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CHEVRON PRODUCTS COMPANY'S COMMENTS ON: PROPOSED STATE IMPLEMENTATION PLAN FOR THE 2015 OZONE NAAQS NORTHERN WASATCH FRONT MODERATE NONATTAINMENT AREA

SUBMITTED ELECTRONICALLY TO THE UTAH AIR QUALITY BOARD

JULY 17, 2023

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Glossary of Terms and Abbreviations

Act	Clean Air Act
BACT	Best Available Control Technology
CAA	Clean Air Act
Division	Utah Division of Air Quality
EPA	U.S. Environmental Protection Agency
NAAQS	National Ambient Air Quality Standards
NO_x	Nitrogen Oxide
NAA	Nonattainment Area
NAAQS	National Ambient Air Quality Standard
NWF	Northern Wasatch Front
Proposed SIP	State Implementation Plan for the Northern Wasatch Front Moderate Nonattainment Area for the 2015 Ozone NAAQS
RACT	Reasonably Achievable Control Technology
RFP	Reasonable Further Progress
SIP	State Implementation Plan
TPD	Tons Per Day
TPY	Tons Per Year
UDAQ	Utah Division of Air Quality
VOC	Volatile Organic Compounds

List of Exhibits

I. Introduction

Chevron Products Company ("Chevron") appreciates the opportunity to comment on the Utah Division of Air Quality's ("UDAQ") proposed State Implementation Plan for the Northern Wasatch Front Moderate Nonattainment Area for the 2015 Ozone NAAQS ("Proposed SIP"). Chevron Products Company is a division of Chevron U.S.A. Inc. Since 1948, Chevron has operated its Salt Lake City Refinery ("SLC Refinery") to manufacture transportation fuels and other products for distribution in Utah and throughout the Mountain West. The Proposed SIP is of critical importance to Chevron because if finalized, it would require installation of $16 million in emission control technology during an unplanned shutdown at the SLC Refinery without a demonstrated benefit.[1]

II. Executive Summary

If finalized, the Proposed SIP would require installation of ultra-low NO_x burners ("ULNBs") on the crude oil heaters at the SLC Refinery by May 1, 2026. In developing the Proposed SIP, UDAQ disregarded Chevron's RACT analysis submissions, which showed that requiring ULNB installation during an unplanned shutdown would impose exorbitant costs on Chevron far beyond the reasonableness standard required by the Clean Air Act ("CAA"). Instead, UDAQ classified these controls as "beyond RACT," acknowledging that the costs associated with them far exceed costs typically deemed "reasonable" under RACT.

The Proposed SIP and UDAQ's process leading to the Proposed SIP exemplifies arbitrary agency action.

First, UDAQ failed to scrutinize the costs associated with the additional controls applicable to the SLC Refinery. In fact, UDAQ dismissed Chevron's updated RACT analysis showing that installation of ULNBs during an unplanned shutdown is not economically feasible. UDAQ also imposed an implementation date for installation of the ULNBs untethered from this Moderate Area SIP as a means of applying the associated emissions reductions towards its Reasonable Further Progress Requirement in a yet-to-be-required Serious Area SIP.

Second, UDAQ's proposed imposition of "beyond RACT" controls at the Chevron Refinery is unjustified where, as here, UDAQ has failed to establish that the associated emissions reductions are necessary to lead to timely attainment of the NAAQS. In fact, UDAQ appears to conclude the opposite – that the weight of the evidence demonstrates that Utah *will* attain the ozone NAAQS without imposing any new controls.

Third, UDAQ was inconsistent in its application of RACT among different major sources. For some sources, UDAQ simply agreed with the source's analysis that additional

[1] Chevron incorporates by reference Comments from the Utah Petroleum Association and Utah Mining Association on Amendment to R-307-110-13, Incorporation of Utah State Implementation Plan, Section IX.D.11: 2015 Ozone NAAQS Northern Wasatch Front Moderate Nonattainment Area, and Incorporation of Utah State Implementation Plan, Section IX.H.31 and Section IX.H.32: Emission Limitations and Operating Practices, R-307-110-17, attached at Exhibit B.

control technologies were not economically feasible. But for Chevron, UDAQ imposed control technologies that cost substantially more and will result in smaller emission reductions than other sources for which UDAQ ultimately declined to impose additional controls. Additionally, UDAQ agreed—consistent with EPA guidance—that certain controls proposed for other major sources were not economically feasible when the analysis considered a large cost of "lost production." But for Chevron, UDAQ refused to recognize that these same costs are even relevant to the economic feasibility of installing ULNBs at Chevron's SLC Refinery.

Lastly, UDAQ did not comply with Utah law when it imposed stricter controls than what is required under the Clean Air Act. Utah law requires that before UDAQ may impose requirements different from what is required under the Clean Air Act, it must make written findings showing that the requirements will provide reasonable added protections to public health or the environment and base the findings on evidence, studies, or other data. UDAQ violated statutory law by not doing so.

Based on the foregoing, Chevron urges UDAQ to amend the Proposed SIP by rescinding its requirement for the installation of additional control technology at Chevron's SLC Refinery.

III. The Division is Obligated to Regulate Sources Pursuant to CAA Provisions Governing Moderate Ozone Nonattainment.

A. EPA's Designation of the Northern Wasatch Front as a Nonattainment Area.

On August 3, 2018, EPA designated Utah's Northern Wasatch Front ("NWF") as a marginal nonattainment area ("NAA") for the 2015 ozone National Ambient Air Quality Standard ("NAAQS").[2] The NWF failed to meet the 2015 ozone NAAQS by the August 3, 2021 attainment date.[3] Therefore, EPA redesignated the NWF NAA from marginal to moderate nonattainment and established a new attainment date of August 3, 2024.[4] The reclassification became effective on November 7, 2022, triggering a statutory clock for submission of a revised SIP by January 1, 2023.[5] UDAQ presented the Proposed SIP to the

[2] Additional Air Quality Designations for the 2015 Ozone National Ambient Air Quality Standards, 83 Fed. Reg. 25,776, 25,837 (June 4, 2018).
[3] Determinations of Attainment by the Attainment Date, Extensions of the Attainment Date, and Reclassification of Areas Classified as Marginal for the 2015 Ozone National Ambient Air Quality Standards, 87 Fed. Reg. 60,897, 60,898 (October 11, 2022).
[4] *See id.* at 60,901, 60,923.
[5] *See id.* at 60,907.

Utah Air Quality Board ("UAQB") at the April 5, 2023 board meeting.[6] UDAQ then submitted the Proposed SIP for public comment on June 1, 2023.[7]

B. Requirements for the Moderate SIP.

The CAA directs states with Moderate NAAs to include in their SIPs a number of demonstrations with which UDAQ has failed to comply.

First, States must demonstrate reasonable further progress ("RFP") toward attainment between the "base year" when emissions were first inventoried and the year prior to attainment.[8] In this case, Utah must demonstrate a 15% reduction in Volatile Organic Compound ("VOC") emissions between 2017 and 2023,[9] which equals a 14.0 tpd reduction.[10] UDAQ acknowledges that Utah will not meet its RFP requirement.[11]

Second, States must require the implementation of reasonably available control technology ("RACT") at every stationary source that emits 100 tons per year (tpy) or more of VOCs or oxides of nitrogen ("NO_x") as well as every stationary source identified in the EPA Control Technique Guideline.[12] EPA defines RACT as "the lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility."[13] Economic feasibility "considers the cost of reducing emissions and the difference in costs between the particular source and other similar sources that have implemented emission reduction."[14] EPA has consistently defined the RACT cost threshold for NO_x control technologies as $160 to $1,300 per ton of NO_x emissions reduced. [15]

States must provide for implementation of RACT "no later than the start of the attainment year ozone season associated with the area's new attainment deadline, or January 1 of the third year after the associated SIP revisions submittal deadline, whichever is earlier."[16] For the NWF, Utah must have implemented RACT by January 1, 2023.[17] States must also adopt all other reasonably available control measures ("RACM") "necessary to

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[6] Utah Department of Environmental Quality, Division of Air Quality, Utah Air Quality Board Meeting Tentative Agenda, Wednesday, April 5, 2023, https://documents.deq.utah.gov/air-quality/board/2023/DAQ-2023-002650.pdf.
[7] Utah Department of Environmental Quality, Division of Air Quality, *Air Quality Rule and Plan Changes Open for Public Comment*, https://deq.utah.gov/air-quality/air-quality-rule-plan-changes-open-public-comment.
[8] *See* 42 U.S.C. § 7511a(b)(1)(A)(i); 40 C.F.R. § 51.1315.
[9] *Id.* § 7511a(b)(1).
[10] Proposed SIP, at 110.
[11] *Id.* at 112.
[12] 42 U.S.C § 7511a(b)(2), (f).
[13] State Implementation Plans; General Preamble for Proposed Rulemaking on Approval of Plan Revisions for Nonattainment Areas-Supplement (on Control Techniques Guidelines), 44 Fed. Reg. 53,761 (Sept. 17, 1979).
[14] State Implementation Plans, General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990; Supplemental, 57 Fed. Reg. 18,070, 18,073 (Apr. 28, 1992).
[15] Approval of Source-Specific Air Quality Implementation Plans; New Jersey, 84 Fed. Reg. 54785, 54,786 (Oct. 11, 2019).
[16] 40 C.F.R. § 51.132(a)(3)(ii).
[17] Determinations of Attainment, 87 Fed. Reg. at 60,900.

demonstrate attainment as expeditiously as practicable and to meet any RFP requirements."[18] Notably, Congress declared that "[a] primary goal of this Act is to encourage or otherwise promote *reasonable* Federal, State, and local government actions, consistent with the provisions of this Act. . . ."[19] Accordingly, control technology requirements imposed by state SIPs must be reasonable as well as technologically and economically feasible.

Notwithstanding the CAA's requirement to implement RACT, UDAQ imposed "beyond RACT" controls at Chevron's SLC Refinery, which included installation of ULNBs on two crude heaters. According to the Proposed SIP, installation of ULNBs would "result in a reduction of 4.7 tpy of NO_x emissions for Crude Heater F21001, and 4.2 tpy of NO_x emissions reductions for Crude Heater F21002," for a total of 8.9 tpy or 0.024 tpd.[20] In proposing these controls, UDAQ acknowledged that the financial feasibility of the "beyond RACT" controls is beyond previously established RACT thresholds, but asserted that it has discretion to "require beyond RACT reductions from any source," if such controls would lead to timely and expeditious attainment of the ozone NAAQS.[21] As discussed below, UDAQ imposes extremely costly beyond RACT controls without making any demonstration that the associated emission reductions will lead to timely attainment.

