Torrance Refining Company

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VIA OVERNIGHT DELIVERY AND E-MAIL: srees@aqmd.gov

Sarah Rees, Ph.D.
Deputy Executive Officer
Planning and Rules
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765

Re: Supplementary Comments on South Coast Air Quality Management District Staff's 1109.1 Proposed Rule Emissions of Oxides of Nitrogen from Petroleum Refineries and Related Industries Study Draft Report, Prepared by Norton Engineering on December 4, 2020.

Dear Dr. Rees,

Torrance Refining Company LLC ("TORC") is pleased to submit the following comments to the South Coast Air Quality Management District ("District") in response to the District's report prepared by Norton Engineering ("Norton") entitled *NOx BARCT Analysis Review* (December 4, 2020) ("Norton Analysis") as part of the ongoing Proposed Rule 1109.1 Emissions of Oxides of Nitrogen from Petroleum Refineries and Related Industries ("PR 1109.1") rulemaking. Our comments specifically address certain sections of the Norton Analysis as noted below. Please note that these comments supplement TORC's comment letters submitted to the District on November 20, 2020, December 14, 2020, and January 27, 2021.

Combining Control Devices

Beginning on page 4, the Norton Analysis explains the different mechanisms for NOx formation, (i.e., prompt NOx, fuel NOx, and thermal NOx), and then, lists combinations of technologies to meet proposed PR 1109.1. NOx BARCT levels. However, the main thrust of the Norton Analysis to achieve the currently proposed PR 1109.1 NOx BARCT levels is the stacking of Ultra-Low NOx Burners ("ULNB") with a Selective Catalytic Reduction system ("SCR") or pairing SCRs in series. The Norton Analysis indicates on page 7 that based on current and emerging technology, PR 1109.1 NOx BARCT levels proposed by the District are not technologically feasible without providing incremental stepped reduction with distinctively different combination of technologies (burner and catalytic reaction). However, based on our inquiries with SCR system vendors, there are no specific examples of refining industry installation using either of the proposed combination

of technologies that can meet the District's currently proposed NOx BARCT levels, which renders the Norton Analysis' BARCT determination as theoretical and untested. In other words, not achieved in practice and currently technically infeasible.

Ultra-Low NOx Burners

On page 12, the Norton Analysis highlights the issues with ULNB retrofit, and based on these issues, suggests that retrofitting may or may not be feasible for every Process Heater covered by PR 1109.1. Thus, according to the Norton Analysis, the only viable method to meet the currently proposed NOx BARCT levels is to replace the entire Process Heater which is cost-prohibitive. The Norton Analysis further suggests on page 12 that additional fuel gas treating equipment is required to condition the fuel for ULNB NOx reduction efficiency, with likely a reduction in overall Process Heater performance and additional significant increases in cost, making ULNBs installation even more cost prohibitive. Yet, these factors associated with the installation of UNLBs have not been factored into the Norton Analysis or any substantive analysis conducted by District staff to date in the PR 1109.1 rulemaking process.

Moreover, the Norton Analysis provides no clear distinction between Low NOx Burners ("LNB") and ULNB, only simply noting that ULNB technology has internal flue gas recirculation ("IFGR"). Notably, in Table 3.1.1 of the Norton Analysis, LNB technology was eliminated as an emission control for meeting proposed NOx BARCT levels, and the discussion beginning on page 13 focuses instead on the next generation of ULNB (i.e., ClearSign Core™, John Zink Hamworthy SOLEX™, Flameless), which departs from existing, demonstrated burner technology, and which the Norton Analysis indicates that it remains unproven technology.

Other NOx Controls

The Norton Analysis provides a discussion on Page 19 of additional NOx control technologies including Selective Non-Catalytic Reduction ("SNCR") and LoTOx™. These technologies are technically infeasible in our Refinery Process Heaters due to absence of appropriate adiabatic chambers in the case of SNCR and the absence of available space in the case of LoTOx™. Additionally, these NOx control technologies may not be capable of meeting the District's currently proposed NOx BARCT levels.

Co-Pollutant Formation

On page 20, the Norton Analysis provides a discussion of ammonia bisulfate ("ABS") formation. Figure 3.2-1: Hitachi-Zosen chart for ABS and Ammonium sulfate formation indicates that ABS formation is temperature dependent and infers that at higher temperatures there is potentially no ABS formation. Accordingly, based on typical SCR operating temperatures, there should be minimal or no secondary particulate matter formation less than 2.5 microns ("PM2.5"). In addition, this should not trigger PM2.5 New Source Review (NSR) Best Available Control Technology (BACT) requirements when installing SCR systems to comply with PR 1109.1. The

ABS/co-pollutant issue needs to be addressed as part of the PR 1109.1 rulemaking process in order to avoid permitting delays associated with rule implementation, if adopted.

