



## REGION 6

DALLAS, TX 75270

July 15, 2024

Mr. Cory Chism, Director  
Office of Air  
Texas Commission on Environmental Quality (MC 122)  
Post Office Box 13087  
Austin, Texas 78711-3087

Re: Texas Commission on Environmental Quality Flare Operating and Monitoring Requirements as Specified in Clean Air Act New Source Review and Title V Operating Permits

Dear Mr. Chism:

As part of our oversight responsibilities under the Clean Air Act (CAA), this letter conveys the EPA's concerns regarding TCEQ's recent responses to various EPA comment and title V permit objection letters related to permit requirements necessary to ensure flares achieve specific destruction and removal efficiencies (DRE). EPA understands the complexity of addressing this issue given that a significant number of facilities operate flares under TCEQ's longstanding guidance-based 99% DRE assumption. Therefore, we are providing an evaluation of this DRE assumption and recommended solutions (see Enclosure to this letter) to ensure that TCEQ permits include sufficient monitoring and operational requirements necessary to assure compliance with all applicable requirements, including compliance with emissions limitations that rely, in part, on the 99% DRE assumption authorized by TCEQ. In addition, the Enclosure to this letter provides recommendations that may contribute to a reduction in VOC emissions in areas with a significant concentration of industrial facilities and potentially decrease disparate impacts to fenceline communities.

As always, EPA remains committed to working with TCEQ to ensure that NSR and title V permits are consistent with all applicable requirements and the EPA-approved Texas air permitting program. If you have questions or wish to discuss this issue further, please contact me or have your staff contact Cynthia Kaleri, Air Permits Supervisor at (214) 665-6772, or Jonathan Ehrhart of her staff at (214) 665-2295.

Sincerely,

David F. Garcia  
Director  
Air and Radiation Division

Enclosure

**ENCLOSURE**  
**U.S. ENVIRONMENTAL PROTECTION AGENCY**  
**EVALUATION OF FLARE DRE AND ENFORCEABLE LIMITS IN CAA PERMITS**

**Introduction**

The U.S. Environmental Protection Agency (“EPA”) Region 6 has evaluated the Texas Commission on Environmental Quality’s (“TCEQ”) responses to our continuing concerns related to Destruction and Removal Efficiency (“DRE”) assumptions for flares and the lack of adequate monitoring and/or operating limits necessary to ensure compliance with VOC emissions limitations that derive, in part, from specific DRE assumptions. The basis of EPA’s evaluation relies on our extensive data and technology review efforts pertaining to flare performance as documented in multiple Federal CAA rulemakings. TCEQ’s implementation of a 99% VOC DRE assumption has become a programmatic concern since this assumption was developed through early TCEQ guidance and included in the Texas Administration Code many years ago. Despite EPA’s concerns, TCEQ’s 99% DRE assumption has not been updated over the years to align with available data and technological advances in flare monitoring that is necessary to determine and verify flare performance.

TCEQ has referenced the monitoring and operating limits (e.g., Net Heating Values or “NHV”) specified in the 40 C.F.R. Part 60 General Provisions (GPs) of the New Source Performance Standards (“NSPS”) and 40 C.F.R. Part 63 GPs of the National Emissions Standards for Hazardous Air Pollutants (“NESHAP”) as well as specific rule subparts such as the Ethylene Production MACT (“EMACT”) and the Petroleum Refinery MACT as justification to allow applicants to assume and attribute a 99% DRE to both assisted and non-assisted flares for C1-C3 compounds. TCEQ has also relied on AP-42, as well as TCEQ’s Chapter 115 HRVOC rules, TCEQ’s Tier I presumptive BACT for flares, and TCEQ flare guidance as justification to authorize a 99% DRE assumption for flares. However, TCEQ’s justifications for the use of a 99% VOC DRE assumption are not supported by the latest scientific data. Thus, EPA recommends that TCEQ address these concerns by considering enhanced flare operational and monitoring requirements that align with available data and technological advances in flare monitoring.

EPA has articulated these concerns in formal comments on TCEQ NSR permits, TCEQ rules, and title V permit objections and petition orders.<sup>1</sup> In addition, EPA Region 6 and the EPA’s Office of Air Quality Planning and Standards (OAQPS) participated in a technical call with TCEQ staff during which EPA provided specific data and information available from federal rulemaking efforts to support our ongoing concerns. As discussed further below, we are providing a summary of our technical concerns related to TCEQ’s flare DRE assumptions and the lack of adequate monitoring and operating requirements necessary to assure continuous compliance with permitted VOC emission limitations.