Third, States are required to submit an "attainment demonstration that provides for such specific reductions in emissions of VOCs and NO_x as necessary to attain the primary NAAQS" within three years of the effective date of the moderate designation.[22] The attainment demonstration must be based on specific modeling methods and emission reduction analyses that account for the impact of the required elements of the SIP.[23] UDAQ's attainment demonstration, paired with its weight of the evidence analysis, "results in a strong case that this attainment demonstration adequately demonstrates the NWF NAA attaining the 8-hour ozone NAAQS by the attainment date of August 3, 2024" without imposing any emissions controls.[24]

IV. UDAQ's Proposal to Require ULNBs for Crude Heaters at the SLC Refinery is Arbitrary and Capricious.

The cost-effectiveness of installing ULNBs on the crude heaters is orders of magnitude higher than any reasonable cost-per-ton threshold, including those historically relied upon by EPA. UDAQ appears to struggle with how to characterize these controls. For example, Table 25 reflects installation of the ULNBs as RACT—but the Proposed SIP later acknowledges that "[n]o other additional add-on controls or limitations are technically or economically feasible options at this time."[25] To avoid the high costs of installing ULNBs on the crude heaters, which UDAQ acknowledges "may be beyond previously established

[18] 40 C.F.R. § 51.1312(c).
[19] 42 U.S.C. § 7401(c) (emphasis added).
[20] Proposed SIP, at 44.
[21] *Id.* at 33, 44.
[22] 40 C.F.R. § 51.1308(a).
[23] *See id.*
[24] Proposed SIP, at 140.
[25] *Id.* at 43.

RACT thresholds," the Proposed SIP simply falls back on the UDAQ's purportedly unfettered discretion to require the installation of the ULNBs as a beyond RACT control.

Under either standard—RACT or beyond RACT—the installation of ULNBs is not economically feasible and therefore cannot be required by the Proposed SIP. Furthermore, UDAQ's unilateral imposition of controls on Chevron—to the exclusion of controls at other facilities that would result in greater emission reductions at a lower cost—is arbitrary and capricious.

A. ULNBs for the Crude Heaters is Not Economically Feasible.

On January 31, 2023, Chevron submitted an initial RACT analysis to UDAQ that estimated that the installation of the ULNBs would cost $26,555 and $28,322 per ton of NO_x removed for F21001 and F21002, respectively.[26] Chevron emphasized that "[t]hese costs are estimates and as this is a retrofit, could go up substantially."[27] This initial analysis contemplated installing the ULNBs during a scheduled shutdown event because installing the ULNBs would require the majority of the SLC Refinery to shut down. As is standard in the industry, Chevron plans shutdowns to occur on multi-year schedules to minimize the number of shutdowns required. Preparing for major retrofits during a scheduled shutdown requires coordination of technical and logistical details concerning design, engineering, procurement, and construction, which takes substantial time.

When Chevron learned that UDAQ planned to require that the ULNBs be installed by May 1, 2026, Chevron submitted an updated RACT analysis that incorporated the costs of installing the technology during an unscheduled shutdown. The Ozone RACT Cost Analysis Workbooks, attached as Exhibit A, demonstrates that the cost of installing the ULNBs would be $300,000 per ton of NO_x removed if required to be installed during an unplanned shutdown. The increase in cost is largely due to the significant loss of production that would occur because of the unplanned shutdown. Notably, lost production caused by unscheduled shutdowns can increase the price of refinery products including oil and gas, particularly if multiple sources are forced into unscheduled shutdowns at the same time.

Chevron presented these Workbooks to UDAQ prior to the April Air Quality Board meeting; however, the Division did not include them in the Proposed SIP and directed Chevron to submit them during the formal comment process. In addition to revising the Workbooks to reflect the material costs increase associated with an unscheduled Refinery shutdown, revisions to the Ozone RACT Cost Analysis were made to remove the cost of the continuous emissions monitoring system on each furnace.

Despite UDAQ's refusal to consider the additional costs of installing the ULNBs during an unscheduled shutdown, the EPA Control Cost Manual confirms that such costs—including the costs of lost production—are appropriately considered when assessing economic feasibility:

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[26] *Id*.
[27] *Id.*

> Lost Production. The shut-down for installation of a control device into the system should be a well-planned and anticipated event, and typically occurs during routine, scheduled outages. As such, its cost should be considered a part of the indirect installation cost (start-up). However, unanticipated problems with the installation due to retrofit-related conditions if they happen could impose significant costs on the system. Retrofit factors should be reserved for those items directly related to the demolition, fabrication, and installation of the control system. . . . If the shut-downs do not occur in a well planned and routine manner, any additional foregone production of goods and products would need to be included as a private cost attributable to the retrofit cost.

The Proposed SIP itself states that UDAQ relies on the Control Cost Manual as guidance in determining the economic feasibility of a control technology. Moreover, UDAQ accepted economic feasibility analyses from two other sources that explicitly included costs related lost production, one of which specifically applied such costs to its economic analysis of ULNB installation.[28] UDAQ also accepted the economic feasibility analysis of another source that "follow[ed] the methodologies outlined in the. . . Control Cost Manual."[29]

We need not over-emphasize the cost and impacts of a forced unplanned shutdown, as even with a planned shutdown the initial cost estimates ($26,555 and $28,322 per ton of NO_x removed) are far beyond the bounds of economic feasibility as contemplated in EPA guidance, other state RACT determinations, and Utah's previous determinations. In 2019, EPA rejected costs per ton of pollutants removed as low as $19,000 as economically infeasible when assessing RACT, noting that it "is well above what EPA has historically defined as economically feasible (i.e., $160-1300)."[30] The initial cost estimate for the ULNBs is over 20 times more expensive than the high end of EPA's historical RACT range while the updated cost estimate is over 230 times this range. The cost estimates for the ULNBs are also dramatically higher than the RACT cost thresholds for NO_x that other states have recently applied. In 2020, Illinois, Maryland, New York, Ohio, Pennsylvania, and Wisconsin set RACT cost thresholds between $2,500 and $5,500 per ton of NO_x removed.[31]

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[28] Big West Oil, LLC, 5 Moderate Ozone Nonattainment Area RACT Analyses Submission ("The costs of the energy impacts either in additional fuel costs or the cost of lost power generation impacts the cost-effectiveness of the control technology."); Hexcel Corporation- West Valley City, Utah, Ozone Moderate Nonattainment RACT Analysis, Attachment B (including costs of lost profit caused by the shutdown required to install a ULNB).

[29] University of Utah, 3-3 Ozone Moderate Nonattainment SIP RACT Analysis (January 31, 2023) ("The economic evaluation centers on the cost effectiveness of the control option. Costs of installing and operating control technologies are estimated and annualized following the methodologies outlined in the U.S. EPA's OAQPS Control Cost Manual (CCM) and other industry resources.").

[30] Approval of Source-Specific Air Quality Implementation Plans, 84 Fed. Reg. at 54,786.

[31] Approval and Promulgation of Air Quality Implementation Plans; Pennsylvania; Reasonably Available Control Technology Determinations for Case-by-Case Sources Under the 1997 and 2008 8-Hour Ozone National Ambient Air Quality Standards, 85 Fed. Reg. 66,484, 66,486 (October 20, 2020).

Even UDAQ concedes that "the financial feasibility of the identified controls may be beyond previously established RACT thresholds. . . ."[32] This conclusion is consistent with UDAQ's approach to assessing Best Available Control Technology ("BACT") during the development of the recent $PM_{2.5}$ serious SIP. Chevron concluded that ULNBs on the crude heaters were not economically feasible based on nearly the same cost estimates ($27,252 and $29,246 per ton removed for F21001 and F21002, respectively) that Chevron calculated for its initial cost determination in this RACT analysis. In that case, UDAQ agreed with Chevron's determination that the costs to install ULNBs on the crude heaters was not economically feasible and thus not BACT.[33] It is axiomatic that if a control recently has been determined not to be economically feasible under a BACT analysis—which contemplates a higher cost effectiveness threshold—then it is not economically feasible under a RACT analysis.

As discussed below, UDAQ cannot simply ignore economic feasibility altogether by labeling the installation of ULNBs as beyond RACT. Thus, no matter whether UDAQ characterizes the control technology as RACT or beyond RACT, the incredibly high cost renders installing the ULNBs economically infeasible.

B. The Implementation Deadline is Arbitrary.

Table 54 in the Proposed SIP imposes an implementation schedule that if finalized, will require installation of ULNBs on the crude heaters at the SLC Refinery by May 1, 2026.[34] As the January 1, 2023 federal deadline for Utah to implement control technologies has already passed, UDAQ acknowledges that the potential emissions reductions from the technologies imposed by the Proposed SIP were not included in the emissions modeling in the Proposed SIP.[35] The Proposed SIP claims that the May 1, 2026 deadline will be necessary for the potential future development of a serious SIP and to generally demonstrate attainment by the earliest achievable date:

> Utah is working to have these strategies fully implemented prior to the summer of 2026 in an effort to count these reductions towards RFP requirements during the state's submission of a potential serious SIP for the same NAA. The UDAQ is simultaneously implementing NO_x emission reductions both in anticipation of future SIP creditability as well as in an effort to demonstrate attainment of the standard at the earliest achievable date.[36]

Additionally, UDAQ stated that imposition of ULNBs at the SLC Refinery by May 1, 2026 is "necessary for the NWF NAA to demonstrate attainment of the 2015 8-hour ozone NAAQS

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[32] Proposed SIP, at 44.
[33] *See* Chevron Products Company, Response to SIP PM2.5 BACT Analysis, 31, 46 (April 26, 2017) (finding that the installation of ULNB on crude heaters F21001 and F21002 was not economically feasible); Utah State Implementation Plan, Emission Limits and Operating Practices, Section IX.H.12.d.vii (only requiring the installation of low NOx burners on the crude heaters).
[34] Proposed SIP, at 92.
[35] *Id.* at 115.
[36] *Id.*

as expeditiously as practicable."[37] These claims provide no justification to support the May 1, 2026 deadline.

First, these claims plainly contradict UDAQ's conclusion in Chapter 8 of the Proposed SIP that UDAQ's modeling data and weight of the evidence analysis present "a strong case" that the NWF NAA will "attain[] the 8-hour ozone NAAQS by the attainment date of August 3, 2024" without including the emissions reductions from implementing the proposed beyond RACT controls.[38] UDAQ cannot claim that installing the ULNBs at an unprecedented cost by the proposed implementation deadline is necessary to demonstrate attainment if UDAQ also claims that there is a strong case for attainment without the control technology.

Second, control technologies necessary for the development of a serious SIP are beyond the scope of this Proposed SIP. Indeed, the Proposed SIP is a moderate SIP, not a serious SIP. Anticipating a future serious designation for the NWF does not justify preemptively imposing control technologies that may be necessary for a serious SIP under the guise of moderate nonattainment SIP requirements.

As it lacks any justification in the Proposed SIP, the May 1, 2026 deadline violates the basic administrative law principle that "[t]he grounds upon which the agency acted must be clearly disclosed in, and sustained by, the record."[39]

V. UDAQ's Requirement of ULNBs for the SLC Refinery's Crude Heaters as a "Beyond RACT" Control is Arbitrary and Capricious, Not Supported by Substantial Evidence, and Exceeds UDAQ's Legal Authority.

