

## **Consolidated information on initial & additional postponements and responses to technical clarifications: Natref**

The information provided below underpins the information already provided and summarised elsewhere in documents pertaining to the postponement application, including the final motivation reports and associated technical appendices, the final Atmospheric Impact Report and the final Comment and Response Report.

This document contains two sections:

- A. Technical clarification on aspects of the applications, linked to information contained in postponement applications;
- B. Reference tables consolidating information pertaining to the applications as extracted from the application documentation, along with references to the applicable emission sources in the redacted Atmospheric Emissions Licence and 2014 annual emissions report;

### **A. Responses to technical clarification questions**

#### **1. Why has Natref proposed a certain set of limits to apply from 1 April 2015 to 1 April 2018 and a different set to apply from 1 April 2018 to 1 April 2020?**

(Note: a detailed explanation of this postponement application is included in Chapter 2 of the technical appendix to the final motivation report for initial postponements, pg 3-5).

Natref's current point of compliance as defined in its licence is the main stack (for all emission sources tied into this stack), as well as six separate "local" stacks (Figure 1). It is currently only possible to sample at the main stack and at each of the 6 local stacks. The 'point of compliance' definition included in Part 2 of the 2013 Minimum Emissions Standards (MES) requires Natref to install 11 additional sample points at various ducts tied into the main stack (Figure 2). Natref has requested postponement until 1 April 2018 to install these sampling points. Since measurements are not presently available at these 11 new points, emissions of the points into the main stack have been estimated via theoretical calculations. These calculations will be verified by measurements once sample points are installed.

Hence, the alternative emission limits requested between April 2015 and April 2018 will be emission limits applicable to the main stack (i.e. point 1 in Figure 1), which are in line with Natref's currently applicable license conditions, and converted to align with the prescribed MES conditions of 10% O<sub>2</sub> reference and on a dry basis, expressed in concentrations. The limits requested for this category are reproduced in Table 1 below, as extracted from Table 4 of the final motivation report for initial postponements, page 21. Six existing local stacks (each one being a point of compliance as defined in the 2013 MES) are already measured in accordance with requirements and are fully compliant with the 2020 new plant standards.

For the period 1 April 2015 to 1 April 2018 Natref therefore requests that the main stack (as the point source) is regarded as the point of compliance for all those listed activities whose emissions exit via the main stack, where a single emission limit would be specified and can be measured to verify compliance thereto.