**EPA’s Evaluation of TCEQ DRE Assumptions and Permit Requirements**

The EPA originally promulgated requirements for flares in the early 1980s based on the best available flare emissions data at the time and presumed that the flare requirements contained in the General Provisions (GPs) of the New Source Performance Standards (NSPS) of 40 C.F.R. Part 60 and the National Emissions Standards for Hazardous Air Pollutants (NESHAP) of 40 C.F.R. Part 63 (specifically, 40 C.F.R. §§ 60.18 and 63.11(b)) would be

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<sup>1</sup> See e.g., Letter from Cynthia Kaleri, Air Permits Section Manager, EPA Region 6 to Laurie Gharis, TCEQ, *Clean Air Act New Source Review Permits for the Formosa Plastics Corporation Texas, Point Comfort Chemical Complex, located in Calhoun County, Texas* (September 28, 2023); EPA Region 6, Quadrennial Review Comments, Non-Rule Project 2023-045-115-AI (May 8, 2023); EPA Region 6 title V permit O1426 objection on Equistar Chemicals, LP, Channelview Facility located in Harris County, Texas (May 18, 2023) at 3; EPA Region 6 title V O1668 objection on Shell Chemical LP, Deer Park Chemical Plant located in Harris County, TX (November 2, 2022) at 4; *In the Matter of BP Amoco Chemical Company*, Order on Petition No. VI-2017-6 at 19-25 (July 20, 2021); *In the Matter of Valero Refining-Texas, L.P.*, Order on Petition No. VI-2021-8 at 36-41 (June 30, 2022); EPA Region 6 title V permit O1267 objection on TotalEnergies Port Arthur Refinery located in Jefferson County, Texas at 6 (April 27, 2023).

sufficient to assure a high level of control efficiency for flares.<sup>2</sup> In particular, it had generally been presumed that “flares operating in accordance with these specifications destroy volatile organic compounds (VOC) or volatile HAP with a destruction efficiency of 98 percent or greater” (63 FR 24437, May 4, 1998). However, more recently, EPA has gathered new flare emissions data suggesting that the GP flare requirements may not be sufficient to ensure this level of control for certain source categories. During the development of the Petroleum Refinery MACT rulemaking for example, EPA discovered that the flare GP requirements do not account for certain problems that can reduce combustion efficiency, such as those caused by over-assisting steam or air-assisted flares.<sup>3</sup> Based on information gathered by EPA, TCEQ, and others, the EPA has been systematically evaluating available data and, where sufficient information exists, updating its regulations on a source category-by-source category basis to include additional requirements to address known problems related to flare performance (among other things).

As discussed at length in the Petroleum Refinery MACT (regulated under 40 C.F.R. part 63, subpart CC), Ethylene Production MACT (regulated under 40 C.F.R. part 63, subpart YY), and Hazardous Organic NESHAP or (“HON”) rulemakings (regulated under 40 C.F.R. part 63 subparts F, G, H, and I), EPA has found that compliance with the flare GP requirements at 40 C.F.R. §§ 60.18(b) and 63.11(b) are inadequate to ensure proper performance of flares at refineries and other petrochemical facilities at all times, particularly when either assist steam or assist air is used. Thus, EPA promulgated additional flare requirements in sector-specific rules such as the Petroleum Refinery MACT (80 FR 75178, December 1, 2015), Ethylene Production MACT (85 FR 40386, July 6, 2020), and HON (89 FR 42932, May 16, 2024) that will ensure steam- and air-assisted flares will meet 98% control of organic HAP (and VOC) when in continuous compliance with these regulations.

The Petroleum Refinery MACT first highlighted the importance of factoring in assist media (e.g., steam) when determining the combustibility of waste gas at the flare tip, also known as the Combustion Zone Net Heating value, or “NHV<sub>cz</sub>.” This new limitation accounts for the dilution in heating value from the addition of assist media and requires monitoring additional operational parameters. Prior to the Petroleum Refinery MACT, flare gas Net Heating Value (“NHV”) was calculated in accordance with the general flare provisions at 40 C.F.R. § 60.18(f)(3), which only accounts for the heating value of flare inlet gas as it entered the flare header. To support the NHV<sub>cz</sub> operational limit, the Petroleum Refinery MACT regulations require, for steam- and air-assisted flares, that “the owner or operator shall install, operate, calibrate, and maintain a monitoring system capable of continuously measuring, calculating, and recording the volumetric flow rate of assist air and/or assist steam used with the flare,” or certain alternative options. *Id.* § 63.670(i). Among other requirements, EPA finalized regulations requiring flares in the petroleum refining sector to meet a minimum NHV<sub>cz</sub> operating limit of 270 Btu/scf on a 15-minute block period basis. *Id.* § 63.670(e).

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<sup>2</sup> EPA originally promulgated requirements for flares used as a control device on October 18, 1983, in the standards of performance for equipment leaks of Volatile Organic Compounds (VOC) in the Synthetic Organic Chemical Manufacturing Industry (SOCMI) at 40 CFR Part 60, Subpart VV. Shortly thereafter, on January 21, 1986, the Agency modified the requirements for flare exit velocity limitations and moved the requirements from 40 CFR Part 60, Subpart VV to the General Provisions at 40 CFR Part 60, Subpart A “for easy reference by all subparts in Part 60 and Part 61” (51 FR 2700). Following the addition of the 1990 amendments to the Clean Air Act, the EPA then promulgated these same requirements for flares used as a control device on March 16, 1994, in the General Provisions at 40 CFR Part 63, Subpart A for easy reference by rules being developed in Part 63. Finally, on May 4, 1998, the EPA added to the General Provisions of both Parts 60 and 63 requirements specifically for non-assisted flares that have a diameter of 3 inches or greater and have a hydrogen content of 8.0 percent (by volume) or greater. Today, flares used as a control device subject to national emissions standards for hazardous air pollutants (NESHAP) or new source performance standards (NSPS) are required to meet these certain design and operating requirements as specified in the General Provisions at 40 CFR 63.11(b) or 40 CFR 60.18(b) respectively.