Recognizing that the cost effectiveness of installing ULNBs is substantially higher than traditional RACT thresholds, UDAQ attempts to circumvent cost altogether by asserting that it has discretion to require ULNBs as a "beyond RACT" control. According to UDAQ, ULNBs for Chevron's crude heaters are appropriate "beyond RACT" controls because "UDAQ has determined that these controls are necessary for the NWF NAA to demonstrate attainment of the 2015 8-hour ozone NAAQS as expeditiously as possible."[40] UDAQ provides no analysis to support this statement, which directly contradicts UDAQ's weight of the evidence finding which concludes there is "a strong case" that the NWF NAA will "attain[] the 8-hour ozone NAAQS by the attainment date of August 3, 2024" without imposing any additional controls.[41] UDAQ's demonstration is therefore not supported by

[37] *Id.* at 44.
[38] *Id.* at 140. Chevron supports UDAQ's analysis in the "Weight of the Evidence" section of the Proposed SIP and UDAQ's conclusion that it has provided a demonstration that the NWF NAA will attain the 2015 ozone NAAQS by the attainment date.
[39] *Olenhouse v. Commodity Credit Corp.*, 42 F.3d 1560, 1575 (10th Cir. 1994).
[40] Proposed SIP, at 44. *See also id*. at 33 ("States may require VOC and NOx reductions that are 'beyond RACT' if such reductions are needed to provide for timely attainment of the ozone NAAQS.")
[41] *Id.* at 140. Chevron supports UDAQ's analysis in the "Weight of the Evidence" section of the Proposed SIP and UDAQ's conclusion that it has provided a demonstration that the NWF NAA will attain the 2015 ozone NAAQS by the attainment date.

substantial evidence. Moreover, UDAQ's proposed beyond RACT requirement is arbitrary and capricious and exceeds UDAQ's legal authority.

A. The Concept of Beyond RACT Does Not Provide UDAQ with Unfettered Discretion to Impose Controls at Any Cost.

UDAQ takes the position that despite the high cost-per-ton associated with ULNBs for the Refinery's crude heaters, "it has discretion under the Clean Air Act to 'require beyond RACT reductions from any source' if those reductions are necessary to demonstrate attainment as expeditiously as practicable"[42] and "if such reductions are needed to provide for timely attainment of the ozone NAAQS."[43] But UDAQ's authority to impose "beyond RACT" is not unlimited and cannot conflict with the CAA's mandate to "to promote reasonable" state actions.[44]

Chevron recognizes that under EPA's SIP requirements for the 2008 ozone NAAQS:

> [A] state has discretion to require beyond RACT reductions from any source, and has an obligation to demonstrate attainment as expeditiously as practicable. Thus, states may require VOC and NO_x reductions that are 'beyond RACT' *if such reductions are needed in order to provide for timely attainment of the ozone NAAQS.*[45]

But forcing a company to take extraordinary actions at an unprecedented cost, with no articulation of the associated benefits, represents an arrogation of UDAQ's power under the CAA and state law. UDAQ cannot simply refer to its discretion to impose beyond RACT as a basis for dismissing the cost of a control technology. Indeed, economic feasibility is a critical component to the regulation of sources under the CAA and the "preclusion of cost consideration requires a rather express congressional direction."[46]

First, EPA's SIP requirements specify that imposition of "beyond RACT" measures are conditioned on the premise that such regulations will "provide for *timely* attainment of

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[42] *Id.*

[43] *Id.* (citing Implementation of the 2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements, 80 Fed. Reg. 12,264, 12,279 (March 6, 2015)).

[44] 42 U.S.C. § 7401(c) (emphasis added).

[45] Implementation of the 2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements, 80 Fed. Reg. 12,264, 12,279 (March 6, 2015) (emphasis added). Notably, EPA's rule implementing the 2015 ozone NAAQS, which applies here, does not contain the same policy that states may impose "beyond RACT" measures. *See* Implementation of the 2015 National Ambient Air Quality Standards for Ozone: Nonattainment State Implementation Plan Requirements, 83 Fed. Reg. 62,998 (Dec. 6, 2018).

[46] *Michigan v. EPA*, 213 F.3d 663, 678 (DC Cir. 2000) (citing Edward W. Warren & Gary E. Marchant, *"More Good Than Harm": A First Principle for Environmental Agencies and Reviewing Courts*, 20 Ecology L.Q. 379, 421 (1993) ("The need to compare benefits and costs has long played a role in judicial review of agency actions regulating health and safety risks.") and Cass R. Sunstein, *Interpreting Statutes in the Regulatory State*, 103 Harv. L. Rev. 405, 487 (1989) (suggesting an "interpretive principle" drawn from case law, including *NRDC v. EPA*, 263 U.S. App. D.C. 166, 824 F.2d 1146, that reviewing courts will read statutes as authorizing regulations with benefits at least "roughly commensurate with their costs, unless there is a clear legislative statement to the contrary")).

the ozone NAAQS" "as expeditiously as practicable."[47] The first clause of the sentence must be read to be contingent on the second clause: only if the reductions are necessary for timely and expeditious attainment may UDAQ impose "beyond RACT" measures. Conversely, if regulating "beyond RACT" will not lead to timely attainment, then UDAQ has arbitrarily imposed requirements more stringent than the CAA.[48]

Second, UDAQ must make the demonstration that "beyond RACT" reductions are *necessary* to timely and expeditiously achieve attainment. The Proposed SIP contains no analysis whatsoever of the impact of emission reductions associated with "beyond RACT" controls. Additionally, as discussed in the following sections, such reductions cannot be deemed "necessary" if UDAQ is not complying with mandatory statutory directives that Congress has expressly stated are necessary to reach attainment.

UDAQ has failed to make the demonstration that the reductions in NO_x emissions from the Chevron SLC Refinery crude heaters are necessary for timely and expeditious attainment and therefore imposition of "beyond RACT" exceeds UDAQ's authority.

B. UDAQ Fails to Demonstrate that ULNB Controls are Necessary to Provide for Timely Attainment of the NAAQS.

UDAQ has failed to establish through substantial evidence that installation of ULNBs for crude heaters is necessary to timely attain the NAAQS. Under Utah's Rulemaking Act, UDAQ must establish that its rulemaking is based on "substantial evidence,"[49] which "is that quantum and quality of relevant evidence that is adequate to convince a reasonable mind to support a conclusion."[50] Here, UDAQ provides no evidence and no analysis establishing the impact of reductions in NO_x from ULNB controls on timely or expeditious attainment of the standard.

According to the Proposed SIP, installation of ULNBs will "result in a reduction of 4.7 tpy of NO_x emissions for Crude Heater F21001, and 4.2 tons per year of NO_x emissions reductions for Crude Heater F21002," for a total of 8.9 tpy.[51] The Proposed SIP also notes that point sources within the NAA account for approximately 20.4 tons per day of NO_x or 7,446 tons per year as of the baseline 2017 inventory year.[52] Thus, a total reduction of 8.9 tpy accounts for only 0.12% of the total 2017 NO_x inventory.

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[47] Implementation of the 2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements, 80 Fed. Reg. 12,264, 12,279 (March 6, 2015).
[48] Chevron recognizes that under section 182 of the CAA, Utah has an ongoing obligation to demonstrate attainment. However, EPA was clear that states may only require beyond RACT reductions if such reductions are necessary "to provide for timely attainment of the ozone NAAQS." *Id.* at 12,279.
[49] Utah Code § 63G-3-602(4).
[50] *Associated Gen. Contrs. v. Bd. of Oil, Gas and Mining*, 2001 UT 112, ¶ 21 (citing *First Nat'l Bank of Boston v. County Bd. of Equalization*, 799 P.2d 1163, 1165 (Utah 1990)).
[51] Proposed SIP, at 44.
[52] *Id.* at 113 tbl. 65.

The Proposed SIP contains no calculation or analysis of how an 8.9 tpy reduction in NO_x emissions would impact the ozone concentration in the NWF NAA—much less a demonstration that such a reduction is "necessary" for attainment. Without showing that conversion, there is no evidence, let alone substantial evidence, as is required by the Rulemaking Act, showing that the 8.9 tpy reduction, or a 0.12% reduction in total 2017 NO_x emissions from point sources, is necessary to provide for timely attainment of the ozone NAAQS of 70 ppb.[53] Reliance on unsupported conclusions as the basis for agency actions is the epitome of arbitrary and capricious decision making.[54]

Additionally, an 8.9 tpy reduction, equating to a 0.12% decrease in NO_x emissions from point sources, addresses just one of the ozone precursors. The Proposed SIP states that "a little more than half of the modeled ozone at both monitoring sites is attributable to NO_x sources" and "ozone at the controlling monitors in the NWF NAA is formed under both NO_x - and VOC-limited conditions, with a little more than half of the ozone formed under NO_x -limited conditions."[55] As installation of ULNBs results only in the reduction of NO_x emissions, ULNB-related emissions reductions make even less of an impact on attaining the NAAQS. Even if UDAQ layers on the "beyond RACT" determination for Marathon Refinery[56], these minimal NO_x reductions are unlikely to result in timely or more expeditious attainment in light of outstanding (and required) VOC reductions and natural and transported anthropogenic ozone. However, without analysis showing how the NO_x reduction equates to a reduction in ppb of ozone, determining the ultimate impact of this minimal reduction is left to guesswork.

Moreover, it is particularly difficult for UDAQ to argue that the small NO_x emissions reductions from "beyond RACT" controls are necessary to demonstrate attainment as expeditiously as possible in light of the complicated variables contributing to the NWF's nonattainment of the ozone NAAQS. The Proposed SIP details how background, interstate, and international ozone emissions all drive the ozone concentrations along the NWF.[57] The Proposed SIP highlights that the "increasing instances of wildfires" as well as "significant regional and local biogenic sources" contribute to a "large proportion of ozone on any given day."[58] UDAQ additionally found that the transport of ozone and its precursor emissions from California, Nevada, Arizona, Idaho, Oregon, and Washington together account for "7% of the total predicted ozone concentrations in the NWF NAA."[59] Similarly, UDAQ's apportionment modeling attributes 6.3% to 6.7% of the ozone concentration to international sources.[60] Together, these sources "account for up to 85.5% of the ozone

[53] Analysis and modeling by Ramboll, an independent third party, show that the reductions that would be achieved through installation of the proposed controls would be less than .03 ppb. Ramboll's comments are attached at Exhibit C and Chevron incorporates those comments by reference.
[54] *See Olenhouse.*, 42 F.3d at 1574–75 (explaining the basic administrative law principles that agencies must "articulate[] a rational connection between the facts found and the decision made" and that "agency action will be set aside as arbitrary if it is unsupported by 'substantial evidence.'").
[55] *Id.* at 114.
[56] *Id.* at 73–74.
[57] *Id.* at 129–50.
[58] *Id.* at 129.
[59] *Id.* at 131.
[60] *Id.* at 132.

comprising the mean daily 8-hour concentrations" in the NWF.[61] As Figures 15 and 16 in the Proposed SIP demonstrate, only 5.8% is attributable to anthropogenic sources that may be subject to regulation by the state of Utah:

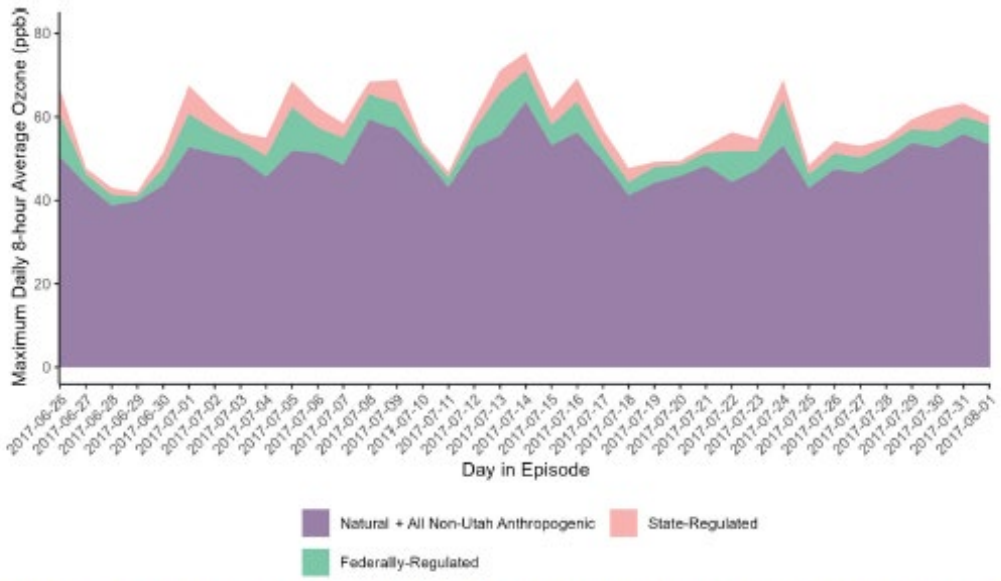

Figure 15: Ozone Attributed to Domain-Wide Sources at Hawthorne as simulated 8-hour mean daily ozone concentrations along the Wasatch Front.

