	File: SOP DPS 34- Greenhouse Gas Emissions_r3_23-05-2014	
	Environmental Management System	Page 1 of 34


DPS SOP

Monitoring & Reporting Procedures for Greenhouse Gas Emissions

Revision List


Revision No.	Description	Written By/ Reviewed By	Date
0	First issue	C. Brincat	30.10.2011
1	Modifications to entire SOP to reflect changes in the new EU regulations for GHG emissions	C. Brincat	19.07.2013
2	Updating of SOP to make reference to new Legal Notice in Section 2; included reference to calibration certificate in Sections 7 & 8; Introduction of formula for the calculation of the overall uncertainty due to tank calibration errors calculation in Annex C (iii) and (iv); amendment to Supplementary information document reference no. in Section 8 and Section 14	C. Abela	15.11.2013
3	Inclusion of formula in Section 8 Table 4 item 3 for the calculation of the Emission Factor (EF) for HFO and Gasoil; Other minor changes	C. Abela	23.05.2014

Reviewed by:	Verified by:	Approved by:
[signed] C. Abela Environmental Representative Regulatory Affairs	[signed] E. Borg Head of Section Regulatory Affairs	[signed] I. D'Amato Acting DPS Station Manager

	File: SOP DPS 34- Greenhouse Gas Emissions_r3_23-05-2014	
	Environmental Management System	Page 2 of 34

Contents

1.	Aim and Scope.....	3
2.	References	3
3.	Terms and Definitions	3
4.	Responsibilities	3
5.	Operative Rules	3
6.	Reference Documents	4

	File: SOP DPS 34- Greenhouse Gas Emissions_r3_23-05-2014	
	Environmental Management System	Page 3 of 34

1. Aim and Scope

The objective of this Procedure is to establish the monitoring and reporting practices for the Delimara combustion installation in line with legal obligations.

2. References

EN ISO 14001:04, clause 4.4.6

EN ISO 14001:04, clause 4.5.1

EN ISO 17025: 2005: General requirements for the competence of testing and calibration of laboratories.

Legal Notice 434_2013, European Union Greenhouse Gas Emissions Trading Scheme (EU ETS) for Stationary Installations Regulations, 2013

Commission Regulation (EU) No 600/2012 of 21 June 2012 on the verification of greenhouse gas emission reports and tonne-kilometre reports and the accreditation of verifiers pursuant to Directive 2003/87/EC of the European Parliament and of the Council

Commission Regulation (EU) No 601/2012 of 21 June 2012 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council

3. Terms and Definitions

'competent authority' means the competent authority or authorities designated in accordance with Article 18 of the Directive 2003/87/EC;

'monitoring methodology' means the sum of approaches used by an operator to determine the emissions of a given installation;

'monitoring plan' means a detailed, complete and transparent documentation of the monitoring;


methodology of a specified installation, including documentation of the data acquisition and data handling activities, and the system to control the trueness thereof;

'annual' means a period of time covering a calendar year from 1 January to 31 December;

'reporting period' means one calendar year during which emissions have to be monitored and reported;

'combustion emissions' means greenhouse gas emissions occurring during the exothermic reaction of a fuel with oxygen;

'process emissions' means greenhouse gas emissions other than combustion emissions occurring as a result of intentional and unintentional reactions between substances or their transformation, including the chemical or electrolytic reduction of metal ores, the thermal decomposition of substances, and the formation of substances for use as product or feedstock;

	File: SOP DPS 34- Greenhouse Gas Emissions_r3_23-05-2014	
	Environmental Management System	Page 4 of 34

'verification' means the activities carried out by a verifier to be able to provide a verification opinion as described in Article 15 and Annex V of the Directive 2003/87/EC;

'verifier' means a competent, independent, accredited verification body or person with responsibility for performing and reporting on the verification process, in accordance with the detailed requirements established by the Member State pursuant to Annex V of the Directive 2003/87/EC.

'OCGT' means Open Cycle Gas Turbine

'CCGT' means Combined Cycle Gas Turbine

'FGD' means flue gas desulphurisation unit

'SCR' means selective catalytic reduction of NOx gases unit

4. Responsibilities


Station Manager, DPS:	Overall management of power station, coordination with shipping office & reagent suppliers, acceptance of fuel & reagent quantities, maintenance of records, hiring of fuel oil third party surveyors; ensuring that third party surveyors are accredited as per requirements; provision of necessary reports for compilation of GHG reports.
Responsible Regulatory Affairs:	Co-ordination and monitoring of data collection and reporting of calculated emissions. Ensuring that third party GHG emissions reports are verified by accredited verifier and forwarding reports to authority. Informing the section responsible for the surrendering process of the emission results.
Third Party Surveyors:	Fuel tank dipping, determination of fuel quantities and quality. Calibration of weighbridge.
Accredited Verifiers:	Verification of GHG emissions reports prepared by Enemalta on an annual basis.

5. Operative Rules

5.1 General Obligations

It is the responsibility of the Responsible Regulatory Affairs, to ensure that this procedure is followed by all those responsible for:

- the supply of fuels, ship-to-shore transfer of fuels, quality control of fuel consignments
- the supply of reagents for the Flue Gas Desulphurisation (FGD) & Selective Catalytic Reduction (SCR) units installed on the Diesel engine plants
- The hiring of the third party surveyors for certification of fuel quantity and quality
- The provision of necessary reports in order to compile the annual GHG emission reports.

	File: SOP DPS 34- Greenhouse Gas Emissions_r3_23-05-2014	
	Environmental Management System	Page 5 of 34

The Responsible, Regulatory Affairs will be responsible for:

- The preparation of the necessary annual GHG emission reports on the basis of combustion and process emissions within the various plants
- Verification of the GHG reports by hiring of accredited verifiers to verify the reports prior submission to the competent authority/s as per deadline dates stipulated in the relevant legislation

The monitoring methodology and reporting procedures to be followed are those detailed in the latest version of the DPS Greenhouse Gas Emissions Monitoring & Reporting Plan approved and issued by the Competent Authority.

5.1 Verification

Verification shall be carried out by independent, competent and accredited verifiers in line with the requirements of Legal Notice 434 of 2013 Environment and Development Planning Act (Cap. 504) Malta Resources Authority (Cap. 423) – European Union Greenhouse Gas Emissions Trading Scheme for stationary Installations Regulations, 2013, Commission Regulation (EU) No 600/2012 of 21 June 2012 on the verification of greenhouse gas emission reports and tonne-kilometre reports and the accreditation of verifiers, Commission Regulation (EU) No 601/2012 of 21 June 2012 on the monitoring and reporting of greenhouse gas emissions, and any other new legislation/ amendments/ guidelines that may be issued or recognized by the local competent authorities and the European Commission.


The two entities sharing competency on issues related to verification of EU ETS reports in Malta are:

- the Malta Resources Authority (MRA) as competent authority for the implementation of the EU ETS Directive, including the receipt and acceptance of reports submitted by Enemalta;
- the National Accreditation Board-Malta (NAB-Malta) as lead competent body for accreditation and supervision of verifiers.

For the purposes of verification of reports to be submitted by Enemalta pursuant to Directive 2003/87/EC, Malta can accept verifiers accredited by the NAB-Malta and verifiers accredited by a member state of the European co-operation for Accreditation (EA) that is also a member state of the European Union (EU). It should be noted that all the current member states of the EU are also full members of the EA.

Responsible Regulatory Affairs is to forward to MRA and NAB-Malta information related to the verifiers, preferably, in early January. He/she shall submit verifier details about their valid accreditation and the names of the verifiers who will be carrying out the verification at the Delimara installation.

Responsible Regulatory Affairs will submit the verified reports for the reporting period to MRA & NAB-Malta **BEFORE** 31st March of the following year.

	File: SOP DPS 34- Greenhouse Gas Emissions_r3_23-05-2014	
	Environmental Management System	Page 6 of 34


6. Activities at the Site: Technical Details

The activities listed in Table 1 account for the GHG emissions from the installation. The emission point references are as per DPS IPPC permit IP 0002/07 (latest revision):

Table 1

Activity	Emission source	Emission point	Fuel or material streams to be monitored and description
Steam plant for electricity production	Boiler 1	stack D1A	Residual fuel oil
Steam plant for electricity production	Boiler 2	stack D1B	Residual fuel oil
Open cycle gas turbine for electricity production	OCGT1	stack D2	Gasoil
Open cycle gas turbine for electricity production	OCGT2	stack D3	Gasoil
Combined cycle gas turbine for electricity production	CCGT3/1	stack D4A (Bypass)	Gasoil
		stack D4B (Main)	
Combined cycle gas turbine for electricity production	CCGT3/2	stack D5A (Bypass)	Gasoil
		stack D5B (Main)	
Combined cycle diesel engines for electricity production, together with De-SO ₂ & De-NO _x reduction units	Diesel Engines 1 & 2	stack D6A	Residual fuel oil or Gasoil
	FGD for 1 & 2		Sodium bicarbonate
	SCR for 1		Urea
	SCR for 2		
Combined cycle diesel engines for electricity production, together with De-SO ₂ & De-NO _x reduction units	Diesel Engines 3 & 4	stack D6B	Residual fuel oil or Gasoil
	FGD for 3 & 4		Sodium bicarbonate
	SCR for 3		Urea
	SCR for 4		
Combined cycle diesel engines for electricity production, together with De-SO ₂ & De-NO _x reduction units	Diesel Engines 5 & 6	stack D6C	Residual fuel oil or Gasoil
	FGD for 5 & 6		Sodium bicarbonate
	SCR for 5		Urea
	SCR for 6		
Combined cycle diesel engines for electricity production, together with De-SO ₂ & De-NO _x reduction units	Diesel Engines 7 & 8	stack D6D	Residual fuel oil or Gasoil
	FGD for 7 & 8		Sodium bicarbonate
	SCR for 7		Urea
	SCR for 8		

A schematic layout of the DPS installation is included in **Annex A**.

