PA 00021/14: COMBINED CYCLE GAS TURBINE AND LIQUIFIED NATURAL GAS RECEIVING STORAGE AND RE-GASIFICATION FACILITIES; AND,

PA 00022/14: CONSTRUCTION OF JETTY AND ANCILLARY FACILITIES;

AT, DELIMARA POWER STATION, TRIQ IL-POWER STATION, MARSAXLOKK

1. INTRODUCTION AND DESCRIPTION OF THE PROPOSED DEVELOPMENT

The Malta Environment and Planning Authority (MEPA) requested an Environmental Impact Statement (EIS) for the developments proposed in permit applications PA 00021/14 (*Combined Cycle Gas Turbine and Liquified Natural Gas Receiving Storage and Re-gasification Facilities, at Delimara Power Station, Triq il-Power Station, Marsaxlokk)* and PA 00022/14 (*Construction of jetty and ancillary facilities, Delimara Power Station, Triq il-Power Station, Marsaxlokk).* The applications required an EIS in accordance with Schedule IA, Category 7.3.1.1 (*Construction of thermal power station and other combustion installation with an output of more than 50MW)* and 7.6.1.1 (*Surface and underground storage of combustible gases including natural gas with a capacity of more than 100,000m^3)* of the Environmental Impact Assessment Regulations, 2007 (Legal Notice 114 of 2007, as amended). The EIS was coordinated by Dr. Paul Gauci, for ERSLI Consultants Ltd.

1.1 Description of the proposed development

The proposed development consists of a 215MW natural gas fired combined cycle gas turbine (CCGT) plant together with liquefied natural gas (LNG) receiving, storage and re-gasification facilities. The proposed development consists of the following major components (Figure 1-4 of the EIS Coordinated Assessment refers):

- A combined cycle gas turbine (CCGT) plant located to the north-west of the Delimara Power Station (DPS) site;
- A jetty situated to the south-west of the DPS site against which a Floating Storage Unit (FSU) with a capacity of 125,000m^3 would be berthed; and
- A re-gasification facility which is located in the southern tip of the DPS site.

The EIS notes that both the FSU and the re-gasification facilities are located at the farthest possible distance away from the existing DPS plant and the site to be occupied by the proposed CCGT.

The proposed CCGT plant shall consist of three (3) gas turbines (producing electricity using natural gas in the 'first cycle') and a steam turbine (which would be driven by steam generated in the heat recovery steam generators by the hot exhaust gases from the gas turbines in the 'second cycle'). The EIS indicates that the combined system being proposed is capable of operating at an efficiency of 54%. The CCGT facility shall include three (3) main stacks of 75m height each and three (3) by-pass stacks of 30m height each.

During the first six months of operations, the plant would be operated as an open cycle gas turbine (OCGT). The EIS estimates that the construction and installation phase for both the CCGT and the LNG facilities will be completed within a maximum period of 15 months.

In terms of decommissioning, the EIS indicates that a detailed plan is not available, however the submission of a decommissioning plan would be required as part of the IPPC process.

An overview of the planning policies and legislative framework which relate to the proposed developments is provided throughout Chapters 3 and 4 of the EIS Coordinated Assessment.

1.2 Assessment of alternatives

The EIS (Chapter 2) has considered the following aspects vis-à-vis alternatives:

- *Alternative sites*: The EIS indicates that the only site found suitable for the proposed development is the Delimara Power Station area, being located at a safe distance from the closest community, Marsaxlokk, and since over the past twenty years, the power distribution infrastructure has been organized in such a manner to preclude other areas into being considered realistically suitable for such a development.

- *Alternative technologies*: With respect to fuel alternatives, the EIS states that the adoption of a natural gas-fired CCGT facility refers to a policy decision by the Government of Malta, and is also established by the Action Plan for the Electricity Sector of the National Energy Plan, 2012. With respect to the types of power plant, the Enemalta Energy Generation Plan, 2006 indicated that the cost of electricity could be minimized through the installation of gas fuelled CCGT units. Such installations would have the potential to meet the expected emission limits of Directive 2001/81/EC on National Emission Ceilings (NEC) for certain pollutants [NEC Directive]. The emissions generated through the use of the interconnector would not have an adverse impact on the NEC Directive, 2001 whereas a gasoil fuelled CCGT plant would generate emissions that would be just within the limits of the NEC Directive by 2020, thereby making the proposed combined use of a CCGT plant and the interconnector the preferred option from a technology perspective.

- *Alternative layouts*: The EIS assessed three different options vis-à-vis the layout of the proposed CCGT and LNG facilities (Figures 2-2 to 2-7 of the EIS Coordinated Assessment refer). The preferred options for both the CCGT and the LNG were primarily based on the assessment of risk of all the elements of the proposed development and on noise impacts on sensitive receptors associated with the proposal. In terms of off-shore options (i.e. outside of the port of Marsaxlokk), the EIS notes that these were not considered for the following reasons: (i) very little sea-room available for a shallow-water platform which is fixed to the sea bed, (ii) no experience of installing a FSRU at a floating connection point to supply gas, (iii) any FSRU moored outside Marsaxlokk harbour, including its attendant pipeline is likely to represent an obstacle to shipping, and (iv) the exposure to severe adverse weather conditions (e.g. wind, waves, and swell) outside the shelter afforded by Marsaxlokk harbour would reduce the ability of the FSRU to receive fuel from supply carriers.

  In this regard, the EIS notes that these conditions were considered to be too risky in terms of security of supply. The EIS concludes that the off-shore option was not completely discarded, given that potential technological developments in the future may render such option a viable solution.

- *Downscaling of the project*: The EIS indicates that the possibility of downscaling could not be considered, due to the fact that: (i) the Marsa Power Station will be decommissioned upon the installation of the interconnector; (ii) DPS 1 will be replaced by the proposed CCGT plant, and (iii) DPS 2A and 2B will be kept going for use in emergencies or as a reserve plant. Only the proposed

215MW CCGT would be capable of taking over the 200MW interconnector in case of a serious fault.

- *Zero option*: The EIS also assessed the implications of the zero option; particularly in terms of marine water bodies, air quality and noise impacts. The EIS notes that the proposed developments may lead to general improvements in the baseline situation, particularly in terms of Malta's commitments with EU targets regarding air pollution and energy management.

EPD Comment (1): *The Environment Protection Directorate (EPD) notes that the EIS has provided an overall outline of the main alternatives considered for the proposed developments and provided the main reasons for such choice, also noting the relevant environmental effects and their prevention, in line with the requirements of Section 2 of the Terms of Reference dated July 2013 and of the EIA Regulations, 2007 (Legal Notice 114 of 2007, as amended).*

EPD Comment (2): *In terms of the off-shore option associated with LNG storage facilities, the EPD notes that any future proposals are not covered by the current assessment and would need to be subject to all the required environmental assessments.*

2. EIA CONSULTATIONS

2.1 EIA Scoping

During the scoping stage, the Project Description Statement (PDS) was circulated to the following consultees and was made available for public consultation from the 4th June 2013 to the 25th June 2013:

- Marsaxlokk Local Council;
- Local Councils Association;
- Malta Resources Authority;
- Transport Malta;
- Environmental Health Directorate;
- Superintendence of Cultural Heritage;
- Civil Protection Department;
- Environmental NGOs: Din l-Art Ħelwa, Kummissjoni Ambjent, Birdlife Malta, Nature Trust Malta, Ramblers Association of Malta, Flimkien għal Ambjent Aħjar, Friends of the Earth Malta, Żminijietna, Fondazzjoni Wirt Artna, GAIA Foundation, Light Pollution Awareness Group, Moviment Graffitti, Malta Organic and Agriculture Movement, Malta Water Association, Youth for the Environment, Noise Abatement Society of Malta, Federazzjoni Birżebbuġa, Birżebbuġa Environmental Action Group.

The PDS was also circulated for internal review within MEPA.

Comments were received from Din l-Art Ħelwa (e-mail dated 21st June 2013), Birżebbuġa Local Council (e-mail dated 24th June 2013), Marsaxlokk Local Council (e-mail dated 25th June 2013) and 2 members of the public (Ing. John Pace – e-mail dated 21st June 2013; Prof. Edward Mallia - letter dated 25th June 2013). A scoping meeting with the Marsaxlokk Local Council, government entities and environmental NGOs was also held on the 19th June 2013. A copy of the submitted comments are included as Appendix I and a copy of the minutes of the scoping meeting have been included in Appendix II to this report.

The final Terms of Reference were issued to the applicant and architect on 10th July 2013.

2.2 EIA Review

The draft EIS was submitted to MEPA on 2nd September 2013 and was circulated for review to the same consultees consulted during the scoping stage (see Para 2.1 above). The EIS was also circulated for internal review within MEPA.