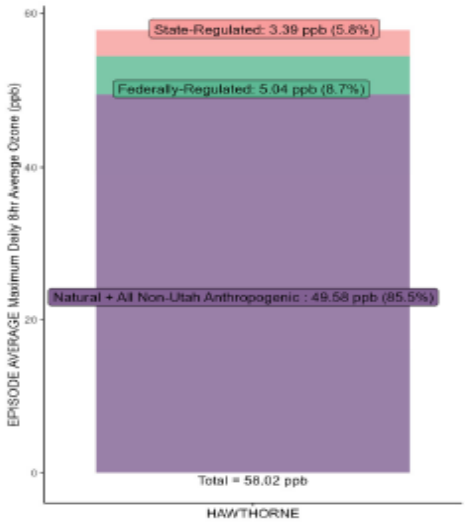

Figure 16: Episode average of simulated 8-hour mean daily ozone concentrations at Hawthorne along the Wasatch Front.

Put practically, the 8.9 tpy NO_x reduction from the installation of ULNBs at the SLC Refinery is not only a small drop in the bucket of the 2017 NO_x inventory, but also insignificant in comparison to the scale of the ozone problem in Utah. It is not credible for UDAQ to claim that emission reductions from this specific control technology is necessary at any cost to achieve attainment as expeditiously as possible.

[61] *Id.* at 129–30.

This is especially true as UDAQ's weight of the evidence analysis, as discussed in Section III.B above, concludes that there is a "strong case" that the NWF NAA will "attain[] the 8-hour ozone NAAQS by the attainment date of August 3, 2024."[62] ULNBs cannot be necessary to reach attainment if UDAQ's own analysis shows likely attainment without installation of these technologies.

C. UDAQ Must Comply With Other Statutory Obligations Before Exercising Discretion to Require Beyond RACT Reductions.

UDAQ's proposed imposition of beyond RACT controls resulting in 0.024 tpd reduction of NO_x as "necessary" to achieve attainment is arbitrary and capricious when UDAQ is not complying with a mandatory statutory requirement that requires and would result in a 14.0 tpd decrease in VOC.

Congress' "stated purpose of 'reasonable further progress' is to ensure attainment by the applicable attainment date."[63] That is, for moderate nonattainment areas, the Clean Air Act explicitly directs states to impose reasonable further progress obligations as a "necessary" step to reach attainment.[64] Yet UDAQ failed to comply with this provision and instead has used its purported discretionary authority to impose "beyond RACT" controls that it asserts—with no justification—are necessary to attain the standard. UDAQ's actions are arbitrary for two reasons.

First, UDAQ cannot demonstrate that beyond RACT controls are necessary to reach attainment when it has failed to comply with the other obligations under the Clean Air Act. Specifically, the Proposed SIP fails to demonstrate RFP by achieving a 15% reduction in VOC emissions from the 2017 baseline.[65] To meet the 15% reduction in VOC emissions, Utah must show a reduction of 14.0 tpd of VOC.[66] Accounting for the reduction in VOC emissions due to improved vehicle emissions reduction technologies and cleaner fuels, and taking into account increased emissions due to population growth, UDAQ calculated a 3.7 tpd reduction in VOC before implementation of any new emissions controls, which means that Utah must reduce its VOC emissions by 10.3 tpd to fulfill its RFP requirements.[67] However, UDAQ acknowledges that Utah will not meet RFP requirements, noting that "due to the short implementation timeframe afforded to states under this SIP revision, paired with the added difficulty of finding viable VOC reduction strategies . . . , these strategies will not be fully implemented by the implementation deadline of January 1, 2023 and thus, will not count towards RFP under the moderate SIP."[68]

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[62] *Id.* at 140.
[63] *Sierra Club v. United States EPA*, 99 F.3d 1551, 1557 (10th Cir. 1996).
[64] 42 U.S.C. § 7511a(b)(1)(A)(i).
[65] 42 U.S.C. § 7502(c)(2).
[66] Proposed SIP, at 110.
[67] *Id.* at 112.
[68] *Id.* at 115.

It is arbitrary for UDAQ to fail to identify statutorily required VOC emissions reductions and yet impose controls more stringent than what is statutorily required for the SLC Refinery's NO_x emissions. If UDAQ were to comply with the CAA's RFP requirement, VOC emissions would be reduced by 14.0 tpd.[69] On the other hand, installation of ULNBs at the SLC Refinery will "result in a reduction of 4.7 tpy of NO_x emissions for Crude Heater F21001, and 4.2 tpy of NO_x emissions reductions for Crude Heater F21002," for a total of 8.9 tpy, which is only 0.024 tpd of NO_x emissions.[70]

Furthermore, UDAQ does not argue that NO_x reductions will have a disproportionately greater effect on ozone concentrations than VOC reductions. UDAQ acknowledges that "a little more than half of the modeled ozone at both monitoring sites is attributable to NO_x sources" and "ozone at the controlling monitors in the NWF NAA is formed under both NO_x- and VOC-limited conditions, with a little more than half of the ozone formed under NO_x -limited conditions."[71] Thus, reductions in VOC and NO_x likely have a substantially similar impact on total ozone concentrations; this does not justify imposition of high-cost measures to reduce a small amount of NO_x emissions.

Second, UDAQ cannot use this moderate SIP planning process to impose controls to address a contingency that has not yet occurred. As noted in the Proposed SIP, "Utah is working to have these strategies fully implemented prior to the summer of 2026 in an effort to count these reductions toward RFP requirements during the state's submission of a *potential* serious SIP for the same NAA."[72] UDAQ is not authorized to impose arduous "beyond RACT" requirements in anticipation of a future event. Such action exceeds UDAQ's authority under the CAA and is arbitrary.

In sum, UDAQ's imposition of "beyond RACT" controls on Chevron, without first complying with mandatory statutory requirements and without adequately demonstrating that such controls are necessary to expeditiously attain the NAAQS, is arbitrary and capricious, not supported by substantial evidence, and exceeds UDAQ's authority and discretion.

VI. UDAQ's Decision to Impose New Control Requirements on Chevron Without Broadly Scrutinizing Cost Effectiveness and NO_x Reductions of Controls for Other Sources is Arbitrary and Capricious.

The Proposed SIP explains that UDAQ relied heavily on previous BACT analyses submitted by sources for the development of the $PM_{2.5}$ serious SIP as the basis for UDAQ's RACT determinations for the Proposed SIP.[73] Sources submitted these BACT analyses in 2017 and UDAQ determined in 2018 which control technologies constituted BACT.[74] To address any industry or source-specific changes in the intervening five years, Chevron and

[69] *Id.* at 110.
[70] *Id.* at 44.
[71] *Id.* at 114.
[72] *Id.* at 115 (emphasis added).
[73] *Id.* at 34–35.
[74] *Id.*

several other sources voluntarily submitted new RACT analyses to update their control assessments.[75] UDAQ also examined new control analyses from four sources that were not evaluated as part of the $PM_{2.5}$ serious SIP.[76]

The Proposed SIP imposes new control technologies on only three sources: Chevron, US Magnesium LLC, and Tesoro Refining & Marketing Company LLC (dba Marathon Refinery).[77] All of these sources submitted new RACT analyses to UDAQ.[78] The Proposed SIP does not require new control technologies at any sources that exclusively relied on their previous BACT analyses. Rather than scrutinizing these BACT analyses, UDAQ simply concluded that "[r]e-evaluation of BACT showed that additional add-on controls or limitations are not technically or economically feasible options at this time."[79] The requirement of additional control technologies only at sources that submitted new analyses is arbitrary and capricious, particularly because the costs of the imposed technologies, including ULNBs on the crude heaters at the SLC Refinery, fall well outside the cost thresholds of previous BACT determinations. Additionally, the Proposed SIP provides no justification for UDAQ's decision to impose beyond RACT at these three sources without comparing these controls to similarly situated sources. Put differently, the Proposed SIP arbitrarily picks winners and losers rather than applying a systematic process to impose controls. UDAQ's failure to "make plain its course of inquiry, its analysis and its reasoning" is a hallmark of an arbitrary and capricious agency action.[80]

UDAQ similarly failed to scrutinize the cost-effectiveness and NO_x reductions of technologies considered by other sources that did submit new RACT analyses but are not subject to additional controls under the Proposed SIP. For these sources, UDAQ concluded that "[n]o additional RACT measures were identified, and all RACT determinations are already being implemented."[81] UDAQ simply agreed with these sources that additional control technologies were not economically feasible without any documented scrutiny.

Table 1 in the Appendix compares the cost and pollutant emission reductions from installing ULNBs at the SLC Refinery to other control technologies that UDAQ determined were not economically feasible. Of the control technologies that UDAQ deemed not economically feasible, fifteen would be less expensive than the $300,000 per ton of pollutant removed-cost of installing ULNBs at the SLC Refinery. These control technologies range in cost from $37,232 to $240,000 per ton removed and would individually yield emissions reductions up to 45.28 tpy, more than five times the emission reduction from installing the ULNBs. The four controls that would provide a 45.28 tpy reduction are less than half as expensive as the ULNBs for the SLC Refinery.

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[75] *Id.*
[76] *Id.*
[77] *Id.* at 91–93.
[78] *Id.* at 34–35.
[79] *Id.* at 51, 66, & 68.
[80] *Olenhouse*, 42 F.3d at 1574.
[81] Proposed SIP, at 38, 47, 51, 55, 58, 64, 66, 68, 74, 76, 80, 87, 88–89, 91.

Several of the control technologies at other sources would also yield far greater reductions in emissions at costs similar to the initial cost estimates ($26,555 and $28,322 per ton of pollutant removed for F21001 and F21002, respectively). For instance, UDAQ agreed that a control technology that would reduce NO_x emissions by 16 tpy was not economically feasible because it would cost $29,000 per ton of pollutant removed. Even under the initial cost estimate, UDAQ effectively ignored a control technology that would provide nearly twice the pollutant reduction as installing ULNBs at the SLC Refinery for only $678 more per ton of pollutant removed.

Additionally, UDAQ agreed that the installation of ULNBs is not economically feasible for two of the sources that specifically incorporated the cost of "lost production" into their economic analyses.[82] Conversely, UDAQ refuses to recognize that these same costs are even relevant to the economic feasibility of ULNBs at Chevron's SLC Refinery to the extent that Chevron cannot expedite the required planning for installation.

