B.02.02.02 TECHNIQUES AND MEASURES TO PREVENT AND REDUCE WASTE AND EMISSIONS OF SUBSTANCES AND HEAT UNDER ANY OPERATING SCENARIO – Non Confidential Summary

FSU AND LNG REGASIFICATION COMPOUND

The FSU, LNG receiving terminal and regasification compound have been designed so as to minimize probability and quantity of both accidental and planned emissions of any substance and heat ingress to the systems. Boil-off gas (BOG), LNG and any other emissions will be avoided with the adoption of the following design principles:

1. Welded inline valves and welded pipelines will be used whenever practical rather than over flange connections with appropriate consideration for commissioning, isolation and maintenance. The number of flanges in pipe runs will be minimized and where required, qualified gaskets complying with EN 12308.

2. Design pressure on LNG and BOG tanks and pipelines will leave sufficient margin above normal operating pressures so as to minimize operation of safety relieve valves (and so emissions) without compromising safety of plant or personnel.

3. Tanks will be gas and liquid tight and will include double cryogenic containment system. This will prevent discharge of LNG or BOG in the event a leak from the primary containment occurs. The FSU's LNG containment system consists of five independently insulated, type B, Moss tanks made of aluminium alloy and designed for operating at cryogenic temperatures. There is a secondary barrier designed for holding maximum envisaged potential leakage from tanks for a period of 15 days as per the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC code). Full tank secondary containment is not present for this design since the spherical tanks present high degree of protection against failure or fracture during the operating lifetime. A sectional cut of a LNG cargo Moss tanks is included in Appendix A for illustration purposes. The total gross volume of the tanks is 125, 877 m^3.

4. Submerged, pot mounted LNG pumps will be included so as to prevent any liquid or gaseous leak.

5. LNG/BOG tanks and pipe connections will be designed with appropriate heat insulation so as to contain heat ingress from the thermodynamic environment. This way BOG production will be controlled and minimized. The generation of BOG is kept to a minimum firstly so as not to exceed the capacity of the on-shore BOG compressors (this would result in the need to flare excess BOG), also BOG generation is minimised so as to maximum the efficiency of the plant as to compressing BOG to 40barg through the on-shore BOG compressor for use in the power plants is less efficient that regasifying the LNG through the IFV skids.

6. LNG tank level alarms and alarms and actuators will be included as a protection for overflow. The tank levels will be monitored with sufficient redundancy and suitable reliability with high level and high-high level alarms. These alarms will be able to be viewed in the distribution and control system of the regasification plant in its control room for a coordinate emergency response or shut down on if required. In addition there are safety release values on the LNG tanks; these are a requirement of the safety mitigation measures for the FSU in order so as not to over pressure the tanks.

7. An emergency non visible combustion chamber (NVCC) will be provided and will be designed to depressurize plant and equipment within a short period of time by flaring/burning natural gas rather than venting to atmosphere. This system should prevent any potential overpressure of the gas lines and thus failure of any LNG tank or pipeline which could result in a major leakage. This system will be designed as per API RP 520 and API RP 521.

8. Detection systems will be provided to give warning of any leakage of LNG or natural gas and also to give warning in the event of fire. Activation of this system will automatically initiate the Emergency Shut-Down systems of the various areas of the facility all of which will have the relevant signals exchanged between the DCSs to allow for coordination of the ESD procedures. Type, redundancy, number and location of gas detectors have been informed by the output from the HAZOP.

9. Closed heat transfer systems, namely the propane and the water/glycol closed loops are being installed to minimize working fluids loss, maximise operational efficiency and thereby minimise emissions.

10. Prior to send out of LNG to shore through the FSU transfer lines full CLASS certification will be completed and an LNG certificate obtained.