<sup>3</sup> See 79 FR 36905 (June 30, 2014) (“In 2012, the EPA compiled information and test data collected on flares and summarized its preliminary findings on operating parameters that affect flare combustion efficiency . . . The EPA submitted the report, along with a charge statement and a set of charge questions to an external peer review panel. The panel concurred with the EPA’s assessment that three primary factors affect flare performance: (1) The flow of the vent gas to the flare; (2) the amount of assist media (e.g., steam or air) added to the flare; and (3) the combustibility of the vent gas/assist media mixture in the combustion zone (i.e., the net heating value, lower flammability, and/or combustibles concentration) at the flare tip.”)

Through the development of the Petroleum Refinery MACT and Ethylene Production MACT rulemakings, EPA explicitly identified monitoring and operating requirements that can ensure flares continuously achieve a level of 98% control of organic HAP and VOC. The petroleum refinery and ethylene production source category standards *did not*, however, identify monitoring and operating requirements that would ensure steam-assisted, air-assisted, or non-assisted flares will continuously achieve 99% VOC DRE. As EPA explained in the final rule for petroleum refineries:

Based on the results of all of our analyses, the EPA is finalizing a single minimum NHVcz operating limit for flares subject to the Petroleum Refinery MACT standards of 270 Btu/scf during any 15-minute period. The agency believes, given the results from the various data analyses conducted, that this operating limit is appropriate, reasonable and *will ensure that refinery flares meet 98-percent destruction efficiency at all times* when operated in concert with the other suite of requirements refinery flares need to achieve (e.g., flare tip velocity requirements, visible emissions requirements, and continuously lit pilot flame requirements).

80 Fed. Reg. 75211 (December 1, 2015) (emphasis added).

Similarly, EPA finalized amendments to the Ethylene Production MACT standards in 2020 which directly applies the petroleum refinery rule flare requirements to the flares in the ethylene production source category (with clarifications). When in continuous compliance with these regulations, a source can ensure a 98% destruction efficiency to conform with the EMACT standards. In its proposed rule, EPA explained again that:

In this action, in lieu of requiring compliance with the operating limits for net heating value of the flare vent gas in the General Provisions, we are proposing a single minimum operating limit for the net heating value in the combustion zone gas (NHVcz) of 270 Btu/scf during any 15-minute period for steam-assisted, air-assisted, and non-assisted flares used as APCDs [air pollution control devices] in the Ethylene Production source category. The Agency believes, given the results from the various data analyses conducted for the Petroleum Refinery Sector Rule, that this NHVcz operating limit promulgated for flares used in the Petroleum Refinery Sector source category is also appropriate, reasonable, and will ensure flares used as APCDs in the Ethylene Production source category meet *98-percent destruction efficiency at all times* when operated in concert with the other proposed suite of requirements that flares need to comply with (e.g., continuously lit pilot flame requirements, visible emissions requirements, and flare tip velocity requirements) (see the memoranda titled *Petroleum Refinery Sector Rule: Operating Limits for Flares and Flare Control Option Impacts for Final Refinery Sector Rule* in Docket ID Nos. EPA-HQ-OAR-2010-0682-0206 and EPA-HQ-OAR-2010-0682-0748, respectively).

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The Agency is unaware of any data that suggest that flares used as controls in the Ethylene Production source category are consistently overcontrolling HAP emissions beyond *98-percent* control. And, while the Agency is proposing new operating requirements for flares used as controls in this source category to ensure at least 98-percent control given that more recent studies have shown that some flares are operating less efficiently than 98-percent control (see section IV.A.1 of this preamble), for purposes of the MACT-allowable risk analysis, we are required to evaluate whether it is necessary to tighten the existing MACT standard and subsequent level of performance a flare is expected to achieve. Thus, weighing all of these factors for flares, we believe that the actual emission levels are a reasonable estimation of the MACT-allowable emissions levels where the performance standards allow the use of a flare as an APCD (e.g., storage vessels, ethylene process vents, equipment leaks, transfer racks, and waste operations).

84 Fed. Reg. 54298, 54286 (October 9, 2019) (emphasis added).<sup>4</sup>

TCEQ's routine reference to the monitoring and operational limitations contained in the Ethylene Production MACT and Petroleum Refinery MACT rulemakings (and the GP requirements at 40 C.F.R. § 60.18) as justification to assume 99% VOC DRE is inconsistent with the EPA's findings. In consultation with both the EPA Sector Policies and Program Division ("SPPD") of OAQPS and flare experts at the Office of Enforcement and Compliance Assurance ("OECA"), EPA Region 6 has communicated that TCEQ's 99% VOC DRE assumptions are not substantiated by EPA MACT regulations nor EPA Consent Decrees issued for facilities since these requirements were not designed to ensure 99% control of organic HAPs or VOCs.