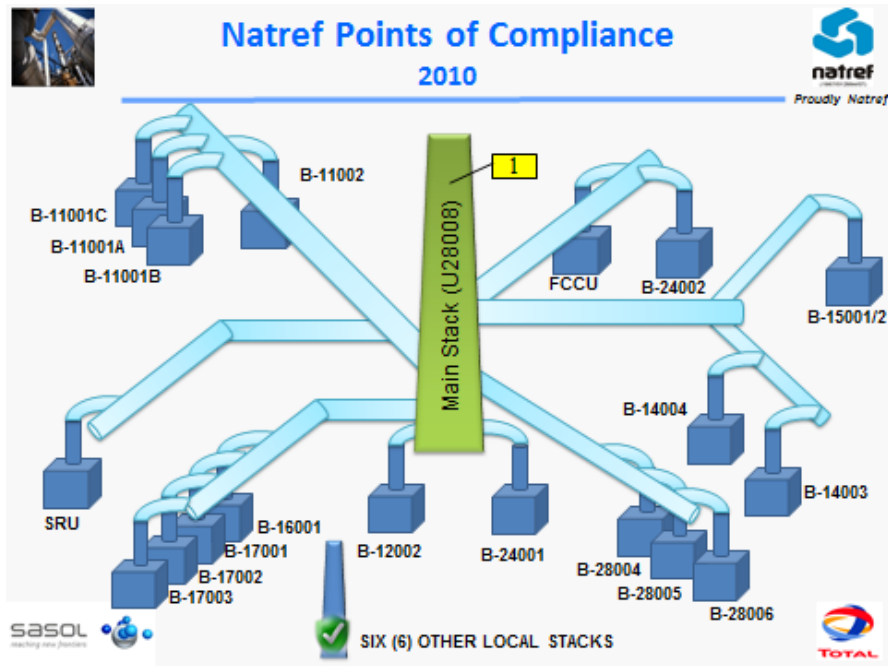


Figure 1: proposed compliance monitoring point for 1 April 2015 – 1 April 2018

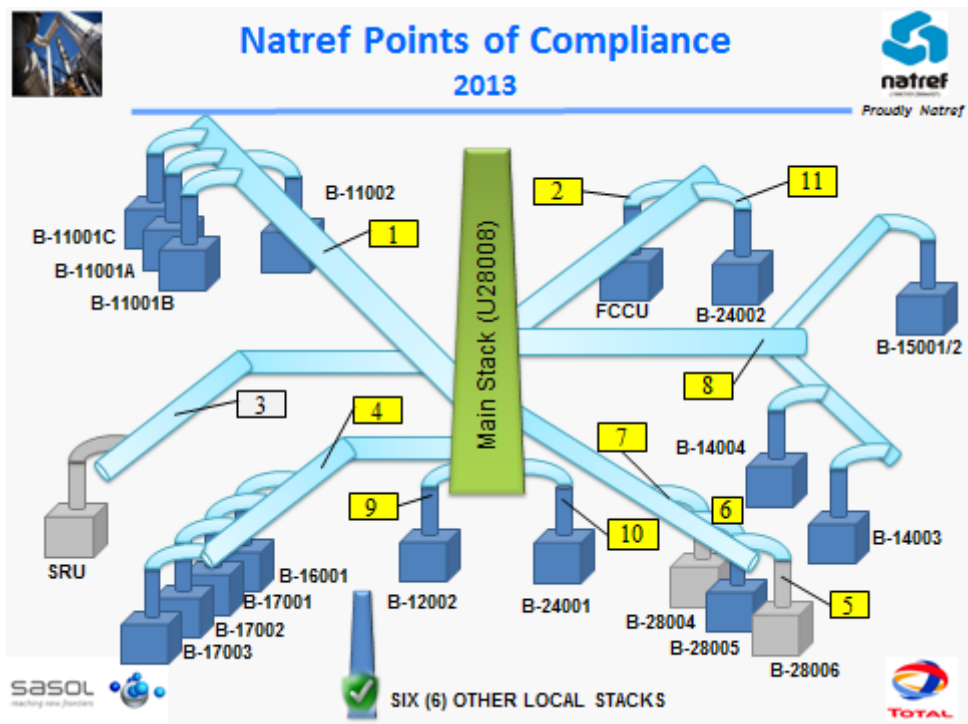


Figure 2: Compliance monitoring points, proposed to apply post 1 April 2018

The alternative emission limits requested for 1 April 2018 to 1 April 2020 are limits applicable to the 11 new points of compliance as shown in Figure 2 above, which are aligned with the ‘point of compliance’ definition provided in the 2013 MES. Since no measurements are presently available, these values were calculated based on available information, for the

purposes of applying for postponement of compliance timeframes. The applicable emission limits to apply from 1 April 2018 – 1 April 2020 are presented in Table 3, pg 23 of the final motivation report for additional postponement, and Table 5, pg 22 of the final motivation report for initial postponement.

**Table 1: Natref alternative emission limits requested for the period 1 April 2015 to 1 April 2018, as per the final motivation report for initial postponements (Table 4, pg 21)**

