Supporting Documents for Part B

Form IPPC Part B - Application for a permit (Delimara Power Station)

Supporting Documents

EU Affairs Section
January 2007

Issue	Original	January 2007
Revision	1	
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General Note:

Queries listed in the application form are presented in blue and underlined. Hence accompanying documents follow the same application form query reference numbers.

B1.1 Installation table for new permit application

Activities in the "stationary technical unit"	Schedule 1 refs	Operator
"Combustion installations with a rated thermal input exceeding 50 MW"	1.1	Applicant

Directly associated activities	Schedule 1 refs	Operator
NIL		

B1.2 Why is the application being made?

It is an existing installation and you are applying in accordance with the timetable in the IPPC Regulations

B1.3 Site maps and reports

General Site Report, Ref. B1.3.1

1.0 General Description

1.1 Introduction

Delimara Power Station is situated on the Delimara peninsula inside Marsaxlokk bay as shown in the site plan at the end of this document. It is important to mention at this stage that the construction of the Delimara Power Station was the subject of an *Environmental Impact Assessment*[1] commissioned by the *Government of Malta* in 1987 and 1988 for the new "Power Station Project" which was then necessary to increase the electricity generation capacity of the islands. Copies of the reports are included in ***Attachment 1: Environmental Impact Assessment Reports***. In this project various sites were considered as alternatives within the very limited choice of available land. The main contending sites were Delimara and Benghisa but the latter was dismissed in view of its proximity to the airport traffic needs and restrictions following consultations with British, French Italian and local entities. Other considerations were access to port facilities for fuel tankers and seawater for cooling purposes. The report covers various areas, including:

- Antiquities considerations
- Geological considerations

[1] The full project report covers three volumes: "Reports on Identification of Site" (Volume One), "Environmental Impact Assessment of a Power station on the Site at Delimara" (Volume Two), and "Comparative Illustrations Showing Blending of New Power Station within the Proposed Location" (Volume Three).

- Geology of L-Inġinier (Delimara)
- Communication considerations
- Ecology considerations
- Civil Engineering considerations
- Impact on Groundwater Resources
- Pollution considerations
- Land use considerations
- Social considerations.

1.2 Station generation plant

The plant as installed in the station is listed in **Table B1.3.1** below:

Table B1.3.1: Plant Listing of Delimara Power Station[2]

Plant Ref.	Plant Type	Fuel	Com. year	Age of Plant	Thermal Rating	Nominal Rating	Actual Rating	Efficiency	Remarks
				years	MWth	MWe	MWe	%	
1	Steam Unit	HFO	1991	14	190	60	60	32	1 & 2 share a common wind shield
2	Steam Unit	HFO	1992	14	190	60	60	32	
3	Gas Turbine 1	Gas Oil	1995	11	121	W[3] 36 S[4] 30			Open Cycle type
4	Gas Turbine 2	Gas Oil	1995	11	121	W 36 S 30			
5	CCGT 1	Gas Oil	1998	8	121	37	W 110 S 90	46 (at base load)	Combined Cycle type
6	CCGT 2	Gas Oil	1998	8	121	37			
7	HRSG units & steam turbine	NIL[5]	1998	8	NA	36			Heat Recovery Steam Generators

The plant was installed in 3 phases:

Phase 1 consists of 2 steam units each consisting of a boiler, a steam turbine and a generator with a capacity of 60 MW. The fuel is heavy fuel oil (HFO). The plant runs at base load.

Phase 2a consists of 2 open cycle gas turbine / generator units each rated at 37.5 MW. The fuel is gasoil and the plant is used for peaking duties. This plant may also be used for synchronous compensation.

Phase 2b consists of a combined cycle gas turbine block consisting of 2 gas turbines, 2 heat recovery steam generators and a steam turbine and associated generators with a total capacity of 110 MW. The fuel is gasoil and the plant is used for mid range duties.

1.3 Fuel oil usage & facilities

Fuel is delivered by tanker alongside the station and stored in the fuel tanks. The total capacity of the HFO tanks[6] is 55,500m^3 and that of the gas oil tanks 26,800m^3.

[2] Information based on the "***Electricity Generation Plan 2006 – 2015***", Enemalta Corporation, refer to ***Attachment 2.***
[3] Winter
[4] Summer
[5] The units recover heat from the exhaust of the gas turbines to generate power steam to drive the steam turbine.
[6] HFO tank No. 3 is still under erection.

In respect of fuel storage facilities the following points are relevant:

1. HFO and gasoil are delivered via ships which berth at the quay at Delimara station. A steel pipeline connects the unloading facility on the quay to the HFO Tanks and another steel pipeline connects the unloading arm of the gasoil to the DO tanks.
2. The high pressure hose connecting the steel pipe to the ship is tested annually in the presence of a third party inspector.
3. The fuel-unloading pipeline is also tested annually.
4. All fuel tanks are contained within an enclosed bund wall. Rainwater collected in the bund area is manually discharged through a valve to two oil interceptors connected in series before being discharged to the sea.
5. HFO flows by gravity to a fuel oil pumping station where the oil is further heated and then transported in above ground pipes to the respective boilers.
6. Gasoil received from the ship is stored in tanks 0, 1 and 2. These tanks are called raw Diesel tanks. From these tanks gasoil is treated by means of centrifuge separators and the gasoil is collected in Diesel Tank 3. The drain system of the centrifuges is collected and piped through an oil interceptor.
7. Gasoil from Tank 3 called treated diesel is then pumped to the gas turbines in aboveground steel pipes.
8. Fuel tank cleaning has not been carried out till now.
9. All fuel tanks have a foam injection system for injecting foam inside the tank and have water cooling rings around the outside of the tanks.

1.4 Steam plant

In the steam plant the fuel is burnt in the boilers to produce steam to power the turbines. The gas resulting from the combustion is discharged to the atmosphere through 2 flues in a single concrete windshield.

3 seawater evaporators produce distillate water for the boilers using seawater and discharge the concentrated brine into the seawater outlet at *Ħofra ż-Żgħira*. The distillate is further treated in a demineralisation plant. Anti-scaling chemicals used in the evaporators are formulated to be environmentally friendly and the sulphuric acid and sodium hydroxide used to regenerate the demineralisation plant are neutralized before discharge into the sea.

In respect of the steam plant the following are relevant:

1. Evaporated storage facilities consist of 2 tanks of 700m^3 each and 3 tanks of 600m^3 each.
2. Anti foaming and anti scale additives are used in the evaporators.
3. Evaporated water is treated to make demineralised water.
4. Demineralised storage facilities consist of 2 tanks of 600m^3 each and 5 tanks of 700m^3 each.
5. The resin of the demineralised water plant is regenerated using sulphuric acid and Soda.
6. Sulphuric acid is stored in a steel tank inside the plant itself within a contained area.
7. Soda is received in sacks and mixed with water inside the plant itself and stored in a tank, which is situated within a contained area.
8. All drains are directed to a neutralizing pit where the ph of the effluent is tested and neutralized before it is discharged with the outfall.

9. The station does not have any fly ash collecting facilities and all dust or particulates of combustion are discharged through the chimney.

Using HFO with low ash and sulphur content than used previously minimizes the production of wastes from boiler operations.

1.5 Steam plant cooling System

From the turbines the steam is exhausted into the condensers, which are cooled by seawater drawn from *Marsaxlokk Bay*. The cooling water is then discharged through a tunnel to the other side of the peninsula in the *Ħofra ż-Żgħira Bay*. This cooling water, which is also used for the combined cycle plant and the seawater evaporator, is treated with the addition of biocide chemical to prevent the accumulation of marine growths in the water passages.

In respect of the cooling plant the following points are relevant:

1. The amount of seawater passing through the system is approx 21,000m^3 per hour for phase 1 turbines and approx 8,500 m^3 per hour for phase 2B.
2. The sea water passes through the bar screen, rotating drum screens and finally through the condensers before discharging to the outfall
3. Anti-fouling is done by means of chlorine dioxide. Chlorine dioxide is generated on site by mixing two chemicals Biocaf and sulphuric acid under water.

1.6 Gas Turbine plants

For the gas turbine plants the fuel is burnt in the gas turbines that provide the motive power for the generators. In the case of the combined cycle plant the exhaust gas delivers its heat energy to the heat recovery steam generators and is then emitted through one chimney for each gas turbine /HRSG unit. The open cycle gas turbines exhaust directly to atmosphere each through its own chimney.

In respect of the Gas Turbine plants the following points are relevant:

1. Fuel is treated by means of centrifuge separation as explained earlier.
2. Gas turbine burn gas oil and all combustion products are discharged to the chimney.
3. The gas turbines have a closed cooling system with the final heat sink being either air in the case of John Brown Gas turbines, or seawater in the case of the combined cycle plants.

1.7 Plant emissions

1.7.1 Sulphur dioxide:

Using fuels with lower ash and sulphur content than used previously minimize the production of wastes from boiler operations, especially sulphur dioxide. Gaseous emissions from the boilers and the gas turbines are monitored by carrying out regular spot measurements in accordance with established standards and using the portable equipment.

1.7.2 Carbon dioxide:

Carbon dioxide emissions from the boilers & gas turbine are monitored by calculation from fuel usage. The methods used are those advocated by the ***Intergovernmental Panel for Climate Change (IPPC)***, and in accordance with ***EU Directive 2003/87/EC*** which amends ***EU Directive 96/61/EC***. A greenhouse gas emissions report for 2005 was submitted to the regulatory authority in April 2006.

1.7.3 Dust:

Dust emissions from the boilers and the gas turbines are monitored by carrying out regular spot measurements in accordance with established standards and using the portable equipment. As noted earlier the station does not have any fly ash collecting facilities and all dust or particulates of combustion are discharged through the chimney.

1.7.4 Liquid wastes:

Water from the fireside cleaning is collected in a boiler-washing pit, allowed to settle, neutralized and pumped out with the outfall. The sludge collected at the bottom of the pit is mechanically cleaned on a regular basis, dried and collected by a contractor for use as an additive in low-grade mass concrete. The other sludge coming from the boiler waterside washing, which contains some heavy metals, and other oily sludge are at present held in storage while a solution is found for its final disposal problem. It is expected that when ***WasteServ Malta Ltd.*** completes the hazardous waste landfill, this sludge could be disposed of there.

Surface water runoff is collected in two underground storage tanks and is used for watering and upkeep of plant open spaces.

Waste oils generated on the site are normally collected inside a settling tank and pumped to the HFO tanks for eventual disposal by burning with the fuel. The amount of waste oil generated is considered to be a very minute amount compared with the amount of HFO burned.

1.7.5 Solid wastes:

Solid wastes are industrial wastes such as lagging, sheet metal, scrap metal etc. The station is asbestos free. However, in respect of general maintenance waste:

1. Iron is normally collected and transported to Kordin for eventual disposal by tender as scrap metal.
2. Spent florescent tubes are collected and stored and transported to ***WasteServ*** facilities.
3. All batteries, both domestic and industrial, are collected and disposed by ***WasteServ.***
4. Plastic to start collecting them separately and disposing of them by ***WasteServ.***
5. Wood is collected separately and disposed by ***WasteServ.***
6. Administration paper is collected separately and recycled.