As a general matter, to ensure a particular control efficiency, a source must ensure that a particular NHVcz is attained, which can vary minute by minute depending on a variety of factors. Such variability necessitates specific monitoring to assure continuous compliance. When in continuous compliance with the operating and monitoring provisions of the Petroleum Refinery and Ethylene Production MACT standards, sources with assisted flares can ensure that they will reliably achieve 98% DRE as established in the regulations, not 99% DRE as claimed by TCEQ. However, using the relationship between Combustion Efficiency (CE), NHVcz, and DRE, EPA believes that the 99% DRE level could be substantiated through the development and implementation of enhanced operating requirements including, but not limited to, a minimum NHVcz limit that is greater than the 270 Btu/scf that has been determined to assure 98% DRE. Such requirements could ensure that flares are achieving the permitted emissions rates that rely, in part, on TCEQ's guidance-based 99% DRE assumption.

#### Emissions Impacts of Concern and Potential Resolutions

While the assumption that flares achieve 99% destruction of compounds with one to three carbon atoms is a widespread occurrence in air permits at industrial sources in Texas, Region 6 has a particular concern for sources with waste gas streams containing significant concentrations of C1-C3 compounds (e.g., petrochemical plants). Sources are representing, and TCEQ is authorizing, an assumption of 99% VOC DRE for these compounds when estimating post-control allowable emission limits in permits and when determining compliance with those limits.<sup>5</sup> However, actual emissions may be two times greater than permitted limits if sources are only meeting 98% VOC DRE rather than the assumed 99% VOC DRE. As TCEQ is aware, underestimating emissions can have a material impact on major NSR applicability, air quality analyses, NNSR offset requirements, and NAAQS attainment.

The EPA reiterated these concerns during the conference call held with EPA Region 6, OAQPS, and TCEQ staff on January 24, 2024.<sup>6</sup> Specifically, EPA explained that compliance with the Petroleum Refinery and Ethylene Production MACT standards do not ensure all assisted flares will continuously achieve 99% VOC DRE. As

<sup>4</sup> The EPA made similar findings for flares in the April 25, 2023, proposed amendments to the New Source Performance Standards for the Synthetic Organic Chemical Manufacturing Industry (SOCMI) and the National Emission Standards for Hazardous Air Pollutants that apply to the SOCMI (commonly known as the Hazardous Organic NESHAP or "HON") and Group I and II Polymers and Resins Industries. See 88 Fed. Reg. 25151 (April 25, 2023).

<sup>5</sup> See e.g., Permit No. 19168 (Project 355784), Conditions, WCC Content ID Number 6906475 at 4-5 (February 8, 2024) (Special condition 12.D specifying that for the assisted elevated flares "[H]ourly mass emission rates shall be determined and recorded using the above readings and the emission factors used in the permit amendment application August 11, 2016." The flare factors in this application account for a 99% VOC DRE for C2-C3 compounds. See Permit No. 19168 (Project 256588), Agency Review Document – WCC Content ID Number 5589659 at 965 (February 26, 2021); See also Permit No. 1176/PSDTX782 (Project 354489), Conditions, WCC Content ID Number 6948864 at 32-33 (March 7, 2024) (TCEQ permit conditions (Attachment E, Monitoring and Compliance Methods) specifying that short-term and annual VOC emission rate calculations for assisted flares are to be determined by "Gas chromatograph. 99% DRE for C1-C3, 98% DRE for C4+."

<sup>6</sup> This call was initiated by TCEQ Technical staff reaching out to Brenda Shine, EPA's Refining and Chemicals Group Lead, Sector Policies and Programs Division, by email on December 20, 2023.

mentioned above, EPA suggested that one potential solution is to require that assisted flares meet more stringent operating requirements including, but not limited to, a minimum NHVcz limit greater than 270 Btu/scf. To implement this requirement, for applicants claiming their assisted flares will achieve 99% VOC DRE of C1-C3 compounds, TCEQ could develop an enhanced (i.e., more stringent) minimum NHVcz value using existing flare performance data contained in the Refinery MACT rulemaking docket, which identifies flare combustion efficiency as a function of NHVcz. *See e.g., Memorandum from Jeff Coburn, RTI International to Andrew Bouchard and Brenda Shine, Office of Air Quality and Standards, Sector Policies and Programs Division, EPA, Flare Control Option Impact for Final Refinery Sector Rule, EPA-HQ-OAR-2010-0682-0748 (July 31, 2015); See also* excel spreadsheets, Steam assisted flare FTIR Data and 15-minute run average data and Monte Carlo analysis of the flare data truncated to include datasets with 15-minute averages greater than 200 Btu/scf, in Docket ID Numbers EPA-HQ-OAR-2010-0682-0791 and -0793, respectively (November 30, 2015). This data can be used to justify the necessity of an increased NHVcz to achieve a destruction and removal efficiency beyond what the EPA's sector-specific NESHAPs ensure currently. The existing Passive Fourier Transform Infrared Spectroscopy ("PFTIR") data supports the well-established concept that as NHVcz increases, so too does combustion and destruction efficiency.