The treatment of Chevron's RACT analysis under the Proposed SIP is inconsistent with UDAQ's approval of the RACT and BACT analyses submitted by other sources in the NAA. The imposition of new control requirements on Chevron without broadly scrutinizing the cost effectiveness and NO_x reductions of controls for other sources is arbitrary and capricious.

VII. Utah Statutory Law Prohibits UDAQ from Imposing Controls Different From Federal Requirements Unless Certain Written Findings are Made.

UDAQ's inclusion of ULNBs for Chevron's crude heaters violates Utah Code § 19-2-106. Under that statute, UDAQ may only "make rules for the purpose of administering a program under the federal Clean Air Act different than the corresponding federal regulations" if it: (1) holds a public comment period and public hearing, (2) "finds that the different rule will provide reasonable added protections to public health or the environment of the state of a particular region of the state," (3) puts that finding in writing "based on evidence, studies, or other information contained in the record that relates to the state of Utah and the type of source involved."[83] UDAQ did not comply with this statutory mandate when imposing "beyond RACT" controls on the SLC Refinery.

A. UDAQ Did Not Make the Required Written Findings

Utah Code § 19-2-106 applies here because the "beyond RACT" controls imposed on Chevron differ from the Clean Air Act and its corresponding regulations. As described above, the CAA requires states to implement RACT on certain stationary sources, which EPA has defined as "the lowest emission limitation that a particular source is capable of

[82] As noted previously, Hexcel specifically included the cost of "lost revenue" for every day of "down time" required to retrofit the facility in its economic analysis of ULNB. Similarly, the University of Utah calculated that the cost of replacing its ULNB would be $107,238 per ton of NOx removed by "following the methodologies outlined in the. . . Control Cost Manual." Conversely, UDAQ refuses to recognize that these same costs are relevant to the economic feasibility of ULNB at Chevron's SLC Refinery.
[83] Utah Code § 19-2-106(1)(a)(i)–(ii) & 106(2).

meeting by the application of control technology that is reasonably available considering technological and economic feasibility."[84] UDAQ acknowledges that the installation of ULNBs at the SLC Refinery is "beyond RACT,"[85] meaning UDAQ is imposing a control that differs from what is required under the CAA.

As such, Utah law requires UDAQ to make a finding that the beyond RACT control "will provide *reasonable added* protections to public health or the environment, and that the finding is *in writing* and *based on evidence, studies, and other information* contained in the record."[86] In other words, UDAQ was required to undergo a distinct and separate analysis and review process to determine whether regulating beyond RACT provides reasonable added protections to health or the environment. To comply with the statute, UDAQ needed to put that separate and distinct finding into writing and support it through modeling, studies, or other evidence.

UDAQ did not do so. The only finding related to the "beyond RACT" regulation is that it will "control emissions from these two heaters by approximately 62%," and that it will "result in a reduction of 4.7 tpy of NO_x emissions for Crude Heater F21001, and 4.2 tpy of NO_x emissions reductions for Crude Heater F21002."[87] UDAQ made no finding that regulating beyond RACT provides additional protections to public health or the environment, and the statute is explicit that this finding must be in writing and supported by evidence, studies, or other materials. It is not enough for UDAQ to summarily conclude that ozone is bad for human health. UDAQ did not comply with these explicit mandates, and thus violated Utah statutory law.[88]

B. The "Beyond RACT" Controls Will Not Provide Reasonable Added Protections to Public Health or the Environment.

Even if UDAQ had undertaken this separate and distinct analysis regarding whether beyond RACT provides additional protections to public health or the environment (which it did not), UDAQ is unable to show that beyond RACT controls result in "reasonable added protections" to human health and the environment.[89] In the context of Utah Code § 19-2-106, "reasonable" can be read to mean that both the "added protections" to human health and the environment are reasonable, as well as the means to achieve such protections. "Reasonable is commonly defined to mean 'not extreme or excessive' or 'fair,'"[90] or "as much as is appropriate or fair; moderate."[91] The beyond RACT controls are not reasonable in either sense.

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[84] State Implementation Plans; General Preamble for Proposed Rulemaking on Approval of Plan Revisions for Nonattainment Areas—Supplement (on Control Techniques Guidelines), 44 Fed. Reg. 53,761 (September 17, 1979).
[85] Proposed SIP, at 44.
[86] Utah Code § 19-2-106(1)(a)(i)–(ii) & 106(2) (emphasis added).
[87] Proposed SIP, at 44.
[88] *See* Utah Code § 63G-3-602(4)(a) (district court may declare the rule invalid if it violates statutory law).
[89] Utah Code § 19-2-106.
[90] *In re A.C.*, 2004 UT App 255, ¶ 14 (quoting Merriam-Webster's Collegiate Dictionary 974 (10th ed. 1999)).
[91] Reasonable, Oxford Dictionary of English.

First, and as noted above, UDAQ did not provide any analysis regarding how reduction of 8.9 tpy converts to a reduction in ozone concentrations in the NWF. Nor did it provide any analysis regarding the impact on human health or the environment resulting directly from the beyond RACT requirements. To the contrary, the NO_x emissions reductions attributable to installation of ULNBs at the SLC Refinery account for only a 0.12% reduction of the total 2017 NO_x inventory from point sources.[92] It is unlikely that such a minimal reduction in NO_x emissions can equate to demonstrable added protections to human health and the environment.

Second, the exorbitant cost per ton of emissions resulting from installation of ULNBs, compared to the minimal NO_x reductions, demonstrates that such a stringent control is an unreasonable means to achieve added protections to human health and the environment, especially considering how minimal those added protections likely are. However, without the written findings and supporting evidence required by Utah Code § 19-2-106, one cannot adequately scrutinize the reasonableness of such controls when compared to the added protections. For those reasons, UDAQ's imposition of beyond RACT controls violates Utah law.

VIII. Conclusion

The installation of ULNBs at Chevron's SLC Refinery is not economically feasible and its implementation deadline is arbitrary. Additionally, requiring the technology as a "beyond RACT" control is not supported by substantial evidence, is contradicted by UDAQ's weight of the evidence analysis, and exceeds UDAQ's legal authority. Further, UDAQ failed to broadly scrutinize the cost effectiveness of controls for other sources. Finally, UDAQ's decision to require this control technology deviates from federal requirements under the CAA without the justification required by Utah law. The imposition of this control technology on Chevron's SLC Refinery in the Proposed SIP is, therefore, arbitrary and capricious as well as violative of Utah law.

Chevron appreciates the opportunity to provide these comments on the Proposed SIP. Chevron urges UDAQ to consider these comments and amend the Proposed SIP by rescinding its additional control technology requirement for the SLC Refinery.

[92] *See* Proposed SIP at 43–44.

APPENDIX

Table 1[93]				
	Control Technology	**cost/ton of pollutants reduced**	**tons/year of pollutants reduced**	**Was the control imposed by UDAQ?**
Chevron SLC Refinery	ULNBs on crude heaters F21001 and F21002	$26,555/$28,322 (planned shutdown) $300,000 (unplanned shutdown)	8.9	Yes
Kennecott Utah Copper	lower temperature SCR on anode furnaces	$44,663	45.28	no
	SCR on anode furnaces	$50,907	45.28	no
	low temperature oxidation system on anode furnaces	$84,844	45.28	no
	wet scrubber on Anode Furnaces	$114,092	45.28	no
Big West Oil, LLC Refinery	secondary seal for storage tank	$29,000	16	no
	ULNB on crude heater H-402 #2	$62,000	6.79	no
	ULNB on crude heater H-621, 622, & 624	$68,000	19	no
	ULNB on heater H-301	$69,000	6.18	no
	ULNB on heater H-601	$88,000	4.84	no
	ULNB on heater H-1001	$240,000	1.80	no
Hexcel Corporation	ULNB on pilot fiber line	$37,232	0.58	no
	ULNBs on fiber lines 11 & 12	$41,905	5.51	no
	ULNB on fiber line 5	$58,392	14.43	no
	ULNB on fiber line 6	$134,381	9.58	no
University of Utah	ULNB replacement	$107,238	5.42	no

[93] *See* Northern Wasatch Front Moderate Ozone SIP Technical Support Documentation, Supporting TSD, DEQ.ORG, https://deq.utah.gov/air-quality/northern-wasatch-front-moderate-ozone-sip-technical-support-documentation#supporting-tsd (last visited June 8, 2023) (providing the RACT analyses submitted to UDAQ).

Exhibit A

SUMMARY OF ULNB COSTS FOR F21001

Emission Point Number			F21001
Service			Crude Unit Heater
Size (MMBtu/hr-HHV)			130.00
CAPITAL COSTS:			
Purchased Equipment (PE) [1]			$300,000
Freight	10%	% of PE [2]	$ 30,000
Sales Tax	6%	% of PE [2]	$ 18,000
Purchased Equipment Cost (PEC)			$ 348,000
Direct Installation Costs			
Foundations	10%	% of PEC [2]	$ 34,800.00
Structure, ductwork, stack	15%	% of PEC [2]	$ 52,200.00
Instrumentation (with CEMS)	8%	% of PEC [2]	$ -
Electrical	10%	% of PEC [2]	$ 34,800
Piping	5%	% of PEC [2]	$ 17,400
Insulation,lagging for ductwork	5%	% of PEC [2]	$ 17,400
Painting	5%	% of PEC [2]	$ 17,400
Direct Installation Costs			$ 174,000
Direct Costs (DC)			$ 522,000
Indirect Costs			
Engineering & Project mgmt.	25%	% of PE [2]	$ 87,000
Construction and field expenses	20%	% of PE [2]	$ 69,600
Contractor fees	15%	% of PE [2]	$ 52,200
Start-up	10%	% of PE [2]	$ 34,800
Performance test	5%	% of PE [2]	$ 17,400
Contingencies	10%	% of DC	$ 52,200
Indirect Costs			$ 313,200
Total Installed Cost (TIC)			$ 835,200
OPERATING COSTS:	NA - Assumed to be the same as existing LNB		

NOx Emission Reduction

	Emission Factor Lb/MMBtu	Emissions TPY
2017 Emissions	0.041	12.3
ULNB Emissions	0.025	7.6
TPY NOx Reduction		4.7

Capital Recovery Factor (10%, 10 yr life)			
Annualized Total Capital Investment [3]	**0.1627**	**x TIC**	**$ 135,925**
Total Annual Costs			**$ 135,925**
NOx Reduction, tons/yr			4.7
NOx Cost Effectiveness, $/ton reduced			**$ 28,987**

Notes:

1) As obtained from discussions with potential vendors, and as compared to the EPA-approved permit applications. ULNB cost are ratioed based on heater duty.
2) Typical industry allowances as a percentage of purchased equipment costs; based on experience, engineering practices, discussions with potential vendors, and as compared to the EPA-approved permit applications.
3) Annualized Total Capital Investment is estimated using the capital recovery factor for 10-yr life and 10 percent average interest; i.e., CRF = (i(1+i)^n)/((1+i)^n)-1).