	File: SOP DPS 34- Greenhouse Gas Emissions_r3_23-05-2014	
	Environmental Management System	Page 7 of 34

7. Monitoring Methodology

The methodology used shall be based mainly on the calculation approach. However in order to obtain the final result, the use of certain measuring equipment may be necessary in order to provide the basic data on which the calculations are based, or as a double check for the quantities specified in purchasing documents.

Table 2


Emission source	Fuel/material stream	Metering device reference	Description of metering device/s	Metering accuracy (+/- %)	Location
Boilers, gas turbines, and diesel engines	Residual fuel oil and gasoil	Tank dipping	Dipping tape in conjunction with temperature and density measurements and applying ASTM 1250 calculation method	As per calibration certificate	Fuel storage tanks
FGD's	Sodium bicarbonate	reagent weight	weighbridge	As per calibration certificate	Next to storage area for bicarbonate & urea
SCR's	Urea	reagent weight	weighbridge	As per calibration certificate	Next to storage area for bicarbonate & urea

8. Applicable Tiers

For each emission source, the tier levels listed in Table 3 shall apply in accordance to Commission Regulation 601/2012:

Table 3

Emission source	Fuel/material stream	Applied tier (tier number corresponding to monitoring and reporting guidelines as applicable)					
		Activity data	Net calorific value	Emission factor	Composition data	Oxidation factor	Conversion factor
Boilers, gas turbines, and diesel engines	Residual fuel oil and gasoil	4	3	3	n/a	1	n/a
FGD's	Sodium bicarbonate	1	n/a	1	n/a	n/a	n/a
SCR's	Urea	n/a	n/a	n/a	n/a	n/a	n/a


	File: SOP DPS 34- Greenhouse Gas Emissions_r3_23-05-2014	
	Environmental Management System	Page 8 of 34

Justification for the selected tier for each source, where applicable, and fuel or material stream is listed in Table 4:

Table 4

Emission source	Fuel/material stream	Justification for the applied tier
Boilers, gas turbines, and diesel engines	Residual fuel oil and gasoil	<p>1. Fuel quantity</p> <p>Each tank is calibrated by an independent surveyor to an accuracy of 1mm according to ISO 7507/2 – API 2550. Moreover all shore tank consignment measurements are carried out by an independent surveyor using their own calibrated measuring equipment (Refer to Table 7 Action “Measuring equipment used: maintenance and calibration – Fuel Oils”, items 1, 2 and 3).</p> <p>On the basis of present tank calibration and measurement conditions as provided by the surveyor the amount of error is found to fall within Tier 4 (±1.5%). For more detailed analysis of the uncertainties involved reference should be made to a supplementary information document EMS DOC 3 (latest revision) which is reproduced in Annex C in this SOP.</p> <p>From the results Tier 4 (±1.5%) can be applied.</p>
Boilers, gas turbines, and diesel engines	Residual fuel oil and gasoil	<p>2. Net calorific value</p> <p>The net calorific value (NCV) representative for each batch of fuel is measured and reported by an independent accredited laboratory to EN ISO 17025 and is based on the use of established petroleum industry standards, mainly: ASTM D4868 or ASTM D240. Hence Tier 3 can be achieved. For the scope of annual reporting, an annual weighted average of the NCV is calculated using the NCV values of all the consignment independent quality certificates.</p> <p>Hence, Tier 3 can be applied.</p>
Boilers, gas turbines, and diesel engines	Residual fuel oil and gasoil	<p>3. Emission factor</p> <p>The emission factor representative for each batch of fuel is calculated on the batch NCV and the % carbon content, which are measured by an independent accredited laboratory (to EN ISO 17025). For the scope of annual reporting, an annual weighted average is worked out on the annual weighted average of the NCV and % carbon content values of all the consignments recorded in the quality certificates . The Emission factor is worked out as follows:</p> $EF \text{ (tCO}_2\text{/TJ)} = \frac{\text{total Carbon content (tC)} \times \text{CO}_2 \text{ conversion factor (tCO}_2\text{)} \times \text{total fuel (t)}}{\text{Total fuel (t)} \times 1 \text{ (tC)} \times \text{Total NCV (TJ)}}$ <p>CO₂ conversion factor = 3.664 (tCO₂/tC)</p> <p>This meets Tier 3 requirements.</p>

Emission source	Fuel/material stream	Justification for the applied tier
Boilers, gas turbines, and diesel engines	Residual fuel oil and gasoil	4. Oxidation factor Oxidation factor is 1.0 for all liquid fossil fuels in accordance with Article 26 of the EU regulation. Hence, Tier 1 is used.
FGD's	sodium bicarbonate	1. Activity data The tonnes of reagent consumed over the reporting period are based on the weighings registered by the weighbridge plus the starting and finishing stocks at the beginning and end of the calendar year. The weighbridge has a nominal capacity that can be set at 80 tonnes or 100 tonnes. For weights up to 60 tonnes, the weighbridge gives readings at 20kg intervals. For higher weights, readings are given at 50kg intervals. Full load calibration is carried out by loading the scale up to 45 tonnes. 20ft containers (~30-33 tonnes) are used. The measurements of the weighbridge are counterchecked against the shipping documents. Accuracy is as per calibration certification. According to the EU Regulation, Tier 1 allows a maximum uncertainty of <7.5% Hence, Tier 1 can be used.
FGD's	sodium bicarbonate	2. Emission Factor The stoichiometric emission factor (= 0.525 tonnes CO ₂ /tonne bicarbonate used) is derived from the equation: $2\text{NaHCO}_3 + \text{SO}_2 + 1/2\text{O}_2 \rightarrow \text{Na}_2\text{SO}_4 + 2\text{CO}_2 + \text{H}_2\text{O}$ Hence, Tier 1 can be used.
SCR's	urea	1. Activity data The tonnes of reagent consumed over the reporting period are based on the weighings registered by the weighbridge plus the starting and finishing stocks at the beginning and end of the calendar year. The weighbridge has a nominal capacity that can be set at 80 tonnes or 100 tonnes. For weights up to 60 tonnes, the weighbridge gives readings at 20kg intervals. For higher weights, readings are given at 50kg intervals. Full load calibration is carried out by loading the scale up to 45 tonnes. 20ft containers (~30-33 tonnes) are used. The measurements of the weighbridge are counterchecked against shipping documents. Accuracy is as per calibration certificate. No tier level is available.

	File: SOP DPS 34- Greenhouse Gas Emissions_r3_23-05-2014	
	Environmental Management System	Page 10 of 34

Emission source	Fuel/material stream	Justification for the applied tier
SCR's	urea	<p>2. Emission Factor</p> <p>Due account shall be taken of rules in the M&R guidelines regarding transfer of CO₂ bound into products that may be used at Delimara Power Station. Such instances shall be clearly indicated and explained in the annual emissions reports submitted to the competent authority, as may be relevant.</p> <p>In cases where the CO₂ must be reported the stoichiometric emission factor (= 0.733 tonnes CO₂/tonne urea used) is derived from the equation: $4\text{NO} + 2(\text{NH}_2)_2\text{CO} + \text{O}_2 \rightarrow 4\text{N}_2 + 4\text{H}_2\text{O} + 2\text{CO}_2$</p> <p>No tier level is available.</p>

9. Sampling approach to be used for determination of Net Calorific Value, Emission Factors & Oxidation Factor

The samples used for the measurement of the net calorific values in the quality data certificates are sampled by the third party surveyors according to industry standards, such as ASTM D 4057, which is API Manual of petroleum measurement chapter 8.1. The Station manager must ensure that the contractor carries out his Sampling Plan according to the latest methodologies and their quality procedures. In addition, the station manager or his representative can carry out inspection of storage tanks sampling practices and audits the contractor's calibration records in respect of measuring equipment.

A sampling Plan is included in **Annex B**.