Within the stipulated consultation period, comments were received from Din l-Art Ħelwa (e-mail dated 7th September 2013), Birżebbuġa Environmental Action Group (letter dated 25th September 2013), Civil Protection Department (letter dated 26th September 2013), Marsaxlokk Local Council (e-mail 30th September 2013), Environmental Health Directorate (e-mail dated 1st October 2013), Birżebbuġa Local Council (e-mail dated 2nd October 2013), Malta Resources Authority – Competence, Licensing and Enforcement (e-mail dated 2nd October 2013) and Superintendence of Cultural Heritage (e-mail dated 14th October 2013). Comments made by MEPA and its consultees during the review stage were forwarded to the EIA Coordinator, the developer and the architect on 3rd October 2013. These comments were addressed by the EIA Coordinator and responses were included in Volume 6 of the EIS Coordinated Assessment Report submitted to MEPA. Comments received during the public consultation period are inserted in Appendix III to this report.

2.3 EIA Certification, Public Consultation and Public Hearing

The EIS was certified on the 23rd December 2013 and was published for a three-week public consultation period, with a deadline for submissions being the 24th January 2014. A public hearing was held on the 27th January 2014, with a deadline for comments by the 3rd February 2014 (included in Appendix IV to this report). Minutes of the meeting are also included as Appendix V. Overall, comments were received from the Birżebbuġa Sailing Club (letter dated 20th January 2014), Din l-Art Ħelwa (e-mail dated 1st February 2014), the Marsaxlokk and Birżebbuġa Local Councils (letter dated 20th January 2014), members of the public (Ing. John Pace – e-mail dated 24th January 2014, Mr. Alfred Falzon – e-mail dated 28th January 2014, Birżebbuġa Environmental Action Group (letter dated 3rd February 2014), Environmental Health Directorate (e-mail dated 3rd February 2014) and Mr. Kees de Jong – e-mails dated 4th and 7th February 2014).

3. EIA FINDINGS

The characteristics of the site, assessment of impacts and mitigation measures were identified in the EIS as follows:

3.1 Land Cover and Land Uses

The Power Station site is located on the westernmost side of the Delimara peninsula, which in terms of topography, incorporates a ridge running along the centre of the peninsula, with land sloping down to the coast on both the western and eastern aspects. The site is characterised by a variety of different geomorphological landforms with a varying and diverse topography. The principal land use in the Delimara peninsula is agricultural, together with the presence of some isolated residential units. Moreover, areas of natural and semi-natural habitats, and areas with historical elements are also present. Figures 3-5 to 3-8 in the EIS Coordinated Assessment illustrate the land cover and land-use in the area.

Il-Port ta' Marsaxlokk, where the FSU and the ancillary infrastructure are proposed to be located, harbours a range of different uses with the most important being fishing, aquaculture, bunkering, shipping and trans-shipment operations.

IMPACT SIGNIFICANCE AND PREDICTIONS

The EIS indicates that the proposed development is expected to have the following effects:

- Changes to the existing land use arrangements and land take-up within the power station site during both construction and operation: *Insignificant,* given that the existing land uses are expected to remain essentially unchanged. A higher proportion of the power station site will be built-up however DPS 1 will be decommissioned while DPS 2A and 2B will be used for back-up only.
- Changes to the existing land use arrangements and land take-up in the surroundings during both construction and operation: *No impact on the surrounding land uses is expected.*
- Changes to existing arrangements with respect to sea uses in relation to the jetty and the FSU locations during construction: Albeit highly likely to occur, the EIS indicates that impact significance is considered to be *low if Transport Malta is kept informed of planned vessel movements or marine engineering works*. During operations, impacts on sea uses are identified as inevitable, however of *low significance* since the location of the jetty was discussed with Transport Malta after the risk assessment indicated the area in the harbour within which the loading arms should be located and the current/wave study indicated that the proposed location was not expected to have a significant impact on wave and current patterns.
- Changes to existing arrangements with respect to sea uses in Il-Ħofra ż-Żgħira during operations: Impact is considered to be of *moderate significance*, particularly on swimmers using the area.

PROPOSED MITIGATION MEASURES

- Good communication with Transport Malta and all the stakeholders involved in the process (for example: fishermen, Malta Freeport, Oil Tanking Malta).
- The possibility of the use of a pipe through which the discharge of cooling water could by-pass Il-Ħofra ż-Żgħira, as proposed by the Marsaxlokk Local Council.

RESIDUAL IMPACTS

No significant residual impacts were identified by the EIS.

3.2 Landscape and Visual Amenity

The landscape character and visual amenity assessment was based on the identification of the zone of visual influence (ZVI) and critical viewpoints for the baseline photographs and a 3D model of the proposed development. The ZVI for the proposed development is presented in Figure 3-9 of the EIS Coordinated Assessment.

GENERAL LANDSCAPE DESCRIPTION

The present-day landscape of the area is characterised by a high diversity and a mosaic of land uses, including industrial, agricultural, residential and recreational elements. Natural habitat coverage is somewhat limited within the area, and there has been significant land conversion in the Marsaxlokk/Delimara area primarily for four purposes: agriculture, residential development, industrial development, tourism and commerce. Il-Port ta' Marsaxlokk has several historical/archaeological features of interest, including 17th-19th century harbour fortifications (Il-Fortizza ta' Delimara, It-Torri ta' San Luċjan and Il-Forti ta' San Luċjan around it, Il-Forti tas-Silġ, and the Wolseley Battery), a landmark lighthouse, (Il-Fanal ta' Delimara), and archaeological sites such as Borġ in-Nadur and Tas-Silġ. In this regard, the Delimara peninsula and the embayments around Marsaxlokk and Birżebbuġa, together with the surrounding sea area, are strongly characterised by a high density and diversity of land and sea uses.

VISUAL AMENITY

Six viewpoints (VPs) (Figures 3-14 to 3-19 of the EIS Coordinated Assessment) were identified to assess the visual impact of the proposed development:

- *Viewpoint 1*: Located within Delimara peninsula, in relatively close proximity to the DPS site. This viewpoint affords a relatively expansive view in several directions; with the exception of the views towards the east, south-east and south.

- *Viewpoint 2*: Located at the junction between Triq tas-Silġ and Triq il-Power Station (Marsaxlokk), with the position affording a view of the Delimara headland to the south and south-east, together with partial views of Marsaxlokk harbour and the San Luċjan headland, and partial long-distance views of parts of Birżebbuġa and parts of the Freeport at Kalafrana. Views from this location are more enclosed, bounded by the Delimara headland to the west, with visibility in other directions is more limited.

- *Viewpoint 3*: Located on the Marsaxlokk seafront, along Xatt is-Sajjieda, with the viewshed delimited by the Delimara and San Luċjan headlands. This position provides a good view of the Marsaxlokk seafront promenade, with views bounded by the two headlands to the south-east and south-west and by existing buildings close to the seashore to the north and north-west.

- *Viewpoint 4*: Located on the Marsaxlokk seafront along Xatt is-Sajjieda, at a point closer to the San Luċjan peninsula. The viewpoint lies directly opposite the Delimara peninsula; the view of the south is limited by the lie of the San Luċjan peninsula and the view of the sea is limited due to the site topography.

- *Viewpoint 5*: Located on the San Luċjan peninsula along Triq it-Trunċiera (Marsaxlokk), directly opposite the power station complex, with the latter dominating the view. The view incorporates much of the Delimara headland, though its southernmost extent is obscured by the San Luċjan peninsula itself. The marine area visible in this viewpoint includes the stretch of sea between the two peninsulae, although the innermost part of Id-Daħla ta' Marsaxlokk is not visible.

- *Viewpoint 6*: Located along Triq San Patrizju on the Birżebbuġa seafront; where much of the Delimara headland is visible except for the southernmost tip, and also parts of the seafront along Ir-Ramla ta' Birżebbuġa (Pretty Bay) and parts of the San Luċjan peninsula. The sea also forms part of the view.

IMPACT SIGNIFICANCE AND PREDICTIONS

Impacts on landscape character

The EIS indicates that the proposed development shall lead to the following impacts in terms of landscape character:

- Presence of construction machinery in the landscape, in contrast with the predominantly rural character of the Delimara peninsula, during construction works: *Low to moderate significance.*
- Increase in industrial elements with the predominantly rural context of Delimara peninsula during operations: *Moderate significance.*
- Weakening of the 'traditional' landscape character of Marsaxlokk Bay, as a result of a stronger industrial presence in the visible landscape: *Moderate significance.*
- Weakening of the residential/recreational values of the landscape at Birżebbuġa, as a result of the increased industrial presence in the landscape: *Moderate to low significance.*

Impacts on visual amenity

The EIS identified the following as key sensitive receptors in terms of the proposed development:

(i) Farmers cultivating land in proximity to VP1 elsewhere on the Delimara peninsula, particularly in areas with a direct view of the power station complex;
(ii) Farmers cultivating land within the Marsaxlokk/Birżebbuġa areas, with a view of the power station complex opposite;
(iii) Residents living close to the area of the power station (on the Delimara peninsula);
(iv) Residents living along the Marsaxlokk and Birżebbuġa seafronts, or further inland but with a direct view of the power station complex;
(v) Drivers passing through the area, as well as casual passers-by;
(vi) Tourist and local patrons of the Marsaxlokk market, and of Marsaxlokk and Birżebbuġa catering establishments;
(vii) Commercial operators of catering/tourism and other establishments;
(viii) Operators at the Freeport complex;
(ix) Individuals out at sea, on pleasure craft or industrial vessels (including fishermen); and
(x) Bathers and other recreational users of the seafronts at Marsaxlokk and Birżebbuġa.