Unit Number as per AEL	Description of Unit	SO <sub>2</sub> mg/Nm <sup>3</sup>	PM mg/Nm <sup>3</sup>	NO <sub>x</sub> mg/Nm <sup>3</sup>	Comment
U28008	Main Stack with FCC (i.e. the combined concentration measured from units 1-11 in Figure 2)	5,600 (equivalent to current licence condition of 32 ton/day)	255 (equivalent to current licence condition of 120mg/Nm <sup>3</sup> )	520 (equivalent to current licence condition of 2.8 ton/day)	Proposed alternative emission limits
B14001	One of six local stacks: NU Reactor Charge	1700	120	1700	Compliant with MES  (hence not part of the postponement application)
B14002	One of six local stacks: NU E14001 Reboiler	1700	120	1700	
B14005	One of six local stacks: Platformer Reactor Charge	1700	120	1700	
B14006	One of six local stacks: Platformer Stabiliser Reboiler	1700	120	1700	
B17004	One of six local stacks: Kerosene Stripper Reboiler	1700	120	1700	
B25001	One of six local stacks: Reformer	1700	120	1700	

Natref's compliance measurements for Financial Year 2013/2014 appear, at face value, to significantly understate the requested alternative emission limits for three main reasons, among others:

1) the 2014 annual emissions report is reporting actual measured emissions based on current licence conditions, which are not corrected for specified MES 2015 conditions (in terms of temperature, pressure and oxygen content), which means the compliance report cannot be directly used for meaningful comparison - particularly where a mass balance approach needs to be equated to maximum daily average emission concentrations to correspond with the MES; 2) gas volumetric flow rates can vary significantly under the normal course of refinery operations, thus impacting the emission concentrations significantly even where tons of emissions from the main stack remain constant; 3) on a monthly basis, depending on the market demand, Natref operates on occasional Bitumen runs. The Bitumen run processes heavy crude oils which have higher sulphur content and hence higher SO<sub>2</sub> emissions than a normal refinery run, for which Natref's historical and current bubble of 32 t/day caters. Therefore, the emissions reported in the compliance report from the main stack are towards the lower end of the normal operating run, and are not representative of the emissions associated with a bitumen run.

To ensure compliance, mindful of the above issues under all normal operating conditions, Natref has applied for the alternative emissions limits as requested and indicated in Table 1.

## **2. The DEA requested Natref to consider a benchmark of 1.9kg SO<sub>2</sub>/ton crude as discussed in 2009. Can this be achieved?**

Comparing this benchmark to the current applicable limit for the main stack in the licence, this would reduce the daily limit of SO<sub>2</sub> from 32 t/day to 28.2 t/day (equivalent to approximately 5000 mg/Nm<sup>3</sup> @ 10% O<sub>2</sub> dry basis, NTP) in the main stack.

Natref may be able to achieve this limit with operational changes, incurring additional financial costs.

## **3. Natref has requested postponement on the special arrangement under sub-category 2.3 for the sulphur recovery unit (SRU) availability. What is the proposed % availability that can be met for the duration of the postponement?**

Based on current and historical performance, Natref may be able to achieve a minimum availability of 95% for the duration of the postponement.

## **4. Natref's application for postponement on storage tank emission abatement under sub-category 2.4 relies on the implementation of the Clean Fuels 2 programme as a solution. Given that the implementation of Clean Fuels 2 has been delayed, what is the alternate interim solution for compliance proposed by Natref?**

(Note: a detailed explanation of this postponement application is included in Chapter 5 of the technical appendix to the final motivation report for initial postponements, pg 9-10).

At the time of Natref's postponement application, Clean Fuels 2 had a defined implementation date. Since that time, and the announcement by the Department of Energy that Clean Fuels 2 is to be postponed, the length of time for which storage tanks would not be further abated is indefinitely extended. Hence, Natref commits that it will use the postponement period to relook at solutions for compliance on these tanks prior to Clean Fuels 2. A five-year postponement is therefore still required to investigate and implement alternate options.

## **5. Can Natref provide additional information on the compliance roadmaps and projects and timelines?**

The information requested is summarised in Chapter 7 of the motivation reports based on the detailed information presented in the technical appendices to the motivation reports for initial and additional postponements.

It is also briefly summarised below.