2 ppmv NOx BARCT Level

On page 30, the Norton Analysis states *"[t]he 2 ppmv NOx emission limit was considered technically feasible during the NOx RECLAIM BARCT review performed by NEC in 2014.[35]"* This statement is misleading because the 2015 RECLAIM NOx shave NO_X BARCT level of 2 ppmv was based on a programmatic approach, not based on individual equipment performance, which is the basis of the current PR 1109.1 rulemaking. Further, the Norton Analysis' proposition that a 2 ppmv NOx BARCT level is technically feasible is based a number of dependent and flawed assumptions, mainly:

- Low superficial velocity (< 10 ft/s),
- SCR system operating in the optimum temperature window based on the selected catalyst formulation,
- Multiple SCR catalyst beds (minimum of two),
- Provision for a secondary ammonia injection grid (AIG) for one or more downstream SCR catalyst bed(s),
- Ammonia ("NH3") destruction bed, and
- Even distribution of NH3 in the flue gas entering the SCR catalyst bed(s).

As we expressed in the December 10, 2020 Working Group 16 meeting, we do not believe that an NH_3 destruction bed will work or should be required as part of meeting any proposed NOx BARCT level. During that working group meeting, neither Norton nor FERCo were able to provide a reasonable explanation on how a NH_3 destruction bed would work with a 2 ppmv NOx BARCT level, particularly when the NH_3 is converted back to NOx after the SCR system.

The Norton Analysis also indicates on page 27 that the 2 ppmv NOx BARCT level is only feasible if SCRs are built in series together with the six criteria stated above. This would potentially double the SCR installation costs, making such an installation cost-prohibitive, and likely technically infeasible due to plot space constraints. In prior discussions or working group meetings, the District has not previously mentioned multiple SCR catalyst beds or reactors with AIGs in between or the need of NH_3 catalyst. Similar with ULNB combined with SCR, the District has not provided any example of a proven refining industry installation with SCRs built in series that can meet the proposed NOx BARCT levels, which renders the Norton Analysis' BARCT determination as theoretical and untested. In other words, not achieved in practice and currently technically infeasible.

Other Considerations

In addition to the comments above regarding the Norton Analysis, the following are important issues, which should be further addressed in the Norton Analysis and/or the District's PR 1109.1 rulemaking process:

- Process Heater convection coils make it more costly to retrofit Process Heaters with ULNBs. We agree with this statement. The District must consider this in their cost effectiveness calculations and analysis.
- The Norton Analysis cost estimate for ULNB is approximately $2,000,000 – $3,000,000 per Process Heater. This estimate significantly understates the actual cost associated with ULNB installation. Depending on the complexity of the retrofit including the Process Heater's convection section, based on our engineering analysis to date, the Norton Analysis cost estimated understates the actual installation cost by a factor of 3 to10.
- The Norton Analysis on the Sulfur Recovery Unit ("SRU") Tail Gas Unit (TGU) is confusing. It states on page 49 that the District's proposed NOx BARCT level can be met by using advanced burner technology. However, the Norton Analysis previously contradicts itself on page 48 by concluding that it is not feasible to be able to control the stack NOx with burners due to the fuel NOx formed in the SRU combustor. We agree with this conclusion as the Refinery's SRU has inline process reaction burners that cannot be retrofitted with ULNBs, and even if it could, would add to the NOx emissions at the SRU stack.
- It is clear throughout the Norton Analysis that they suggest that less than 10 ppmv NOx is achievable with current technology and that 2 ppmv is only potentially possible on a theoretical basis. It is unclear whether technology in any form will be achieved in practice and commercially viable when needed in order to meet a theoretical NOx level. Therefore, the District must reconsider the currently proposed NOx BARCT levels, which based on its own consultants are technically infeasible and/or cost prohibitive.

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In closing, based on the comments provided in this letter, TORC believes that the Norton Analysis requires additional work. Thus, it cannot be a basis to support the District's currently proposed PR 1109.1 BARCT NOx levels. We ask that the District direct Norton to address the inaccurate assumptions/deficiencies identified in our and other stakeholder comments and then issue a revised NOx BARCT analysis review.

Thank you for the opportunity to submit comments on the Norton Analysis. We stand ready to work diligently with District staff and other stakeholders to address the complex issues associated with PR 1109.1.

Please note that in submitting this letter, TORC reserves the right to supplement its comments as it deems necessary, especially if additional or different information is made available to the public regarding the PR 1109.1 rulemaking process.

If you have any questions regarding TORC's comments, please call or email me or John Sakers. Our office phone numbers are 310-212-4500 (Steve) and (310) 212-4292 (John).

Sincerely,

Steve Steach
Refinery Manager

cc: **District Staff - via e-mail and overnight delivery**

Wayne Nastri	Executive Officer
Susan Nakamura	Assistant Deputy Executive Officer
Michael Krause	Planning and Rules Manager

cc: **District Refinery Committee Members - via e-mail and overnight delivery**

Dr. William A. Burke	Governing Board Chair
Hon. Ben Benoit	Governing Board Vice-Chair and Refinery Committee Member
Hon. Larry McCallon	Governing Board Member and Refinery Committee Chair
Hon. Lisa Bartlett	Governing Board Member and Refinery Committee Member

cc: **District Governing Board Members - via overnight delivery**

Hon. Joe Buscaino	Governing Board Member
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