10. Analytical Approaches for determination of Net Calorific Value, Emission Factors & Oxidation Factor

The intended sources of information or analytical approaches for the determination of the net calorific value, emission factor and oxidation factor for each fuel type are the following:


	File: SOP DPS 34- Greenhouse Gas Emissions_r3_23-05-2014	
	Environmental Management System	Page 11 of 34

Table 5


Emission source	Fuel	Item to be determined	Analytical approach applied for each source and fuel type
Boilers, gas turbines and diesel engines	Residual fuel oil and gasoil	Net calorific value	The NCV used is either the value given in the supplier fuel quality certificate or that provided by other third party surveyors. The standards used for measurement of the NCV are established industry standards such as ASTM D4868, ASTM D240, and IP 12 and are indicated in the quality certificates. For the scope of annual reporting, an annual weighted average of the NCV is calculated from the NCV values of all the consignment independent quality certificates.
Boilers, gas turbines and diesel engines	Residual fuel oil and gasoil	Emission factor	The emission factor representative for each batch of fuel is calculated on the batch NCV and the % carbon content, which are measured by an independent accredited laboratory (to EN ISO 17025). For the scope of annual reporting, an annual weighted average is worked out using the annual weighted average of the NCV and % carbon content of all the consignment independent quality certificates.
Boilers, gas turbines and diesel engines	Residual fuel oil and gasoil	Oxidation factor	The adopted Oxidation factor is the one recommended in Article 37 of Commission Regulation 601/2012.

11. Quality Assurance and Quality Control

The responsibilities for monitoring and reporting within the installation are those as listed in Table 6 below, given their role relevant to monitoring and reporting.

Table 6

Job Title / Post	Role
Executive Head (Generation)	Appoints responsibilities for the monitoring & reporting functions of the GHG emissions.
Third Party Surveyors	Fuel tank dipping, determination of fuel quantities and quality. Calibration of weighbridge.
Station chemists	Coordination with third party surveyors on fuel quality, acceptance of quality reports and testing standards used.
Station manager	Overall management of power station, coordination with shipping office & reagent suppliers, acceptance of fuel & reagent quality and quantities, maintenance of records
Manager maintenance	Fuel tank & weighbridge calibration and maintenance including measuring equipment

	File: SOP DPS 34- Greenhouse Gas Emissions_r3_23-05-2014	
	Environmental Management System	Page 12 of 34

Job Title / Post	Role
Shift engineers	Power station plant operation. Supervision of operating personnel including tank farm operators and boiler/gas turbine / diesel engines operators.
Fuel tank farm operators	Coordination with surveyors and customs officials on fuel consignments, general duties on fuel tanks, tank-dipping and temperature measurements for internal purposes.
Weighbridge operators	Weighbridge operation, recording of reagent quantity consignments, assisting in weighbridge third party calibration certification.
Responsible Regulatory Affairs	Co-ordination of monitoring data collection and reporting of calculated emissions.

Table 7 shows the setup that shall be put in place for an effective data management system.

Table 7

Action	Description
Identification of greenhouse gas sources covered by the scheme under Annex I to the Directive	<p>The station manager collates daily system generation performance figures provided by the generation staff and reports on a monthly basis the monthly performance. This report, which includes fuel oil consumptions within the various plants, is also passed on to other staff members, including the Responsible of Regulatory Affairs for co-ordination of monitoring data collection and reporting of calculated emissions.</p> <p>On a separate level, the third party surveyors carry out fuel consignment measurements on the shore tanks following ships' arrivals and discharge in the presence of Enemalta and Customs Department staff.</p> <p>With respect to the use of reagents Sodium bicarbonate and Urea, the station manager or his Assistant collects the records for each consignment registered by the weighbridge and counterchecks these against the consigned weights.</p> <p>The installation activities are subject to an annual management review as per Environment Management System Manual, section 6.</p>
The sequence and interaction of monitoring and reporting processes	<p>Fuel Oils</p> <ol style="list-style-type: none"> 1. Fuel stock levels in every shore tank are measured by the third party surveyor on 1st January of each year witnessed and checked by Enemalta officers and Auditors. The surveyor submits his reports to the station manager and the Responsible Regulatory Affairs in charge of emissions reporting. 2. The station manager is informed of a forthcoming ship's fuel oil delivery or transfer by the officer who is in charge of shipping and communication with the suppliers' and surveyor/s. Fuel quality reports of the blend before loading tanker from the suppliers are forwarded for review by the station manager who will in turn pass this information on to the station chemist to check specs of composition and testing methods. Another analysis is then performed on the blend from this same tanker prior to discharge to shore tank and the quality report is forwarded to the Responsible Regulatory Affairs.




Action	Description
	<p>3. Following each fuel consignment or transfer, the third party surveyor carries out the tank ullage measurements, together with temperature and density measurements and converts this data into tonnes of fuel mass (air) using the Volume Correction and Weight Correction factors (Tables 54B & 56 respectively of ASTM-IP standards). The surveyor submits his "Vessel Survey Discharge" reports to Enemalta shipping staff. The quality and quantity certificates are forwarded to the Station manager for review and acceptance. Consignments are counterchecked by generation staff members who also report separately their measurements and calculations to the station manager.</p> <p>4. Copies of the surveyor's quantity reports and quality reports are also passed on to the Responsible Regulatory Affairs who will record the fuel oil consignment or transfer details in an appropriate Excel spreadsheet for that particular year.</p> <p>5. The latter will carry out the necessary calculations to establish the total energy in GJ of the quantity of fuel consigned or transferred for the whole year.</p> <p>6. On the basis of total annual data the weighted average value of the Net Calorific Value (NCV) and Emission Factor (EF) of the HFO or Gasoil for that year is calculated.</p> <p>7. The total fuel consumed by the station is calculated on the basis of stock levels at the beginning and end of the year, and fuel consignment/transfers in and out of the station. This value is counterchecked against the sum of the monthly fuel consumptions reported in the monthly System Generation reports.</p> <p>FGD & SCR Reagents</p> <p>8. Reagents stock levels are measured on 1st January of each year. The officer-in-charge submits his reports to the station manager and the Responsible Regulatory Affairs in charge of emissions reporting.</p> <p>9. Consignments are registered by the weighbridge operating system and checked by generation staff members. Copies of the consignments reports are also given to the Responsible Regulatory Affairs who will record the reagents' consignment details in an appropriate Excel spreadsheet for each month and for that particular year.</p> <p>10. The total reagents consumed by the station are calculated on the basis of stock levels at the beginning and end of year, and reagents' consignments to the station.</p> <p>11. On the basis of total annual reagents' consumptions the total emissions of GHG from the FGD and SCR are calculated according to the Commission Regulation 601/2012 or as indicated by MRA.</p> <p>General</p> <p>12. Based on the annual fuel and reagents consumption the total emissions of GHG are calculated according to the Commission Regulation 601/2012.</p> <p>13. The preliminary data and the GHG emissions reports are passed on to the station manager for his counterchecking and approval.</p> <p>14. On counterchecking and approval of all reports the documentation for the GHG emissions reporting is submitted to the external verifier for approval prior to submission to MRA. Changes are incorporated as requested by the verifiers.</p> <p>15. Verifiers' reports and observations are noted for future improvements and submitted to MRA for approval.</p>




Action	Description
Responsibilities and competence	<p>The station manager is responsible to designate data collection functions and ensures competence of personnel involved. The allocation of responsibilities by the station manager follows job description allocations in line with the Collective Agreement. Hence the duty of data collection is part and parcel of such duties when this data is required by the station (see EMS Manual, sections 4.1 & 4.2). To supplement this function there is an EMS Procedure on "Competence, Training and Awareness" (MP-6).</p> <p>Responsible Regulatory Affairs is to carry out the collation of data and reporting of GHG emission reporting as per Commission Regulation 601/2012.</p>
The methods of calculation or measurement which are used	<p>The GHG emissions are calculated based on total mass of fuel or reagents consumed for that year as explained in previous sections.</p> <p>For fuels, the annual GHG emissions are calculated using the annual weighted average NCV, the emission factor, and the oxidation factor. An Excel spreadsheet system developed specifically for this purpose is used to calculate emissions.</p> <p>For reagents, the annual GHG emissions are calculated from the annual consumed weight and the emission factors, and are incorporated in the same Excel spreadsheet.</p>