2.0 Operation Philosophy at Delimara Power Station

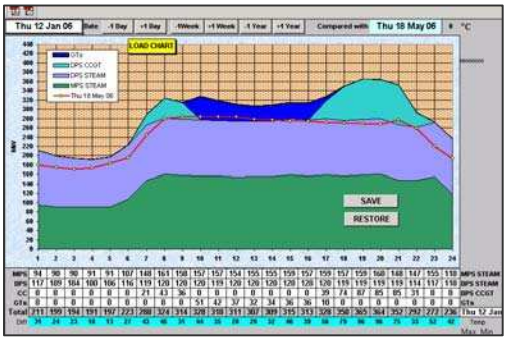
2.1 General scheme

The generation capacity of Delimara Power Station plant has been presented in **Table B.1.3.1**. **Table B.1.3.2** presents how this capacity is *combined together* with the generation capacity of Marsa Power Station, given that their *combined output follow a common operation philosophy* in the manner as explained in the same table. **Charts B.1.3.3 (a), (b), (c)** and **(d)** show graphically how typical load variations take place and how the combined plants operate on these various days of the year.

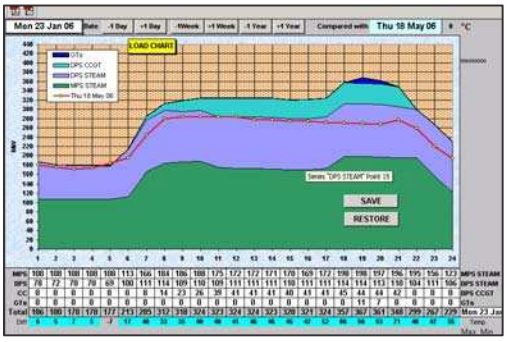
Table B.1.3.2: Combined generation plants operating modes

Plant	Base Load Plant	Two-Shifting Plant	Peak lopping (Emergency) Plant	Total
	MW	*MW*	*MW*	*MW*
MPS: Conventional Steam Units				
T/alternator 1	10			
T/alternator 2	10			
T/alternator 3	30			
T/alternator 4	30			
T/alternator 5	30			
T/alternator 6	30			
T/alternator 7	30			
T/alternator 8	60			
S/Total:				*230*
MPS: Gas Units				
GT 9			37	
S/Total:				*37*
DPS: Conventional Steam Units				
Unit 1	**60**			
Unit 2	**60**			
S/Total:				***120***
DPS: Gas Units				
CCGT 3A (+HRSG)		**37**		
CCGT 3B (+HRSG)		**37**		
Steam Turbine		**36**		
S/Total:				***110***
GT1			**37**	
GT2			**37**	
S/Total:				*74*
Overall Total:	**350MW**	**110MW**	**111MW**	**571MW**

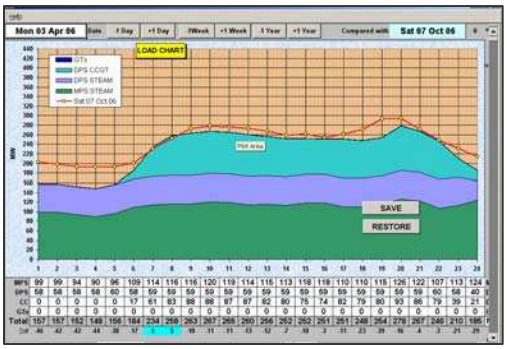
Charts B.1.3.3: Typical Load variations and loading on MPS & DPS plants



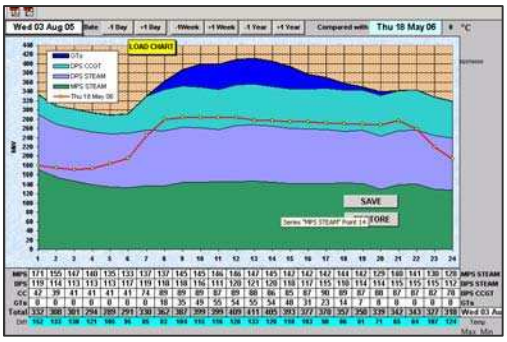
(a) 12th January 2006



(b) 23rd January 2006



(c) 3rd April 2006



(d) 3rd August 2006

The overall combined total is therefore 571 MW, however as can be seen from above these consist of 350MW of base load plant, 110MW as two shifting plant, and 111MW peak lopping or emergency plant. The latter is required since the system is an isolated one therefore backup is a priority and a basic requirement.

As can be noted from ***Table B.1.3.2*** 66% of the base load plant is located at the Marsa Power Station. Most of these units are old and past their 25 year economic lifetime. It can be considered that the newest steam turbine dates from 1971. 3 of these units which were originally commissioned in 1952, were brought over second hand from Palermo, Italy, whilst a fourth which was originally installed in 1959, was brought over from Little Barford, UK. This makes the youngest steam turbine 35 years of age. The frequency of faults in this power station is on the increase and it is only due to the quality and dedication of the operation and maintenance staff that the machines are still in operation. To restrict the number of faults, the philosophy of operation of these units although cyclic due to the load curve, is never two shifting. This includes the base load steam plants at Delimara, which are also being cycled, again due to the load curve. However, because they are the most efficient steam plant they are the last to cycle.

The CCGT plant at Delimara is operated in a two shifting mode. Start up and shut down every day. Although this plant was designed for this type of operation, it too is showing signs of stress.

The rest of the plant, i.e. the OCGTs, is used for peak lopping especially during the winter season when the peak duration is short or during emergencies, when a loss of one of the units is experienced.

2.2 Efficiency Consideration

The anticipated load demand is calculated on historical data and anticipated weather conditions. The best mix of plant to meet this demand is decided upon. The mix of plant mainly depends on availability and efficiency of plant. Since each unit has its own efficiency curve, the operations personnel work out the most economical loading procedure on each unit every hour and each unit is thus loaded accordingly. Hence the most economical combination is acquired. This is explained in more detail in the proposed ***Boiler & Turbine Plant Operations Procedures*** (please refer to ***Report Ref. B2.3: Proposed Installation Activities & Techniques to Reduce Waste & Emissions***).

2.3 Efficiency Improvement

It is company policy is to concentrate efforts to improve plant efficiency and for this reason various plant maintenance activities are carried. Typical efforts include:

Plant Item	Maintenance activity description	Frequency	Typical Results
Condenser maintenance	It is a priority to keep condensers as clean as possible. Tube plate surface is cleaned very frequently as the need arises. The inside of the tubes are cleaned by a tube scrubber system at least annually and if possible every 6 months depending on load and degree of blockage.	Surface cleaning as often as necessary. Inside tube cleaning annually or semi annually	NA
Insulation maintenance	Normally insulation is repaired after maintenance and during overhauls	Immediate	NA
Furnace maintenance	Furnace tubes are cleaned annually during the major overhaul	Annually	NA
Superheater tubes maintenance	Sootblowing of superheater tubes is done every shift. The superheater tubes are washed with water semi annually	Every 8 hours Semi annually	NA
Steam leakages control & repair	Steam leakages are normally tackled immediately load permitting	Immediate if possible	NA
Fuel burners maintenance	Burner tips are cleaned on a weekly basis. During major overhauls the complete barrels are stripped. Burner tips are replaced when worn	Weekly Semi annual	NA

Other activities to improve overall plant efficiencies are also carried out on a regular basis and these are detailed more in the ***Boiler & Turbine I&M Procedures***.

2.4 Emission Improvements

Unlike the Marsa Power plant the DPS boilers have no ESPs but that these in all probability will be installed in the future as explained later.

Plans are also in hand to reduce the emissions at the DPS plant. For this scope a tender has been awarded in January 2007 for contracting out consultancy services in order to determine the BATs to reduce NO_X, SO_2, & dust emissions at DPS[7] with respect to the two steam boiler plants and

[7] ***Advert No. E/E/T/70/2005***: Consultancy Services on Power Station Emission Reduction Project, Publication date 10/03/06; Closing date 02/05/06.

make them compliant with the LCP Directive. Please refer to ***Attachment 3: Consultancy Services on Power Station Emission Reduction Project***. Discussions are currently in progress with the successful bidder and expect to appoint the bidder by the end of January 2007. Over the next few months certain specific test will be carried out to analyse the situation and it is expected that a detailed report will be submitted by summer 2007. The report will also include a CFD[8] modelling exercise on the boilers. Such a study will be used as the basis for any conversion works which will be required to ensure that the boilers are compliant with current emission legislation. Tender specifications for the necessary conversions are expected to be issued by October 2007. Actual works on conversion are anticipated to take place towards the end of 2008 to mid-2009, depending on plant availability and load conditions.

Furthermore the tender for the automated measuring system is currently being adjudicated[9]. Please refer to ***Attachment 4: Supply and Installation of Automated Measuring Systems and Data Acquisition Recording System***. Technically this will be the adoption of BAT for emissions monitoring and measurement. From acceptance of tender it is estimated that it will take 38 to 52 weeks till final commissioning and handing over of equipment. Hence it is projected that the equipment will be in use by the 1st or 2nd quarter of 2008.

2.5 Fuel

In 1998 the CCGT at Delimara was commissioned and as from that year onwards 10% of the units generated were produced burning light fuel diesel with low emission values and having 0.2% sulphur and low particulate matter.

From 2004 Enemalta started using low sulphur HFO to fire its boilers (sulphur content < 1%). The concentration of SO_2 has diminished from a level of 2472mg/Mm^3 as registered during 2002 to the present value of around 1600mg/Nm^3.

As regards dust reduction no dedicated plant exists at DPS. Various chemical combustions additives and also a modified burner atomizer were tested, however the results obtained were disappointing.

2.6 Future Plans

For various reasons, the *Electricity Generation Plan 2006 – 2015* for Enemalta Corporation (please refer to ***Attachment 1: Electricity Generation Plan 2006 – 2015***) highlights the need for additional capacity in the coming years. In fact this is currently the subject of a request for proposal in a public tender document[10]. Pleas refer to ***Attachment 5: New Power Plant***. The tender offers at least two main options: either (Build & Transfer) for operation by Enemalta, or (Build, Own & Operate) by the successful contractor, apart from other options which the bidder may propose. Therefore, the installation and operation of new, more efficient plant that abides with all the EU Directives and local legislation will definitely reduce primary fuel consumption, which in turn will reduce most of the airborne and water emissions to acceptable levels, provided

[8] *Computational Fluid Dynamics*

[9] ***Advert No. GN/DPS/T/3/2006***: Supply and Installation of Automated Measuring Systems and Data Acquisition Recording System, Publication date 22/09/06; Closing date 05/12/06.

[10] ***Advert No. GN/DPS/8/2006:*** New Power Plant; Published date 13/11/06; Closing date 20/02/07; refer to ***Attachment 5***.

Enemalta will be the operator of the new plant. It is anticipated that the new unit will be in service by late 2009.