SUMMARY OF SCR COSTS FOR F21001

Emission Point Number			F21001
Service			Crude Unit Heater
Size (MMBtu/hr-HHV)			130.00
CAPITAL COSTS:			
Purchased Equipment (PE) [1]			
SCR Unit			$ 479,926
Ammonia Skid			$ 223,966
Ammonia Tank			$ 153,577
Ductwork,dampers,stack,Fan			$ 575,912
Instrumentation(with CEMS)			$ 339,148
Freight	10%	% of PE [2]	$ 47,992.59
Sales Tax	6%	% of PE [2]	$ 28,796
Purchased Equipment Cost (PEC)			$ 1,849,317
Direct Installation Costs			
Foundations	10%	% of PEC [2]	$ 184,932
Structure, ductwork ,stack, Fan	15%	% of PEC [2]	$ 277,398
Instrumentation (with CEMS)	8%	% of PEC [2]	$ 601,198.79
Electrical	10%	% of PEC [2]	$ 184,932
Piping	5%	% of PEC [2]	$ 92,466
Insulation,lagging for ductwork	5%	% of PEC [2]	$ 92,466
Painting	5%	% of PEC [2]	$ 92,466
Direct Installation Costs			$ 1,525,857
Direct Costs (DC)			$ 3,375,175
Indirect Costs			
Engineering & Project mgmt.	25%	% of PE [2]	$ 462,329
Construction and field expenses	20%	% of PE [2]	$ 369,863
Contractor fees	15%	% of PE [2]	$ 277,398
Start-up	10%	% of PE [2]	$ 184,932
Performance test	5%	% of PE [2]	$ 92,466
Contingencies	10%	% of DC	$ 337,517
Indirect Costs			$ 1,724,505
Total Installed Cost (TIC)			$ 5,099,680
OPERATING COSTS:			
Catalyst Replacement (5-yr lifetime)			$ 7,113
Disposal	50%	% of CR [2]	$ 3,557
Ammonia (17/46 x tpy NOx removed)	$ 455.00	per ton [4]	$ 1,854
Utilities [3]	$0.066	per kW-hr [4]	$ 13,529
Operating labor (0.5 hr / 8 hr shift), OP	$ 25.00	per hour [4]	$ 13,688
Supervisory labor, SL	15%	% of OP [4]	$ 2,053
Maintenance labor (0.5 hr / 8 hr shift), ML	$ 25.00	per hour [4]	$ 13,688
Maintenance Materials, MM	100%	% of M [4]	$ 13,688
Overhead	40%	% of OP+SL+ML+MM [4]	$ 17,246
Taxes, Insurance, and Admin.	4%	% of TCI [4]	$ 203,987
Annual Operating Costs			**$ 290,402**
Capital Recovery Factor (10%, 20 yr life)			
Annualized Total Capital Investment [5]	**0.1175**	**x TIC**	**$ 599,006**
Total Annual Costs			**$ 889,408**
2015 NOx Emissions, Tons/Yr			12.3
SCR NOx Emissions, Tons/Yr [6]			1.23
NOx Reduction, Tons/Yr			11.0
NOx Cost Effectiveness, $/ton reduced			**$ 80,658**

Notes:

1) As obtained from discussions with potential vendors, and as compared to the EPA-approved permit applications. SCR Unit cost are ratioed based on heater duty.
2) Typical industry allowances as a percentage of purchased equipment costs; based on experience, engineering practices, discussions with potential vendors, and as compared to the EPA-approved permit applications.
3) Required Utility Cost based assumed average of 0.18 KWH per MMBtu/hr of firing duty.
4) Costs based on experience, engineering practices, and the design for this project.
5) Annualized Total Capital Investment is estimated using the capital recovery factor for 20-yr life and 10 percent average interest; i.e., CRF = (i(1+i)^n)/((1+i)^n)-1).
6) Assumed 90% control efficiency

	NOx	VOC	MMBtu/ hr
Combined Emissions	23.1	2.5	245.1
F21001	12.3	1.3	130
F21002	10.8	1.2	115.1
Combined - Confirm	23.10	2.50	

SUMMARY OF ULNB COSTS FOR F21002

Emission Point Number			F21002
Service			Crude Unit Heater
Size (MMBtu/hr-HHV)			115.1
CAPITAL COSTS:			
Purchased Equipment (PE) [1]			$300,000
Freight	10%	% of PE [2]	$ 30,000
Sales Tax	6%	% of PE [2]	$ 18,000
Purchased Equipment Cost (PEC)			$ 348,115
Direct Installation Costs			
Foundations	10%	% of PEC [2]	$ 34,812
Structure, ductwork, stack	15%	% of PEC [2]	$ 52,217.27
Instrumentation (with CEMS)	8%	% of PEC [2]	$ -
Electrical	10%	% of PEC [2]	$ 34,812
Piping	5%	% of PEC [2]	$ 17,406
Insulation,lagging for ductwork	5%	% of PEC [2]	$ 17,406
Painting	5%	% of PEC [2]	$ 17,406
Direct Installation Costs			$ 174,058
Direct Costs (DC)			$ 522,173
Indirect Costs			
Engineering & Project mgmt.	25%	% of PE [2]	$ 87,029
Construction and field expenses	20%	% of PE [2]	$ 69,623
Contractor fees	15%	% of PE [2]	$ 52,217
Start-up	10%	% of PE [2]	$ 34,812
Performance test	5%	% of PE [2]	$ 17,406
Contingencies	10%	% of DC	$ 52,217
Indirect Costs			$ 313,304
Total Installed Cost (TIC)			$ 8,835,476
OPERATING COSTS:	NA - Assumed to be the same as existing LNB		

NOx Emission Reduction

	Emission Factor Lb/MMBtu	Emissions TPY
2017 Emissions	0.041	10.8
ULNB Emissions	0.025	6.7
NOx Reduction		4.2

Capital Recovery Factor (10%, 10 yr life) Annualized Total Capital Investment [3]	**0.1627**	**x TIC**	**$ 1,437,933**
Total Annual Costs			**$ 1,437,933**
NOx Reduction, tons/yr			4.2
NOx Cost Effectiveness, $/ton reduced			**$ 343,406**

Notes:

1) As obtained from discussions with potential vendors, and as compared to the EPA-approved permit applications. ULNB cost are ratioed based on heater duty.
2) Typical industry allowances as a percentage of purchased equipment costs; based on experience, engineering practices, discussions with potential vendors, and as compared to the EPA-approved permit applications.
3) Annualized Total Capital Investment is estimated using the capital recovery factor for 20-yr life and 10 percent average interest; i.e., CRF = (i(1+i)^n)/((1+i)^n)-1).

SUMMARY OF SCR COSTS FOR F21002

Emission Point Number			F21002
Service			Crude Unit Heater
Size (MMBtu/hr-HHV)			115.1
CAPITAL COSTS:			
Purchased Equipment (PE) [1]			
SCR Unit			$ 424,919
Ammonia Skid			$ 198,296
Ammonia Tank			$ 135,975
Ductwork,dampers,stack,Fan			$ 509,903
Instrumentation(with CEMS)			$ 300,277
Freight	10%	% of PE [2]	$ 42,491.90
Sales Tax	6%	% of PE [2]	$ 25,495
Purchased Equipment Cost (PEC)			$ 1,637,357
Direct Installation Costs			
Foundations	10%	% of PEC [2]	$ 163,736
Structure, ductwork ,stack, Fan	15%	% of PEC [2]	$ 245,604
Instrumentation (with CEMS)	8%	% of PEC [2]	$ 585,301.77
Electrical	10%	% of PEC [2]	$ 163,736
Piping	5%	% of PEC [2]	$ 81,868
Insulation,lagging for ductwork	5%	% of PEC [2]	$ 81,868
Painting	5%	% of PEC [2]	$ 81,868
Direct Installation Costs			$ 1,403,980
Direct Costs (DC)			$ 3,041,337
Indirect Costs			
Engineering & Project mgmt.	25%	% of PE [2]	$ 409,339
Construction and field expenses	20%	% of PE [2]	$ 327,471
Contractor fees	15%	% of PE [2]	$ 245,604
Start-up	10%	% of PE [2]	$ 163,736
Performance test	5%	% of PE [2]	$ 81,868
Contingencies	10%	% of DC	$ 304,134
Indirect Costs			$ 1,532,151
Total Installed Cost (TIC)			$ 4,573,489
OPERATING COSTS:			
Catalyst Replacement (5-yr lifetime)			$ 6,298
Disposal	50%	% of CR [2]	$ 3,149
Ammonia (17/46 x tpy NOx removed)	$ 455.00	per ton [4]	$ 1,642
Utilities [3]	$0.066	per kW-hr [4]	$ 11,978
Operating labor (0.5 hr / 8 hr shift), OP	$ 25.00	per hour [4]	$ 13,688
Supervisory labor, SL	15%	% of OP [4]	$ 2,053
Maintenance labor (0.5 hr / 8 hr shift), ML	$ 25.00	per hour [4]	$ 13,688
Maintenance Materials, MM	100%	% of M [4]	$ 13,688
Overhead	40%	% of OP+SL+ML+MM [4]	$ 17,246
Taxes, Insurance, and Admin.	4%	% of TCI [4]	$ 182,940
Annual Operating Costs			**$ 266,368**
Capital Recovery Factor (10%, 20 yr life)			
Annualized Total Capital Investment [5]	**0.1175**	**x TIC**	**$ 537,200**
Total Annual Costs			**$ 803,568**
2015 NOx Emissions, Tons/Yr			10.8
SCR NOx Emissions, Tons/Yr [6]			1.08
NOx Reduction, Tons/Yr			9.8
NOx Cost Effectiveness, $/ton reduced			**$ 82,307**

Notes:

1) As obtained from discussions with potential vendors, and as compared to the EPA-approved permit applications. SCR Unit cost are ratioed based on heater duty.
2) Typical industry allowances as a percentage of purchased equipment costs; based on experience, engineering practices, discussions with potential vendors, and as compared to the EPA-approved permit applications.
3) Required Utility Cost based assumed average of 0.18 KWH per MMBtu/hr of firing duty.
4) Costs based on experience, engineering practices, and the design for this project.
5) Annualized Total Capital Investment is estimated using the capital recovery factor for 20-yr life and 10 percent average interest; i.e., CRF = (i(1+i)^n)/((1+i)^n)-1).
6) Based on 0.006 lb/MMBtu

	NOx	VOC	MMBtu/ hr
Combined Emissions	23.1	2.5	245.1
F21001	12.3	1.3	130
F21002	10.8	1.2	115.1
Combined - Confirm	23.1	2.5	

Exhibit B

Utah Petroleum Association
6905 South 1300 East #288
Cottonwood Heights, UT 84047

Utah Mining Association
4286 South Main Street
Salt Lake City, UT 84107

July 17, 2023

Erica Pryor
Ryan Bares
Utah Division of Air Quality
P.O. Box 144820
Salt Lake City, Utah 84114-4820

Submitted by email to *epryor1@utah.gov* and *rbares@utah.gov*.

Subject: Comments from the Utah Petroleum Association and Utah Mining Association on Amendment to R-307-110-13, Incorporation of Utah State Implementation Plan, Section IX.D.11: *2015 Ozone NAAQS Northern Wasatch Front Moderate Nonattainment Area,* and Incorporation of Utah State Implementation Plan, Section IX.H.31 and Section IX.H.32: *Emission Limitations and Operating Practices*, R-307-110-17.