Impacts for each of the viewpoints analysed in the EIS are as follows:

- Viewpoint 1: *High significance*
- Viewpoint 2: *Moderate significance*
- Viewpoint 3: *Moderate significance*
- Viewpoint 4: *Low significance*
- Viewpoint 5: *High significance*
- Viewpoint 6: *High significance*

PROPOSED MITIGATION MEASURES

A good landscaping plan for the Delimara peninsula can mitigate the impact, though not substantially.

RESIDUAL IMPACTS

The EIS notes that the impacts on landscape and the visual scene from the proposed development are unavoidable and thus residual visual impacts of *high significance* would remain.

EPD Comment (3): *The Environment Protection Directorate (EPD) agrees with the conclusions of the EIA Coordinator in terms of impacts on landscape character and visual amenity. Whilst having no significant concerns from a landscape and visual amenity point of view vis-à-vis the location of the CCGT plant (including the location of the three primary stacks and the three by-pass stacks) and the onshore re-gasification facility, the introduction of the FSU shall lead to an additional significant impact in the landscape character and visual amenity of the port of Marsaxlokk which is difficult to eliminate completely. Nevertheless, the EPD is requesting a detailed landscaping plan (e.g. camouflaging, design of structures and materials, colour treatments and textural finishes to aid integration with surroundings and thus minimise impacts) to be submitted, also taking into consideration any requirements arising from both the Industrial Emissions Directive and the Seveso Directive.*

3.3 Geo-environment (geology – geomorphology – hydrology – hydrogeology)

3.1.1 Geology

The DPS site is located on Middle Globigerina Limestone, overlain by the Upper Globigerina Limestone (Figure 3-43 of the EIS Coordinated Assessment Report refers).

In terms of Middle Globigerina Limestone, the EIS indicates that this rock unit is well exposed in the cliff section forming the eastern boundary of the DPS and is over 50m thick, consisting of a bedded sequence of marls and marly limestone. On the other hand, the Upper Globigerina Limestone consists of two beds of a cream fine, soft, massive, bio-turbated, moderately weak limestone beds each about 8m thick and a middle marly bed, about 5m thick, with it being entirely composed of tests of benthonic and planktonic foraminifera, some echinoid spines, echinoids and scattered whole or fragmented bivalve shells. The EIS states that the power station site *per se* is located on Middle Globigerina Limestone while the Area of Study is mostly located on the Upper Globigerina Limestone.

3.1.2 Mineral resource assessment

The EIS included a mineral resource assessment of the site and was undertaken through:

- A field survey of the site;
- Fieldwork comprising the drilling of 7 boreholes (Figure 3-46 in the EIS Coordinated Assessment refers);
- Offshore holes drilled to investigate the geology of the seabed; and
- Previous *in situ* testing close the DPS site.

The laboratory tests on the samples collected through the boreholes indicate that the rock is moderately strong, having an uniaxial compressive strength[1] that varied from 6.2 to 20.6N/mm^2 and an average uniaxial compressive strength of 13.5N/mm^2. Petrographic examination reveals that the rock is a marly limestone.

In terms of quality of the resource, the EIS indicates that such rock would be suitable for cement manufacture and may be suitable for filling of trenching works and screed.

Offshore subsurface investigations were also carried out in the EIS and analysed seabed soft-sediment thickness, depth to bedrock and rock core sample recovery. The identified maximum depths to the bedrock were 33m, 32m and 20.5m respectively at each of the profiles analysed.

3.1.3. Geomorphology

The following geomorphologic features were identified within and around the area of study:

- Middle Globigerina Limestone slopes at Il-Ballut – an exposed marl which weathers very easily to form a rather gentle slope;
- Cuesta-like ridge (*i.e.* ridge which possesses both scarp and dig slopes) marking the north-eastern boundary of the site, formed at the up-dip axis of the Upper Globigerina Limestone strata which dip to the northeast;
- Cliff margin at Delimara – the DPS site (L-Ingernier) and the rest of the west-facing slope of Delimara forms a steep cliff as a result of wave erosion of the weaker strata exposed at sea level;
- Shingle beach at Is-Sarċi, near the northern side of Fort Delimara;
- Serrated coastline forming the northeast margin of the Delimara peninsula;
- Circular amphitheatre-like bays of Il-Ħofra l-Kbira and Il-Ħofra ż-Żgħira on the north-east coastline; and
- The DPS site lies inside a deep excavation initially cut into Rdum il-Bies in the early-1990s to accommodate the DPS, producing a steep near-vertical rockface up to about 40m high.

3.1.4. Hydrology and hydrogeological features

The EIS indicates that area of study for the hydrology and the hydrogeology includes a number of surface hydrological features in the form of water wells, small reservoirs and a disused canal irrigation system. No

[1] The capacity of a material or structure to withstand loads tending to reduce size, which can be measured by plotting applied force against deformation in a testing machine. Compressive strength is a key value for design of structures.

well-developed watercourses are located within the area of study. Overland flow is discharged in a diffuse manner along the coastline. No mean sea level aquifer is developed in the area of study, as the Middle Globigerina Limestone is impermeable and extends well below sea level. The actual sites to be developed as part of the proposal have a total catchment area of 15,000m^2. The site also incorporates the remnants of a system of surface concrete canals dating back to the 1980s; the system has been abandoned and whole sections been removed.

In terms of ground water protection, the site lies outside the groundwater protection zone and no public boreholes are located within the area of influence.

IMPACT SIGNIFICANCE AND PREDICTIONS

The proposed development is not expected to have any significant impact on the geology, geomorphology, hydrology and hydrogeology of the area. The proposed development does not involve major excavation works, and the DPS site is located within an artificially-excavated area, thus making the overall impact on geology *low to insignificant*, while that on geomorphology would be *insignificant*.

The EIS notes that there is the remote possibility for wave and sea current action to affect the stability of the rubble mound in Area B during both construction and operation, with an impact of *high significance*, in terms of destabilisation of the proposed re-gasification plant.

PROPOSED MITIGATION MEASURES

Protection of the coastal margin through rock armour to protect the area around the re-gasification plant, which would need to be inspected regularly and after major storms.

RESIDUAL IMPACTS

The above mitigation measure should effectively mitigate the impacts associated with stability of slope in Area B, subject to regular monitoring, reducing the impact to *low significance.*

3.4 Marine Water Bodies

The study of the marine water bodies focused on the following two main elements:

- A review of the current seawater and sediment quality within the relevant parts of Il-Port ta' Marsaxlokk (including the Delimara headland in particular) and Il-Ħofra ż-Żgħira, to establish the current sources of marine contaminants in the area and subsequently, establish the current risk profile to the marine environmental quality; and
- Changes to the marine environmental quality risk profile.

The EIS establishes the following main sources of marine pollution in Marsaxlokk (Figure 3-50 in the EIS Coordinated Assessment): (i) sewage overflows and other sources; (ii) maritime and fuel handling; (iii) fish-farming; (iv) Delimara Power Station; and (v) land runoff. The study focused most on the effects on Il-Port ta' Marsaxlokk and Il-Ħofra ż-Żgħira.

IL-PORT TA' MARSAXLOKK

The EIS notes that some water stratification is evident during the summer months; however no anoxic conditions were reported in the bottom waters, though occasional low levels of dissolved oxygen were recorded at surface waters off the power station. Water transparency in general is very good except occasionally due to runoff events, and decreases rapidly with depth. Total suspended solids as monitored in Marsaxlokk and Il-Ħofra ż-Żgħira were comparable to those found in other local coastal waters. Nutrient and chlorophyll levels indicate that, as a whole, Marsaxlokk is the least exposed to eutrophic risks when

compared to other local harbours. Levels of heavy metals were found to be generally lower than annual average-environmental quality standards (AA-EQS and MAC-EQS) set by the Water Framework Directive (Directive 2000/60/EC) and the Environmental Quality Standards Directive (Directive 2008/105/EC). Mercury often features prominently in surface waters, with an annual average being estimated at above the set standards (Table 3-22 of the EIS Coordinated Assessment refers). Levels of petroleum hydrocarbons and most other organic contaminants, including pesticides, solvents and antifouling agents were below detection limits within the coastal waters. In sediments, such hydrocarbons were found in various locations in the port, with their levels ranging from low to moderate. Other organic compounds were found to be below the detection limit.

IL-ĦOFRA Ż-ŻGĦIRA

Currently, Il-Ħofra ż-Żgħira receives up to 43,000m^3/h of cooling waters at temperatures up to +8˚C above ambient. Aside from the thermal pollution, the EIS indicates no major impacts on the normal marine water quality parameters, most likely due to the rapid diffusion of contaminants.