### **5.1 Additional Sample Ports for points of compliance monitoring on sources other than main stack**

#### Applicable to:

- Liquid Fuel Combustion Installation – Fuel Oil Fired Boiler (MES 1.2)
- Gas Fuel Combustion Installation – Fuel Gas Fired Boiler (MES 1.4)
- Combustion Installation – Furnaces (MES 2.1)
- Catalytic Cracking Units – FCC (MES 2.2)
- Sulphur Recovery Units – New SRU (MES 2.3)

Current Status:

- Installation has been completed for six (6) new emission sampling points on the refinery local stacks.
- Emission surveys were performed on these local stacks in October 2014 which re-confirmed that the SO<sub>x</sub>, NO<sub>x</sub> and PM are in compliance with both existing and new plant standards.
- Capital applications and procurement processes were advanced for the implementation of emissions monitoring infrastructure on eleven (11) points of compliance associated with the refinery's main stack as per Figure 2 above.

Planned Completion Date:

- Phased implementation from November 2015 to November 2018.

## 5.2 Fluid catalytic cracking (FCC) unit cyclone replacement (Phase 1)

Note that this is a partial measure toward FCC compliance. A further intervention to attain compliance is detailed in 5.3 below.

Description:

- Applicable to Catalytic Cracking Units – FCC (MES 2.2)
- Replacement of existing flue gas cyclones with new cyclones
- Expecting an improvement in efficiency over existing cyclones

Current Status:

- Refer to Chapter 1 of the technical appendix to initial postponement motivation report for an explanation of Natref's capital project due diligence process.
- The Front End Engineering Design development and governance process was completed and the project is presently in the detailed engineering phase in preparation for execution.

Planned Completion Date:

- Beneficial Operation date of October 2016, linked with the planned refinery maintenance schedule. Natref maintenance schedule dates are subject to revision, based on planned and unplanned shutdown scenarios and national refinery maintenance schedule activities.

## 5.3 Fluid catalytic cracking unit additional PM abatement technology (Phase 2)

Description:

- Applicable to Catalytic Cracking Units – FCC (MES 2.2)
- Expected reduction in particulate matter according to equipment manufacturers in the range of 85% to 95% and on this basis the FCC point of compliance is estimated to be brought within new plant standards following implementation of Phase 2

Current Status:

- Refer to Chapter 1 of technical appendix to initial postponement motivation report for an explanation of Natref's capital project due diligence process
- The Front End Engineering Design development and governance process was progressed for the installation of particulate matter abatement technology on the Fluid Catalytic Cracking unit.

**Planned Completion Date:**

- Beneficial Operation date of March 2022 for FCC flue gas treatment technology to reduce particulate matter emissions to full compliance with new plant standards, linked with the planned refinery maintenance schedule. Natref maintenance schedule dates are subject to revision, based on planned and unplanned shutdown scenarios and national refinery maintenance schedule activities.

**5.4 Installation of Low NOx burners on Boilers****Description:**

- These boilers are mixed fuel combustion installations – MES 1.2 and 1.4
- Retrofitting existing boilers (2 units) with NOx abatement system in the form of new burners

**Current Status:**

- Refer to Chapter 1 of technical appendix to initial postponement motivation report for an explanation of Natref's capital project due diligence process
- The Front End Engineering Design development and governance process was progressed for the installation of low NOx burners on two boilers

**Planned Completion Date:**

- Beneficial Operation date of July 2019, linked with the planned refinery maintenance schedule. Natref maintenance schedule dates are subject to revision, based on planned and unplanned shutdown scenarios and national refinery maintenance schedule activities.

**5.5 Rerouting H<sub>2</sub>S containing process gas from combustion systems and flare****Description:**

- Combustion Installations (MES 2.1)
- Applicable to Amine flash drum and Vacuum pre-flash off-gas
- Relates to MES 2.1 special arrangement (a)(i)

**Current Status:**

- Preliminary engineering studies initiated to explore the viability of implementing alternative processing technologies for off gas streams currently routed to the vacuum pre-flash vacuum off gas furnace and flare.

