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OFFICE OF THE PRIME MINISTER (Energy & Projects) – Malta

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# PROVISION OF SERVICES FOR A TECHNICAL STUDY AND COST-BENEFIT ANALYSIS FOR THE DEVELOPMENT OF LNG AS A MARINE FUEL IN MALTA

## WORK PACKAGE 2

*EXECUTIVE SUMMARY*

# EXECUTIVE SUMMARY

Health, Safety and the Environment protection shall be taken into account at the earliest project development stage to ensure a safe design, manufacturing, installation, commissioning, operations & maintenance of the facilities and to comply with the following HSE objectives:

- No Accidents;
- No Harm to People;
- No degradation of the Environment;

As such, Work Package 2 aims at ensuring that the project will be developed in such a way that any risks have been identified, are assessed and eliminated where possible or mitigated to a level as low as reasonably practicable throughout the whole project's lifecycle.

As part of this WP, several documents have been produced:

- a risk assessment philosophy;
- a HAZID study
- a SIMOPS study.

**Risk assessment philosophy**

The risk assessment philosophy defines the risk management process that will be developed during the project, from the design phase to the Operations and Maintenance phase, including:

- Presenting the general hazards associated with LNG;
- Presenting the general mitigation measures associated with LNG and bunkering hazards;
- Ensuring that the concept "safety by design" is integrated in early stage and throughout each of the design stages;
- Defining the risk management process to be followed in each of the different design stages;
- Defining the risk acceptance framework against which the HSE risks will be evaluated (risk matrix).

A set of risks assessment will have to be planned throughout the project phases and all protective / preventive measure will need to be implemented in the design and reflected in the supportive documentation.

All identified hazards shall be evaluated and mitigation measures shall be implemented so that they remain ALARP based on the predefined project risk matrix

**HAZID**

A HAZID workshop has been performed to identify the main HSE hazards associated with several possible scenarios for the LNG bunkering station.

The following scenarios have been studied during the HAZID:

1. Bunker terminal Option 1: ISO containers including storage, bunkering, transport by truck, and loading of the ISO containers for bunkering purposes;
2. Bunker terminal Option 2: Onshore tanks (A) + jetty (B) + truck loading station (C)
3. Bunker terminal Option 3: Scenario 2 + onshore liquefaction
4. Bunker terminal Option 4 and 5: FSU (D) or FSRU (E)

The main recommendations from the HAZID session are summarized in the table below.

*Table 1: Recommendations from HAZID workshop*

| | Recommendations | | Category |
|---|---|---|---|
| 1. | Avoid stacking more than 3 containers | 1. | Natural Hazards |
| 2. | Ensure one ISO container is attached to another (for instance using twist locks) | 1. | Natural Hazards |
| 3. | Take into account safety distances to existing plants. | 1. | Natural Hazards |
| 4. | Consider using a permanent structure for supporting the ISO containers. (use the EUROCODE for earthquakes) | 1. | Natural Hazards |
| 5. | Get clearance from port authorities to proceed operations. | 1. | Natural Hazards |
| 6. | After an earthquake, assess damage to the equipment. | 1. | Natural Hazards |
| 7. | Inform third parties about the dedicated areas. | 2. | External effects |
| 8. | Apply LNG collecting system with dispersion limitation equipment (foam). | 2. | External effects |
| | | 3. | Fire and Explosion Hazards |
| | | 4. | Personal Hazards |
| 9. | Continuous training and people development. | 3. | Fire and Explosion Hazards |
| 10. | Start a gas dispersion study based on a QRA. | 3. | Fire and Explosion Hazards |
| 11. | Implement fire detection system. | 3. | Fire and Explosion Hazards |

| Recommendations | | Category | |
|---|---|---|---|
| 12. | Inspect the safety valves for proper functioning. | 5. | Facility Hazards |
| 13. | Perform drills involving external emergency response. | 6. | Emergency Operations |
| 14. | Ensure requirements for manufacturers include zero emission. | 8. | Environmental Impact |
| | | 8. | Environmental Impact |
| 15. | Avoid lifting over sensitive equipment. If lifting over this equipment is necessary, protect the equipment (for instance with scaffolding). | 2. | External effects |
| 16. | Consider use of a breakaway coupling at the truck loading system. | 5. | Facility Hazards |
| 17. | Ensure that the structure and equipment are maintained and preserved to the required standards. | 7. | Past and Future use |
| 18. | Implement a grievance procedure and investigate any noise disturbance report. | 8. | Environmental Impact |
| 19. | Use of liquid N2 only. | 5. | Facility Hazards |
| 20. | To be assessed in a QRA. | 1. | Natural Hazards |
| 21. | Based on FSRU design, additional measures may need to be considered. | 1. | Natural Hazards |
| 22. | Reassess incidents at a later stage and include any findings into the project. | 9. | Feedback other installations |

**SIMOPs**

A SIMOPs generic case study has been performed to identify the simultaneous operations that can occur during bunkering operations, to define the risks associated with these operations and to give examples of mitigation measures that can be put in place in order to reduce/control such risks.

SIMOPs assessment was performed on 2 case studies:

1. Shore-to-Ship bunkering: covering Terminal-to-Ship, Truck-to-Ship and iso-containers,
2. Ship-to-Ship bunkering;

And based on three different vessel classes:

- General cargo vessels/container ships
- Passenger ships/ferries
- Tankers

The following SIMOPs have been identified and mitigated during the case study.

*Table 2: Identified generic SIMOP hazards*

| SIMOPs |
| --- |
| Cargo operation |
| Cargo operation : movement of trucks/vehicles |
| Cargo operation : Transfer (loading/offloading) of containers |
| Connection/disconnection of power supply (ironing) |
| Crew movement and visitors by boat |
| Crew movement, visitors and vehicles |
| External activities that include maintenance or hot working on other ships or onshore equipment in the vicinity of the LNG bunkering activity |
| Inspection with divers : hull inspection |
| Maintenance and inspection |
| Manipulation/maintenance of lifeboats |
| Mooring & ballast management at berth |
| Movement of container port cranes and tractor trailer units |
| Movement of hazardous cargo containers |
| Movement of passengers |
| Movement of passengers by service boat |
| Movement of refrigerated containers |
| Sea leisure activities for passengers at anchorage (jet-ski,…) |
| Simultaneous bunkering of other bulk fuels, lub-oil,… |
| Simultaneous bunkering of other bulk fuels, lub-oil,…by barge |
| Transfer (loading/offloading) of containers on a barge |
| Transfer (loading/offloading) of goods, waste removal by barge |
| Transfer (loading/offloading) of goods, waste removal waste removal… |

**SIMOPs**

Use of cargo vessel crane to load/unload goods

Use of cargo vessel crane to load/unload goods on a barge

Use of two-way radios, mobile telephones and other electrical/ electronic equipment