IMPACT SIGNIFICANCE AND PREDICTIONS

The EIS indicates that the proposed development shall have the following effects on the quality of the waters within the Marsaxlokk harbour through:

- The release of particulate matter, and increased turbidity during construction, due to coastal engineering works: *Moderate to low significance.*
- Increased nutrients in the water body during construction, due to coastal engineering works: *Moderate to low significance*.
- Releases of oil/fuel and other contaminants during construction, due to land-based activities and increased maritime activities related to coastal engineering works: *Moderate to low significance.*
- Discharge of re-gasification waters during operation, due to re-gasification of LNG: *Low significance.*
- The discharge of other wastewater streams from CCGT and LNG facilities during operation: *Moderate to low significance.*
- Atmospheric fallout of gases emitted by the development at the Delimara Power Station, into the water column, during operation of the re-gasification plant and storage facilities: *Low significance.*
- Increased maritime traffic and increased potential operational releases of pollutants (*e.g.* fuel lubricating oils) during operation: *Low significance.*
- Changes in the hydrodynamics of the water body, in relation to construction of jetty leading to reduced diffusivity of marine contaminant, during operation: *Low significance.*

PROPOSED MITIGATION MEASURES

- Good practice of coastal engineering works (e.g. the deployment of strategically-placed geo-textile curtains along the DPS shoreline and jetty works) through the submission of a detailed Construction Management Plan (CMP).
- Strict compliance with all discharge regulations for all wastewater streams.
- Good workmanship and strict supervision of all operations including water treatment.
- Minimisation of all gaseous emissions.
- Proper supervision of harbour and maritime activities.
- Full compliance with regulations controlling the discharge of solid and liquid wastes from ships in harbours.
- Proper supervision of DPS operations to avoid any oil spills in the immediate vicinity of the cooling water intake.
- Prompt contingency planning to control minor spills, should they occur.

- An integrated liquid waste management programme (within the whole of the DPS), which would include the management of any ballast waters, bilge oils, sanitary liquid wastes, and other effluents generated by the LNG facilities.
- Bunded storage areas should be properly supervised to minimise contamination of any surface runoff which may be generated within them. Drainage from such areas should be controlled through the provision of valved outlets which should normally be in the closed position. The contents of bunds ancillary to bulk chemical tanks should be chemically monitored prior to their release.
- Delivery of bulk chemicals should be permitted only in a designated area, draining from which should be directed to the neutralisation system of a water treatment plant.
- Detailed monitoring programme related to marine water bodies, which should include monitoring of water turbidity, nutrient levels, spatial extent of cool plume, and the chemical profiles of the various waste streams to be discharged into the marine environment.
- Detailed hydrodynamic survey to identify the current regime as it changes with different seasons in the area of influence assessed in the EIS. Water stratification and surface and sub-surface currents in the area would also be identified.
- Monitoring and surveillance monitoring during operations.

RESIDUAL IMPACTS

Residual impacts are expected to range from *none* (specifically where impacts are temporary) to *low significance*, mainly in cases of discharges of treated waters into the sea, additional sea-craft movements in the harbour (maximum 10 additional trips per annum to the current 2,700 per annum), the discharge of pollutants such as oils and fuels, and the anticipated changes to hydrodynamics.

EPD Comment (4): *The Environment Protection Directorate recommends that the mitigation measures listed in the above section, including monitoring, are included as development permit conditions and the IPPC permit conditions.*

3.5 Terrestrial Ecology

The area of study for terrestrial ecology assessed in the EIS (Figure 3-55) encompasses three distinct ecological units, all of which represent different stages in the recolonisation of former agricultural areas by natural communities.

The agricultural land in the area of study has been subject to recent cultivation and is colonised by herbaceous ruderal species that may generally be considered as 'weeds' exploiting the recently-released habitat-space. The margins of agricultural land provide corridors for dispersal and have been colonised by species characteristic of greater ecological stability. The presence of rubble wall remnants in the southern portions of the area of study suggests that these areas were also cultivated in the past.

Vertical faces in the area of study were all colonised by a rupestral community dominated by the Maltese Salt Tree (*Darniella melitensis).* The composition of these rupestral assemblages was similar across the area of study and there was little detectable difference in community composition between 'recent' and 'non-recent' rock faces. 'Recent' faces were artificially created following excavation works to accommodate the DPS whilst 'non-recent' faces are essentially the natural cliffs that have been available for colonisation for much longer periods of time. The relatively homogenous community composition across rock faces of different ages suggests that the time required to achieve a local climax in these habitats is less than 25 years.

The species composition of the 'plantation' in the southern sector of the area of study suggests a complex ecological history. The area is characterised by remnants of ruderal communities from agricultural areas, various trees and large shrubs that were presumably introduced for embellishment, and species characteristic of early-pioneer and later-pioneer stages of secondary ecological succession. The lower parts of the slopes, closer to the shoreline, were characterised by ruderals characteristic of coastal communities.

VERTEBRATE FAUNA

A study of the terrestrial fauna (birds, mammals including bats, amphibians and reptiles) was also undertaken.

In terms of bird species, the EIS notes that the Delimara peninsula is known to hold no less than seven breeding species, namely: Blue Rock Thrush (*Monticola solitarius*), Great Short-toed Lark (*Calandrella brachydactyla*), Zitting Cisticola (*Cisticola juncidis*), Sardinian Warbler (*Sylvia melanocephala*), Spectacled Warbler (*Sylvia conspicillata*), Tree Sparrow (*Passer montanus*) and Spanish Sparrow (*Passer hispaniolensis*). In terms of seabirds, no such species are known to breed in the area of influence and the closest colonies are situated at Benġisa with both Scopoli's and Yelkouan Shearwaters breeding along the cliff-faces.

Bats and other vertebrate fauna were also noted, however the EIS indicates that considering that the area is already very much disturbed especially due to the construction of the Delimara Power Station and by the roads leading to it, the current project is not likely to affect much of the vertebrate fauna of the area. Minor disturbance may occur during the construction phase, especially to birds breeding in the immediate vicinity of the site. One issue of concern listed in the EIS is related to light pollution, which may negatively affect the behavioural patterns of birds and other vertebrate species.

IMPACT SIGNIFICANCE AND PREDICTIONS

Impacts on terrestrial ecology

The EIS indicates that the main impact associated with terrestrial ecology is the obliteration of biological communities during excavation, stabilisation and construction phases in the CCGT site and the re-gasification facility, which may lead to an impact of *high significance* in the area.

Other impacts listed in the EIS, which however are not of high significance include:

- Disturbance arising from noise and vibration during construction;
- Effects of windblown limestone dust on habitats and biota during construction;
- Obliteration of biological communities in possible storage sites due to storage of excavated material;
- Redistribution of particulates during storage of excavated material;
- Proliferation of ruderal species during storage of excavated material;
- Degradation of biological communities due to leakages from the storage of excavated material and construction materials and wastes;
- Disturbance of susceptible fauna due to site illumination during the night; and
- Possible damage to vegetation due to emissions of primary and secondary pollutants.

Impacts on vertebrates

The EIS indicates that the proposed development will have the following impacts on vertebrate fauna:

- Light spillage during construction and operation, leading to the disruption of normal behaviour in vertebrate fauna: *Moderate to high significance.*
- Noise impacts throughout all phases: *Moderate significance.*

PROPOSED MITIGATION MEASURES

- Damping mechanisms to reduce effects of vibrations on terrestrial fauna.
- Dust suppression measures to minimise wind-blown dispersion (e.g. collection of fine particulates generated during onsite working of stone, covering of stored material, water-spraying of active areas).
- Stockpiles of excavated material should be either removed or underlain with porous bedding and covered with a tarpaulin in order to minimise redistribution by wind and water. Onsite storage should be as brief as possible. Height and slope should be limited in order to reduce wind erosion and wet suppression of dust.
- Siting of stockpiles away from the rupestral habitats characterising the western perimeter of the DPS complex should be considered.
- Insulation of stockpiles to minimise dispersal of propagules of invasive species.
- Containment of spillages through secure storage and confinement of loads in vehicles.
- Secure storage of potential pollutants (including oils and cement) with secondary containment and fire-prevention systems.
- A contingency plan to clean up any spills should also be established.
- Use of downward-facing lights (although such lights may still cause light pollution that may negatively influence wildlife) and low-intensity lighting is recommended wherever possible. Fixtures that are acceptable to the International Dark Sky Association should be used.
- Appropriate noise control.

RESIDUAL IMPACTS

Residual impacts with respect to terrestrial ecology are considered to be *insignificant to low*, based on the observation of recolonisation by shrub formations in areas impacted by construction of the current Delimara PS complex in the early 1990s.

3.6 Marine Ecology

The marine ecological study was undertaken using direct observation by scientific SCUBA divers, with the main aim of producing maps showing the distribution of the main benthic habitats and to establish the presence of any habitats and species that are protected and/or have a high conservation value. The 2013 studies built upon the work carried out, with respect to both Il-Ħofra ż-Żgħira and the Marsaxlokk side of the peninsula by the marine ecology consultants who prepared the EIS for the 2011 extension to the DPS. The 2009 studies consisted of: (i) benthic surveys aimed at mapping the distribution of main benthic habitats in the study areas; and (ii) the collection of samples of biota from hard substrata and soft sediments to characterise the flora and fauna present (Figures 3-60 to 3-62 in the EIS Coordinated Assessment refers).

The following biocoenoses and mosaics were recorded from the infralittoral zone at Il-Ħofra ż-Żgħira and Marsaxlokk-side study areas as follows (Figure 3-65 in the EIS Coordinated Assessment):

- Biocoenosis of infralittoral algae;
- Biocoenosis of infralittoral stones and pebbles;
- Biocoenosis of well-sorted fine sands;
- Biocoenosis of superficially muddy sand in sheltered waters;
- Biocoenosis of polluted harbour mud and sandy mud; and
- Biocoenosis of *Posidonia oceanica* meadows.