**Planned Completion Date:**

- Phased implementation from April 2018 to November 2020, linked with the planned refinery maintenance schedule. Natref maintenance schedule dates are subject to revision, based on planned and unplanned shutdown scenarios and national refinery maintenance schedule activities.

**5.6 Additional Sulfur Recovery Unit (SRU)****Description:**

- Applicable to Sulphur Recovery Units – (MES 2.3)
- Installation of a new SRU

Current Status:

- The tender process was completed as part of the Front End Engineering Design for a new SRU to reduce SOx emissions and meet MES requirements, specifically the prescribed availability level of 99%

Planned Completion Date:

- Refer to Chapter 1 of technical appendix to initial postponement motivation report for an explanation of Natref's capital project due diligence process
- Beneficial Operation date of June 2022, linked with the planned refinery maintenance schedule. Natref maintenance schedule dates are subject to revision, based on planned and unplanned shutdown scenarios and national refinery maintenance schedule activities.

## B. Table of consolidated information for Natref as extracted from initial and additional postponement applications

Located in initial or additional postponement application:	Listed activities seeking postponement		Applicable equipment unit numbers	Description of activity	Applicable MES, and requested alternative emissions limits and arrangements	Technical detail on application	Assessment of impacts on postponements for ambient air quality:					Other relevant references in application
	MES Category	Name of process plant					Atmospheric Impact Report					
				Section and page reference to applicable motivation report	Section and page reference to applicable motivation report		Pollutant	Point source parameters - AIR Table 4.1 pg 12	Emission rates – AIR Table 4.2 pg 12 (baseline) and Table 5.15 & 5.16 pg 61-62 (compliance scenarios)	Start up, shut down and upset conditions	Impacts: sensitive receptors & isopleths – AIR Section 5.1	
Additional postponement	1.2	Oil-fired boilers (PM, SO <sub>2</sub> ) (note: information is included in respect of 2020 new plant standard for NO <sub>x</sub> )	B28004, B28006	Section 2.3.1, pg 6  (additional postponement)	applicable MES and the alternative emissions limits or alternative special arrangements which Natref proposes to prevail during the period of postponement from <u>April 2018-April 2020</u> , at the defined points of compliance per listed activity: Table 3, pg 23  (additional postponement)	Chapter 1 (Section 1.2, pg 2) & Chapter 2 (Section 2.1-2.3, pg 4-17; & Section 2.4.2 pg 18-19)  (additional postponement)	SO <sub>2</sub>	Emissions to atmosphere via Main stack	Emissions to atmosphere via Main stack	Annexure 5 of Comment & Response Report	Section 5.1.8.1.1 and Fig 5-31, 5-32, 5-33 pg 64-66 *	Note that in Natref's case, all emissions from the main stack are modelled together, since monitoring is not currently in place at defined "points of compliance". Hence, results in the column to the left are in fact cumulative emissions from the various component listed activities as follows:  Section 5.1.8.1.1 and Fig 5-31, 5-32, 5-33 pg 64-66 (SO <sub>2</sub> );  Section 5.1.8.1.2 and Fig 5-34, 5-35, 5-36 pg 67-68 *  Section 5.1.8.1.3 pg 69-71 and Fig 5-37, 5-38, 5-39 *
							NO <sub>x</sub>				Section 5.1.8.1.2 and Fig 5-34, 5-35, 5-36 pg 67-68 *	
							PM				Section 5.1.8.1.3 pg 69-71 and Fig 5-37, 5-38, 5-39 *	
Initial postponement	1.4	Gas-fired boilers (NO <sub>x</sub> )	B28004, B28006	Section 2.3.1, pg 8  (initial postponement)	applicable MES and the alternative emissions limits or alternative special arrangements which Natref proposes to prevail during the period of postponement from <u>April 2018-April 2020</u> , at the defined points of compliance per listed activity: Table 5, pg 22  (initial postponement)	Chapter 3, pg 6-8  (initial postponement)	NO <sub>x</sub>	Emissions to atmosphere via Main stack	Emissions to atmosphere via Main stack	Annexure 5 of Comment & Response Report	Section 5.1.8.1.2 and Fig 5-34, 5-35, 5-36 pg 67-68 *	Section 5.1.8.1.3 pg 69-71 and Fig 5-37, 5-38, 5-39 (PM);  In addition, the cumulative impact of Sasolburg Operations' and Natref's criteria pollutant emissions (SO <sub>2</sub> , NO <sub>x</sub> , PM) is included in Appendix L of the AIR, with further information provided in Annexure 4 of the Comments & Responses Report
Additional postponement	1.4	Gas-fired boilers (NO <sub>x</sub> )  (note: information is included in respect of 2020 new plant standard for NO <sub>x</sub> )	B28004, B28006	Section 2.3.1, pg 6  (additional postponement)	applicable MES and the alternative emissions limits or alternative special arrangements which Natref proposes to prevail during the period of postponement from <u>April 2018-April 2020</u> , at the defined points of compliance per listed activity: Table 3, pg 23  (additional postponement)	Chapter 1 (Section 1.1, pg 1-2) & Chapter 2 (Section 2.3, pg 14-17; & Section 2.4.1 pg 17-18)  (additional postponement)	NO <sub>x</sub>	Emissions to atmosphere via Main stack	Emissions to atmosphere via Main stack	Annexure 5 of Comment & Response Report	Section 5.1.8.1.2 and Fig 5-34, 5-35, 5-36 pg 67-68 *	
Initial postponement	2.1	Amine flash drums: special arrangement regarding continuous flaring of hydrogen sulphide rich gas (SO <sub>2</sub> )	F16105	Section 2.3.6, pg 9  (initial postponement)	applicable MES and the alternative emissions limits or alternative special arrangements which Natref proposes to prevail during the period of postponement: Table 5 pg 22  (initial postponement)	Chapter 4, pg 8-9  (initial postponement)	SO <sub>2</sub>	Emissions to atmosphere via Main stack	Emissions to atmosphere via Main stack	-	Section 5.1.8.1.1 and Fig 5-31, 5-32, 5-33 pg 64-66 *	