After developing an enhanced minimum NHVcz sufficient to ensure flares will continuously achieve 99% DRE during the relevant compliance period, TCEQ could impose a permit provision requiring sources who wish to take advantage of additional VOC reductions, e.g., 99% DRE, to calculate hourly and annual VOC mass emission rates using a *maximum* VOC reduction of 99% when the flare meets or exceeds the enhanced NHVcz on a 15-minute block period basis. Conversely, during each 15-minute block period when the calculated flare NHVcz is less than the enhanced NHVcz, and greater than or equal to 270 Btu/scf, the permit would require the source to calculate VOC emissions using a *maximum* VOC reduction of 98%. This permit term would be required for the purposes of calculating and demonstrating compliance with the hourly and annual VOC mass emission rates identified in the Maximum Allowable Emission Rate Table ("MAERT") for flares. If TCEQ does not wish to develop an enhanced NHVcz limit, or for sources who do not wish to take credit for additional VOC reductions and account for potential collateral NOx emissions increases, TCEQ could impose a permit provision which requires sources to calculate VOC mass emission rates using a *maximum* VOC reduction of 98% during each 15-minute block period when the calculated flare NHVcz is greater than or equal to 270 Btu/scf. Such a permit term would be required for the purposes of calculating and demonstrating compliance the hourly and annual VOC mass emission rates identified in the MAERT for flares.

Ultimately, to the extent that TCEQ is relying on the combustibility of vent gas and/or vent gas and assist media mixture in excess of the 40 C.F.R. § 63.670(e) minimum net heating values to claim flares are reliably achieving 99% VOC DRE for specific compounds, EPA encourages TCEQ to: 1) clearly incorporate any such determinations in the permit record for each affected project; 2) make any enhanced minimum NHVcz values enforceable limitations within these permits; and 3) provide technically-sound supporting rationale for the enhanced NHVcz limit that TCEQ has determined is sufficient to ensure compliance with established emission limits for each facility.

### **30 Texas Administrative Code ("TAC") Chapter 115 HRVOC Rules**

The 30 TAC Chapter 115 Highly Reactive Volatile Organic Compounds ("HRVOC") rules supplemented Texas' existing rules for controlling VOCs by providing more extensive requirements for certain equipment in HRVOC service and provided improvement to the Texas SIP's VOC Reasonable Available Control Technology ("RACT") rules. These additional controls of HRVOC emissions were to help attain and maintain the National Ambient Air Quality Standards ("NAAQS") for ozone in the Houston, Galveston, and Brazoria ("HGB") ozone nonattainment area. The 30 TAC Chapter 115 HRVOC rules were adopted by TCEQ based on findings that certain highly reactive chemicals (ethylene, propylene, 1,3 butadiene and butenes) contribute disproportionately to the ozone problem

in the HGB area. HRVOC is a term used to refer to chemicals that because of their very high propensity (reactivity rate) to form ozone had been targeted for additional control beyond the level of control that had been established for controlling VOCs in general. At the time of SIP approval, ambient measurements from both airplanes and ground-based monitors had shown that the historical emissions estimates for HRVOCs were substantially underestimated. See 70 FR 17641 (April 7, 2005).<sup>7</sup> Therefore, there was a need to improve the emissions estimates of HRVOCs through better source monitoring. The rule provided for an HRVOC cap-and-trade program within Harris County.

In addition to the Petroleum Refinery and Ethylene Production MACT requirements, TCEQ routinely references the 30 TAC Chapter 115 HRVOC rules as the basis for approving specific DRE assumptions for flares. Again, EPA established minimum requirements for the operation of flares in the GPs at 40 C.F.R. §§ 60.18 and 63.11(b). The requirements in the GPs are then coupled with more specific requirements in the various NSPS and NESHAP subparts for sources subject to Parts 60, 61, and 63. Texas adopted, by reference, minimum performance requirements for net heating value (“NHF”) and exit velocity as found in 40 C.F.R. § 60.18 for flares in HRVOC service within the 30 TAC Chapter 115 HRVOC rules. These rules include limits for the minimum heating value for the inlet gas to a flare and for maximum gas exit velocity at the flare tip.

The Texas Chapter 115 HRVOC rules establish additional flow and composition monitoring requirements beyond those in 40 C.F.R. § 60.18 to ensure flares controlling HRVOCs are operated properly. Using the flow data and an assumed DRE for a properly operated flare, a company may estimate the HRVOC emission rate to determine compliance with the short and long-term caps for HRVOC emissions. When meeting the heating value and exit velocity requirements of 40 C.F.R. § 60.18, the 30 TAC Chapter 115 rules allow companies to assume a 98% DRE for most VOCs and a 99% DRE for ethylene and propylene routed to a flare for the purposes of demonstrating compliance with the short-and long-term caps. Flares not operated in compliance with the heating value and exit velocity requirements of 40 C.F.R. § 60.18 are required to assume a lower DRE of 93% for HRVOC. See e.g., 30 TAC § 115.725(d)(7). See also 70 Fed. Reg. 17642 (April 7, 2005).<sup>8</sup> Texas based these assumed destruction efficiencies on EPA studies of flare destruction efficiencies that were performed during the timeframe of 1983-1986.<sup>9</sup> TCEQ has indicated that the EPA-approved 30 TAC Chapter 115 HRVOC requirements at 30 TAC § 115.725(d)(7)<sup>10</sup> still support an assumption of 99% DRE for ethylene and propylene and 98% DRE for all other HRVOCs when the flares are complying with the continuous monitoring requirements at § 115.725(d) and in continuous compliance with the net heating value and velocity specifications of 40 C.F.R. § 60.18.