One has to mention again the emission improvements that will result once BAT measures are installed and operated properly following the previously mentioned consultation process (***Attachment 3***) and the installation of the continuous emissions monitoring (CEM) system (***Attachment 4***).

2.7 Limitation

The main limitation of the present combined Marsa and Delimara power plant system is its isolation. It is not interconnected with the main land, thus a high spare capacity is required. At present the capacity of the units installed for this purpose is 111MW equivalent to 19% of all the nominal capacity, this excluding a 60MW m/c out for maintenance at any time of the year. If this is included then the percentage rises to 30%. Another reason for having such a high percentage of spare capacity is related to the size of the installed machines, which are mainly 60MW machines. In a small isolated system with an average peak load of 300MW (max of 410MW), a 60MW machine represents 20% of the whole load. This is already too high because in a case of loss of on of these units, the transient on the system is too high to handle and it may easily destabilize the whole system. On the other hand, the higher the nominal capacity of a unit, the higher its efficiency, thus a compromised should be found.

This disadvantage of having to limit the size of machines to 60MW and running machines in cyclic mode has great influence on the BAT available with respect to emission abatement. Present emission abatement technology is concentrating on big machines running on base load. The effectiveness and experience of these abatement systems on smaller machines running on cyclic or two shifting is very limited.

For these reasons the options open for a small isolated system is very limited. This restricts the type and size of machines and the fuel used, with the consequence that energy generation in a small isolated system is much more expensive than on the mainland where connection with an infinite grid is possible. A study was performed for the cable interconnection by ***Electricté de France*** (EdF), and another one by ***Eni Snamprogetti*** (SNAM) for a gas pipeline. Please refer to ***Attachments 6: EdF Report (Cable Interconnection)*** and ***Attachment 7: SNAM Report (Gas Pipeline)***. The ***Malta Resource Authority*** is currently in the process of starting a study about a cable interconnection and Malta has been mentioned in EU documents for priority projects of interconnection.

Site Plans, Ref B1.3.2

The following site plans and drawings are included at the end of the supporting documents:

1. Map of Malta showing sites of Enemalta power stations at Marsa & Delimara, *Drawing No. B132-1*
2. Delimara Power Station: Schematic of steam plant & material inputs and discharge levels, *Drawing No. DPS/XZ/52*
3. Delimara Power Station: Schematic of CCGT plant & material inputs and discharge levels, *Drawing No. DPS/XZ/51*
4. Delimara Power Station Site Plan, *Drawing No. DPS/XZ/45*
5. Delimara Power Station Block Plan, *Drawing No. CDS/DPS/02-08.*

B2.1 Provide details of your proposed management techniques

Proposed Management Techniques, Ref. B2.1

1.0 General observations

Power plant generation emissions and waste management has been assessed in terms of the various parts that contribute to or are a potential source of waste or emissions. A qualitative and quantitative assessment has been done of the various raw and auxiliary materials used for power generation, and of the various parts of the plant and its supporting services. Given such information it was then possible to identify and list all possible pollutants or wastes in order to:

- Adopt an ***integrated approach*** by taking into account the whole environmental performance of the plant, covering as far as possible all the sources of pollution, plant efficiencies, and safety practices, e.g. emissions to air, water and land, generation of waste, use of raw materials, energy efficiency, noise, prevention of accidents.
- Adopt the ***Best Available Techniques*** **(*BAT*)** for emissions reduction and control in order to manitain ***emission limit values (ELVs)*** below those targets defined in the appropriate relevant directives
- Establish and maintain ***monitoring performance and operational procedures*** including any associated equipment
- Carry out regular ***data analysis*** to ensure satisfactory performance of the plant and other asociated resources and ensuring that the monitoring procedures are effective
- Maintain appropriate ***records*** as necessary for reporting purposes
- Carry out ***regular reviews*** of all techniques and procedures in order to maintain and/or develop further the quality performance of the plant.

In the context of the above the following management activities are performed on a routine basis to run the power plant as efficiently as possible:

1.0 Raw materials & other consumables management

a. Planning, procurement and delivery procedures
b. Storage and issuing procedures
c. Monitoring of consumption and performance
d. Storage and disposal of waste generated from raw materials & consumables
e. Training of staff as necessary.

2.0 Generation Plant management

a. Planning of plant operation to optimise performance and minimise emissions
b. Regular monitoring of power plant performance, including gaseous, liquid and solid emissions
c. Upkeep and maintenance of power plant equipment and machinery, including maintenance of effective procurement and storage of spare parts and replacement machinery
d. Plant development and/or modification work
e. Effective plant and site housekeeping
f. Training of staff as necessary.

2.0 Environment Managment System

In order to ensure that such good management practice are reinforced within the organization an *internal* ***Environmental Management System*** is now being proposed to be set up and implemented. The proposed structure of such EMS is presented in ***Attachment 8: Basic Elements of Proposed Environment Management System***. It is anticipated that the organisation and implementation of the EMS will take around 30 months, hence assuming commencement of project beginning early 2007 it will be running by mid- to late-2009. Further details on such an internal EMS is given in the subsequent sections with due emphasis on the implementation of related procedures.

B2.2 Identify the raw and auxiliary materials, other substances and water that you propose to use

Proposed Raw & Auxiliary Materials, Ref. B2.2

The following materials are the main fuels and chemicals used in power plant generation, as shown in ***Table B2.3.1.*** Related data sheets are included in ***Attachment 9: Material Safety Data Sheets of Materials Used at Marsa Power Station***.

Table B2.2.1: Main Materials used at Delimara Power Plant

No.	Material	Details	Qty[11]	Units	Remarks
1	Heavy Fuel Oil (HFO)	With maximum sulphur content of 1% & low ash	212,547	tonnes	
2	Gas Oil	With maximum sulphur content of 0.2%	48,137	tonnes	
3	Fuel oil additives	Magnesium Oxide (MgO) slurry emulsifier (*FireMag / PentoMag 2000*)	36	tonnes	
4	Sea water treatment chemical	Chemical to generate Chlorine Dioxide in situ (*Biocaf 1320*)	50	tonnes	
5		Ferrous Sulphate	1,300	kg	
6	Boiler water intake treatment chemical	Tri Sodium Phosphate	250	kg	
7		Ammonia solution	3,000	litres	
8	Evaporators chemical treatments	Anti-scaling chemical (*Belgard EV*)	2,400	litres	
9		Sulfamic Acid	200	kg	
10		Corrosion Inhibitor (*Dizsolve*)	10	kg	
11	Demineralisation plant regeneration chemicals	Sulphuric Acid 98%	80	tonnes	
12		Caustic soda flakes	20	tonnes	
13	Gas turbine compressor cleaning	Industrial Detergent (*Zok 27*)	1,200	kg	
14	Acid spills	Sodium Bicarbonate (Acid neutralizer)	1,000	kg	In emergencies only

[11] Annual Average consumption values for year 2005/6

B2.3 Describe the proposed installation activities and the proposed techniques and measures to prevent and reduce waste arisings and emissions of substances and heat

Proposed Installation Activities & Techniques to Reduce Waste & Emissions, Ref. B2.3

The installation activities or sources that contribute towards or may influence waste, emissions generation and potential hazards are listed in ***Table B2.3.1.*** The list also indicates their actual or potential pathways by which they may contaminate the environment, especially if no measures are taken or are insufficient.

Table B2.3.2 is an extension to ***Table B2.3.1*** and lists various techniques and measures used to prevent or reduce waste or emissions in the context of an Internal ***Environment Management system***.

Table B2.3.1: Listing of Sources, Pollutants & Potential Hazards at Delimara Power Station

No.	Activity	Pollutant	Pathways
	Fuel System Operations		
1	Solid, liquid or sludge waste from fuel oil spillage & deposits in fuel oil tanks and associated cleaning operations	Fuel sediments & suspended organic compounds Fuel oil & water emulsions Tank cleaning additives	Water
	Boiler Water Preparation & Treatment		
2	Discharge of brine & chemical treatment deposits in evaporators	Water treatment chemical deposits	Water
3	Liquid waste generated from makeup water demineralisation	Chemical regeneration effluents	Water
	Boiler Operation & Cleaning		
4	Dust and gaseous emissions generated from combustion of fuels for boiler/s and gas turbine plant	Particulate matter (fly ash) Oxides of sulphur, nitrogen, carbon Organic compounds Compounds of trace metals in fuel	Air
5	Solid, sludge and liquid waste generated from *fireside* boiler/s maintenance & cleaning operations	Bottom ash & boiler slag Unburnt fuel deposits Suspended matter scale deposits	Water Land
6	Liquid waste generated from *waterside* boiler/s cleaning & blowdown	Cleaning chemical treatment effluents	Water
7	Sludge waste generated from fuel oil filtration	Oil filtration waste products	Water Land
	Cooling Systems Operations		
8	Liquid waste or contaminants generated from sea water cooling systems	Seawater treatment chemical deposits	Water
	Plant Maintenance		
9	Liquid waste from changeover of lubricating oils used in stationary and mobile plant	Spent organic, mineral or synthetic oils	Water
10	Liquid waste from changeover of transformer /switchgear oils	Spent organic, mineral or synthetic oils	Water
11	Solid and liquid waste and gaseous emissions generated from general plant maintenance and repair work	Various scrap metal items & fittings Fabric, mineral and plastic materials Spent detergents & containers	Land
	Oily Water Plant Drains Collection		
12	Oily water plant drains at oil interceptors	Oil effluents	Water
	Administrative Operations		
13	General solid waste generated from administrative work and use of electrical/non-	General office waste Scrap office electrical/non-electrical equipment	Land

No.	Activity	Pollutant	Pathways
	electrical equipment	and/or parts	
	Environmental Hazards		
14	Hazards resulting from noise in proximity to plant operation	Steam Plant & associated auxiliary equipment Gas turbine plant & associated auxiliary equipment	Air
15	Hazards resulting from vibration in proximity to certain plant items operations	Steam Plant & associated auxiliary equipment Gas turbine plant & associated auxiliary equipment	Land
16	Hazards arising from handling of hazardous substances & waste	Toxic, oxidizing, corrosive, carcinogenic or ozone-depleting substances (e.g. SF6) which may affect the aquatic or non-aquatic environment	Air Water Land
17	Hazards from potential major accidents arising from failure of fuel storage facilities or plant equipment	Major oil spills & leakages Fuel and lube oil tank fires Other plant fires	Air Water Land