The EIS indicates that, overall, the shore and benthic biotic assemblages and the demersal and pelagic fauna (including fish) recorded from the two areas of study are typical of those occurring in local bays and

inlets. The type of benthic assemblages and habitat types that occurred was influenced by the physical features of the seabed and water quality characteristics. In parts of the areas of study, a mosaic of different assemblage types was present, which results from the heterogeneous physical characteristics of the seabed. In terms of status, the benthic assemblages and demersal fauna appeared to be in a better state at Il-Ħofra ż-Żgħira compared to the waters along the power station site, particularly in relation to the case of seagrass (*Cymodocea nodosa* and *Posidonia oceanica*) habitats.

A number of species and habitats have been recorded to occur in the areas of study. These include:

- *Posidonia* beds (listed in Schedule I and Schedule III of the Flora, Fauna and Natural Habitats Protection Regulations, 2006; Appendix I of the Bern Convention and Annex II of the Barcelona Convention);
- The lesser Neptune Grass, *Cymodocea nodosa* (Appendix I of the Bern Convention, Annex II of the Barcelona Convention and Appendix I of the Bern Convention);
- *Cystoseria foeniculacea* (listed in Schedule III of the Flora, Fauna and Natural Habitats Protection, Regulations, 2006); and
- The Rock Urchin, *Paracentrotus lividus* (listed in Schedule VIII of the Flora, Fauna and Natural Habitats Protection Regulations, 2006 and Annex III of the Barcelona Convention and Appendix III of the Bern Convention).

IMPACT SIGNIFICANCE AND PREDICTIONS

The EIS indicates that the proposed development is expected to have the following effects on marine life:

- Release of particulate matter and increased turbidity due to construction-phase coastal engineering works: *Moderate to low significance;*
- Releases of oil/fuel and other contaminants from land-based activities and increased maritime activities due to construction-phase coastal engineering works: *Low significance;*
- Increases in sea vessel traffic during construction: *Low significance;*
- Physical alteration of the sea-bed due to construction-phase coastal engineering works: *Moderate significance;*
- Construction of rock armour for construction-phase coastal engineering works: *Low significance;*
- Changes in the hydrodynamics of the water body due to construction of the jetty, leading to reduced diffusivity of marine contaminants: *Insignificant;*
- Discharge of other wastewater streams from the CCGT and LNG facilities during operation: *Moderate to low significance;*
- Atmospheric fallout of LNG into the water column, via the re-gasification plant and LNG storage facilities during operation: *Low significance;*
- Disturbance and pollution through vessel activity during operation: *Low significance;*
- Thermal and chemical pollution via the re-gasification plant and LNG storage facilities during operation: *Low significance.*

PROPOSED MITIGATION MEASURES

- Good practice during coastal engineering works, adhering to a detailed Construction Management Plan (CMP).
- Measures to reduce the introduction of toxic substances and contaminants into the marine environment.
- Good operational procedures and supervision with adherence to the relevant standards, guidelines and conventions.
- Monitoring of water quality and benthic assemblages.

RESIDUAL IMPACTS

The residual impacts identified in the EIS are of *low significance* and are related to the following:

- Effects on marine life through the release of particulate matter and increased turbidity during construction;
- Effects on marine life, through changes in the hydrodynamics of the water body during construction and operation;
- Effects on marine life, through the discharge of other wastewater streams;
- Effects through atmospheric fallout of LNG into the water column;
- Effects through disturbance; and
- Thermal and chemical pollution during operation.

3.7 Agricultural Land and Soils

AGRICULTURAL LAND

The agriculture area of study (Figure 3-67 to Figure 3-70) assessed in the EIS is largely characterised by small-sized terraced dry land farm parcels located on shallow soils over a parent bedrock of Globigerina Limestone. The larger part is utilised for the production of a single winter crop, namely wheat. The edaphic conditions in the area, namely the shallowness of the soil and adverse climatic conditions (lack of rainwater and sea spray-laden winds) prohibit the successful completion of a single crop cycle. The EIS notes that the primary agricultural land use is the growing of wheat, with a few instances where legumes were sown to enhance crop rotation. A degree of crop rotation is still being practiced within the study area, which includes fallow land as well as a small number of vineyards and a few olive groves.

The main agricultural system is that of low-intensity traditional agricultural farming that is primarily influenced by limited soil depth and by prevailing salt-laden winds. Accessibility is also an issue in some of the areas within the area of study.

SOILS

The EIS indicates that the soils in the area of study can be mostly categorised as Terra soils from the upper range to the west and lower xerorendzinas to the east. Soils located in the area are typical of a hot, dry climate, particularly arid and semi-arid areas. Such soils are effectively weakly developed with typical ochric colour, of medium texture and well-drained, leading to low water-holding capacity and high permeability. Soil depth is variable, ranging between 10cm and 60cm, and is likely to reflect previous farming practices and erosion patterns.

IMPACT SIGNIFICANCE AND PREDICTIONS

In terms of agricultural land, the EIS indicates that the proposal shall not lead to any direct agricultural loss as a result of construction and operation of the DPS. Impacts on agricultural land due to dust generated during construction works during construction was determined to be of *low to no significance.*

PROPOSED MITIGATION MEASURES AND RESIDUAL IMPACTS

The EIS indicates that good construction site practices would effectively mitigate any impacts on agricultural land, leading to no residual impacts.

3.8 Cultural Heritage: Coastal and Marine

The study carried out to assess marine archaeology and coastal and marine cultural heritage was carried out through a marine magnetometer survey with an accompanying sub-bottom profiler survey. Single beam bathymetric data was derived from the first seafloor reflector as recorded by the sub-bottom profiler. Furthermore, a desk-top study, a diver survey and an analysis of remote sensing data was also carried out.

The marine archaeology study covered the site illustrated in Figure 3-73 and 3-74 in the EIS Coordinated Assessment and was based on the following:

- *Disturbance factors in Maltese bays and harbours*: Dredging, anchoring, propeller wash, World War II bombs and local fishing habits.
- *Discoveries from an underwater context*: Over the past decades, a number of archaeological objects have been discovered and raised from the seabed at Il-Port ta' Marsaxlokk, including (non-exhaustive list): one partial amphora of the late Roman period; a ceramic artefact dating back to the Arab period and other ceramic fragments; a large bronze cannon; and pottery fragments.
- *Diver survey*: The EIS indicated that there are no significant archaeological deposits present on the seabed in the area of study.
- *Sub-bottom survey targets:* 9 sub-bottom targets were located, varying in size from 6m to 20m, and it was determined that the objects detected in this survey do not coincide with any known archaeological sites or objects but may still be of cultural heritage value.
- *Magnetometer survey targets*: The quantity of targets identified by the magnetometer survey indicates that many pieces of modern debris may be lying on the seabed in the study area.

IMPACT SIGNIFICANCE AND PREDICTIONS

The EIS notes that the significance of impacts associated with damage and obliteration of cultural heritage on the seabed during the construction works for the jetty may vary from *high to low,* for the above-mentioned reasons.

PROPOSED MITIGATION MEASURES

Proposed mitigation measures include exploration of the seabed and sediment, together with monitoring of works.

RESIDUAL IMPACTS

The EIS indicates that further exploration and monitoring would effectively mitigate any impacts on marine archaeology, leading to no residual impacts.

3.9 Cultural Heritage: Terrestrial

A cultural heritage study was carried out as part of the EIS, after the quantitative risk assessment report prepared as part of the same EIS indicated that in case of a major accident, some cultural heritage features located close to the Delimara Power Station site may be affected. The study consisted of both desk-top and field research, and covered the two terrestrial sites (Areas A and B) that could be potentially affected by the proposed development (Figure 3-109 of the EIS Coordinated Assessment refers).

The historical importance of the area dates back to the prehistoric period, with the multicultural site of Tas-Silġ located approximately one kilometre north of the Delimara Power Station. The strategic importance of Tas-Silġ continued throughout the Classical period, particularly during the Phoenician and Roman periods and also in the medieval period, through the Paleochristian and Arab era. During the Knights' Period, the vulnerability of the Marsaxlokk area to attacks by the Ottoman Turks lead to the decision by the Grandmaster Alof de Wignacourt to commission a set of coastal towers, including It-Torri ta' San Luċjan in 1610, as a first step to defend the coast of Marsaxlokk Bay. In 1658, smaller coastal towers were commissioned by Grandmaster De Redin, including the ones built at Xifer l-Infern (Delimara) and Xrobb l-Għaġin. Furthermore, throughout the 18th Century, three harbour batteries were constructed: the San Luċjan battery (in front of It-Torri ta' San Luċjan, subsequently demolished and replaced by Fort San Luċjan in the 19th Century), the battery known as It-Trunċiera tal-Wilġa (still largely extant near the main road

leading to the power station, albeit in a bad state of repair) and the battery at Ras it-Tumbrell (of which only vestiges survive). The strategic importance of Marsaxlokk was further acknowledged during the British period, where a number of forts were built, including: Il-Fortizza ta' Delimara, Il-Forti San. Luċjan, Il-Forti Tas-Silġ, St. Paul's Battery (also known as Il-Fortizza taż-Żebbuġ), Wolseley Battery (also known as Il-Fortizza tal-Basal) and Il-Fortizza ta' Bengħisa which lies well away from the area of influence of the proposal. Other complementary elements that needed to be erected included: Tal-Bies Position Finding Station, a lighthouse (Il-Fanal ta' Delimara) near the tip of the Delimara peninsula which included a Fresnel lantern, a number of pill boxes, beach posts and Heavy Anti-Aircraft batteries.