Dear Ms. Pryor and Mr. Bares:

In 2015, the Environmental Protection Agency ("EPA") lowered the National Ambient Air Quality Standard ("NAAQS" or "standard") for ozone from 75 parts per billion ("ppb") to 70 ppb.[1] On June 4, 2018, EPA designated the Northern Wasatch Front ("NWF") as an ozone nonattainment area ("NAA") under the 2015 NAAQS for ozone, in accordance with the requirements of the federal Clean Air Act ("CAA"), with an effective date of August 3, 2018. The NWF includes all of Salt Lake and Davis County and portions of Toole and Weber Counties. The rulemaking also designated the Southern Wasatch Front ("SWF") including all of Utah County as a separate NAA. Both NAAs had an initial designation of Marginal.[2]

The NWF failed to attain the NAAQS by the attainment date of August 3, 2021, and EPA reclassified it to Moderate status on October 7, 2022, with an effective date of November 7, 2022. The rulemaking established due dates for State Implementation Plan ("SIP") revisions for Moderate areas and implementation of Reasonably Available Control Technology ("RACT") and Reasonably Available Control Measures ("RACM"), setting these dates at no later than January 1, 2023. In the same action, EPA granted the Determination of Attainment by Attainment Date ("DAAD") to the SWF, meaning that the SWF will remain at Marginal status with no SIP or additional controls required.[3]

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[1] 80 FR 69292, *National Ambient Air Quality Standards for Ozone*.
[2] 83 FR 25776, *Additional Air Quality Designations for the 2015 Ozone National Ambient Air Quality Standards* ("Initial Designations").
[3] 87 FR 60897, *Determinations of Attainment by the Attainment Date, Extensions of the Attainment Date, and Reclassification of Areas Classified as Marginal for the 2015 Ozone National Ambient Air Quality Standards* ("DAAD"). Discussion of due dates begins on p. 60906.

On April 5, 2023, the Utah Air Quality Board ("AQB") approved for public comment the Moderate SIP for the NWF ("proposed Moderate SIP", "Moderate SIP", or "SIP") and proposed revisions to Part H for formal proposal. This letter provides comments on the proposed Moderate SIP and proposed revisions to Part H, by both the Utah Petroleum Association ("UPA") and the Utah Mining Association ("UMA"), collectively the "Associations". We are pleased to be able to offer these comments. Given the importance of the SIP to our member companies and to the NWF, we sincerely appreciate the extended comment period.

UPA is a statewide oil and gas trade association established in 1958 representing companies involved in all aspects of Utah's oil and gas industry. UPA members range from independent producers to midstream and service providers, to major oil and natural gas companies widely recognized as industry leaders responsible for driving technology advancement resulting in environmental and efficiency gains. Five member companies each operate a petroleum refinery in the NWF. Additionally, UPA member companies operate oil and gas production and midstream facilities within the Uintah Basin ozone NAA. Thus, our member companies have an interest in air quality and air emissions controls throughout Utah.

UMA was founded in 1915 and serves as the voice of Utah's mine operators and service companies which support the mining industry. The member companies operate hardrock, industrial mineral, and coal mines throughout the State of Utah. UMA has an interest in air quality in support of the communities in which our member companies operate and air emissions controls in Utah.

The Associations support regulations that will be cost-effective towards improving air quality. Towards that end, Utah's petroleum refineries are producing Tier 3 gasoline for sale within the NWF, rather than using other methods to comply with EPA Tier 3 requirements such as averaging or purchasing credits. Several refineries have made multi-million dollar investments to produce Tier 3 and to support other significant air quality improvements. The proposed Moderate SIP acknowledges the benefits of Tier 3 gasoline.[4] While we support cost-effective regulations towards improving air quality, we have several concerns about the proposed Moderate SIP.

The CAA requires the Moderate SIP to include several items, as detailed in Table 3 of the proposed Moderate SIP:[5]

- Reasonable Further Progress ("RFP") showing a 15% reduction in volatile organic compound ("VOC") emissions from the baseline inventory to the attainment year
- Base year and projected inventories of VOC and nitrogen oxides ("NOx")
- Attainment demonstration using a photochemical model that shows the NWF will attain the NAAQS
- RACT application (technically and economically feasible) at major sources
- RACM for all other sources of ozone precursors
- Motor Vehicle Inspection and Maintenance ("I/M") program or assessment of whether the current program meets the requirements
- Nonattainment New Source Review ("NNSR") program for major sources and major modifications of NOx and VOC with increased offsets from 1.1 to 1.15

[4] Proposed Moderate SIP, p. 134.
[5] Proposed Moderate SIP, pp. 16-17.

- Contingency measures ("CM") triggered if EPA makes a finding that the area failed to attain by the attainment date or a finding that the SIP fails to meet RFP[6]
- Motor vehicle emission budgets to establish the maximum allowable ozone precursor emissions from the on-road mobile sector used in the transportation conformity analysis

These comments focus on the air quality modeling and related scientific studies, the attainment demonstration, RFP, CM, RACT and RACM, and additional controls required on two of the refineries including proposed revisions to Part H. We also make editorial suggestions for these and other parts of the proposed Moderate SIP.

I. Summary of Comments

We appreciate the extensive work that the Utah Division of Air Quality ("UDAQ") staff have put into the Moderate SIP and some of the difficult decisions that had to be made under tight timing. Nonetheless, the SIP will not be approvable by EPA because it does not fulfill some of the obligations.[7] Upon submittal of the Moderate SIP, UDAQ staff will need to focus on addressing the deficiencies as a top priority.

Statements that the model performs well are questionable at best and unsubstantiated. The modeling discussion omits important issues and fails to address discrepancies between modeling and recent monitoring studies with respect to the ozone formation regime, i.e., whether the NWF is NOx- or VOC-limited or both.

The SIP falls far short of the required 15% VOC RFP reduction and provides an incomplete plan to address the shortfall, lacking a robust discussion of all viable options to close the considerable gap. EPA will not be able to approve the Moderate SIP without the full 15% reduction in VOCs. NOx may not be substituted for VOC until the full 15% VOC RFP has been demonstrated.

Furthermore, the CM do not meet EPA requirements including requirements set forth in a recent court opinion. This aspect of the SIP also cannot be approved by EPA.

Additionally, unless UDAQ resolves the shortcomings in a timely manner, they leave the NWF vulnerable to EPA imposing a Federal Implementation Plan ("FIP") and to highway funding sanctions.[8]

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[6] An EPA finding of these types requires a formal notice in the Federal Register as a final rulemaking.

[7] See statement by Ryan Bares, Utah Air Quality Board Meeting, April 5, 2023 ("AQB 4/5/2023"): "We know this plan does not fully fulfill some of those obligations. These obligations do not go away after the finalization or submission of a SIP." Meeting recording at 0:02:40.

[8] The AQB 4/5/2023 suggests that failure to attain the standard as soon as possible triggers the sanctions and FIP. Meeting recording at 0:22:20. However, the missing or incomplete SIP elements including RFP and CM would trigger clocks for sanctions and a FIP, not failure to attain as soon as possible. Furthermore, the AQB 4/5/2023 narrative goes on to say that UDAQ believes they will avoid a finding of failure to submit. Meeting recording at 0:23:48. However, EPA issued a final finding of failure to submit to Utah for submitting an incomplete SIP for interstate transport for the 2015 ozone NAAQS. See 84 FR 66612, *Findings of Failure to Submit a Clean Air Act Section 110 State Implementation Plan for Interstate Transport for the 2015 Ozone National Ambient Air Quality Standards (NAAQS)*, Final Action. Thus, we can assume that EPA will likely issue a Finding of Failure to Submit for the Moderate SIP, if the shortcomings are not corrected in a timely way.

While we support including the 179B(a) demonstration in the Moderate SIP as an essential element, the demonstration is not approvable without all the other parts required by the CAA being approved, including the RFP and CM. This again emphasizes the need to close the gaps on other SIP elements.

The SIP and Part H revisions impose controls on the Marathon and Chevron refineries, either as RACT or as controls needed for expeditious attainment. However, these controls far exceed the reasonable requirement for RACT and the reasonable requirement for controls that go beyond RACT. Furthermore, UDAQ has failed to show the extent that these controls contribute to attainment, a requirement for controls that go beyond RACT. Ramboll has shown that, based on UDAQ's SIP modeling results, they only contribute approximately 0.03 ppb to attainment, in other words 0.04% of the current design value, a miniscule amount that cannot be considered helping the NWF to attain as quickly as possible. In other words, these controls do not meet the requirements for either justification presented, either RACT or expeditious attainment achieved by beyond RACT. Finally, retaining these controls as part of the SIP requires proper justification under the Utah Code.

We discuss each of these issues in detail below.

II. The SIP fails to address some important scientific considerations.

The proposed SIP acknowledges:

> *Despite years of success in reducing precursor emissions of NOX and VOCs, the region still faces significant and unique challenges in meeting ambient ozone concentration health based standards. These regionally specific challenges include significantly elevated background ozone levels, increasing instances and contributions of emissions from wildfire events, significant biogenic contributions, as well as both interstate and international transport.*[9]

The proposed SIP acknowledges substantial emission reductions in both NOx and VOC over the past six years, with NOx emissions decreasing by 21.3 tons per day ("tpd") and VOC emissions decreasing by 3.7 tpd. These significant decreases came about in part due to past SIP efforts and in part due to improvements to the mobile on-road sector associated with lower emissions from Tier 3 fuels and engines. Beyond the inventoried reductions, these reductions likely underestimate the full extent of emission reductions in this sector since they fail to capture Utah's high adoption rate of zero emission vehicles ("ZEVs"), predominantly in the light duty sector, with growth rates of 940.3% for ZEVs and 101.6% for electric hybrid vehicles in Utah from 2015 to 2021.[10] Concentrations of NO_2 dropped steadily from 2000 to 2019, and yet ozone fourth high values remained constant between 70 and 80 ppb.[11]

[9] Proposed Moderate SIP, p. 22.
[10] Proposed Moderate SIP, p. 133.
[11] CRC (Coordinating Research Council, Inc.) Report No. A-124, *Evaluation of Ozone Patterns and Trends in 8 Major Metropolitan Areas in the U.S.*, Final Report, March 2021, prepared by Daniel A. Jaffe ("Jaffe CRC report", available on CRC website at http://crcao.org/wp-content/uploads/2021/04/CRC-Project-A-124-Final-Report_Mar2021.pdf, accessed on June 22, 2023), Figure S3 for Salt Lake City, Trend in 4th highest O3 and daily max NO2, 1995-2019 for Hawthorne site, p. A67.