Table B2.3.2: BAT and Procedures for Delimara Power Station

No.	Item Description	Related EU Directive/s or Other Documents	Waste & Emission Control Techniques	Methodology	Remarks
	Fuel System Operations				
1	Solid, liquid or sludge waste from fuel oil spillage & deposits in fuel oil tanks and associated cleaning operations		• Fuel management operations good practice and energy efficient measures which regulate those activates associated with higher risk levels of emissions • Carrying out regular I&M[12] on plant • Selection, use, and I&M of instrumentation • Safe disposal of sludge & liquid waste • Staff training on operational and maintenance practices in respect of emissions control Containment of sludge or waste oil	• Documented ***Fuel Oil Operations Procedures*** on best practice and emissions measurements & control arising from filling, tank-to-tank transfer, tank-to-burner transfer, pre-treatment, emptying, cleaning, sludge removal, sampling, gauging, draining & leakage testing activities • Documented ***Fuel Oil I&M Procedures*** for oil storage, transfer and pre-treatment facilities • Documented ***Power Station Fuel Data Management System*** • Documented ***Waste Management Procedures*** to minimise, recycle, and safe disposal of waste • *Liquid or sludge disposal measurement requirements* incorporated in ***Waste Management Procedures***	*To be developed* *To be developed* *To be developed* *To be developed*
	Boiler Water Preparation & Treatment				
2	Discharge of brine & chemical treatment deposits in evaporators	IPPC BREF document[13] [*LCP*] IPPC BREF document[14] [*Monitoring*]	• Regular I&M of water treatment dosing system • Safe disposal of waste	• *Makeup water treatment* incorporated in ***Boiler & Turbine Operations Procedures*** • Documented ***Waste Management Procedures*** • *Waste water testing and / or measurement requirements* incorporated in ***Waste Management Procedures***	*To be developed*
3	Liquid waste generated from makeup water demineralisation	IPPC BREF document [*LCP*] IPPC BREF document [*Monitoring*]	• Regular I&M of water treatment dosing system • Safe disposal of waste	• *Makeup water treatment* incorporated in ***Boiler & Turbine Operations Procedures*** on boiler and fuel preparation to optimise performance and energy efficiencies	

[12] Inspection and Maintenance
[13] European Commission: Integrated Pollution Prevention & Control Reference Document on the Best Available Techniques for Large combustion Plants, July 2006
[14] European Commission: Integrated Pollution Prevention & Control Reference Document on the General Principles of Monitoring

No.	Item Description	Related EU Directive/s or Other Documents	Waste & Emission Control Techniques	Methodology	Remarks
				• Documented ***Waste Management Procedures*** • *Waste water testing and / or measurement requirements* incorporated in ***Waste Management Procedures***	
	Boiler Operation & Cleaning				
4	Dust and gaseous emissions generated from combustion of fuels for boiler/s and gas turbine plant	2001/80/EC[15] 2001/81/EC[16] 1999/32/EC[17] IPPC BREF document [*LCP*] IPPC BREF document [*Monitoring*]	• Boiler operations good practice to optimise energy efficiency • Use of low ash & sulphur (less than 1%) HFO • Appropriate fuel filtration methods • Use of fuel additives to improve combustion efficiency • Optimizing combustion controls • Use of low excess air • Regular maintenance and repair work on fuel system and boiler furnace • Recycling of ash material • Safe disposal of ash & other solid waste • Staff training on boiler operations, energy efficiency, plant maintenance and emissions control	• Documented ***Manual Emissions Measurement Procedures*** using portable equipment • Documented ***CEM[18] Procedures*** on the use of online equipment in compliance with EN 14181[19] standard • Carbon Dioxide (CO_2) emissions reporting as per Documented ***Power Station Fuel Data Management System*** • Documented ***Boiler & Turbine Operation Procedures*** • Documented ***Boiler & Turbine I&M Procedures*** on boilers and firing systems • Documented ***Waste Management Procedures*** • *Waste ash measurement requirements* incorporated in ***Waste Management Procedures***	*In place* *To be developed* *To be developed* *To be developed*
5	Solid, sludge and liquid waste generated from *fireside* boiler/s maintenance & cleaning operations	IPPC BREF document [*LCP*]	• Use & maintenance of waste water treatment plant. • Separation and filtration of solid waste from liquid effluent • Safe disposal of solid waste	• Documented ***Waste Management Procedures*** • *Waste water testing and / or measurement requirements* incorporated in ***Waste Management Procedures***	
6	Liquid waste generated from *waterside* boiler/s	IPPC BREF document [*LCP*]	• Use & maintenance of waste water treatment plant.	• Documented ***Waste Management Procedures*** • *Waste water testing and /*	

[15] EU Directive 2001/80/EC: Limitation of emissions of certain pollutants into the air from large combustion plants [*LCP Directive*]
[16] EU Directive 2001/81/EC: National emissions ceilings for certain atmospheric pollutants
[17] EU Directive 1999/32/EC: Reduction in the sulphur content of certain liquid fuels
[18] Continuous Emissions Measurement
[19] EN 14181: Stationary source emissions - Quality Assurance of Automated Measuring Systems

No.	Item Description	Related EU Directive/s or Other Documents	Waste & Emission Control Techniques	Methodology	Remarks
	cleaning & blowdown	75/442/EEC[20]	• Separation and filtration of solid waste from liquid effluent • Safe disposal of solid waste	*or measurement requirements* incorporated in ***Waste Management Procedures***	
7	Sludge waste generated from fuel oil filtration	IPPC BREF document [*LCP*]	• Safe disposal of solid waste	• Documented ***Waste Management Procedures*** • *Waste oil testing and / or measurement requirements* incorporated in ***Waste Management Procedures***	
	Cooling Systems Operations				
8	Liquid waste or effluents generated from sea water cooling systems	2000/60/EC[21] IPPC BREF document[22] [*Industrial Cooling Systems*] 75/442/EEC	• Controlled use of sea water intake, and I&M of pre-filtration /screening facilities • Regular I&M of cooling water plant to improve plant energy efficiency • Choice of appropriate water treatment additives • Controlled use of cooling water additives by appropriate settings and practices, and I&M of dosing systems • Staff training on cooling systems	• Documented ***Auxiliary Plant Operation Procedures*** to optimise performance and energy efficiencies • Documented ***Auxiliary Plant I&M Procedures*** • Documented ***Waste Management Procedures*** • *Waste cooling water testing and / or measurement requirements* incorporated in ***Waste Management Procedures***	*To be developed* *To be developed* *To be developed*
	Plant & Site Maintenance				
9	Liquid waste from changeover of lubricating oils used in stationary and mobile plant	75/442/EEC 75/439/EEC[23] 2000/76/EC[24]	• Re-cycling of waste oils together with new fuel oils in boiler combustion • Staff training on plant maintenance practice	• *Recycling of waste oils requirements & monitoring activities* incorporated in ***Fuel Oil Operations Procedures*** • Documented ***Auxiliary Plant I&M Procedures*** • Documented ***Waste Management Procedures*** • *Waste oils testing and / or measurement requirements* incorporated in ***Waste Management Procedures***	
10	Liquid waste from changeover of transformer /switchgear oils	75/442/EEC 75/439/EEC	• Re-cycling of waste oils together with new fuel oils in boiler combustion • Staff training on plant	• *Recycling of waste oils requirements & monitoring activities* incorporated in ***Fuel Oil Operations***	

[20] EU Directive 75/442/EEC & related Amendments: Waste Framework Directive
[21] EU Directive 2000/60/EC: Establishing a framework for Community action in the field of water policy [*Water Framework Directive*]
[22] European Commission: Integrated Pollution Prevention & Control Reference Document on the Best Available Techniques to Industrial Cooling Systems, December 2001
[23] EU Directive 75/439/EEC & related Amendments: Disposal of waste oils [***Waste Oils Directive***]
[24] EU Directive 75/439/EEC & related Directives: On the incineration of waste

No.	Item Description	Related EU Directive/s or Other Documents	Waste & Emission Control Techniques	Methodology	Remarks
		2000/76/EC	maintenance practice	***Procedures*** • Documented ***Auxiliary Plant I&M Procedures*** • Documented ***Waste Management Procedures*** • *Waste oils testing and / or measurement requirements* incorporated in ***Waste Management Procedures***	
11	Solid and liquid waste and gaseous emissions generated from general plant maintenance and repair work	75/442/EEC 91/689/EEC[25] 87/217/EEC[26] IPPC BREF document [*LCP*]	• Segregation of solid waste in appropriate containers • Controlled use of maintenance activities which generate polluting gases • Safe disposal of solid wastes	• Documented ***Waste Management Procedures*** • *General waste testing and / or measurement requirements* incorporated in ***Waste Management Procedures***	
	Oily Water Plant Drains Collection				
12	Oily water plant drains at oil interceptors	75/442/EEC IPPC BREF document [*LCP*]	• Separation of oils by oil interceptor • Recycling of oils	• Documented ***Waste Management Procedures*** • *Runoff waste testing and / or measurement requirements* incorporated in ***Waste Management Procedures***	
	Administrative Operations				
13	General solid waste generated from administrative work and use of electrical/non-electrical equipment	75/442/EEC 2002/95/EC[27] 2002/96/EC[28]	• Procuring materials & equipment which are energy efficient and / or eco-friendly or biodegradable • Minimizing consumption of materials & promoting energy efficiency practices • Recycling of materials • Segregation of solid waste & scrap equipment in appropriate containers • Safe disposal of solid waste & scrap equipment • Training of staff	• Documented ***Waste Management Procedures*** • *Administrative waste measurement requirements* incorporated in ***Waste Management Procedures***	
	Environmental Hazards				

[25] EU Directive 91/689/EEC & related Amendments: Disposal of hazardous waste [***Hazardous Waste Directive***]
[26] EU Directive 91/689/EEC & related Amendments: The prevention and reduction of pollution by asbestos [***Asbestos Directive***]
[27] EU Directive 2002/95/EC: Restriction in the use of certain hazardous substances in electrical and electronic equipment [**RoHS Directive**]
[28] EU Directive 2002/96/EC: Waste electrical and electronic equipment [***WEEE Directive]***

No.	Item Description	Related EU Directive/s or Other Documents	Waste & Emission Control Techniques	Methodology	Remarks
14	Hazards resulting from noise in proximity to plant operation	2002/49/EC[29] IPPC BREF document [*LCP*]	• Use and application of noise abatement practices and materials • Use of vibration isolators • Regular I&M of rotating plant & sound insulation materials or partitions • Regular I&M of sound muffling or silencing equipment • Training of staff	• Documented ***Boiler & Turbine Operation Procedures*** • Documented ***Boiler & Turbine I&M Procedures*** Documented ***Auxiliary Plant Operation Procedures*** • Documented ***Auxiliary Plant I&M Procedures*** • *Noise monitoring and / or measurement requirements* incorporated in ***Boiler & Turbine I&M Procedures***, and in ***Auxiliary Plant I&M Procedures***	
15	Hazards resulting from vibration in proximity to certain plant items operations	2002/44/EC[30] IPPC BREF document [*LCP*]	• Use and application of vibration abatement practices and materials • Use of vibration isolators • Regular I&M of rotating plant & other vibration generation sources • Regular I&M of rotating plant & machinery • Training of staff	• Documented ***Boiler & Turbine Operation Procedures*** • Documented ***Boiler & Turbine I&M Procedures*** • Documented ***Auxiliary Plant Operation Procedures*** • Documented ***Auxiliary Plant I&M Procedures*** • *Vibration monitoring and / or measurement requirements* incorporated in ***Boiler & Turbine I&M Procedures***, and in ***Auxiliary Plant I&M Procedures***	
16	Hazards arising from handling of hazardous substances & waste	91/689/EEC[31] 87/217/EEC[32] IPPC BREF document [*LCP*]	• Replacement with non-hazardous material • Seclusion and containment of hazardous material for safe use or waste disposal as per national requirements • Training of staff	• Documented ***Waste Management Procedures*** • *Hazardous waste inspection requirements* incorporated in ***Waste Management Operation Procedures***	