Within the area of study (Figure 3-111 in the EIS Coordinated Assessment), a list of recorded cultural features and their proposed protection is provided in Table 3-50. Such features include vernacular features such as farmhouses and field rooms (DLM13/001, DLM13/003, DLM13/005 and DLM13/006). In terms of rubble walls (Figure 3-112 in the EIS Coordinated Assessment), 39 per cent of those surveyed were considered to be in good condition (Grade A). With respect to military features, the area of study included the following features: Tal-Wilġa battery (DLM 13/002), the Tal-Bies Position Finding Station (DLM13/007), a circular stone-clad pillbox (DLM 13/009) and parts of Wolseley Battery (DLM13/010).

IMPACT SIGNIFICANCE AND PREDICTIONS

The EIS indicates that since the proposed development is within the footprint of the already-existing power station, and the areas earmarked for development are located on already developed land, the possibility of uncovering new archaeological material is minimal and thus the impact on cultural heritage in this scenario is considered to be *insignificant*. In terms of the worse-case scenario, the EIS notes that in the event of ignition points from the DPS igniting the gas cloud (as indicated by the preliminary risk assessment report), the area covering all the cultural sites from DLM13/002 to DLM13/10 to Delimara Lighthouse and Fort Delimara may be significantly affected.

PROPOSED MITIGATION MEASURES AND RESIDUAL IMPACTS

In light of the above, the EIS indicates no mitigation measures are being proposed and no residual impacts are envisaged.

3.10 Air Quality

The air quality report was based on air dispersion modelling, utilising the following models:

- AERMOD for the long term annual runs (hourly resolution), point sources and including the local background;
- AERMOD/TRAFFIC for high resolution line sources/traffic;
- CAM_x nested grid for the regional background (starting with a 2,400km domain around Malta); and
- MM5, 3D prognostic non-hydrostatic metereological model.

The runs generated by the above-mentioned models compared the relative and absolute changes which would be created by the proposed CCGT plant in various combinations of assumptions regarding emissions. These include the switch to gas at the DPS and the decommissioning of specific components of the plants at both the Marsa power station and the Delimara power station. The baseline scenario and the results from the numerical air quality simulation models were also taken into account.

The air quality study was based on scenario analysis, using simulation models, with more than 350 annual model runs executed as hourly resolution runs. These runs were performed with detailed hourly and distributed (1km resolution) meteorological data for five years (2008 – 2012), together with a range of measures and indices of air quality and regulatory compliance, based on the Air Quality Directive (Directive

2008/50/EC). The EIS states that the study utilised worst-case assumptions and explored various ranges of assumptions.

BASELINE SCENARIO

The baseline scenario analysed by the EIS considered the following point, area and line sources:

- The Marsa Power Station and OCGT;
- The Delimara Power Station steam turbines, and CCGT plants (DPS 1, DPS 2A and DPS 2B), together with the recently installed medium speed diesel engines and steam turbine of DPS 3 running on gasoil or heavy fuel oil (HFO);
- Minor point sources: Malta Waste Incinerator, Oil Tanking Malta, 31st March 1979 installation in Birżebbuġa, the Wied Dalam fuel depot and a number of stone crusher operations;
- Area sources, namely Malta International Airport, the Grand Harbour, the Malta Freeport Terminal and San Luċjan Oil Company Ltd; and
- The road network, for traffic generated emissions.

The EIS notes that the annual average for the baseline scenario in terms of total emissions[2] for NO_x is estimated at 397g/s while that for PM_{10} is 145g/s. However in order to provide more realistic estimates, the study provided load-corrected emission estimates[3], based on Tier 2 estimates (EEA/EMEP emission factors) and the 2012/2013 load factors for the energy sector point sources. In this regard, the annual averages for the baseline scenario are estimated as 275g/s NO_x and 27.2g/s PM_{10}.

Tables 3-35 and 3-36 of the EIS Coordinated Assessment provide a yearly assessment (2008–2012) of both the NO_x and PM_{10} values. The air quality model indicates that there are few exceedances of the hourly maxima in terms of NO_x at the sensitive receptor points[4] for most years, all below the regulatory maximum of 18 annual exceedances, except for 2008. In terms of PM_{10}, the corresponding values yield an annual average maximum within 15km impact radius of 17.4µg/m^3, which is below the EU limit value of 40µg/m^3. The EIS also provides an analysis of the baseline scenario for the energy sector only, including sources from the Marsa power station and the Delimara power station, excluding all other point, area and line sources.

IMPACT SIGNIFICANCE AND PREDICTIONS

In terms of air quality impacts, the EIS considers the latest proposal by the applicant, *viz.* the plant having three gas turbines plus a steam turbine and three 75m-high stacks and another three 30m-high by-pass stacks. A number of scenarios/combinations have been simulated for the three stack configuration, over a five year period (2008 – 2012) as follows:

- DPS/CCGT – 3 stacks – base emissions – background levels;
- DPS/CCGT – 3 stacks – base emissions – no background readings;
- DPS/CCGT – 3 stacks – load corrected emissions – background levels;
- DPS/CCGT – 3 stacks – load corrected emissions – no background readings; and
- DPS/CCGT – 3 stacks – incremental contributions.

[2] Base set emission estimates are based on measured flue gas concentrations and estimated (reported) flue gas volumes. Base set emissions estimates are based on stack monitoring (pollutant concentrations and gas flow). The availability of such data is limited and characterized by high temporal variability.

[3] Load corrected emissions refer to estimates based on capacity (thermal or electrical power rating, efficiency), fuel and boiler burner technology corrected by the actual, average load (actual power generation as a fraction of design capacity) of the sources.

[4] Table 3.38 in the EIS Coordinated Assessment provides a list of the 23 sensitive receptor locations, while Figure 3-87 illustrates the location for each of the sensitive receptors.

The EIS notes that the final configuration of the proposed development (with three stacks) has no significant impact on the estimated ambient concentrations in terms of compliances with the respective national and EU legislation, and if anything, the results indicate improvements over the original configuration (one stack) and emission data. The indicated NO_x concentrations remain more or less the same (and within the range of the inter-annual variability) and with the revised stack and emission data provided by the applicant, yield very closely the same NO_x emission as that communicated previously and used for the original single stack configuration simulations (9.18g/s versus 10.15g/s).

The incremental contributions from the three stack configuration (limit value of 3% of the annual average NO_2 concentration or 1.2µg/m^3) estimated are well below that limit value for the reported stack (75m) and emission data. No violations of the 1.2µg/m^3 target are predicted at any of the sensitive receptor locations, but also there is no increase in the hourly exceedances in the immediate vicinity of the stacks.

Impacts from the alternative CCGT configurations in terms of PM_{10} are negligible, well below the impacts from the original single stack configuration. The alternative three-stack configuration has no negative impacts in terms of PM_{10}.

During the first six months of commissioning of the new power plant, this would be operated as an OCGT (Open Cycle Gas Turbine), with emissions passing through the 30m-high by-pass stacks. Two scenarios were analysed in the study:

- DPS/OCGT – Three 30m stacks – Natural gas; and
- DPS/OCGT – Three 75m stacks – Natural gas.

The EIS indicates that the two configurations (OCGT and CCGT) differ in terms of physical stack height, stack-emission parameters and the resulting dispersion patterns. Whilst assuming identical operational/load conditions, the dispersion-related differences are the stack heights for the OCGT and CCGT (30 and 75m, respectively) and flue gas temperatures and velocities, the latter being considerably higher for the OCGT configuration. This mostly compensates for the lower physical stack height. The EIS notes that physical stack height and the plume rise (the virtual stack) influence dispersion in opposite ways, and are subject to the meteorological conditions, which makes the combined effect non-intuitive.

Based on the balance between the effects of the different (higher CCGT) physical stacks and the (higher OCGT) virtual stack height or plume rise due to higher temperature and flue gas velocities for the OCGT configuration, the comparison of the scenarios indicates that:

- Average NO_x concentration values are lower (up to 50%) for the OCGT configuration (30m, hotter, faster); and
- Maxima of the NO_x concentrations are lower (close to 10%) for the CCGT configuration (75m, cooler, slower).

This generally suggests ‘better’ overall, long-term dispersion from the OCGT, but at the same time a higher sensitivity to extreme weather situations that can lead to maxima of short-term concentrations and suggests that the (very small absolute) differences expected between the two configurations may also depend on, and vary with, the period of implementation.

For both configurations, all values are well below any applicable air quality standard or limit value, including the 1.2µg/m^3 incremental contribution limit.