At the time EPA was approving the Chapter 115 HRVOC requirements in 2006, EPA remained concerned that steam and air assist could impact flare efficiency. EPA recommended that TCEQ strongly consider, for both flares in HRVOC service and general VOC service, developing requirements for monitoring steam and air assist ratios to ensure that operators maintain optimum combustion and encouraged TCEQ to pursue approaches to directly

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<sup>7</sup> Specifically, data from the Texas 2000 Air Quality Study (“TexAQS 2000”) and subsequent TexAQS 2006 both included plane flights, helicopter flights, and mobile ground monitoring that indicated the emission inventories underestimated the HRVOC emissions.

<sup>8</sup> Although the Chapter 115 HRVOC regulations authorize the use of these assumed DRE’s, the 2023 TCEQ Emissions Inventory Guidelines acknowledge the potential for flare over-assistance, including flares subject to Chapter 115. See TCEQ, 2023 Emissions Inventory Guidelines, RG-360/23 at 135 (January 2024) (“For assisted flares, there is potential for over-assisting the waste gas stream, and the destruction efficiency may be lower than either the permitted efficiency or the appropriate efficiencies contained in Chapter 115 HRVOC regulations or Table A-8. Emissions determinations must be adjusted accordingly.”)

<sup>9</sup> See Flare Efficiency Study, EPA-600/2-83-052 (July 1983); Evaluation of the Efficiency of Industrial Flares: Test Results, EPA-600/2-84-095 (May 1984); Evaluation of the Efficiency of Industrial Flares: Flare Head Design and Gas Composition, EPA-600/2-85-106 (September 1985); Evaluation of the Efficiency of Industrial Flares: H2S Gas Mixtures and Pilot Assisted Flares, EPA-600/2-86-080 (September 1986).

<sup>10</sup> See also id. §§ 115.725(e)(3), 115.725(f)(5), and 115.725(g)(2)(E) (Containing similar language regarding the assumption of 99% and 98% DRE; each with varying monitoring requirements depending on flare service.)

monitor DRE.<sup>11</sup> As TCEQ is aware, a considerable amount of research in flare combustion efficiency has occurred since EPA originally approved the Chapter 115 HRVOC rules into the Texas SIP. Specifically, the HRVOC DRE assumptions at 30 TAC § 115.725 were approved into the Texas SIP in 2006 (71 FR 52655), long before EPA's evaluation and data analyses regarding the potential for flare over-assistance and DRE reduction was conducted as a part of the Petroleum Refinery MACT and Ethylene Production MACT rulemakings in 2015 and 2020, respectively. In these source category-specific rulemakings, EPA promulgated additional requirements addressing the use of a flare as a control device. For example, to ensure the proper performance of flares at refineries, the NESHAP for Refineries at 40 C.F.R. Part 63, Subpart CC, requires additional operational limits and monitoring requirements beyond what is included in 40 C.F.R. § 60.18. Yet, 30 TAC § 115.725(d)(5) only requires that the vent gas NHV is calculated according to the equation at 40 C.F.R. § 60.18(f)(3), which does not account for any dilution in heating value from assist media (e.g., steam), nor does it require calculation of the NHV of the combustion zone gas ("NHV<sub>cz</sub>") as defined in 40 C.F.R. § 63.641.

According to TCEQ, "The use of a 99% destruction efficiency for ethylene and propylene in a flare meeting the requirements of 40 CFR § 60.18 is based on a limited amount of data from EPA flare studies conducted in the early 1980's." See 29 Tex. Reg. 11656 regarding Rule Project No. 2004-037-115-AI (December 17, 2004). In TCEQ's response to EPA comments regarding flare destruction efficiency on the proposed amendments to the HRVOC regulations at 29 Tex. Reg. 11657, TCEQ stated, in relevant part, that "The commission sponsored preliminary studies of a pilot test method, using a passive Fourier transform infrared spectrophotometer, for the determination of actual flare destruction efficiency. The technology is not ready for commercial use, but the commission will continue to follow technological advances in this area and will reevaluate use of the assumed destruction efficiency in the future if reliable data indicate a need to do so." However, almost 20 years later, TCEQ appears to continue to rely on the "limited amount" of EPA data from the 1980's to apply a 99% propylene and ethylene DRE assumption to flares subject to 30 TAC Chapter 115 HRVOC regulations.

In light of the aforementioned rulemakings, and the implications of any underreporting of emissions, EPA reiterates its recommendation that TCEQ evaluate the 30 TAC § 115.725 assumed destruction efficiencies for steam and air assisted flares, as the agency has previously committed to do, now that reliable flare performance data is available.<sup>12</sup> TCEQ should consider updating the 30 TAC Chapter 115, Subchapter H, Division 1 requirements to include flare monitoring and operational requirements consistent with the substantive requirements laid out in EPA's sector-specific rulemakings – e.g., Petroleum Refinery MACT and Ethylene Production MACT. Absent adequate supplemental monitoring and operational requirements that account for potential issues affecting flare performance, EPA does not believe that the current Chapter 115, Subchapter H requirements, and the monitoring therein, are sufficient to ensure assisted flares will continuously achieve 98% DRE, let alone 99% DRE.

