underway
- East Med ports ready for the transition

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sailing on the LNG era

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Thank You

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