Impacts associated with air quality can be summarised as follows:

- Impact on air quality due to dust generated during the construction works: *Low to insignificant.*
- Impacts on air quality due to emissions of pollutants and greenhouse gases (GHG) during operations: *High beneficial significance.*

PROPOSED MITIGATION MEASURES

- Good construction site practices through the implementation of a detailed Construction Management Plan (CMP).

- Minimise the use of gasoil at a national level and focus on gas and renewables.
- Regular on-site inspections.
- Detailed air quality monitoring programme, based on continuous (hourly) multi-parameter minimally monitoring of the pollutants addressed by Directive 2008/50/EC on Ambient Air Quality and a Cleaner Air for Europe, air quality modeling, air quality simulation and an operational real-time monitoring, data management and simulation system.

RESIDUAL IMPACTS

In terms of residual impacts, a *low beneficial* residual impact was identified in terms of emissions of pollutants and greenhouse gases (GHGs) during operations.

EPD Comment (5): *The Environment Protection Directorate agrees with the EIA Coordinator's proposal with respect to the requirement for a detailed air quality monitoring programme during operation of the new plant. Such programme would include air quality modelling, air quality simulation and an operational real-time monitoring, data management and simulation system.*

3.11 Climate Change

In terms of impacts on climate change, the EIS notes that it is expected that the proposed CCGT plant and LNG facilities will aid Malta into lowering its greenhouse gas (GHG) emissions. The high efficiency of a CCGT plant and the possibility of one of the gas turbine (GT) units being switched off in times of lower electricity demand would also contribute to a reduction of CO_2 emissions from the site:

- The expected net heat rate of the proposed CCGT plant operated on gas is 6865MJ/MWh;
- The expected net heat rate of the converted engine operated on gas is equivalent to 47.6% net efficiency;
- By comparison, the net heat rate of the existing un-converted engine operated on HFO is equivalent to 48.1% net efficiency; and
- The CO_2 emissions per MWh for the various plants are: (i) new CCGT plant: 0.38t/MWh; (ii) the converted DPS 3 on gas: 0.42t/MWh; and (iii) existing unconverted DPS 3 on HFO are 0.58t/MWh.

3.12 Noise

BASELINE NOISE SURVEY

The noise assessment (Figure 3-88 of the EIS Coordinated Assessment) carried out in the EIS was based on the construction of a 3-dimensional spatial model of the area of concern in order to simulate the propagation of individual noise sources inside the Delimara Power Station. The model was based on the following: (i) geo-spatial data; (ii) calculation methods for the model set to ISO 9613-2:1996 with an assessment period of an L_{Day} 07:00 to 23:00 and an L_{Night} 23:00 to 07:00; and (iii) BS 4142. The preferred measurement approach for the proposed development was determined to be ISO 9614-2:1996.

The noise sources that were measured within the DPS boundary were identified as follows:

- DPS Phase 1 complete with sheds, doors left open, fan assisted transformer and stacks;
- Extra high voltage (EHV) section – fan-assisted transformers and air-conditioning external units;
- Phase 2A OCGTs – emergency units and their fan-cooled systems;
- Phase 2B complete with stacks;
- Phase 3 complete with engine shed, auxiliary building door openings and stacks;
- Fuel pumping area – openings and shed;
- VOC/Urea pump areas;
- Seawater cooling pumps; and
- Pumps at rear of demineralization shed and water storage.

In terms of sensitive receptor locations, the EIS identified three locations for measurements (Figure 3-91 in the EIS Coordinated Assessment):

- PM1 and PM2, referred to as *noise sensitive positions* (located to the north and south of the DPS site respectively). These noise sensitive points were selected given that the said locations have the most exposed façades and are the nearest and most exposed noise sensitive positions/receptors. One such noise sensitive point is an area where there are at least five family groups living in proximity to the DPS area boundary (within 200m). The EIS also notes that the measurement locations were considered to be optimal in terms of validation of the noise model*;* and
- SM1 as *secondary measurement position* located to the west of the roundabout between Triq il-Power Station and Triq Tas-Silġ.

In terms of the current situation, the results indicate that at a two-metre height, parts of Marsaxlokk (mainly the waterfront to the south-west of il-Magħluq) are presently subject to noise levels between 35 to 40 dB L_{Aeq} over a day or night period. Such levels are not audible outside during the day but will be heard under the right conditions at night time (Figures 3-107 and 3-108 in the EIS Coordinated Assessment refer).

With the existing situation, no residence is currently being affected during the day except for the residence in the vicinity of DPS to the south (PM2). The EIS indicates that during night-time, the possibility of DPS being heard along the waterfront is likely but the level is not sufficiently significant to disturb residents inside their homes. However, the situation would be significantly different under emergency conditions at night, whereby the areas of Il-Wilġa and Il-Kavallerizza would be affected with a noticeable change in noise levels with a moderate impact.

IMPACT SIGNIFICANCE AND PREDICTIONS

The EIS notes that the noise profile, in terms of the final configuration of the proposed development, would have an impact on receptors in the following locations:

- The Marsaxlokk waterfront, with the EIS indicating that there is a high probability of introducing audible tonal components into the local environment, similar to the smaller-scale localised situation when the emergency turbines are used;
- The DPS administration building and entrance gate, workshop and office building;
- Parts of Birżebbuġa; and
- Residents in the vicinity of the DPS.

In terms of the Environmental Noise Directive (Directive 2002/49/EC), the EIS concludes that the scenario with the final configuration of the proposed development would be well within limits for both façade protection to the residents in Marsaxlokk and within the existing noise profile.

In this regard, impacts associated with noise can be summarised as follows:

- Impacts from noise generated by construction equipment, mainly during excavations: *Moderate significance.*
- Impacts from noise generated by CCGT and LNG during normal operations: *Low to insignificant significance,* depending on the location of sensitive receptors.

PROPOSED MITIGATION MEASURES

- Submission of a detailed Construction Management Plan (CMP).
- Use of enclosures around the gas turbines (GTs) and heat recovery steam generator (HRSG) and silencers as per BREF document regarding Large Combustion Plants. The EIS also proposes that the re-gasification unit be enclosed in a shed-like structure, in order to maintain small or no changes in level at the nearest property building.

- Monitoring noise generation in locations determined by the EIS Coordinated Assessment (carried out pre- and post- installation of the CCGT).

RESIDUAL IMPACTS

In terms of residual impacts, a *low to insignificant* impact was identified in terms of noise generated by the CCGT and LNG operations, following the use of noise-abatement measures such as enclosure and silencers.

3.12 Environmental Risk

The aim of the preliminary quantitative risk assessment (QRA) is the following:

- Comparison of the risk level of the different initial alternative options regarding the location within the DPS site of the CCGT plant and the LNG facilities; and
- In the event that the risks of major accidents of one or more of these options were found to be unacceptable, make alternative proposals.

The EIS notes that the focus of the QRA was the location of the LNG receiving, storage and re-gasification facilities. Table 4-100 in the EIS Coordinated Assessment indicates the main differences between the LNG facilities as tested in the first draft EIS and those tested in the third draft EIS. The options originally studied are as follows:

- Option A (Figure 2-2): Location of a CCGT in Area A and an onshore natural gas storage;
- Option B (Figure 2-3): Location of a CCGT in Area A and an alternative between an FSU and FSRU; and
- Option C (Figure 2-4): Location of the CCGT plant in the southern side of the DPS site (Area B) with an FSU/FSRU adjacent to it.

The results from the preliminary QRA noted the following main aspects: (i) maximum extension of the gas clouds; (ii) individual risk contours; and (iii) societal risk FN curves (where F is the cumulative frequency of accidents with N or more deaths). The main points arising from the preliminary QRA are as follows:

- The alternative options evaluated earlier in the process were engineered as a first step in order to carry out the preliminary QRA and such options are based on general risk assumptions. The EIS notes that final configuration of the proposal may vary significantly with respect to engineering the assumptions made in the initial part of the EIS process.
- The comparison between the three alternative options using the risk contours shows that Option A presents the largest individual risk to some of the scattered houses near the power station. Option C was considered the best option in terms of minimising risks to the population. Option B could also be adopted as long as the re-gasification unit is relocated as far as possible from the DPS and as close as possible to the unloading facilities.
- The comparison between the three options using the extension of the gas cloud contour, demonstrates that for the three options a flammable gas cloud can travel to the DPS and possibly find an ignition point.
- The possibility to locate both Options B and C in the inner part of the harbour was taken into account and a suitable location for the jetty is presented in the final configuration of the proposal in order to remove most of the possible flash-fires which may be generated from the ignition of the flammable gas cloud.
- An FSRU (Option C) or a FSU plus a re-gasification unit located in the recommended zone (i.e. Option B plus the location of the re-gasification unit as per Option A) is the preferred choice in order to minimise the individual risk to the population as well as to minimise the damage to the DPS in case of flash-fire. However, the risk assessment indicates that such locations may have problems

from a nautical perspective given that such a location may lead to an increase in the probabilities of a collision with a manoeuvring ship or for damage in the FSRU or FSU itself due to high waves, storms and other atmospheric phenomena, against which the tanker would not be protected.