[29] EU Directive 2002/49/EC: The assessment and management of environmental noise - Declaration by the Commission in the Conciliation Committee on the Directive relating to the assessment and management of environmental noise

[30] EU Directive 2002/44/EC: Minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (vibration) (sixteenth individual Directive within the meaning of Article 16(1) of Directive *89/391/EEC*) - Joint Statement by the European Parliament and the Council

[31] EU Directive 91/689/EEC & related Amendments: Disposal of hazardous waste [***Hazardous Waste Directive***]

[32] EU Directive 87/217/EEC & related Amendments: The prevention and reduction of pollution by asbestos [***Asbestos Directive***]

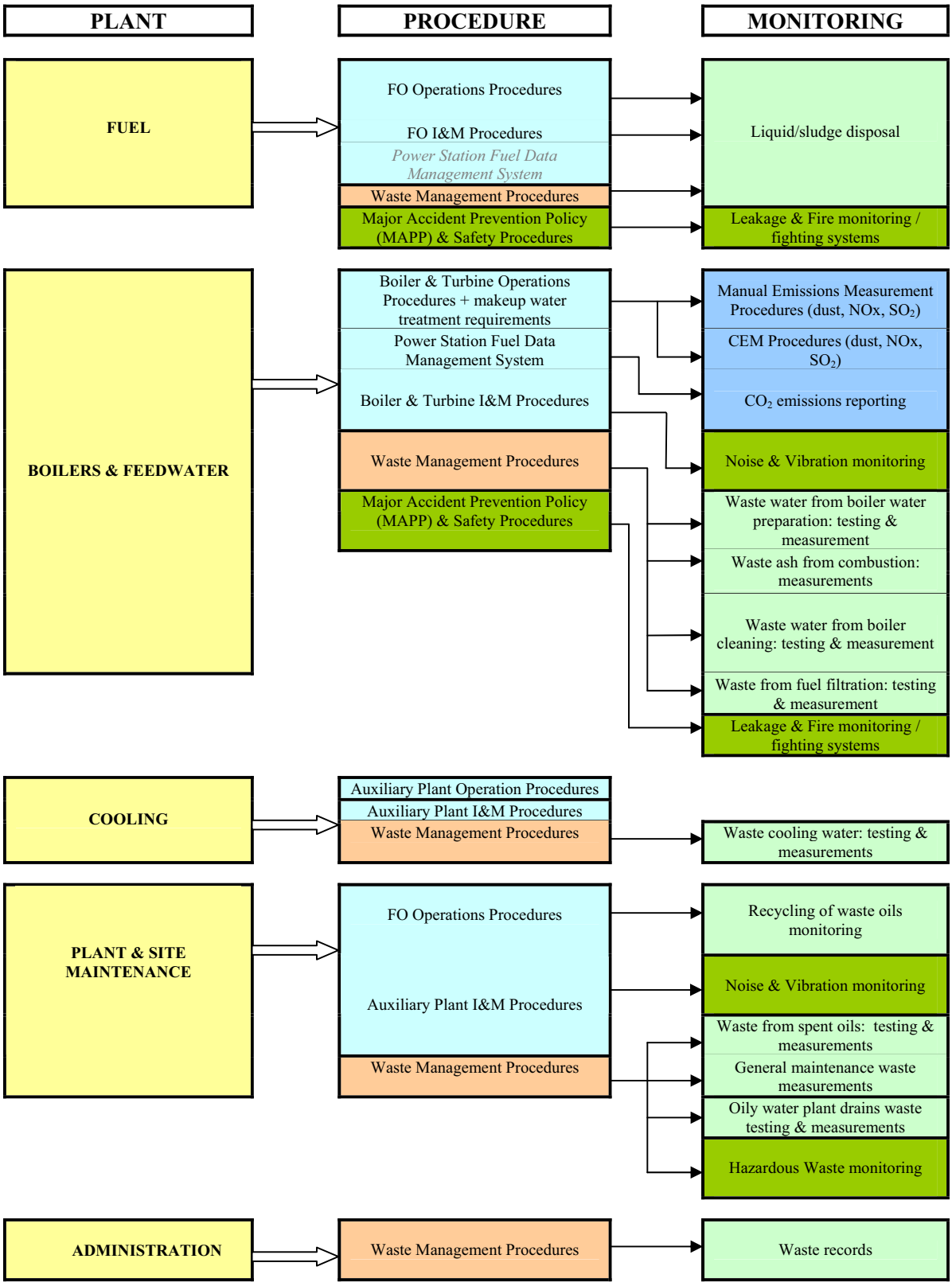
No.	Item Description	Related EU Directive/s or Other Documents	Waste & Emission Control Techniques	Methodology	Remarks
17	Hazards from potential major accidents arising from failure of fuel storage facilities or plant equipment	96/82/EEC[33] IPPC BREF document [*LCP*]	• Provision of fire or hazardous substance detection equipment • Provision of fire fighting equipment facilities & consumables including access to site • Provision of emissions containment facilities • Training of staff	• Documented ***Fuel Oil Operations Procedures*** • Documented ***Fuel Oil I&M Procedures*** • Documented ***MAPP*** [34] ***& Safety Procedures***	*In Place*

Chart B2.3.3 presents the overall Procedures and Monitoring activities as listed in ***Table B2.3.2*** in the context of the internal ***Environment Management System. Attachment 10: EMS Procedures*** includes the proposed Procedures and Monitoring Methodologies developed to date.

[33] EU Directive 96/82/EEC & related Amendments: The control of major-accident hazards involving dangerous substances [***The Seveso II Directive***]

[34] MAPP: Major Accident Prevention Policy. This is a requirement of the Seveso Directive.

Chart B2.3.3 Plant Procedures & Monitoring Activities forming part of the EMS



B2.4 Characterise and quantify each waste stream from the installation and describe the proposed measures for waste management, storage and handling

Waste Streams & Proposed Measures for Waste Management, Ref. B2.4

The emission and waste components[35] that are measured or calculated using emission factors and other methods are given in ***Table B2.4.1***.

Table B2.4.1: Emission components & measures for waste management, storage & handling

No.	Emission components	Amounts[36]	Units	Method	Activity	Waste Management Measures[37]
	Air Stream					
1	Methane, CH_4	8,000	kg/year	Estimated	Fuel combustion	Item no. 4
2	Carbon monoxide, CO	175,000	kg/year	Estimated	Fuel combustion	Item no. 4
3	Carbon dioxide, CO_2	821,747,000	kg/year	Estimated	Fuel combustion	Item no. 4
4	Nitrous oxide, N_2O	3,000	kg/year	Estimated	Fuel combustion	Item no. 4
5	Oxides of nitrogen, NO_x	2,376,000	kg/year	Estimated	Fuel combustion	Item no. 4
6	Sulphur dioxide, SO_2	6,310,000	kg/year	Estimated	Fuel combustion	Item no. 4
7	Heavy Metals:				Fuel combustion	Item no. 4
a	*Arsenic*	34	kg/year	Calculated		
b	*Cadmium*	10	kg/year	Calculated		
c	*Chromium*	22	kg/year	Calculated		
d	*Nickel*	168	kg/year	Calculated		
e	*Lead*	39	kg/year	Calculated		
8	PCDD + PCDF (Dioxins & Furans)	NM[38]			Fuel combustion	Item no. 4
9	Polycyclic Aromatic Hydrocarbons	NM			Fuel combustion	Item no. 4
10	Chlorine & inorganic compounds	NM			Fuel combustion	Item no. 4
11	Fluorine & inorganic compounds	NM			Fuel combustion	Item no. 4
12	Dust (PM10)	390,935,702	g/year	Estimated	Fuel combustion	Item no. 4
	Water Stream					
13	Total - Nitrogen	73,000	kg/year	Calculated	Boiler operations	Item nos. 2 to 12
14	Total - Phosphorus	9,723	kg/year	Calculated	Boiler operations	Item nos. 2 to 12
15	Heavy Metals:				Boiler operations	Item nos. 2 to 12
a	*Cadmium*	NR[39]	kg/year	Estimated		
b	*Chromium*	2,585	kg/year	Calculated		
c	*Copper*	1,477	kg/year	Calculated		
d	*Mercury*	0.011	kg/year	Calculated		
e	*Nickel*	986	kg/year	Calculated		
f	*Lead*	NR	kg/year	Calculated		
g	*Zinc*	0	kg/year	Calculated		
16	Benzene, Toluene, ethyl	NR	Kg/year	Calculated	Boiler operations	Item nos. 2 to 12

[35] Mostly based as applicable on details given in*: Guidance Document for EPER implementation. European Commission Directorate-General for Environment, November 2000.*
[36] Based on data give to MEPA with respect to EPER forms & other communications
[37] As listed and explained in **Table2.3.2**.
[38] Not Monitored
[39] No traces

No.	Emission components	Amounts[36]	Units	Method	Activity	Waste Management Measures[37]
	benzene, xylene					
17	Polyaromatic hydrocarbons	NR	Kg/year	Calculated	Boiler operations	Item nos. 2 to 12
18	Total Organic Carbon (TOC)	3,565	Kg/year	Calculated	Boiler operations	Item nos. 2 to 12
19	Chloride	NR	Kg/year	Calculated	Boiler operations	Item nos. 2 to 12
20	Fluoride	NR	Kg/year	Calculated	Boiler operations	Item nos. 2 to 12
	Land Waste Stream					
21	Fly ash	No dust collection facilities	NA	NA	Boiler plant operation, cleaning & maintenance	Item nos. 4 & 6
22	Other maintenance solid wastes	150	Tonnes/ year	Estimated	Plant maintenance	Item 10
23	Administrative operations waste				Administration work	Item 12

B2.4.1 Identify if there may be discharge of any List I or List II substances and if any are identified, explain how the requirements of the Groundwater Regulations (LN203 of 2002) have been addressed

Groundwater Discharge, Ref. B2.4.1

Discharge into groundwater: There are no discharges which effect groundwater.

B2.5 Could the installation involve the release of any Schedule A or Schedule B substance into the sewers and if any are identified, explain how the requirements of LN139 of 2002 have been addressed

Sewer Discharge, Ref. B2.5

Discharge into sewers: There is no discharge into sewers except for drains from the personnel toilets.

B2.5.1 Could the installation involve the release of any substances directly into relevant territorial waters or coastal waters?

Sea Discharge, Ref. B2.5.1

Discharge into the sea: Further to details presented in earlier sections the following effluents are discharged into the sea:

- ***Cooling water*** after passing through condensers and heat exchangers. The temperature is raised typically by 6 to 8 degrees Celsius between intake and outfall. The seawater is treated using methods approved by environmental authorities (e.g. the EPA) and the residual chemicals are below the approved minimum.