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<sup>11</sup> See 71 FR 52673 (September 6, 2006) ("For purposes of estimating emissions for compliance with the Short-term and annual caps, TCEQ adopted rules requiring companies to assume specific flare destruction efficiencies for properly operating flares and for when a flare operates outside the parameters of 40 CFR 60.18. EPA is approving the estimates used for flare destruction efficiency for use in the attainment demonstration because the estimates are based on the best information available. We, however, remain concerned about the uncertainty created in the attainment demonstration by having a significant source of emissions which cannot be directly measured. We note that some operating parameters for flares such as steam and air assist ratios are not covered specifically by 40 CFR 60.18 but some studies have indicated these parameters can impact flare efficiency. Because of the prevalence of flares in the HGB area, we believe Texas should strongly consider, for both flares in HRVOC service and general VOC service, requirements for monitoring steam and air assist ratios to [e]nsure that operators maintain these parameters, not covered by 40 CFR 60.18, in a range to [e]nsure optimum combustion. We also encourage TCEQ to pursue new technology such as the Fourier Transform Infrared Spectrophotometer which would eventually allow the direct measurement of destruction efficiency in the field.")

<sup>12</sup> See Letter from Jeff Robinson, Branch Manager, Air Permits, Monitoring and Grants Branch, EPA Region 6 to Gwen Ricco, Office of Legal Services, TCEQ, *Quadrennial Review Comments, Non-Rule Project Number 2023-045-115-AI* (May 5, 2023); See also Letter from Melanie Magee, Infrastructure & Ozone Section Supervisor, EPA Region 6 to Cory Chism, Director, Office of Air, TCEQ, *Dallas-Fort Worth (DFW) Moderate Area Attainment Demonstration (AD) State Implementation Plan (SIP) Revision for the 2015 Ozone National Ambient Air Quality Standards (NAAQS)* at 6-7 (July 17, 2023) (EPA requesting for an evaluation of existing DRE assumptions when commenting on Texas Proposed SIPs and discussing the potential effects of underreporting emissions due to default flare DRE assumptions).

**TCEQ Flare Guidance DRE Assumptions and Tier I BACT for Flares**

In response to flare DRE concerns, TCEQ continues to reference its own flare guidance as the basis for approving specific DRE assumptions for flares. EPA understands that TCEQ's current guidance contains commission-accepted flare destruction efficiencies that allow applicants to claim and apply an assumption of 99% VOC DRE for compounds with three carbons or less (e.g., acetylene, ethylene, propylene, methylacetylene, as well as methanol, ethanol, propanol, ethylene oxide, and propylene oxide) and 98% DRE for compounds with at least 4 carbon atoms when in compliance with 40 C.F.R. § 60.18. See TCEQ, Air Permits Division NSR Emission Calculations, Attachment A – Flare Factors at 8 (March 2021); See also TCEQ 2023 Emissions Inventory Guidelines, RG-360/23, Table A-8 at 136 (January 2024) (Outlining requirements to assume a 99% DRE assumption C1-C3 VOCs and 98% DRE for C4+ VOC compounds).<sup>13</sup> EPA understands that this guidance is similarly based on EPA / Chemical Manufacturer's Association ("CMA") flare studies conducted in the early 1980s. TCEQ is certainly aware that such studies have been expanded by more recent studies that were utilized to support of the development of the Refinery MACT and Ethylene Production MACT rulemakings.<sup>14</sup>

The option to claim specific DRE of 99% (or higher) based upon simplified assumptions for certain VOCs has persisted in TCEQ permitting guidance since at least late 2000.<sup>15</sup> Similar DRE assumptions are still used today. In fact, TCEQ's current flare guidance allows for DRE assumptions that TCEQ's very own flare performance study concludes are not guaranteed. Since at least 2012, TCEQ's emissions inventory guidance has referenced its 2010 flare study which identified that operating a flare in compliance with 40 C.F.R. § 60.18 does not ensure that the flare will achieve 98% DRE.<sup>16</sup> Meanwhile, this same document affords applicants with flares in compliance with 40 C.F.R. § 60.18 the ability to assume and apply 99% and 98% DRE depending on waste stream composition.

Ultimately, TCEQ has not sufficiently justified its continued reliance on 1983 EPA/CMA flare study data as the basis for assuming 40 C.F.R. § 60.18-compliant flares will achieve 99% VOC DRE for C1-C3 compounds, nor as the basis for validating the current 99% VOC DRE assumption in its flare guidance. EPA recommends that TCEQ evaluate and update its guidance-based flare DRE assumptions for 40 C.F.R. § 60.18-compliant flares and ensure that appropriate DRE assumptions are identified.

**Tier I BACT for Flares:** With respect to flare DRE assumptions authorized through Tier I BACT determinations, applicants routinely rely on the application of TCEQ's Tier I presumptive BACT guidelines for flares (in addition to TCEQ's flare guidance) which allows applicants to assume a 99% VOC DRE for C1-C3 compounds emitted from all flares when in compliance with TCEQ's Tier I BACT requirements. For the control of VOC emissions, TCEQ's Tier I presumptive BACT requirements for flares reference the work practices and operating requirements outlined in

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<sup>13</sup> In addition, the Texas Natural Resource Conservation Commission's (TCEQ's predecessor agency) October 2000 draft guidance entitled *Air Permit Technical Guidance for Chemical Sources: Flares and Oxidizers* (RG-109), Chapter 5 – Emission Factors, Efficiencies, and Calculations discusses different methods for justifying up to 99.5% VOC DRE based on VOC compounds present in the waste stream.