In summary, the EIS notes that:

- The data related to the detailed specifications of the plant and its final layout as provided by the applicant suggest that the projected plant fits into the data and layout originally assessed and proposed by the risk assessment consultant;
- The location of the jetty and the FSU proposed by the applicant fits in the recommended area in order to minimise ignition of gas cloud in the existing DPS;
- The required recalculation of scenarios has been carried out when required with negligible impact on the result of the risk contour estimation; and
- Introduction of hoses instead of arms is not quantifiable in the risk contour due to lack of evidence in the comparison of frequencies in their respective sources of information.

EPD Comment (6): *In terms of environmental risk, the EPD notes that issues related to the risk from the proposed development on the different environmental aspects were dealt separately in the different sections of the EIS, and therefore any comments related to worse-case scenarios are discussed in the previous sections.*

EPD Comment (7): *The Environment Protection Directorate (EPD) takes note of the conclusions of the preliminary quantitative risk assessment and agrees with the EIA Coordinator in that both a nautical risk assessment and a harbour risk assessment are to be carried out by the applicant, to the satisfaction of the relevant competent authorities. Furthermore, a more detailed quantitative risk assessment (QRA) would also be required to enable the determination of the following:*

- *The establishment of risk zones around the Delimara Power Station complex;*
- *The prevention and minimisation of risks in connection with the requirements of both the Industrial Emissions Directive (Directive 2010/75/EU) and the Seveso Directive (Directive 2012/18/EU); and*
- *The drawing up of contingency measures required to ensure a state of readiness in case of emergencies of different types, including major accidents with reference to the Seveso Directive and the drawing up of the necessary harbour management plans and emergency procedures.*

3.13 Impacts on Human Populations

3.13.1. Health impacts

The assessment of health impacts carried out as part of the EIS takes note of the findings of the air quality, noise, quality of the marine environment and social impact, while taking into consideration both the current situation regarding known hazards and their health effects, together with any new hazards arising from the proposed development. The study assessed the benefits and potential hazards following the proposed conversion to a natural gas-based power plant. The EIS identifies the following as the expected changes and health impacts of the proposal:

- *Air pollution*: The EIS envisages a general positive effect on health and reduced respiratory illnesses (including mortality) should be expected, especially when considering the energy sector as an individual contributor to air pollution in Malta.
- *Greenhouse gas emissions:* The EIS discusses that the move towards a cleaner source of fuel would lead to both environmental and health benefits.
- *Noise pollution:* Noise pollution studies have indicated that there will be a negligible increase in noise pollution levels but this is within recognised safe EU health limits. In turn, in the 2015+

scenario, noise levels are not expected to increase significantly, subject to effective mitigation as proposed in the EIS. Moreover, during construction no negative health impacts are anticipated.

- *Water pollution:* Water quality changes are expected to be minimal, with low to negligible health impact.
- *Waste:* In terms of waste, the EIS predicts a positive health impact on both the local population and the workers on site, particularly during operations, given that: (i) the new plant shall be reducing the risk of a toxic waste spill from hazardous waste arising from HFO plants; and (ii) natural gas is a cleaner fuel which is expected to generate no solid waste. During transportation, transfer of LNG and overall operations, as long as adequate health and safety precautions are duly taken, no negative health effects should be expected. During construction, no significant impacts are expected as long as the necessary mitigation measures are effectively implemented.
- *Risk assessment:* The EIS notes that the following LNG hazards may occur, albeit highly unlikely: (i) cryogenic burns; (ii) asphyxiation; (iii) explosions and spill risk; and (iv) leakage and gas cloud.

The risk associated with natural disasters was also considered and indicated the major hazards as being: earthquakes, tsunamis and fires. The EIS notes that, however remote or unlikely such eventuality actually is, personnel on site should be adequately trained to tackle such situations.

3.13.2. Social Impacts

In terms of social impacts, the EIS indicates that the majority of the stakeholders perceive that the proposed new power plant is not expected to have a drastic and harsh impact on the communities in question. Most of the stakeholders interviewed as part of this EIS, particularly residents, welcomed the construction of the new power plant on the basis that they perceived the new construction as a 'greener' and 'eco-friendlier' option compared to the present power station, albeit objections, resistance and concerns still remained.

With respect to the preferred building options, the majority of the stakeholders interviewed expressed a preference for the storage facility to be situated on board a floating vessel rather than a land storage facility on the basis that this option would be visually more acceptable. Furthermore, a large majority of respondents (those from Marsaxlokk) preferred having the storage and re-gasification facility outside the port (and therefore unseen from land) given that such possibility would be safer, less visually intrusive, and less in the way of fishermen vessels. In terms of mitigation, a number of possibilities were provided by the respondents: maintaining access to the boats, sustainable security plans, planning gains (e.g. creating a national family park, day centre for older persons, residential/nursing home for older persons, enclosure of the water polo pitch), local management committee and detailed health/safety plans.

3.14 Infrastructure and Utilities

The EIS notes that the DPS infrastructural network (both internal, external and distribution) will not be affected by the new CCGT plant. The electricity produced by the new plant will be distributed through the existing network, which is continuously being upgraded in order to minimise losses through the distribution system.

3.15 Public Access

The EIS indicates that the DPS is not, and should not, be accessible to the public except when interested members of the public apply for access for educational purposes.

4. ENVIRONMENT PROTECTION DIRECTORATE COMMENTS AND CONCLUSIONS

The Environment Protection Directorate acknowledges that the main justification for the proposed development is based on: (i) the National Energy Policy for the Maltese Islands, 2012, (ii) the economic considerations, and (iii) commitments with reference to EU environmental and energy policies. The Directorate also notes that the proposal was made in response to a policy decision made by the Government of Malta that, as from spring 2015, base-load electricity should be sourced by Enemalta from an independently owned, high-efficiency power plant powered by natural gas. The proposal is intended to contribute towards an overall reduction in air pollution and is expected to function more efficiently in terms of fuel use and energy efficiency.

As discussed in the above sections, the EIS has predicted a number of potential impacts on the environment as a result of the proposed development, some of which are potentially of *high significance*. The mitigation measures proposed in the EIS are aimed at minimising the predicted impacts, however despite the mitigation measures, impacts on the landscape character and visual amenity of the Delimara peninsula, Marsaxlokk and Birżebbuġa are of high significance and cannot be effectively mitigated. The Environment Protection Directorate (EPD) agrees with these conclusions of the EIA Coordinator. Whilst there are no significant concerns from a landscape and visual amenity point of view vis-à-vis the location of the CCGT plant (including the location of the three primary stacks and the three by-pass stacks) and the onshore re-gasification facility, the introduction of the FSU shall lead to an additional significant impact in the landscape character and visual amenity of the port of Marsaxlokk which is difficult to eliminate. Nevertheless, the EPD is requesting a detailed 'landscaping' scheme (e.g. camouflaging, design of structures and materials, colour treatments and textural finishes to aid integration with the surroundings and thus minimise impacts), also taking into account any requirements arising from both the Industrial Emissions Directive and the Seveso Directive.

In terms of overall risk implications, the Environment Protection Directorate (EPD) notes that these are largely beyond the Directorate's remit, and in this regard takes note of the conclusions of the preliminary quantitative risk assessment and agrees with the EIA Coordinator's recommendation in that both a nautical risk assessment and a harbour risk assessment need to be carried out by the applicant, to the satisfaction of the relevant competent authorities (e.g. Transport Malta, Operational Health and Safety Authority and the Civil Protection Department). Furthermore, a more detailed quantitative risk assessment (QRA) is also required to enable the determination the following:

- The establishment of risk zones around the Delimara Power Station complex;
- The prevention and minimisation of risks in connection with the requirements of both the Industrial Emissions Directive (Directive 2010/75/EU) and the Seveso Directive (Directive 2012/18/EU); and
- The drawing up of contingency measures required to ensure a state of readiness in case of emergencies of different types, including major accidents with reference to the Seveso Directive and the drawing up of the necessary harbour management plans and emergency procedures.

Moreover, aside from mitigation measures emerging from the EIS which should be included as part of the development permit application, the Environment Protection Directorate is also including additional recommendations in terms of monitoring, with respect to: air quality (including air quality modelling, air quality simulation and an operational real-time monitoring, data management and simulation system), noise and the marine environment (marine ecology, marine water bodies and marine archaeology). A comprehensive construction management plan (CMP) is also being requested to holistically address the entire range of issues relevant to the construction-phase works. Such requirements, along with other permit conditions can be found in the attached document.

With respect to alternatives, the EPD notes that the EIS has provided an overall outline of the main alternatives considered for the proposed developments and has provided the main reasons for such choice,

also noting the relevant environmental effects and their prevention, in line with the requirements of Section 2 of the Terms of Reference dated July 2013 and of the EIA Regulations (Legal Notice 114 of 2007, as amended). In this regard, the EPD would also like to clarify that, since any future proposals associated with an offshore location of the FSU are not incorporated into the currently proposed plans, they would need to be subject to all the required environmental assessments.

The Environment Protection Directorate's assessment as summarized in this report is primarily concerned with the *environmental* implications of the proposal, and is without prejudice to any other potentially relevant considerations (e.g. evaluation of safety risks, navigation and port management issues, etc.) falling within the competence of other authorities.