- ***Brine*** discharged from the seawater evaporator. Approved scale control chemicals are used which are formulated to be environmentally acceptable.
- ***Boiler blowdown***, which is technically pure water, except for some highly diluted levels of contaminants as referred in the attachment below.
- ***Surface runoff water***, discharged through oil interceptors to remove any contamination by oil.
- Samples of water discharges are analyzed by a certified laboratory in accordance with MEPA requirements.

Please refer to ***Attachment 11: Marine Discharges to Comply with EU Directive 78/464*** for more details about discharge to sea and "***Analytical Reports***" for discharge water samples taken on 27th April 2004 and 1st September 2004.

B2.6 Describe how each waste stream is proposed to be recovered or disposed of and, if you propose any disposal, explain why recovery is technically and economically impossible and describe the measures planned to avoid or reduce any impact on the environment.

Proposed Recovery or Disposal of Waste Streams, Ref. B2.6

Please refer to *Waste Management Procedures*.

B2.7.1 Provide a breakdown of the proposed energy consumption and generation by source and end-use

Proposed Energy Consumption & Generation, Ref. B2.7.1

Energy is generated from heavy fuel oil from the units listed in ***Table B1.3.1: Plant Listing of Delimara Power Station***, except for minor contribution by the gas turbine, which uses gas oil.

The following figures are for ***Budget Year 2005/2006*** and are typical:

Item	Quantity	Units
Units generated by steam units	**830,092**	MWh
Units used in station	**41,921**	MWh
Heavy fuel oil consumed	**212,547**	tonnes
Units generated by gas turbine	**5,198**	MWh
Gas oil consumed by gas turbine	**1,902**	tonnes
Units generated by Gas CCGT	**152,664**	MWh
Units generated by steam HRSG	**76,556**	MWh
Units used in station by CCGT	**14,021**	MWh
Gas oil consumed by CCGT	**46,439**	tonnes

B2.7.2 Describe proposed basic measures for improvement of energy efficiency.

Proposed Energy Efficiency Measures, Ref. B2.7.2

The power station plant is designed for generation at optimized efficiency at all stages and the management and staff give priority to efficiency improvements in the steam and gas turbine cycle, avoidance of energy losses, retention and reuse of condensate drains, heat insulation, plant controls, economy in the use of standby plant, energy efficient lighting, etc. Further details are presented in the appropriate Procedures listed in earlier ***Report B2.3***, viz.

- *Table B2.3.2: BAT and Procedures for Marsa Power Station*
- *Chart B2.3.3 Plant Procedures & Monitoring Activities.*

B2.8 Describe the documented system proposed to be used to identify, assess and minimize the environmental risks and hazards of accidents and their consequences.

Proposed Documented System for Environmental Risks & Hazards of Accidents, Ref. B2.8

Enemalta has a ***Fire and Safety section*** which is engaged in providing for safe plant and procedure, including the certification of plant including pressure vessels, cranes etc. and procedures such as hot work, gas free enclosures, confined space working, scaffolding, etc. The ***Health and Safety section*** is engaged in safety of personnel and work practices.

According to ***Legal Notices 37(2003)***[40] and ***6(2005)***[41] the Delimara Power Station is a ***COMAH***[42] site since the gas oil storage capacity falls above the threshold level for an upper tier site. Therefore a ***Major Accident Prevention Policy (MAPP)*** is in place as detailed in *Table B2.3.2: BAT and Procedures for Marsa Power Station.* Please refer to ***Attachment 12: Delimara Power Station Safety Report.***

B2.9 Describe main source of noise and vibration (including infrequent sources); the nearest noise sensitive locations and relevant environmental noise measurement surveys which have been undertaken, and the proposed techniques and measures for control.

Environmental Noise & Vibration, Ref. B2.9

1.0 Noise

While the power station plant is intrinsically noisy the specifications for the plant require compliance with noise standards in accordance with industry practice. Silencers are installed on noisy plant such as safety valve and steam vent tailpipes, while sound barriers are used on the gas turbine.

[40] Control of Major Accident Hazard Regulations, 2003
[41] Control of Major Accident Hazards (Amendment) Regulations, 2005
[42] Control Of Major Accident Hazards

Personnel workstations for operating staff are enclosures with noise reduction measures, which are assessed by the H&S department. Ear protectors are provided for personnel working in high noise areas.

Periodic hearing tests by qualified external personnel are carried out on personnel working at the power station.

Moreover environmental noise tests at the site boundary have been carried out to assess noise level hazards in adjacent areas to the station. Such noise emission level results are presented in ***Attachment 13: Noise Emission Level at DPS Plant Boundaries***.

2.0 Vibration

As far as vibration the main sources are related to rotating plant such as turbines, pumps, fans, compressors and motors. Whenever such items may pose such hazard vibration absorption and damping features and equipment are normally installed to isolate the item from its supporting structure according to equipment manufacturer recommendations. However, since abnormal vibration patterns are also intrinsically indicative of potential plant problems, continuous vibration-monitoring equipment is installed on all the turbo-alternator sets since these constitute the major risk to power plant failure. Hence, technically major plant is continuously monitored visually and/or physically for the least amount of vibration and safe operation.

B2.10 Describe the proposed measures for monitoring emissions including any environmental monitoring and the frequency, methodology and evaluation procedures proposed.

Proposed Environmental Monitoring Methodology & Procedures, Ref. B2.10

Details about monitoring of emissions is given in the respective procedures indicated in the following:

- *Table B2.3.2: BAT and Procedures for Marsa Power Station*
- *Chart B2.3.3 Plant Procedures & Monitoring Activities.*

B2.11 Describe the proposed measures upon definitive cessation of activities, to avoid any pollution risk and return the site of the installation to a satisfactory state (including relevant measures for the design and construction of the installation).

Proposed Installation Decommissioning & Reinstatement of Site, Ref. B2.11

For this scope a draft report is presented in ***Attachment 14: Draft Report on the Decommissioning of Delimara Station***. Details about the site prior to the installation of the various plants are included with ***Attachment 1***.

B2.12 Where you are not the only operator of the installation, describe the proposed techniques and measures (including those to be undertaken jointly by yourself and other operators) for ensuring satisfactory operation of the whole installation.

Proposed Techniques & Measures for Joint Installation Operation, Ref. B2.12

Not applicable.

B3 Please provide written information about the emissions which will result from the techniques described in response to the question in section B2.

You should:

- Provide any other information about the installation which you think is relevant to that issue

B3.1 Describe the nature, quantities and sources of foreseeable emissions into each environmental medium

Foreseeable Emissions into Environmental Media, Ref. B3.1

The emissions to the air are expected to improve in so far as Dust, Sulphur Dioxide and Nitrogen Dioxides are concerned, especially when the projects mentioned in earlier sections B1.3 and B2.1 will be implemented at the power plant. ***Attachment 15: Projected Emissions for Delimara Power Plant*** gives more details about the foreseeable emissions according to the Enemalta Generation Plan as referenced in ***Attachment 2***.

Emissions in the sea will be below the threshold for such emissions.

B4 Please provide written information about the impact your emissions may have on the environment.

You should:

- Address all of the issues set out in the section
- Justify your proposals
- Provide any other information about the installation which you think is relevant to that issue.

B 4.1 Provide an assessment of the potential significant environmental effects (including transboundary effects) of foreseeable emissions.

Transboundary Effects, Ref. B4.1

It is not expected that emissions to the air will have significant transboundary environmental effects. The measures taken to limit pollution should be sufficient to eliminate such effects. The exhaust gases are discharged through a chimney at 150 meters above ground level. The prevailing wind is northwesterly and the location of the power station is such that exhaust gases disperse towards the open sea. Given our island conditions with approximately 100km south

from Sicily, the nearest island forming part of the Italian territories, it is believed that the presence of the power station at Delimara has no significant transboundary effects on other Member States. On the other hand transboundary air pollution from other countries are considered as an "*issue of concern given the Islands' geographical situation and typical weather patterns with high solar irradiation and low wind speeds*".[43]

More details are included in the Environmental Impact Assessment referred to in the ***General Site Report, Ref. B1.3.1.***

B4.2 Provide an assessment of whether the installation is likely to have a significant effect on another site in Malta and if it is, provide an assessment of the implications of the installation for that site

Effects on Other Sites, Ref. B4.2

The presence of the power station at Delimara is close to Marsaxlokk village but does not restrict mooring, water sports, swimming, etc in the area next to the station. More details are included in the Environmental Impact Assessment referred to in the ***General Site Report, Ref. B1.3.1.***

B5.1 Has the development of the installation (or any subsequent change or extension of the development) required an environmental statement under LN 204/2001 on the assessment of certain public and private projects on the environment?

No.

B 6.1 In which area is the installation located?

If premises are on a boundary please give names of all relevant authorities.

Local Council

Although Delimara Power Station is in the area of Marsaxlokk Local Council, Act No. XV of 1993 excludes the area from the responsibility of the local council.

Malta Maritime Authority

B6.2 Are there any other sites which may be affected by emissions from the installation?

Yes

[43] Malta Environment & Planning Authority (MEPA) January 2006. *State of the Environment Report 2005, Sub-report 2: Air*, page 23.

Although Delimara has the advantage that the prevailing winds blow the emissions away from the island, nevertheless the following neighbouring towns or villages may be affected to some extent:

- Birzebbugia
- Marsascala
- Marsaxlokk
- Żejtun.

B6.3 Could the installation involve the release of any substance into a harbour managed by a port authority?

Yes. Please name the port authority.

Malta Maritime Authority

B7.1 Are you applying to operate any 'specified waste management activities'?

No. [*Activities are interpreted in the context of Schedule 1, part 5 "Waste Management" industrial activities of* ***Legal Notice No. 234 of 2002***]

B7.2 Which of the following applies to the specified waste management activities identified in B7.1?

You have planning permission.
You have a certificate of lawful existing use or development.
Planning permission is not required – please say why.
If you have submitted an application for planning permission which has not yet been determined, please provide a copy of the application.

Not Applicable (N/A)

B7.3 Has the operator or any relevant person been convicted of any 'relevant offence'?

N/A

B7.4 Who will provide the technically competent management of the specified waste management activities?

N/A

B7.6 Are any of these 'Responsible people' already providing the technically competent management at other IPPC installations or at sites licensed under the Environment Protection Act 2001?

N/A

B7.7 If known how does the operator intend to make financial provision for the specified waste management activities?