11. No odour emissions are anticipated from the FSU and LNG Regasification plant. No NG odourising plant is to be installed within the facility

12. Noise emissions are discussed further in section B3.9. The FSU will be built and maintained with NK Rules and to IMO Regulations. New equipment will be certified to BV Rules and IMO regulations and maintained with BV Rules and to IMO regulations. The specific standard for noise emissions shall be 2002/49/EC as well as all requirements of the EIA

CCGT POWER PLANT

The SCC-800 type gas turbine combined cycle plant will be designed with a reliable and efficient technology which minimises the probability and quantity of emissions of any working fluid, natural gas or heat within the systems. Some of these systems and design principles are outlined below:

1. The GT combustion system and transition ducts will be lined with a proprietary thermal barrier coating to minimize heat losses to the environment. This way, most of the heat

developed during the combustion process is converted into shaft work in the turbine gas expansion optimizing the efficiency.

2. The power plant will be able to perform a cold start-up in around 290 minutes. The power plant will ramp up to 70% load in less than 160 minutes. At this load the power plant emissions will meet the guaranteed levels (NOx < 50 mg/Nm^3 and CO<100 mg/Nm^3 at 15% vol. O_2) in order to comply with the BAT guidelines. The power plant will shut down from 100% load in circa 20 minutes. Such fast start-up and shut-down transitions will minimise emissions.

3. The plant is designed to be operated as a base load plant thus should operate in combined cycle mode at maximum capacity and maximum efficiency. As such start-ups and shut-downs will be minimised, and thus the plant will be operated in a high efficiency mode and reduce the inefficient burning of NG during these start up and shut downs. Start-ups and shut downs will be required for routine maintenance.

   Appendix B contains typical start-up and shut-down curves for the plant

4. The air sealing system is design to prevent the GT from air and bearing lubricating oil leakage, ensuring hot gases are not diverted from the exhaust gas expansion path and lube oil is kept in the bearing house thus minimising emissions.

5. The exhaust diffuser and the HRSG section will be coated with thermal insulator material which shall prevent from heat leakage into the environment. This way the exhaust gas energy content is recovered to the full extent possible with current state of the art technology in the heat exchangers within the HRSGs, enhancing overall efficiency of the plant.

6. Gas detection equipment will detect any fuel leakage and activate alarms at different levels depending on the gas concentration within the GT enclosure. These alarms are both visual and auditory. The gas detection signals will be monitor in the distribution and control system (DCS) and if necessary will activate an emergency shut-down (ESD). This system will have signals exchanged with the DCS systems of the regasification compound for fast coordinated system shut downs so as to minimise emissions losses in an ESD event.

7. The ST gland steam sealing system will prevent any steam leakage from the high pressure section of the steam turbine and the air ingress from the last stages of the ST will be under vacuum conditions. The steam used as sealant will be condensed and fed back to the steam cycle therefore minimising emissions of steam into the environment.

8. The blow-down system will collect any drum blow-down and other water drains from the steam system and collect within the neutralisation tank for treating and testing prior to discharging with the cooling water outfall.

9. The steam by-pass system will lead the IP and HP steam directly into the condenser in order to close the steam cycle avoiding the discharge of steam into the environment in cases where the steam cannot be admitted to the Steam turbine. Such event will occur during start-ups, emergency shut-downs and when the ST is out of service.

10. The GTs are equipped with annular-type Dry Low Emission (DLE) burners. A fuel-lean, staged combustion process is developed within the DLE burners accomplishing low level of NOx and CO emissions. The DLE technology guarantees compliance with EU directive 2010/75/EU and the Maltese LN 11/2013 without the necessity of using any post-combustion emission abatement technology.