Action	Description
Measuring equipment used: maintenance and calibration	<p>Fuel Oils</p> <p>The calculation of the mass of fuel delivered to the station is based on the surveyor's equipment and tank calibration tables:</p> <ol style="list-style-type: none"> 1. Level dip readings: calibrated working steel dipping tape, constantly verified against tapes traceable to national standards. This method of verification is done as per method API MPMS 3.1A. The working tape is compared to the standard/reference tape and deviations must not exceed $\pm 1\text{mm}$ /10 metres. This is usually done before initial use and at least every 6 months. The reference tape is checked once every 5 years and is not being used on the field. Manual gauging requires obtaining either two consecutive gauge readings to be identical, or three consecutive readings within a range of 3 mm. If the first two readings are identical, this reading is reported to the nearest 1 mm. When three readings are taken, all three readings shall be within the 3 mm range and readings averaged to the nearest 1 mm for metric tapes. 2. Fuel temperature measurements: field glass thermometers or portable electronic equipment (PET's), verified as per MPMS Chapter 7. All field thermometers or PET's are verified against a standard calibrated ASTM thermometer traceable to national standards. The field thermometers and/or PET's are verified before 1st use and once every three months. This is done at 3 different temperatures (typically the checkpoints should be at 10%, 50%, and 90% of the temperature range in which the thermometer is expected to be used. Temperature device versus Reference Thermometer should not exceed 0.3°C. All temperatures are read and recorded to the nearest 0.1°C. The temperature (or average of multiple temperatures) is reported to the nearest 0.1°C. 3. Fuel density measurements: automatic testing equipment as per method ASTM D 4052. This equipment is being calibrated on a monthly basis with distilled water as reference. This is done at a standard temperature of 15°C (that used for lighter products such as Gasoil) and 50°C (that used for fuel oils). The equipment auto calibrates itself with the distilled water as reference. Repeatability on density by ASTM D 4052 is of 0.0001 kg/litre. <p>Tank calibration: tanks are calibrated on a regular basis by independent third party surveyors and <i>Calibration Certificates</i> are issued for each tank.</p> <p>Measuring Equipment Calibration: dip measuring, temperature and density measuring equipment are calibrated by an authorised accreditation body where the certificates state the validity period of the calibration. In addition the contractors carry out regular internal calibration checks of their field equipment against their own reference equipment kept within their laboratories.</p> <p>FGD & SCR Reagents</p> <p>The calculation of the mass of reagents delivered to the station is based on the weighbridge equipment, which is subject to regular internal maintenance practice and calibration tests by third party surveyors. Maintenance work is scheduled by the Station manager & the Assistant Manager Maintenance and this includes calibration of equipment.</p>

	File: SOP DPS 34- Greenhouse Gas Emissions_r3_23-05-2014	
	Environmental Management System	Page 16 of 34

Action	Description
Reporting and records	<p>The third party surveyors responsible for fuel consignments are certified to and follow the Quality Management System Standard ISO 9001:2008. Moreover, the surveyors are also accredited to EN ISO 17025: 2005 for various parameters including sampling, sulphur content, viscosity and density measurements as required by the GHG and IPPC permits.</p> <p>All reporting and data related to the GHG emissions are entered and recorded in dedicated software files developed specifically for the intended purpose. In addition hard copies of the data are also maintained within the RAO for ease of access to the verifiers or the Competent Authority. The verifiers are also given soft and hard copy versions of all information which they request, prior to the verification or during the verification process.</p> <p>Records of data shall be kept for a minimum period of 10 years as per legal obligations.</p>
Control of Outsourced Processes	<p>Outsourcing of processes like fuel tank dipping and quality testing of fuels follows the obligations of Enemalta procurement practices which are in turn controlled by the EMS Procedures that are certified to ISO 14001: 2004. In the context of fuel quantity and quality inspection Enemalta obliges the contractor to follow established industry standards and industry good practices. Moreover quantity measurements are witnessed by Enemalta personnel. All equipment used by the contractors for quantity dipping and quality tests are covered by valid calibration certificates.</p>
Internal reviews of reported data and the quality system	<p>The third party surveyor responsible for fuel consignments is certified to and follows the Quality Management System Standard ISO 9001:2008. Moreover, the surveyors are also accredited to EN ISO 17025: 2005 for various parameters including sampling, sulphur content, viscosity and density measurements as required by the GHG and IPPC permits.</p> <p>With respect to internal practices related to reviews and validation of data, all incoming reported data is reviewed for completeness, accuracy, consistency and validity by making reference to past performance data or specifications as required by the Corporation. In cases where there is disagreement with data submitted by the contractors this is discussed with the same contractors to ensure correctness of the data. Although to date no official Quality Assurance system is in place, the installation operates an Environment Management System that is certified to ISO 14001: 2004.</p>
Corrective and preventive action	<p>The third party surveyors are certified to and follow the Quality Management System Standard ISO 9001:2008.</p> <p>Enemalta takes note of the verifiers' reports and does its best to take the necessary measures to implement any recommended corrective measures and takes preventive actions to avoid repetition. Although to date no official Quality Assurance system is in place, the installation operates an Environment Management System that is certified to ISO 14001: 2004. For this scope, the practice of GHG emissions measurements and reporting follows a Standard Operating Procedure intended for this purpose. If any other non-conformities are identified during the auditing of this procedure the necessary corrective/ preventative actions have to be implemented also.</p>
Data management: quality assurance and quality control	<p>Data storage in the IT system is managed centrally within Enemalta by a designated IT section team who follows established IT industry good practices and procedures in respect of installation and use of dedicated software and hardware, access control, backup and recovery facilities, recovery and security of data functions.</p>
Review of the M&R Plan	<p>The M&R Plan shall be reviewed regularly and updated whenever changes in the installation operation, changes in legal requirements, and any changes arising from other sources (competent authorities, verifiers, etc).</p>

	File: SOP DPS 34- Greenhouse Gas Emissions_r3_23-05-2014	
	Environmental Management System	Page 17 of 34

Action	Description
Inherent Risks & risk Control	<p>Possible sources of data inaccuracies, missing data or valid reporting, or transcription errors related to inherent risks in the data flow, and the control activities used to minimise the overall risks are all reviewed in a Risk Assessment as detailed in Annex D.</p> <p>This Risk Assessment shall form part of an internal EMS audit of this SOP. Hence the audit shall be implemented according to the audit programme and if there are any changes or recommendations arising from the audit, measures shall be taken to implement the changes or recommendations.</p>

12. Quality management and environmental management systems

To date no official Quality assurance system is in place at DPS.

However, the installation implements an ***Environment Management System*** in accordance with ISO 14001: 2004 standard (Second edition). The installation was first certified in August 2011 and subsequently recertified with annual surveillance audits in between.


13. Reporting and Record Keeping

The reporting requirements and reporting format set out in Commission Regulation 601/2012 shall be used. Information shall be retained in accordance with the requirements set out in this Regulation.

14. Supplementary Documentation

The following supplementary documents form part of this SOP, as included in the **Annex C**:

Supplementary Documentation Reference Number	Title/Description of Supplementary Documentation
EMS DOC 3 (latest revision)	GHG Emissions Reporting: Uncertainty Calculations

	File: SOP DPS 34- Greenhouse Gas Emissions_r3_23-05-2014	
	Environmental Management System	Page 18 of 34

15. Monitoring and Reporting Plan Versions & Revisions

The M&R Plan versions as approved by MRA are the following:

Table 8

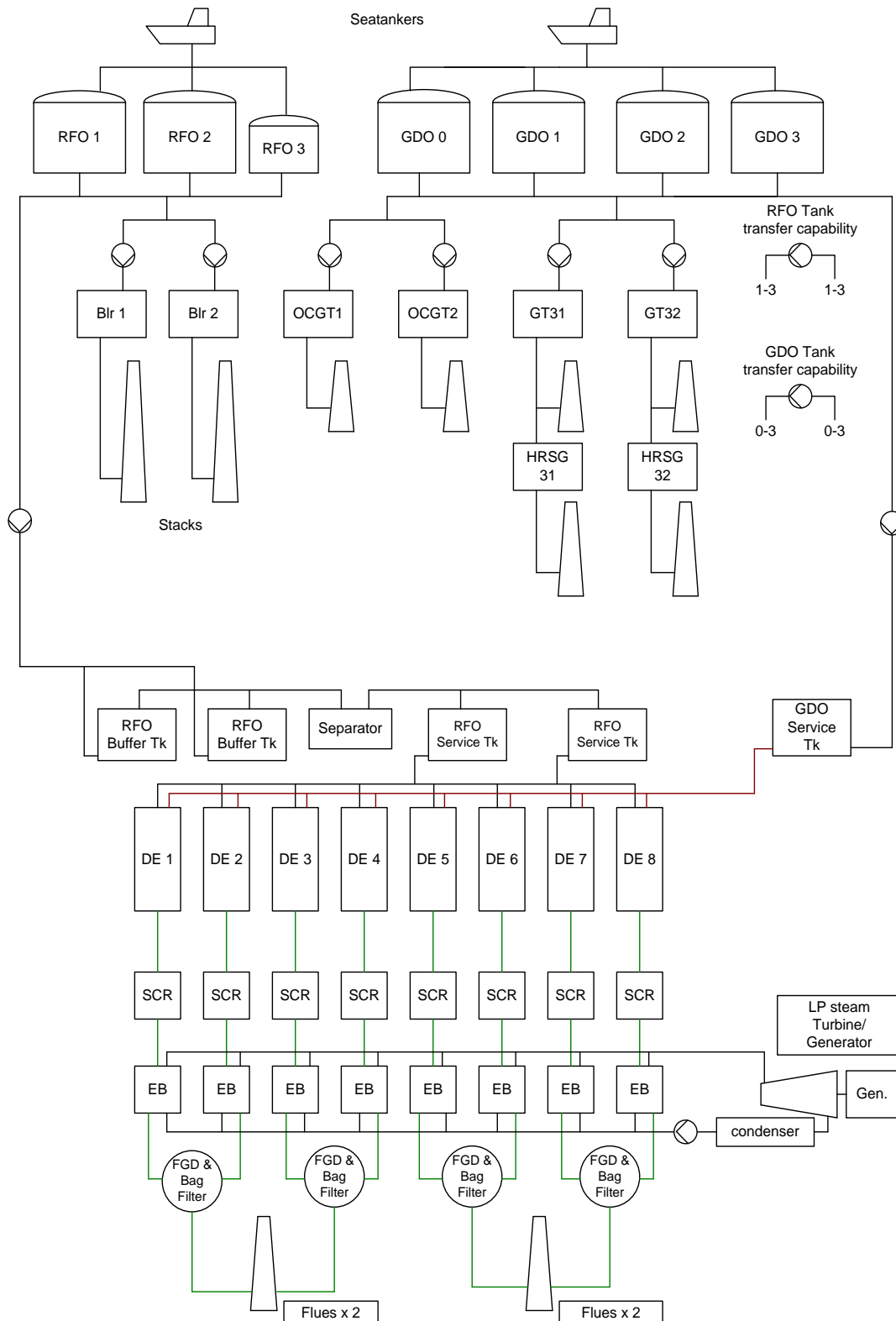
Version No	Reference date	Status at reference date	Chapters where modifications have been made. Brief explanation of changes
1	29/01/2007	Approved by competent authority	M&R plan for the period 2005-2007
2	13/02/2009	Submitted to competent authority	M&R Plan for period 2008-2012 as per Decision 2007/589/EC
2	23/02/2009	Approved by competent authority	M&R Plan for period 2008-2012 as per Decision 2007/589/EC
3	07/11/2011	Submitted to competent authority	Revised M&R Plan for period 2008-2012 as per Decision 2007/589/EC to include new plant & other changes
3	27/01/2012	Approved by competent authority	Revised M&R Plan for period 2008-2012 as per Decision 2007/589/EC to include new plant & other changes
4	20/05/2013	Submitted to competent authority	M&R plan for the period 2013-2020 using new template
4	07/08/2013	Approved by competent authority	M&R plan for the period 2013-2020 using new template