Additional postponement	2.1	Furnaces except vacuum offgas furnace (PM, SO <sub>2</sub> )	B11001A, B11001B, B11001C, B11002, B24002, B15001/2, B14003, B14004, B24002, B24001, B16001, B17001, B17002, B17003	Section 2.3.2, pg 6 (additional postponement)	applicable MES and the alternative emissions limits or alternative special arrangements which Natref proposes to prevail during the period of postponement from <u>April 2018-April 2020</u> , at the defined points of compliance per listed activity: Table 3, pg 23  (additional postponement)	Chapter 1 (Section 1.3, pg 3-4) & Chapter 2 (Section 2.1 & 2.2, pg 4-13; & Section 2.4.3 pg 20)  (additional postponement)	SO <sub>2</sub>  PM	Emissions to atmosphere via Main stack	Emissions to atmosphere via Main stack	Annexure 5 of Comment & Response Report	Section 5.1.8.1.1 and Fig 5-31, 5-32, 5-33 pg 64-66 *  Section 5.1.8.1.3 pg 69-71 and Fig 5-37, 5-38, 5-39 *
Additional postponement	2.1	Vacuum offgas furnace (PM, SO <sub>2</sub> )	B12002	Section 2.3.3, pg 6 (additional postponement)	applicable MES and the alternative emissions limits or alternative special arrangements which Natref proposes to prevail during the period of postponement from <u>April 2018-April 2020</u> , at the defined points of compliance per listed activity: Table 3, pg 23  (additional postponement)	Chapter 1 (Section 1.3, pg 3-4) & Chapter 3, pg 21-23  (additional postponement)	SO <sub>2</sub>  PM	Emissions to atmosphere via Main stack	Emissions to atmosphere via Main stack	Annexure 5 of Comment & Response Report	Section 5.1.8.1.1 and Fig 5-31, 5-32, 5-33 pg 64-66 *  Section 5.1.8.1.3 pg 69-71 and Fig 5-37, 5-38, 5-39 *
Initial postponement	2.2	Fluidised Catalytic Cracker (FCC)	FCCU	Section 2.3.4, pg 8-9 (initial postponement)	applicable MES and the alternative emissions limits or alternative special arrangements which Natref proposes to prevail during the period of postponement from <u>April 2018-April 2020</u> , at the defined points of compliance per listed activity: Table 5, pg 22  (initial postponement)	Chapter 6, pg 11-13 (initial postponement)	PM	Emissions to atmosphere via Main stack	Emissions to atmosphere via Main stack	Annexure 5 of Comment & Response Report	Section 5.1.8.1.3 pg 69-71 and Fig 5-37, 5-38, 5-39 *
Additional postponement	2.1 & 2.2	Special arrangement: bubble cap of all Combustion Installations and Catalytic Cracking Units (SO <sub>2</sub> )  (note: information is included in respect of bubble cap of all Combustion Installations and Catalytic Cracking Units for new plants)	All units referenced above in this table classified as Category 2.1 and 2.2 listed activities	Section 2.3.2, 2.3.3 & 2.3.4 pg 6 (additional postponement)	applicable MES and the alternative emissions limits or alternative special arrangements which Natref proposes to prevail during the period of postponement from <u>April 2018-April 2020</u> , at the defined points of compliance per listed activity: Table 3, pg 23  (additional postponement)	Chapter 1 (Section 1.4, pg 4) & Chapter 2 (Section 2.2, pg 9-13)  (additional postponement)	SO <sub>2</sub>	n/a  Emissions as separate listed activities as described above			Section 5.1.8.1.1 and Fig 5-31, 5-32, 5-33 pg 64-66 *
Initial postponement	2.3	Sulfur recovery unit: special arrangement (a) (SO <sub>2</sub> )	SRU	Section 2.3.5, pg 9 (initial postponement)	applicable MES and the alternative emissions limits or alternative special arrangements which Natref proposes to prevail during the period of postponement from <u>April 2018-April 2020</u> , at the defined points of compliance per listed activity: Table 5, pg 22  (initial postponement)	Chapter 7, pg 13-14 (initial postponement)	SO <sub>2</sub>	Emissions to atmosphere via Main stack	Emissions to atmosphere via Main stack	Annexure 5 of Comment & Response Report	Section 5.1.8.1.1 and Fig 5-31, 5-32, 5-33 pg 64-66 *