<sup>14</sup> For a list of these studies, refer to the technical report entitled *Parameters for Properly Designed and Operated Flares*, in Docket ID No. EPA-HQ-OAR-2010-0682-0191.

<sup>15</sup> See *supra* note 13 at 19-29. EPA is also aware of mid-1990's guidance published by the Texas Natural Resource Conservation Commission (TNRCC), which similarly identifies that flares should achieve 99% DRE for C1, C2, and C3 compounds.

<sup>16</sup> Dating back to at least 2012, multiple TCEQ publications have documented TCEQ's awareness and research regarding the potential for issues that affect flare destruction efficiency. See TCEQ, 2011 Emissions Inventory Guidelines, RG-360/11 at A-51 to A-52 (January 2012) ("In the fall of 2010, TCEQ funded a research project on flare destruction and removal efficiency (DRE) at a flare-test facility. The results demonstrated that air-assisted and steam-assisted flares must operate with a very limited range of assist rates to achieve the assumed DRE of 98 percent or greater. This project also demonstrated that operating a flare in compliance with 40 CFR § 60.18 does not ensure that the flare will achieve 98 percent DRE. Flare assist rates and other operating information should be reviewed and assessed to determine whether a flare may be operating at assist ranges that do not achieve 98 percent DRE, in which case the flare DRE must be reduced accordingly when determining and reporting flare emissions in the EI. The final report and additional project information are at [www.tceq.texas.gov/goto/2010-flare-study/](http://www.tceq.texas.gov/goto/2010-flare-study/)."

the NSPS GP requirements at 40 C.F.R. § 60.18.<sup>17</sup>

TCEQ's Air Permit Reviewer Reference Guide ("APDG 6110") includes specific instructions for permit reviewers on how to conduct a three-tiered BACT analysis and establish emissions limitations based on the maximum degree of reduction achievable taking into consideration a variety of factors described in the definition.<sup>18</sup> The majority of BACT reviews evaluated in Texas begin and end at Tier I of TCEQ's tiered BACT approach. In other words, a limit is selected by comparing the applicant's BACT proposal to emission reduction performance levels accepted as BACT in recent permit reviews for the same process and/or industry and considering whether any technological developments in emission controls warrant further consideration. TCEQ does not require applicants to progress to a Tier III analysis (similar to the EPA's "top-down" methodology) unless the Tier I and Tier II analysis have failed to identify a technically practicable and economically reasonable control option. Consequently, through Tier I BACT determinations, TCEQ routinely authorizes applicants to apply 99% VOC DRE for C1-C3 compounds to flares as a default assumption (provided these applicants comply with the work practice standards and operational limitations of the NSPS GPs at 40 C.F.R. § 60.18) since TCEQ has already approved these requirements as BACT for the same process and industry type.

The Petroleum Refinery MACT, Ethylene Production MACT, and HON all require enhanced flare stream monitoring requirements and operating limits that exceed TCEQ's current VOC Tier I presumptive BACT requirements for flares. However, as the EPA has already explained, even the enhanced monitoring and operating limits contained in these rulemakings were not designed to ensure flares will continuously achieve 99% DRE. As such, it remains unclear to EPA how TCEQ can justify its continued authorization of a 99% DRE for flares through compliance with TCEQ's presumptive Tier I BACT flare requirements. EPA recommends, in light of the technical considerations described throughout this document, that TCEQ also evaluate its basis for authorizing 99% DRE for flares through its Tier I presumptive BACT guidelines.

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<sup>17</sup> See Current Tier I BACT Requirements: Chemical Sources (Specifying that the presumptive VOC control requirements for flares: "Meets 40 CFR § 60.18. Destruction Efficiency: 99% for certain compounds up to three carbons, 98% otherwise. No flaring of halogenated compounds is allowed. Flow monitor required. Composition or BTU analyzer may be required.") Available electronically at: [https://www.tceq.texas.gov/permitting/air/nav/air\\_bact\\_chemsource.html](https://www.tceq.texas.gov/permitting/air/nav/air_bact_chemsource.html); See also TCEQ's Air Permit Technical Guidance for Chemical Sources: Flares and Oxidizers, RG-109, at 9-13 (Draft October 2000) (Specifying TCEQ's BACT guidelines for flares).

<sup>18</sup> See TCEQ APDG 6110, Air Permit Reviewer Reference Guide, Air Pollution Control: How to Conduct a Pollution Control Evaluation at 11-20 (January 2011). (Detailing TCEQ's three-tiered methodology for determining BACT. Available electronically at: [https://www.tceq.texas.gov/assets/public/permitting/air/Guidance/NewSourceReview/airpoll\\_guidance.pdf](https://www.tceq.texas.gov/assets/public/permitting/air/Guidance/NewSourceReview/airpoll_guidance.pdf).)