It is important to ensure that the latest versions of the M&R Plan templates are used whenever any revisions are necessary as a result of M&R Plan reviews or as instructed by the Competent Authority.

16. Reference Documents

DPS Greenhouse Gas Emissions Monitoring & Reporting Plan, latest approved version.

Annex A: Schematic arrangement of installation at Delimara



	File: SOP DPS 34- Greenhouse Gas Emissions_r3_23-05-2014	
	Environmental Management System	Page 20 of 34

Annex B: Fuel Sampling Plan

This is an overview of what takes place from start to discharge on a vessel discharged at Enemalta terminals by the surveyor (Saybolt, Inspectorate, etc).

1. Before vessel arrives the nominated shore tank/s are gauged and sampled (if there is sufficient product in tank to be able to sample),
2. Inlet valves of idle shore tanks are sealed before discharge so that no other cargo can enter shore tank during vessel discharge,
3. Line samples are drawn ex-shoreline (if sampling point available) before discharge [*this applies mostly for white products to asses appearance at Has Saptan and 31st March Installations*],
4. Vessel is sampled tank by tank on arrival / before discharge (to consider if sampling possible manually via open hatch or under hermetic system using vessel's equipment),
5. A copy of load port analysis (if available onboard) is collected together with the load port samples for receivers,
6. Samples are transported to surveyor's premises for retention or testing as requested,
7. In case testing is requested on samples before discharge, Enemalta will instruct if discharge is to await results or not before commencement,
8. If cargo is analysed & results are to spec, vessel will commence discharge operations,
9. When operationally possible various manifold samples / line samples are drawn during discharge operations (refer to above item 3),
10. Upon completion of discharge operations all valves of receiving shore tanks are sealed in the closed position by the surveyor. After 24 hours settling time the seal on the drain valve is broken by the surveyor and water is drained from the receiving shore tanks. The surveyor together with the terminal representative and customs official gauges and samples the tanks,
11. The receiving shore tank's inlet valve is rechecked to ensure that the seal is still intact,
12. Samples drawn ex-receiving shore tanks are analysed and counterchecked if within repeatability / reproducibility with the load port quality / contractual agreement,
13. Once quantity & quality results are confirmed in line with load port quantity & quality, and if all parties involved agree (Enemalta / surveyor / customs & other parties if any), cargo will be released.

Remarks:

- When sampling is possible to perform manually via open hatch using surveyor's equipment (as is the case on shore tanks) ASTM D4057 standard practice for manual sampling of petroleum and petroleum products along with other international regulations and standards is followed,
- When sampling on board is performed via closed system to consider the technical limitations imposed from such activity where sample might not be representative of cargo sampled,
- All surveyor's activities are performed within national and international safety standards.
- In cases where homogeneity of the fuel may be a problem, several samples are taken from different levels within the tank in order to work out representative values of temperature and density.

Annex C: GHG Emissions Reporting: Uncertainty Calculations

1.0 Fuels

1.1 *Uncertainty calculations*

- 1.1.1 In the case of combustion emissions, activity data is based on the mass of fuel consumed which in turn is calculated on the basis of the following formula:

$$\text{Fuel Mass} = \text{Volume} \times \text{Mass Correction factor (MCF)} \times \text{Volume Correction factor (VCF)}$$

Hence errors arising from volume measurements and correction factors calculations will lead to an overall error in fuel mass measurements.

Volume measurement errors arise from human errors in dipping measurements, tank calibration errors and tank volume changes (expansion/contraction) as a result of changes in temperature.

The mass correction factor (MCF) is dependent on the measurement of density, hence there are equipment errors and human factors for analogue readings.

The volume correction factor (VCF) is dependent on density and temperature measuring equipment errors, and on human factors for analogue readings of these instruments.

Therefore, in order to establish the uncertainty in measurements of the fuel levels ***in the shore tanks*** at Marsa and Delimara, the possible errors can be summarised as follows:


- i. Uncertainty due to human errors
- ii. Errors due to volume changes due to temperature variation of the shore tanks
- iii. Tank calibration errors
- iv. Dipping tape errors
- v. Fuel oil temperature measuring equipment errors
- vi. Fuel oil density measuring equipment errors.

Table 1 shows the values of the above uncertainties based on the information given by 3rd Party Surveyor, tank calibration certificates, and Enemalta calculations on tank area changes errors due to temperature variation.

Table 9

Tank measurement uncertainty values for MPS & DPS

Tank measurement Errors	MPS Uncertainty %	DPS Uncertainty %	Remarks
Human errors			
dipping	0.200	0.200	worst case of $\pm 1.0\text{mm}$ at 1.0m depth
density	0.000	0.000	digital readout
temperature	0.000	0.000	digital readout
Equipment errors			
dipping tape	0.090	0.090	Based on maximum error of - 0.9mm at worst case depth of 1.0m as per tape calibration certificate
Density	0.010	0.010	based on average fuel oil density oil 980kg/m^3 & repeatability on density by ASTM D4052 of 0.0001kg/l .
temperature	0.6	0.6	based on maximum error of 0.3°C as per thermometer calibration certificate
tank area changes errors (due to temp. variation), say 20°C	0.048	0.048	based on coefficient of area expansion for steel and taken as $0.000024 / ^\circ\text{C}$
tank calibration tables	0.024	0.026	data from tank calibration tables for MPS & DPS

	File: SOP DPS 34- Greenhouse Gas Emissions_r3_23-05-2014	
	Environmental Management System	Page 23 of 34

Explanations to Table 9:

- i. **Human error in dipping:** Assuming a 2mm error (tape measurement is graduated every 1mm and assuming an operator measurement error of 1mm) for a worst case at a fuel level of 1m in a calibrated tank. It is to be noted however that no tank level is allowed to be lower than 1m under any operating condition. The operators entrusted with taking measurements of fuel tanks are skilled and experienced. Hence the uncertainty due to human limitations is considered to be within 0.2% (2mm on 1m). This is considered equally applicable for measurements taken by the independent surveyor when gauging by measuring tape.
- ii. **Tank area changes** due to temperature: It can be shown that the change in area due to dimension changes of metal tanks with a coefficient of expansion of 0.000012/°C and a temperature variation of 20°C is 0.048%.
- iii. **Tanks Calibration errors, MPS:** 6 tanks are used for the storage of RFO, Tank 1, 2, 3, 4, 5 and 6. The uncertainty of each tank is specified in the **Calibration Certificate**. Gasoil is stored in one GDO tank. The overall uncertainty for Gasoil depends on the uncertainty of this tank as specified in its calibration certificate. Hence the overall uncertainty for all tanks due to calibration errors can be worked out as follows:

$$U_{\text{total}} = \frac{\sqrt{(U_1 \cdot x_1)^2 + (U_2 \cdot x_2)^2 + \dots + (U_n \cdot x_n)^2}}{|x_1 + x_2 + \dots + x_n|}$$

Where:

U_{total} is the uncertainty of the sum, expressed as a percentage;

x_i and U_i are the uncertain quantities and the percentage uncertainties associated with them, respectively;

- iv. **Tanks Calibration errors, DPS:**
 - RFO is stored in 3 tanks HF01, HF02 and HF03. The uncertainty of each tank is specified in the **Calibration Certificate**.
 - Gasoil is stored in 4 tanks DO0, DO1, DO2, DO3. The uncertainty of each tank is specified in the **Calibration Certificate**.