Initial postponement	2.4	Storage tanks: Special arrangement (b)(i) (TVOC)		Section 2.3.7, pg 10 (initial postpone-ment)	applicable MES and the alternative emissions limits or alternative special arrangements which Natref proposes to prevail during the period of postponement: Table 5 pg 22  (initial postponement)	Chapter 5, pg 9-10  (initial postpone-ment)	TVOC	n/a (fugitive emissions)  Refer to AIR Section 4.4 pg 13 for detail on monitoring and measurement	
Initial postponement	Part 2: General	Compliance monitoring under regulation (16) and reporting under regulation (17) in respect of monitoring and reporting at "points of compliance" as defined in Part 1: Definitions	n/a	n/a	Refer to text under Chapter 5 pg 20-21.  As a consequence, compliance monitoring is proposed to be conducted at the main stack for <u>April 2015-April 2018</u> (Table 4 pg 21).  (initial postponement)  Figures 1 and 2 above graphically illustrate the proposed compliance monitoring point for <u>1 April 2015 – 1 April 2018</u> and compliance monitoring points <u>post 1 April 2018</u> , aligned with 2013 Minimum Emissions Standards.	Chapter 2, pg 3-5  (initial postpone-ment)	n/a  (monitoring require-ment)	n/a.  Since monitoring will only be implemented at defined "points of compliance" by April 2018, all emissions from the main stack have been modelled together.	

\*Note that all emissions from the main stack are modelled together, since monitoring is not currently in place at defined "points of compliance".