Renewable Bonds
Bonds
Bank Guarantee
Parent company guarantee
Escrow account
Trust fund
Insurance captive
Lump sum
Others

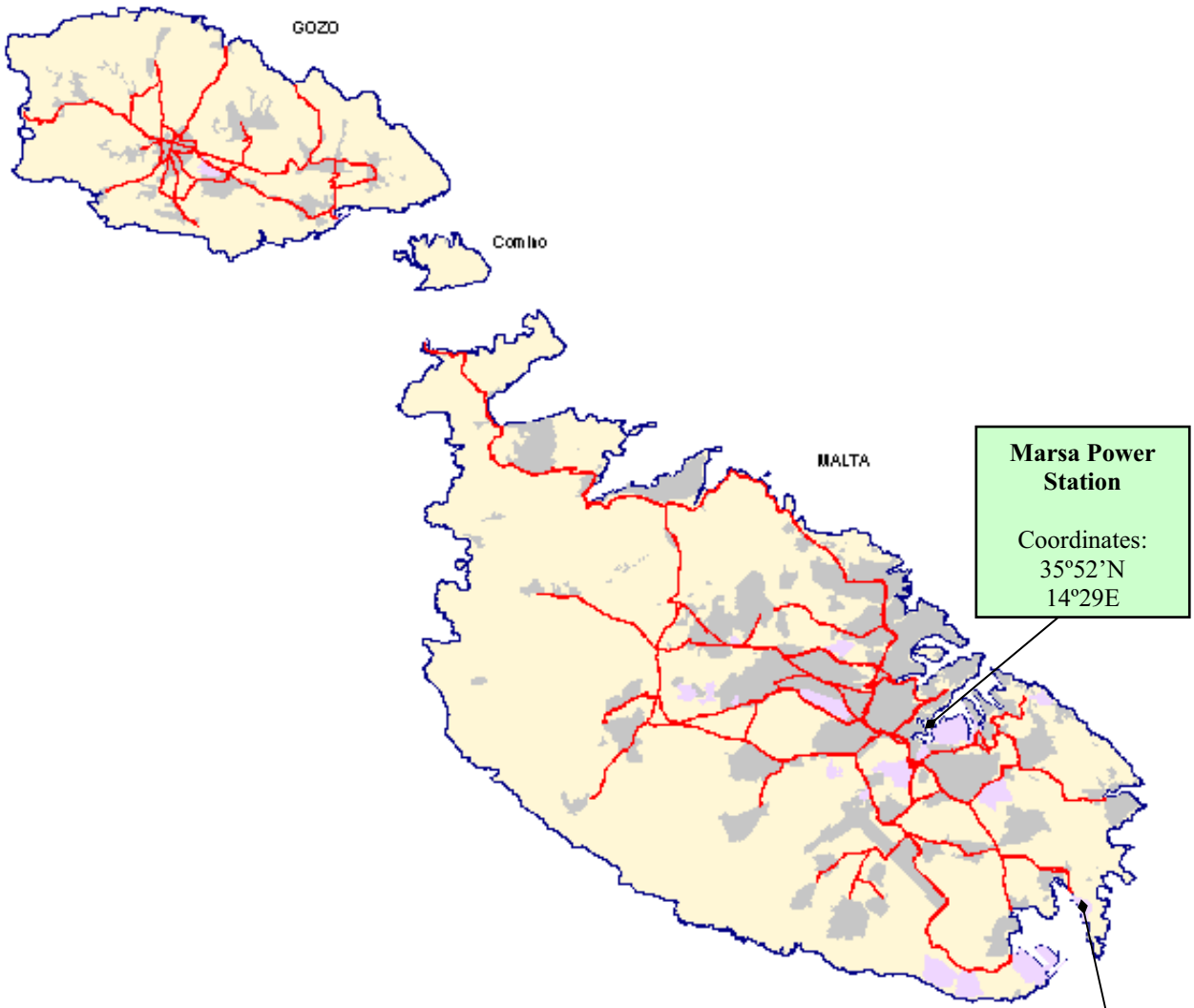
N/A

B7.8 Please provide a plan of the estimated expenditure for each phase of the specified waste management activities.

The plan should include the likely cost of

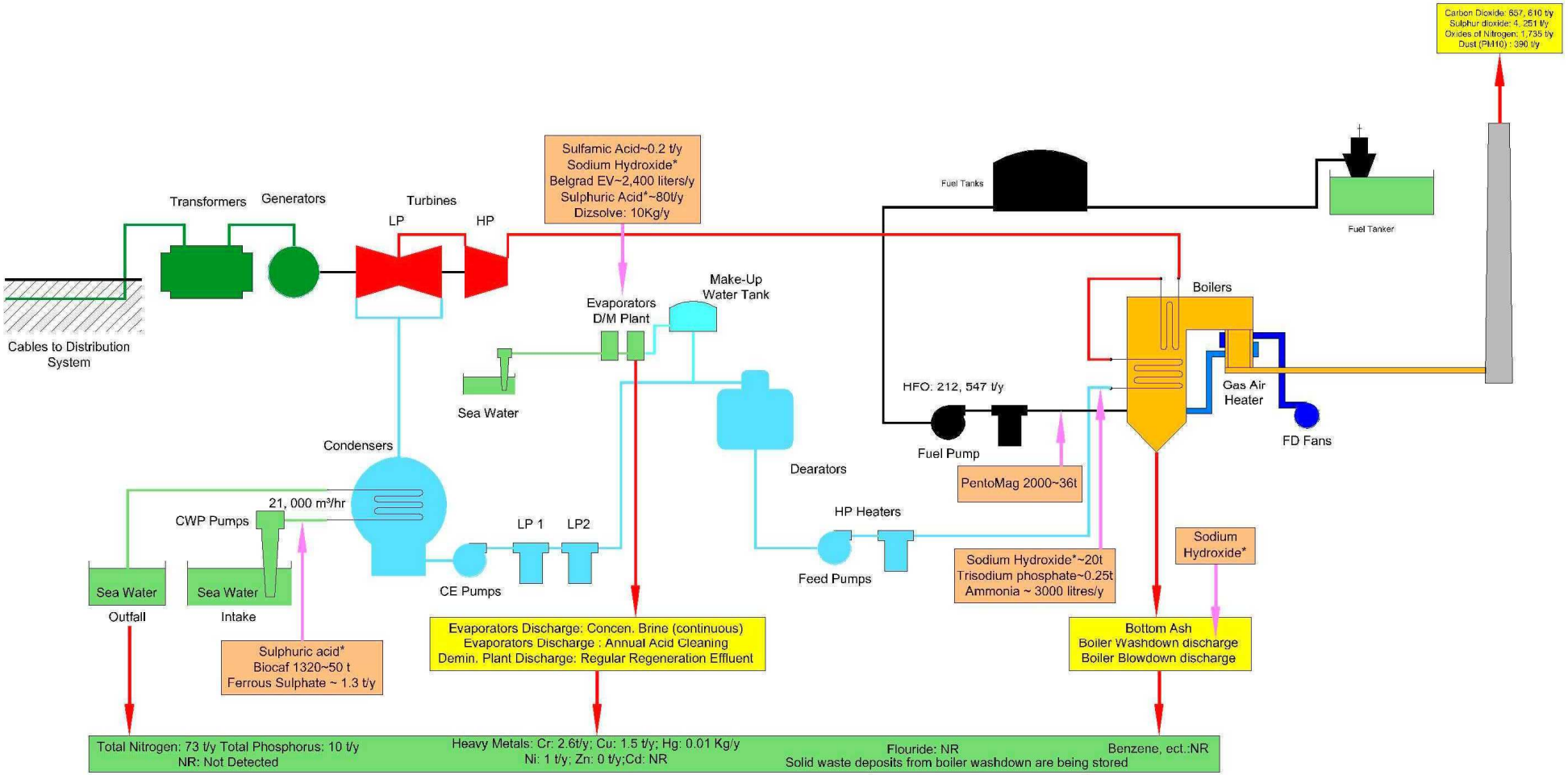
- Monitoring
- Restoration - *landfill only*
- Aftercare - *landfill only*
- Clearing the installation (including drainage systems) of all wastes – *non-landfill*
- Remedial action in the event of the failure of pollution control systems

N/A



Map of Malta showing sites of Enemalta Power Stations at Marsa & Delimara

Drawing No. B132-1



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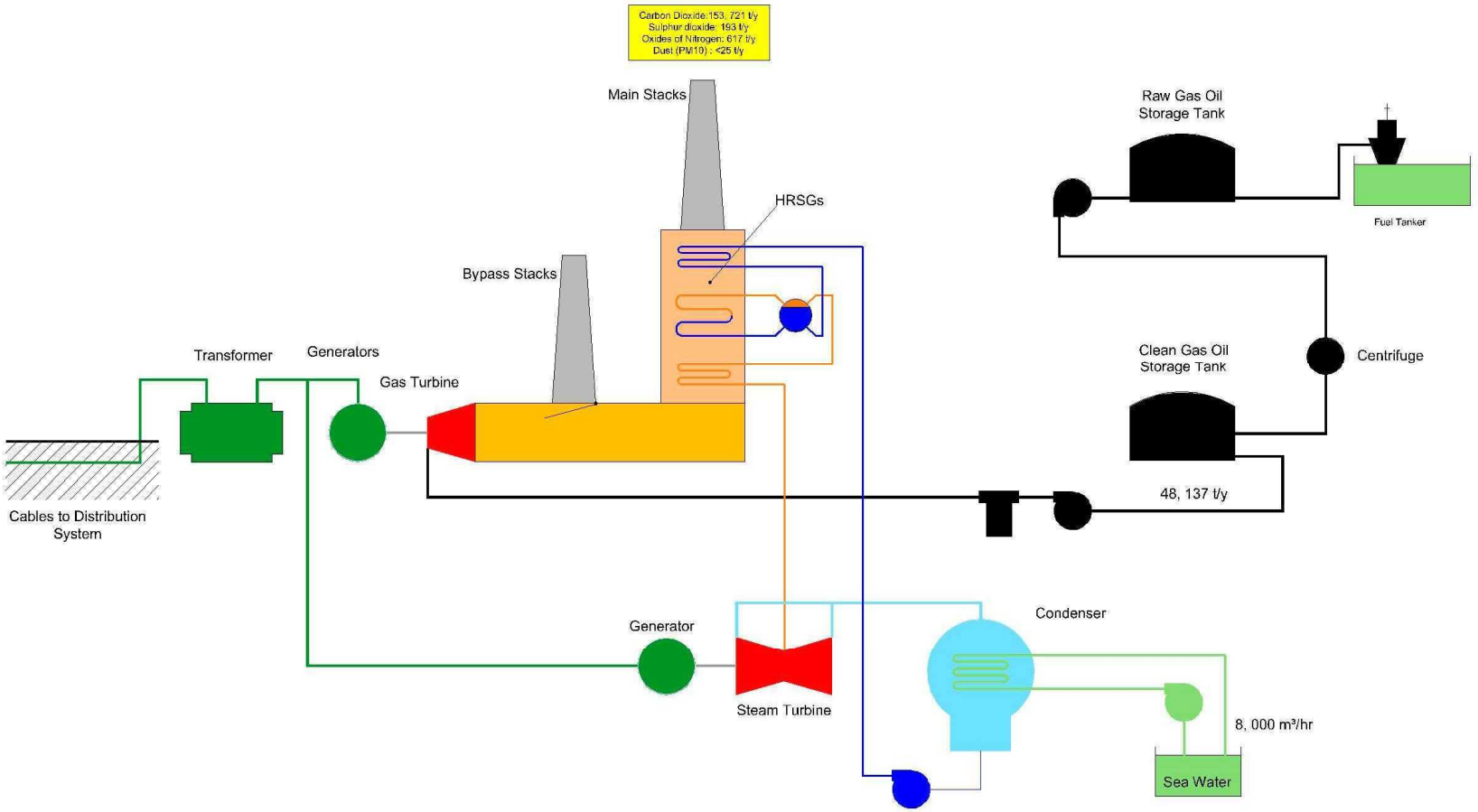
MARSA POWER STATION
CHURCH WHARF MARSA MALTA .
TEL. 22 36 01, 22 19 07, 22 04 62
TELEGRAMS: ELPEGA MALTA
TELEX No.: 1735 ENECOR MW, 1942-ENERGY MW