11. Minimal SOx emissions are expected as Natural Gas from the regasification of LNG has a low sulphur content even compared to the already low Natural Gas standard. Most of the sulphur contained in the NG prior to liquefaction is removed at source in a gas treatment plant via a gas purification processes. The Sulphur removal efficiency of these processes, although high, does not achieve 100%. That is why the LNG could contain traces of sulphur presented as H_2S and COS. These compounds are completely oxidized in the GT combustion chambers to SOx. The concentration of total sulphur in the Natural Gas shall always be lower than 30mg/Nm^3 and will on average not be greater than 5mg/Nm^3. This sulphur content is then highly diluted with air in the GTs combustion chambers so that the concentration of sulphur in flue gases at the stacks, based on the maximum value above, shall always be lower than 10mg/Nm^3 at 15% O2 (dry basis). This value is in line with European Best available technique (BAT) recommendations for gas fired power plants and no further technical measures for abatement of SOx are required. Refer to BAT comparison section B2.2.4

12. No odour emissions are anticipated from the FSU and LNG Regasification plant. No NG odourising plant is to be installed within the facility

13. Noise emissions are discussed further in section B3.9. The noise generated by the operation of the proposed development, under all operating conditions and site climatic conditions, shall comply with EU Directive 2002/49/EC and the Maltese Directive LN 193/2004 in order to comply with the limits imposed by the environmental and personnel safety regulations.

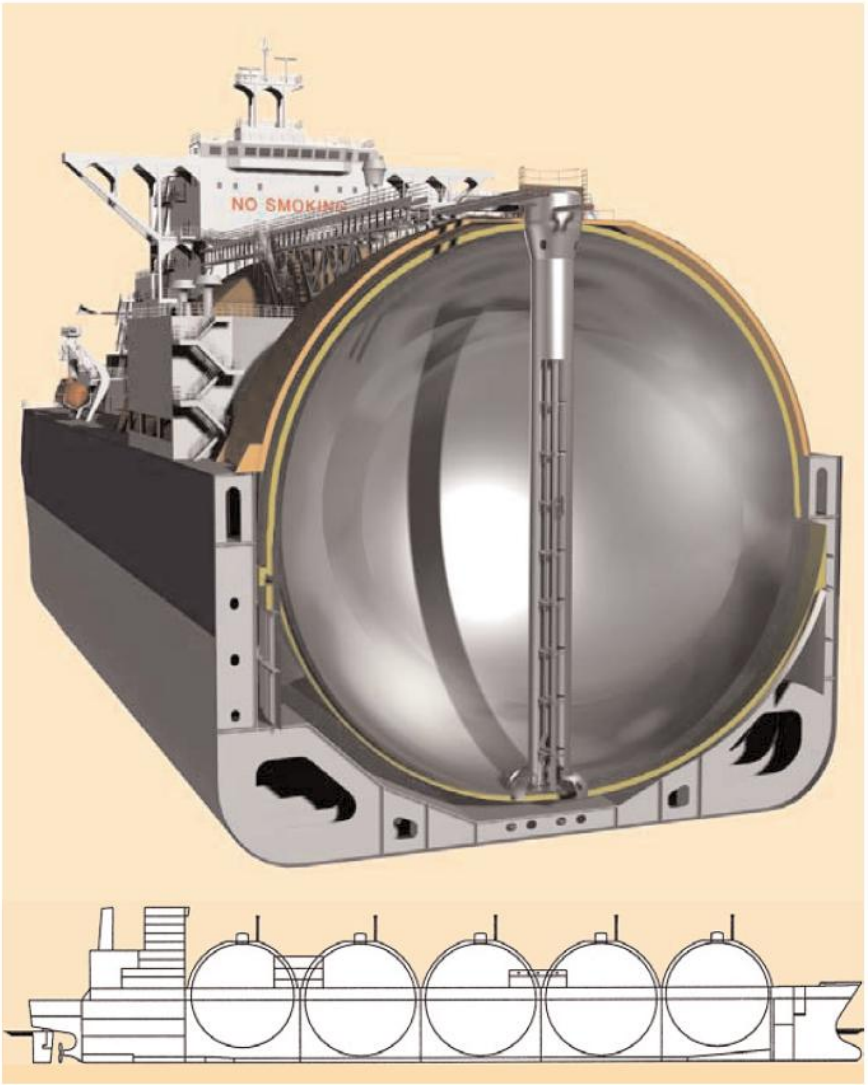

Figure 1 Sectional cut of a LNG cargo Moss tank (Source: Moss Maritime)