Hence the overall uncertainty for all tanks due to calibration errors can be worked out as follows:

$$U_{\text{total}} = \frac{\sqrt{(U_1 \cdot x_1)^2 + (U_2 \cdot x_2)^2 + \dots + (U_n \cdot x_n)^2}}{|x_1 + x_2 + \dots + x_n|}$$

Where:

U_{total} is the uncertainty of the sum, expressed as a percentage;

x_i and U_i are the uncertain quantities and the percentage uncertainties associated with them, respectively;

1.2 ***Uncertainty results & tier application for Marsa & Delimara Installations***

1.2.1 Uncertainty Calculations

Fuel Mass = **Volume x Mass Correction Factor (MCF) x Volume Correction Factor (VCF)**

Volume function of = dip reading, tank calibration tables

Volume errors = human reading errors, dipping $U_{hum\ d}$ (if analogue)
dip gauge errors, U_{dip}
tank calibration errors, U_{cal}
tank expansion errors, U_{exp}

MCF errors = density equipment errors, U_{ρ}
human reading errors, density, $U_{hum\ \rho}$ (if analogue)

VCF errors = density equipment errors, U_{ρ}
human reading errors, density, $U_{hum\ \rho}$ (if analogue)
temperature equipment errors, U_{temp}
human reading errors, temp, $U_{hum\ t}$ (if analogue)


The following formula is used:

$$U_{mass} = \sqrt{[U_{hum\ d}^2 + (U_{hum\ p}^2 \times 2) + U_{hum\ t}^2 + U_{dip}^2 + U_{cal}^2 + U_{exp}^2 + (U_{\rho}^2 \times 2) + U_{temp}^2]}$$

1.2.2 Uncertainty Results

On the basis of section 7 of Commission Decision 2007/589/EC, for RFO and GDO consignments the total uncertainty works out to be equal to **0.641%**.

Hence, the accuracy required to attain Tier 4 ($\pm 1.5\%$) can be achieved for the Marsa & Delimara installations.

	File: SOP DPS 34- Greenhouse Gas Emissions_r3_23-05-2014	
	Environmental Management System	Page 25 of 34

2.0 Process Materials (Sodium Bicarbonate & Urea)

2.1 *Uncertainty calculations*

The tonnes of reagents consumed over the reporting period are based on the readings of the weighbridge installed at DPS over the mentioned period plus the starting / finishing stocks at the beginning / end of the calendar year. The weighbridge measurements are counterchecked against the suppliers' purchasing documents. The weighbridge has a nominal capacity that can be set at 80 tonnes or 100 tonnes. For weights up to 60 tonnes, the weighbridge gives readings at 20kg intervals. For higher weights, readings are given at 50kg intervals. Full load calibration is carried out by loading the scale up to 45 tonnes. 20ft containers (~30-33 tonnes) are used to transport the material.

The uncertainty for the weighbridge is specified in the calibration certificate of the instrument.

According to Commission Decision 2007/589/EC activity data having an uncertainty within $\pm 7.5\%$ is classified under Tier 1.



Annex D: Risk Assessment of Data Flow

1.1 Basis of the Risk Assessment

The data flow activities were identified both for the combustion fuels and the process materials. The results are presented in the flow charts D1 and D2 below. In addition a task list was established which indicates what checks should be carried out on every task. The list is presented in Table D3

1.2 Risk Assessment Analysis

The analysis follows from the task list where a number of possible incidents arising from the checks were identified with possible variations of these incidents. The following scales were adopted to assess the inherent risk:

Probability (P) levels

Very low	Unlikely to occur more than once per year
Low	May occur up to 4 times per year
Moderate	May occur up to 12 times per year
High	May occur up to 24 times per year
Very high	May occur more than 24 times per year


Impact (I) levels

Very low	No noticeable effect on measured parameter
Low	Effect leads to misstatement of max. ± 50 tonnes CO ₂ (e)
Moderate	Effect leads to misstatement of max. ± 250 tonnes CO ₂ (e)
High	Effect leads to misstatement of max. ± 500 tonnes CO ₂ (e)
Very high	Effect leads to misstatement of more than ± 500 tonnes CO ₂ (e)

The Inherent Risk (IR) matrix of Probability against Impact is as follows:

		Impact				
		Very low	Low	Moderate	High	Very high
Probability	Very low					
	Low					
	Moderate					
	High					
	Very high					

	LOW
	MODERATE
	HIGH

	File: SOP DPS 34- Greenhouse Gas Emissions_r3_23-05-2014	
	Environmental Management System	Page 27 of 34

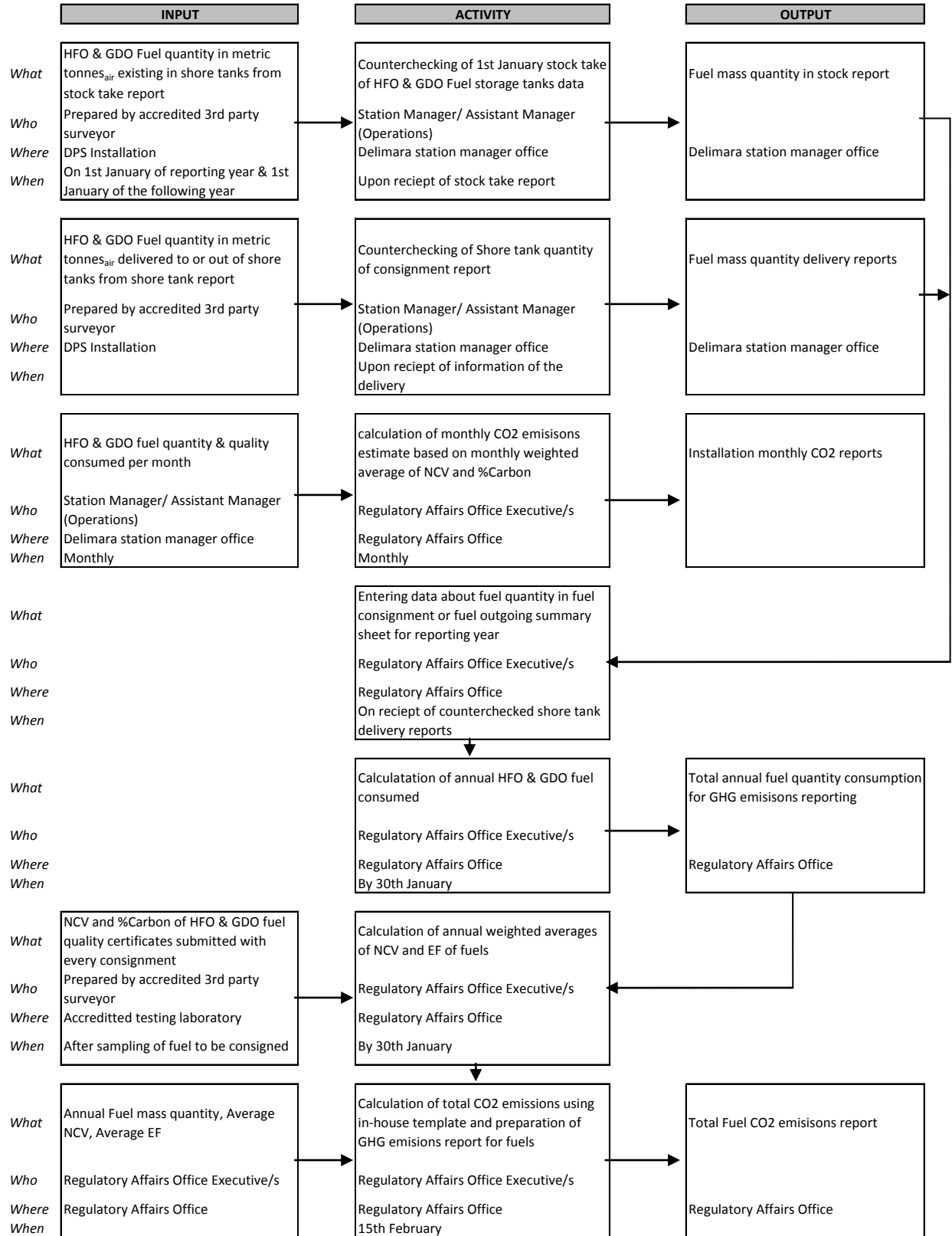
The variations of each incident that have been identified are mainly the following, as applicable:

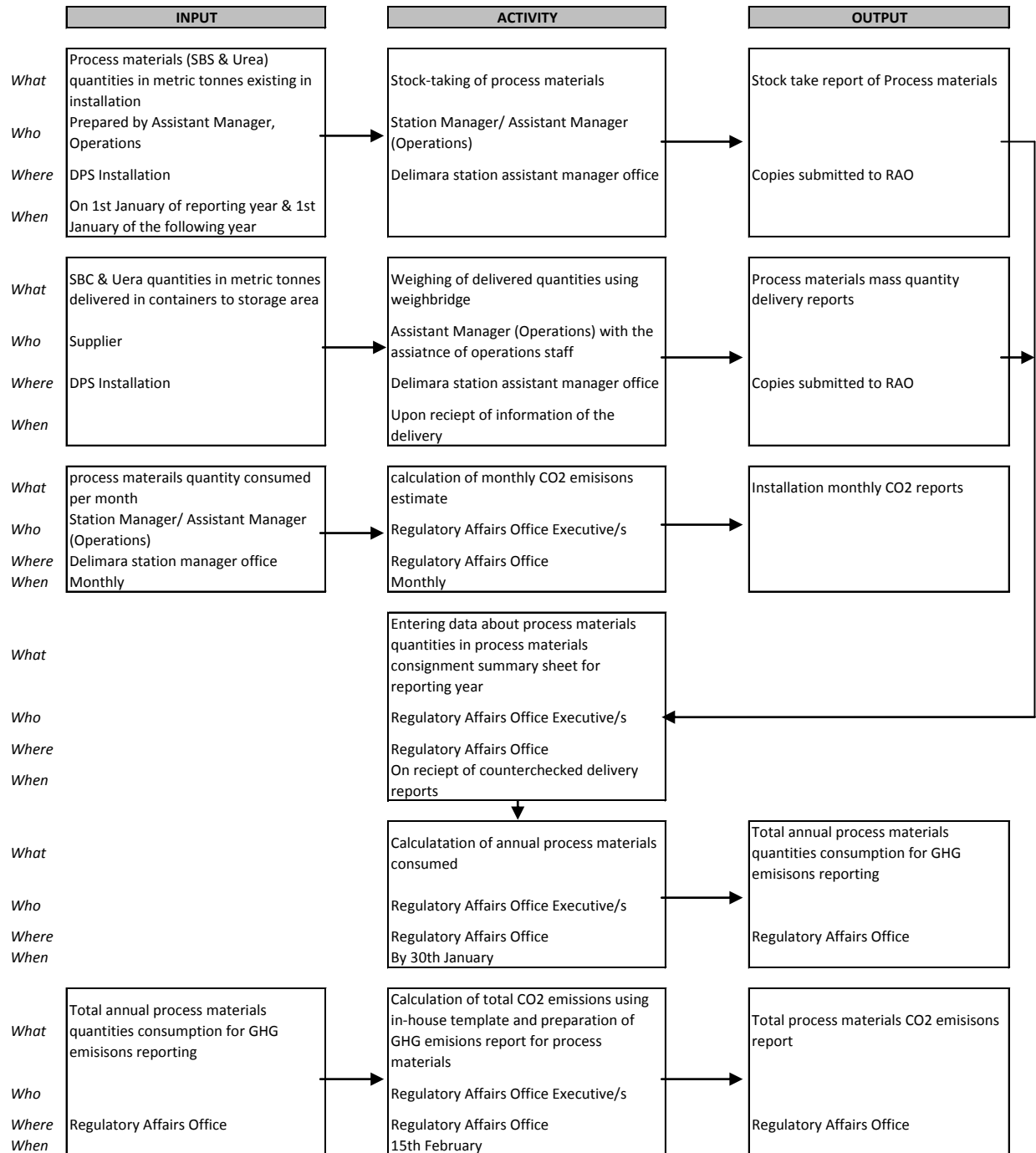
- Data inaccuracy or not valid
- Data not available
- Sampling Plan [for fuel oils] not followed
- Data transcription errors ("misreading" faults)
- Data loss mainly arising when saved in soft version/s
- Weighbridge failure (in the case of process materials)
- Data logging fault (weighbridge data)
- Equipment data display fault (weighbridge data).

1.3 Control Activity & Overall Risk

For each identified risk a **Control Activity** was indicated which should reduce the **Overall Risk** to within acceptable materiality levels. The overall Risk assessment is presented in **Table 11-/1/2/3/4**, where the following abbreviations were used:

P:	Probability
I:	Impact
IR:	Inherent Risk
CA:	Control Activity
OR:	Overall Risk
Na:	not applicable

Flow Chart D1**COMBUSTION OF FUELS: DATA FLOW**

Flow Chart D2**PROCESS MATERIALS: DATA FLOW****Table 10**



DATA FLOW: TASK LIST

Task No.	Task Description	Who	Section	When	Checks
1	Stock take of Fuel and Process materials stock take quantities on 1st January of every year & submission of reports	3rd Party surveyor in the presence of Station Officials	contractor	every 1st January	Availability and validity of accreditation certificate to ISO 17025
					availability & validity of calibration certificates of:
					Master & field dipping tape
					Master & field temperature probe
					density meter
					availability and validity of tanks calibration certificates
2	Confirmed Fuel and Process materials stock take quantities on 1st January of every year to be submitted to RAO	Station Manager/ RAO Executive	Generation/ RAO	as soon as submitted to station manager by surveyor	consistency of report in line with gauging procedure
					completeness of report that it covers all tanks
3	Fuel dipping process in shore tanks on arrival of consignment	3rd Party surveyor in the presence of Station Officials	Contractor/ Generation	for every consignment	Availability and validity of accreditation certificate to ISO 17025
					availability & validity of calibration certificates of:
					Master & field dipping tape
					Master & field temperature probe
					density meter
					availability and validity of tanks calibration certificates
4	Submission of advance copies of shore tanks fuel dipping and quality reports	3rd Party surveyor	contractor	for every consignment	
5	Counterchecking of advance copies of consigned quantities and quality certificates of fuels and process materials for accuracy and lab accreditation	Station Manager/ RAO Executive	Generation/ RAO	On receipt of advance delivery reports from 3rd Party surveyor	consistency of report in line with gauging procedure & timeframes
					completeness of report that it covers all tanks in question
					completeness of quantity report that it shows fuel source for traceability purposes
					completeness of report for consistency in NCV & % carbon values
6	Fuel materials consignment quantity & quality reports to be submitted to the RAO	Shipping Officer/ RAO Executive	Stores section/ RAO	On receipt of confirmed delivery reports from 3rd Party surveyor	consistency of reports in line with advance reports submitted to Station manager
7	Process materials consignment quantity reports to be submitted to the RAO	Assistant Manager, Operations/ RAO Executive	Generation/ RAO	On receipt of confirmed delivery reports from weighbridge data	consistency of reports
8	Monthly fuel and process materials consumption to be submitted to RAO	Station Manager/s/ RAO Executive	Generation/ RAO	Monthly	consistency of data of reports
9	Entering of fuel and process materials quantity [mainly in tonnes] and quality information [mainly NCV & %C] in respective in-house template yearly summary sheet/s, together with shipping details, date of shore tank gauging, names of testing laboratory, standards used	Professional Executive	Regulatory Affairs Office	On receipt of consignment reports	check each data input for accuracy of transcription
10	Calculation of monthly CO2 emissions in in-house template from weighted average NCV & %Carbon [for the Emission factor] of monthly fuel consumed	Professional Executive	Regulatory Affairs Office	on receipt of monthly fuel Delivery and consumption report from Station Manager	check consistency of monthly weighted average of NVC & Emission factor from % Carbon
					check uncertainty calculations for monthly dipping measurements
11	Calculation of monthly CO2 emissions from monthly process materials consumed	Professional Executive	Regulatory Affairs Office	on receipt of monthly consumption report from Assistant Manager Operations	check consistency of emission factor used in calculations
					check uncertainty calculations of monthly weighbridge measurements
11	Calculation of total annual CO2 emissions using in-house template and preparation of GHG emissions report for fuels & process materials	Professional Executive	Regulatory Affairs Office	15th February	check each data input for accuracy of transcription
					check uncertainty calculations for annual dipping measurements
					check uncertainty calculations of annual weighbridge measurements