FAX: 243055, 232592
DELIMARA POWER STATION
DELIMARA MALTA. ZTN 09
TEL. 65 02 92/5
FAX: 653519, 657449

REFER ERRORS TO DRAWING OFFICE | DO NOT SCALE DRAWING

DPS Schematic of Steam Plant and Materials Input and Discharge Levels

SCALE		ALL DIMENSIONS IN mm	
DRAWN BY	M. Borg	ISSUE	1
CHECKED BY	C. Busuttil	DATE	18-12-06
APPROVED BY		DRG. No.	DPS/XZ/52
REVISED			



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MARSA POWER STATION
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TELEGRAMS: ELPEGA MALTA
TELEX No.: 1735 ENECOR MW, 1942-ENERGY MW

FAX: 243055, 232592
DELIMARA POWER STATION
DELIMARA MALTA. ZTN 09
TEL. 65 02 92/5
FAX: 653519, 657449

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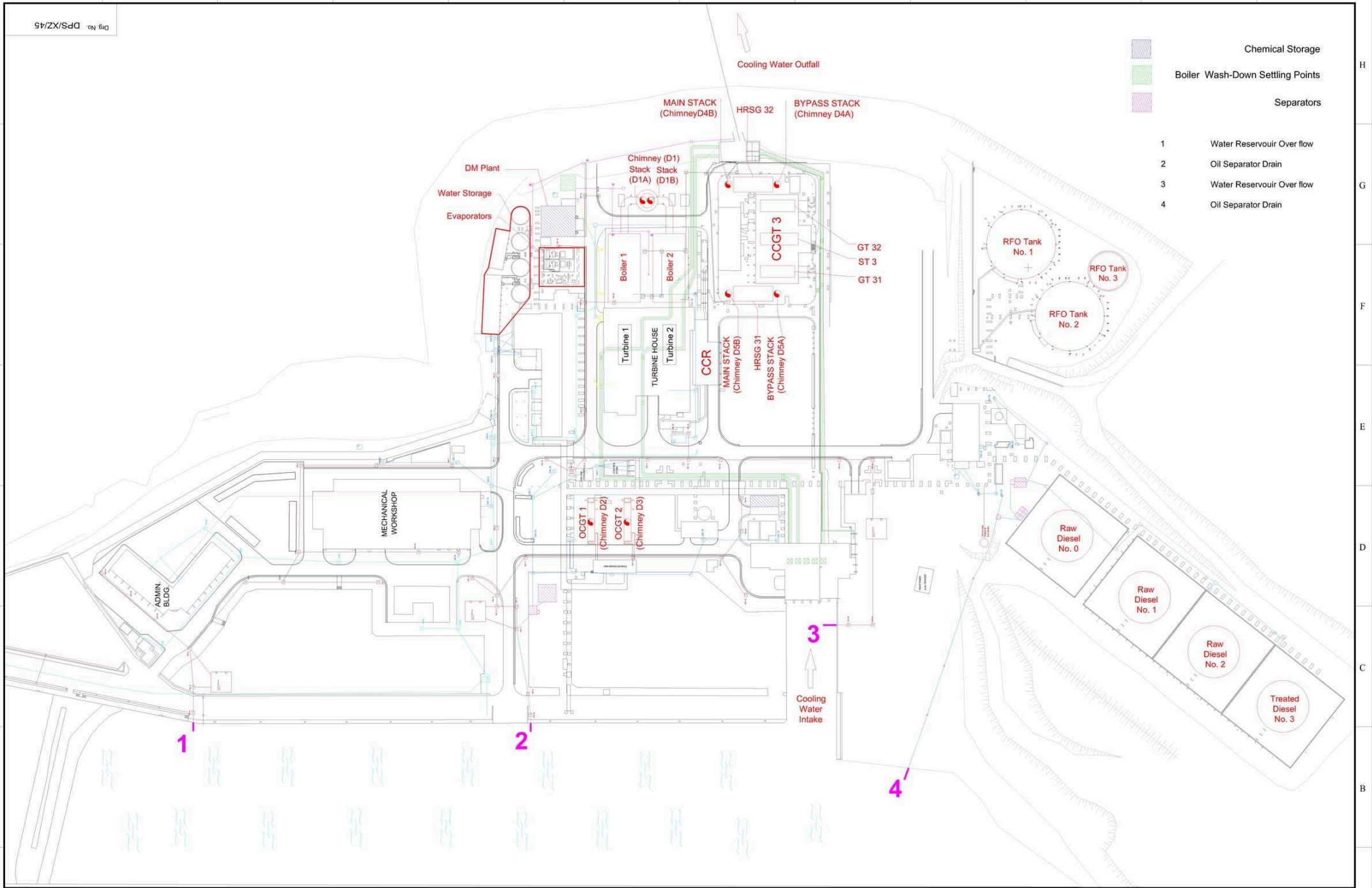
DPS Schematic of CCGT & Material Inputs and Discharge Levels

SCALE		ALL DIMENSIONS IN mm	
DRAWN BY	M. Borg	ISSUE	1
CHECKED BY	C. Busuttil	DATE	19-12-06
APPROVED BY		DRG. No.	DPS/XZ/51
REVISED			

Dig. No. DPS/XZ/45



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MARSA POWER STATION
CHURCH WHARF MARSA MALTA
TEL. 21223601, 21231907, 21220462
TELEGRAMS: ELPEGA MALTA
TELEX No.: 1735 ENECOR MW, 1942-ENERGY MW
FAX: 21243055, 21232592

DELIMARA POWER STATION
DELIMARA MALTA ZTN 09
TEL. 21650293/5
FAX: 21653519, 21657449

REFER ERRORS TO DRAWING OFFICE

ALL DIMENSIONS IN MM

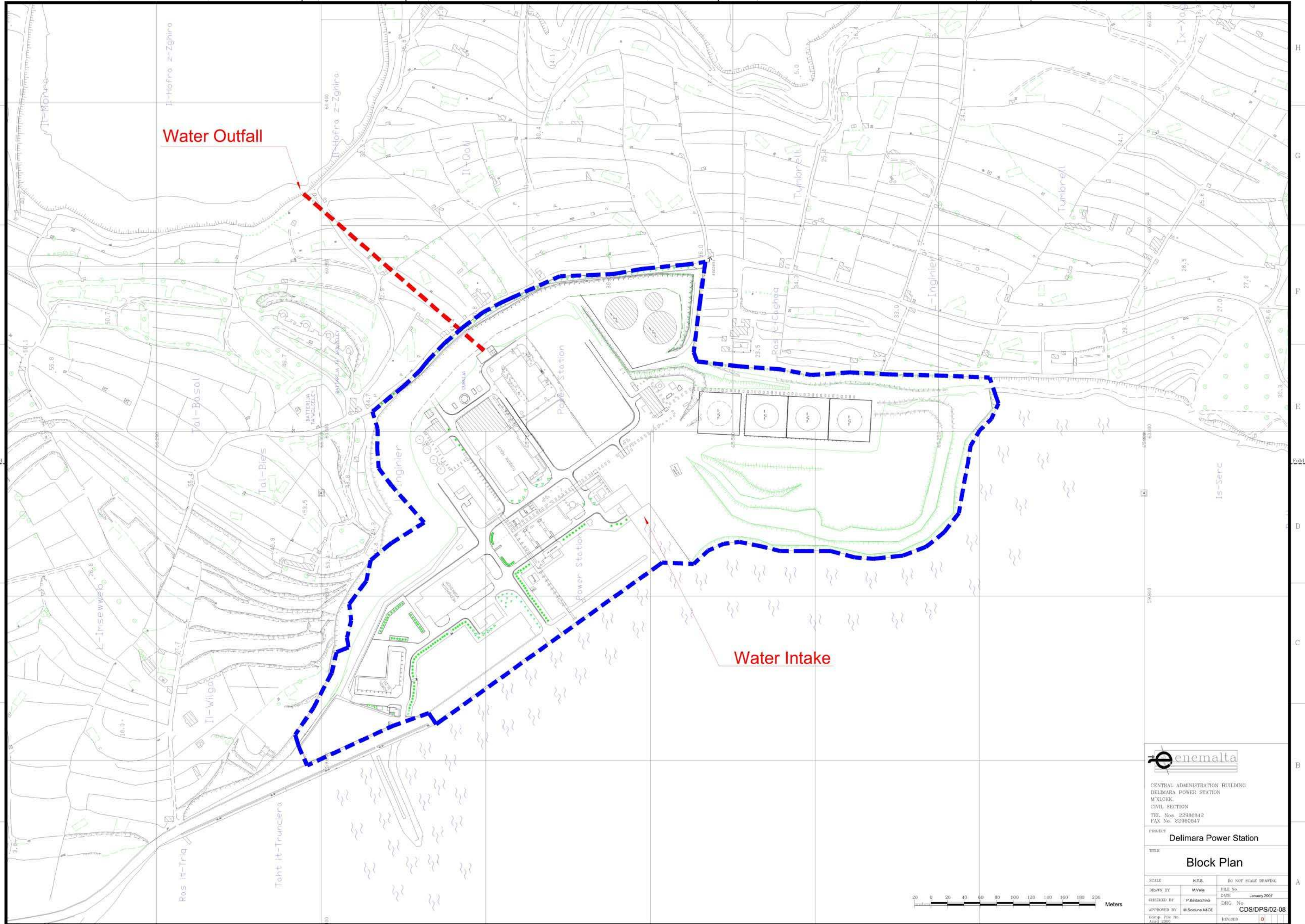
REV	DATE	BY	ALTERATION	CHK'D	APP'D

Delimara Power Station Site Plan

SCALE	1/1000
DRAWN BY	P.George
CHECKED BY	
APPROVED BY	
REVISION	
ISSUE	1
DATE	04/04/05

DO NOT SCALE DRAWING

DRG. No. DPS/XZ/45



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CENTRAL ADMINISTRATION BUILDING
DELIMARA POWER STATION
M'XLOKK.
CIVIL SECTION
TEL Nos. 22980842
FAX No. 22980847

PROJECT
Delimara Power Station

TITLE
Block Plan

SCALE	N.T.S.	DO NOT SCALE DRAWING	
DRAWN BY	M.Vella	FILE No	
CHECKED BY	P.Bardacchino	DATE	January 2007
APPROVED BY	M.Scicluna A&CE	DRG. No	CDS/DPS/02-08
Comp. File No. Acad 2000		REVISED	0