Table 11-1



				Incidents Outcome & Risk Assessments														
Task No.	Task Description	Checks	Incident	Data inaccuracy/ not valid					Data not available									
				P	I	IR	CA	OR	P	I	IR	CA	OR					
1	Stock take of Fuel and Process materials stock take quantities on 1st January of every year & submission of reports	Availability and validity of accreditation certificate to ISO 17025	accreditation certificate not available or valid	very low	very low	low	Request update	low	very low	very low	low	Request update	low					
		availability & validity of calibration certificates of:																
		Master & field dipping tape	Calibration certificate not available or valid	very low	very low	low	Request update	low	very low	very low	low	Request update	low					
		Master & field temperature probe	Calibration certificate not available or valid	very low	very low	low	Request update	low	very low	very low	low	Request update	low					
		density meter	Calibration certificate not available or valid	very low	very low	low	Request update	low	very low	very low	low	Request update	low					
		availability and validity of tanks calibration certificates	Calibration certificate not available or valid	very low	very low	low	Request update	low	very low	very low	low	Request update	low					
2	Confirmed Fuel and Process materials stock take quantities on 1st January of every year to be submitted to RAO	consistency of report in line with gauging procedure	data inaccurate	very low	very low	low	Request revision	low	very low	very low	low	Request revision	low					
		completeness of report that it covers all tanks	data incomplete	very low	very low	low	Request revision	low	very low	very low	low	Request revision	low					
3	Fuel dipping process in shore tanks on arrival of consignment	Availability and validity of accreditation certificate to ISO 17025	data not available or not valid	low	very low	low	Request update	low	very low	very low	low	Request revision	low					
		availability & validity of calibration certificates of:																
		Master & field dipping tape	Calibration certificate not available or valid	low	very low	low	Request update	low	low	very low	low	Request update	low					
		Master & field temperature probe	Calibration certificate not available or valid	low	very low	low	Request update	low	low	very low	low	Request update	low					
		density meter	Calibration certificate not available or valid	low	very low	low	Request update	low	low	very low	low	Request update	low					
		availability and validity of tanks calibration certificates	Calibration certificate not available or valid	very low	very low	low	Request update	low	very low	very low	low	Request update	low					
4	Submission of advance copies of shore tanks fuel dipping and quality reports																	
5	Counterchecking of advance copies of consigned quantities and quality certificates of fuels and process materials for accuracy and lab accreditation	consistency of report in line with gauging procedure & timeframes	report data not correct	low	moderate	moderate	Request revision	low	very low	very low	low	Request report	low					
		completeness of report that it covers all tanks in question	tank data missing	very low	very high	moderate	Request revision	low	very low	very low	low	Request report	low					
		completeness of quantity report that it shows fuel source for traceability purposes	fuel source missing	low	very low	low	Request update	low	low	very low	low	Request update	low					
		completeness of report for consistency in NCV & % carbon values	NCV & % carbon data not accurate or missing	low	very high	high	Request revision	low	low	high	high	Request update	low					
6	Fuel materials consignment quantity & quality reports to be submitted to the RAO	consistency of reports in line with advance reports submitted to Station manager	inconsistent data	low	very low	low	Request update	low	na	na	na	na	na					
7	Process materials consignment quantity reports to be submitted to the RAO	consistency of reports	inconsistent data	low	very low	low	Request update	low	low	very high	very high	request for delivery note data	low					
8	Monthly fuel and process materials consumption to be submitted to RAO	consistency of data of reports	inconsistent data	low	very low	low	Request update	low	na	na	na	na	na					
9	Entering of fuel and process materials quantity [mainly in tonnes] and quality information [mainly NCV & %C] in respective in-house template yearly summary sheet/s, together with shipping details, date of shore tank gauging, names of testing laboratory, standards used	check each data input for accuracy of transcription	wrong entries of quantities or calculations	low	very high	high	double checking of data	low	low	very high	high	request for source data	low					
10	Calculation of monthly CO2 emissions in in-house template from weighted average NCV & %Carbon [for the Emission factor] of monthly fuel consumed	check consistency of monthly weighted average of NVC & Emission factor from % Carbon	wrong entries of quantities or calculations	low	very high	high	double checking of data	low	low	very high	high	request for source data	low					
		check uncertainty calculations for monthly dipping measurements	wrong entries of quantities or calculations	low	very high	high	double checking of data	low	low	very high	high	request for source data	low					
11	Calculation of monthly CO2 emissions from monthly process materials consumed	check consistency of emission factor used in calculations	wrong entries of quantities or calculations	low	very high	high	double checking of data	low	low	very high	high	request for source data	low					
		check uncertainty calculations of monthly weighbridge measurements	wrong entries of quantities or calculations	low	very high	high	double checking of data	low	low	very high	high	request for source data	low					
11	Calculation of total annual CO2 emissions using in-house template and preparation of GHG emissions report for fuels & process materials	check each data input for accuracy of transcription	wrong entries of quantities or calculations	low	very high	high	double checking of data	low	low	very high	high	request for source data	low					
		check uncertainty calculations for annual dipping measurements	wrong entries of quantities or calculations	low	very high	high	double checking of data	low	low	very high	high	request for source data	low					
		check uncertainty calculations of annual weighbridge measurements	wrong entries of quantities or calculations	low	very high	high	double checking of data	low	low	very high	high	request for source data	low					



Table 11-2

				Incidents Outcome & Risk Assessments												
Task No.	Task Description	Checks	Incident	Sampling Plan not followed					Data transcription errors (misreading Faults)							
				P	I	IR	CA	OR	P	I	IR	CA	OR			
1	Stock take of Fuel and Process materials stock take quantities on 1st January of every year & submission of reports	Availability and validity of accreditation certificate to ISO 17025	accreditation certificate not available or valid	na	na	na	na	na	na	na	na	na	na	na		
		availability & validity of calibration certificates of:														
		Master & field dipping tape	Calibration certificate not available or valid	na	na	na	na	na	na	na	na	na	na	na		
		Master & field temperature probe	Calibration certificate not available or valid	na	na	na	na	na	na	na	na	na	na	na		
		density meter	Calibration certificate not available or valid	na	na	na	na	na	na	na	na	na	na	na		
		availability and validity of tanks calibration certificates	Calibration certificate not available or valid	na	na	na	na	na	na	na	na	na	na	na		
2	Confirmed Fuel and Process materials stock take quantities on 1st January of every year to be submitted to RAO	consistency of report in line with gauging procedure	data inaccurate	low	very high	very high	request for revised data	low	na	na	na	na	na	na		
		completeness of report that it covers all tanks	data incomplete	low	very high	very high	request for revised data	low	na	na	na	na	na	na		
3	Fuel dipping process in shore tanks on arrival of consignment	Availability and validity of accreditation certificate to ISO 17025	data not available or not valid	na	na	na	na	na	na	na	na	na	na	na		
		availability & validity of calibration certificates of:														
		Master & field dipping tape	Calibration certificate not available or valid	na	na	na	na	na	na	na	na	na	na	na		
		Master & field temperature probe	Calibration certificate not available or valid	na	na	na	na	na	na	na	na	na	na	na		
		density meter	Calibration certificate not available or valid	na	na	na	na	na	na	na	na	na	na	na		
		availability and validity of tanks calibration certificates	Calibration certificate not available or valid	na	na	na	na	na	na	na	na	na	na	na		
4	Submission of advance copies of shore tanks fuel dipping and quality reports															
5	Counterchecking of advance copies of consigned quantities and quality certificates of fuels and process materials for accuracy and lab accreditation	consistency of report in line with gauging procedure & timeframes	report data not correct	low	very high	very high	request for revised data	low	na	na	na	na	na	na		
		completeness of report that it covers all tanks in question	tank data missing	low	very high	very high	request for revised data	low	na	na	na	na	na	na		
		completeness of quantity report that it shows fuel source for traceability purposes	fuel source missing	na	na	na	na	na	na	na	na	na	na	na		
		completeness of report for consistency in NCV & % carbon values	NCV & % carbon data not accurate or missing	low	very high	very high	request for revised data	low	na	na	na	na	na	na		
6	Fuel materials consignment quantity & quality reports to be submitted to the RAO	consistency of reports in line with advance reports submitted to Station manager	inconsistent data	low	very high	very high	request for revised data	low	na	na	na	na	na	na		
7	Process materials consignment quantity reports to be submitted to the RAO	consistency of reports	inconsistent data	na	na	na	na	na	na	na	na	na	na	na		
8	Monthly fuel and process materials consumption to be submitted to RAO	consistency of data of reports	inconsistent data	low	very high	very high	request for revised data	low	na	na	na	na	na	na		
9	Entering of fuel and process materials quantity [mainly in tonnes] and quality information [mainly NCV & %C] in respective in-house template yearly summary sheet/s, together with shipping details, date of shore tank gauging, names of testing laboratory, standards used	check each data input for accuracy of transcription	wrong entries of quantities or calculations	na	na	na	na	na	very low	very high	moderate	double checking of data	low			
10	Calculation of monthly CO2 emissions in in-house template from weighted average NVC & %Carbon [for the Emission factor] of monthly fuel consumed	check consistency of monthly weighted average of NVC & Emission factor from % Carbon	wrong entries of quantities or calculations	na	na	na	na	na	very low	very high	moderate	double checking of data	low			
		check uncertainty calculations for monthly dipping measurements	wrong entries of quantities or calculations	na	na	na	na	na	very low	very high	moderate	double checking of data	low			
11	Calculation of monthly CO2 emissions from monthly process materials consumed	check consistency of emission factor used in calculations	wrong entries of quantities or calculations	na	na	na	na	na	very low	very high	moderate	double checking of data	low			
		check uncertainty calculations of monthly weighbridge measurements	wrong entries of quantities or calculations	na	na	na	na	na	very low	very high	moderate	double checking of data	low			
11	Calculation of total annual CO2 emissions using in-house template and preparation of GHG emissions report for fuels & process materials	check each data input for accuracy of transcription	wrong entries of quantities or calculations	na	na	na	na	na	very low	very high	moderate	double checking of data	low			
		check uncertainty calculations for annual dipping measurements	wrong entries of quantities or calculations	na	na	na	na	na	very low	very high	moderate	double checking of data	low			
		check uncertainty calculations of annual weighbridge measurements	wrong entries of quantities or calculations	na	na	na	na	na	very low	very high	moderate	double checking of data	low			

[illegible]

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