Despite the emission reductions, **Figure 1** shows that the ozone design value in the NWF has failed to improve even though the 24-hour $PM_{2.5}$ design value, which includes VOC and NOx as precursor emissions, shows a substantial long term improvement trend:

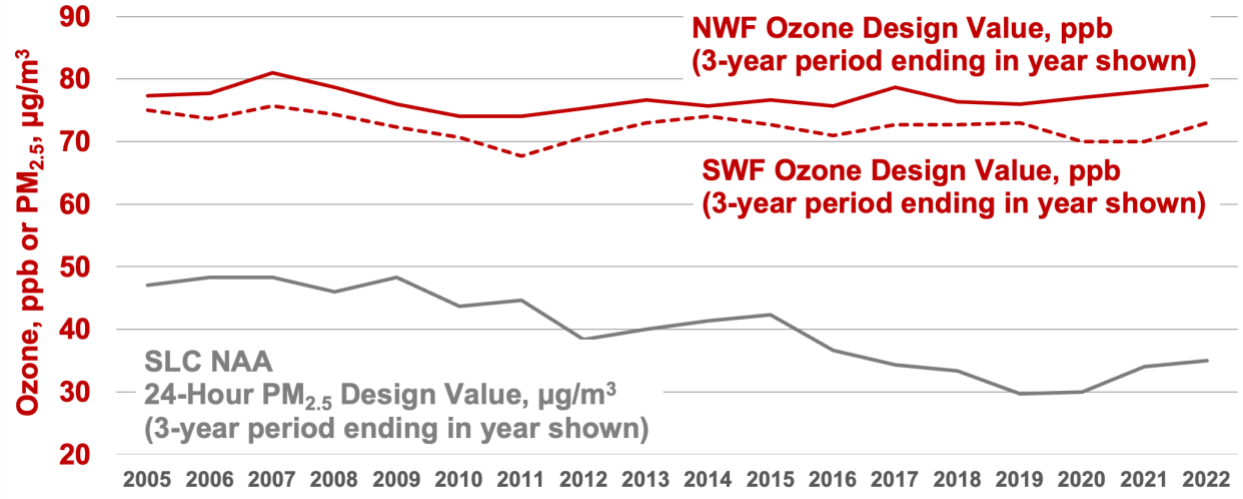

Figure 1. Ozone and 24-Hour $PM_{2.5}$ Long Term Trends

The proposed Moderate SIP makes no attempt to explain why the design value trend over the past twenty years would suddenly be responsive to new and very limited NOx and VOC reductions, significantly smaller than reductions over the past several years, and provides little or no evidence in support of the anticipated response. It is not enough to simply trust the model.

Furthermore, UDAQ must explain these air quality measurements compared to its contention that the model shows equal benefit of NOx and VOC reductions.[12] Past reductions in these emissions provided no ozone air quality benefit. In the absence of a rational scientific explanation, the actual air quality measurements showing little benefit of the emissions reductions should take precedence. Reasons for model non-performance should be identified and corrected. While VOC reductions must be included in this SIP to achieve the 15% VOC RFP, the SIP must include only those NOx reductions needed to achieve RACT and RACM.

Evidence presented at the 2023 Science for Solutions ("S4S") conference from data gathered under the Salt Lake Regional Smoke, Ozone, and Aerosol ("SAMOZA") study shows that at least for the Utah Tech Center monitoring location ("UTC"), small to moderate reductions of NOx such as those proposed in this SIP will have no effect on ozone concentrations, and reductions must be substantial, at least 75%, to make a difference in ozone.[13] Conversely, the SAMOZA study shows direct benefits from small VOC reductions at UTC. Contrary to the 75% NOx reduction

[12] See Proposed Moderate SIP, section 7.4.1 beginning on p. 114.

[13] Presentation at 2023 S4S conference, *Investigation of Ozone Formation Chemistry During the Salt Lake Regional Smoke, Ozone, and Aerosol Study (SAMOZA)* by Matt Ninneman, Marc Mansfield, Seth Lyman, Lu Hu, and Dan Jaffe; presented by Matt Ninneman ("Ninneman S4S presentation" or "SAMOZA study"), available on S4S website at https://byu.app.box.com/s/v2cm42e4i73s0l1fhbn1301zi6dt5gtv/file/1200206266091 (accessed on June 22, 2023).

needed, point sources account for only 13% of NWF anthropogenic emissions with refineries contributing and even smaller portion, only 3%.[14] The reductions from the added NOx controls comprise only a portion of the refinery emissions. Again, UDAQ made no attempt to rationalize this difference from its contention that small reductions in NOx from added NOx controls imposed on Chevron and Marathon will benefit ozone reductions. These scientific measurements must be explained vis-à-vis the conflicting modeling results.

Granted, the SAMOZA study findings represent the UTC location and not the entire nonattainment area, but the Jaffe CRC report also shows consistent results, that very large reductions of NO_2, 59.6%, would be needed to reduce ozone at the Hawthorne monitor.[15] Thus, multiple recent scientific studies call for very large reductions of NOx or NO_2 to make a difference in ambient ozone concentrations and stand in stark contrast to the very small reductions from the added NOx controls.

III. Ramboll's scientific review of the modeling aspects of the SIP calls the modeling conclusions into question, indicating the area may be more likely VOC-limited during peak ozone formation hours, and shows the insignificance of the added NOx controls requested of Marathon and Chevron in the proposed Part H revisions.

The Associations asked Ramboll to conduct a scientific review the CAMx modeling aspects of the SIP and associated Technical Support Documents ("TSDs").[16] We provide Ramboll's report of their review in its entirety as Attachment 1 to this letter, as part of these comments.[17] The report identifies various errors, and missing, overlooked analyses in the modeling.

We summarize some of the highlights of the Ramboll report as follows:

- There is little shown or explained in the main SIP document that supports UDAQ's claim that "the CAMx model performs well at simulating ozone at all sites." Maximum daily average 8-hour ("MDA8") ozone performance over all days is consistently under predicted by a large margin and reported normalized mean bias is at the outer end of referenced performance criteria. Bias and correlation are worse when considering only days when observed MDA8 ozone exceeds 60 ppb.
- The claim that "model performance statistics suggest that the model performs well" is questionable and inaccurate.
- Additional information on precursor performance should be included in the main SIP document to support the argument that the modeled ozone is well simulated, and to present likely root causes for the ozone under prediction tendency.
- ***Poor model performance degrades confidence that it will respond appropriately to modeled emission changes.***

[14] Utah Division of Air Quality, *Marginal Ozone Inventory, Northern Wasatch Front, UT*, June 2020, available on UDAQ website at https://documents.deq.utah.gov/air-quality/planning/air-quality-policy/DAQ-2022-012149.pdf ("NWF 2017 Inventory") (accessed on March 6, 2023).
[15] Jaffe CRC Report, Table 4, Estimated NOx reductions needed to reach an annual fourth highest O3 MDA8 of 70 ppb, p. 13.
[16] See Modeling TSDs at https://deq.utah.gov/air-quality/northern-wasatch-front-moderate-ozone-sip-technical-support-documentation#supporting-tsd.
[17] *Comments on State Implementation Plan for the 2015 Ozone NAAQS Northern Wasatch Front Moderate Nonattainment Area, Section IX Part D.11* ("Ramboll report").

- Ozone source apportionment modeling indicates that 54% of ozone is attributable to NOx while 46% is attributable to VOC at Hawthorne, based on UDAQ's modeling for the SIP. In support of this result, daily measured VOC-to-NOx ratios from a 2021 UDAQ monitoring study indicate that ozone at Hawthorne forms in a transitional regime (NOx and VOC sensitive). However, measured VOC-to-NOx ratios from using reactivity-weighted VOC show a stronger tendency toward VOC sensitive conditions, which should be emphasized given the abundance of reported higher-reactivity alkene, aromatic, and aldehyde compounds. Additionally, a UDAQ weekday-weekend analysis indicates statistically significant ozone **increases** for 2021 summer weekends relative to weekdays due to reduced mobile source NOx emissions. The authors correctly suggest that this "points to a VOC-limited regime" during 2021.
- NOx sensitivity indicated by the CAMx modeling results do not agree with a conceptual model for VOC sensitivity indicated by monitoring studies. UDAQ uses NOx sensitivity suggested by the modeling as justification for NOx controls despite not meeting VOC reduction requirements. ***NOx controls under VOC-limited conditions may result in higher ozone, or a "NOx disbenefit".***
- Furthermore, the recent 2022 SAMOZA monitoring study shows ozone production increasing during the morning hours and peaking around noon, after which ozone destruction processes dominate. Therefore, the VOC-to-NOx ratio is best evaluated during the morning hours (e.g., 6 AM to 12 PM), when results from the 2021 UDAQ study indicate a more VOC-limited regime regardless of reactivity weighting. As stated above, box modeling showed strong responses to VOC and little response to NOx, supporting VOC-limited conditions.
- Both modeling and monitoring techniques are associated with uncertainties, and these are likely at play to various extents. However, ***the documented CAMx performance issues weaken conclusions drawn from the modeling that suggest NOx-sensitive conditions and strengthen conclusions drawn from two monitoring studies that suggest VOC-sensitive conditions.***

In other words, recent studies show the NWF to be more likely VOC-limited during peak ozone formation hours, and NOx reductions may have little or no benefit or may even pose a disbenefit in some areas, resulting in increased ozone formation.

Notably, Ramboll used the SIP source apportionment modeling results to estimate the approximate benefit of the added NOx controls requested of Chevron and Marathon Petroleum, and found the benefit to be miniscule, not nearly of the magnitude expected to fulfill the claim in the SIP that the added NOx controls support expeditious attainment. According to source apportionment results, over the top 10 simulated MDA8 ozone days in 2023, the "other point sources" sector (i.e., exclusive of electric generation and Rio Tinto mine haul truck emissions) in Salt Lake County contribute 0.30 ppb and 0.04 ppb from NOx and VOC sensitive chemistry, respectively. That same source sector in Davis County contributes 0.18 ppb from NOx sensitive chemistry. Combining results from above, Ramboll found that ***the total simulated 2023 ozone design value reduction from the NOx and VOC controls required of Marathon and Chevron is a combined 0.03 ppb*** based on the SIP source apportionment modeling results, in other words, not enough to support expeditious attainment. Conceivably this impact would be smaller if the model simulated a VOC-sensitive environment rather than NOx-sensitive, as indicated by monitoring studies.

These are only some of the highlights of the Ramboll report, which we include here in its entirety as part of these comments. In conclusion, we recommend addressing each of the recommendations from the Ramboll report.

IV. The SIP does not meet the required 15% VOC reduction.

The CAA and the SIP implementation rule for the 2015 ozone standard require the Moderate SIP to demonstrate RFP showing a 15% reduction in VOC emissions within the nonattainment area.[18] The proposed Moderate SIP falls far short, demonstrating only 3.7 tons per day ("tpd"), a shortfall of 10.3 tpd.[19]

RFP reductions for this Moderate SIP must come from VOC reductions and cannot come from NOx reductions, considering that this Moderate SIP is the first ozone standard with the 15% RFP applicable.[20] NOx emission reductions may not be substituted for VOC. The AQB 4/5/2023 narrative states, "We've actually worked pretty hard to try and get some NOx substitutions creditable towards [the RFP] because we've seen such impressive reductions in that area, and we have not been able to find a viable way to make that work."[21]

EPA cannot approve the RFP with this shortfall and may make a "finding of failure to submit" a complete SIP.[22]

Furthermore, neither the proposed SIP nor the associated TSDs include a sufficiently robust analysis of additional potential emission reductions that could be used to achieve the 15% VOC reduction or to get closer to the required reduction. The SIP provides some discussion of potential strategies and paths forward to make the gap smaller but no strategy to completely close the gap, even though the SIP states, "UDAQ also posted all documents related to the development of this SIP revision, including all technical supporting documentation, to its public webpage as soon as they became available."[23]

We recommend adding a robust discussion of additional VOC reduction opportunities to Chapter 7 of the Moderate SIP. The discussion should include evaluation of various options to make the I/M programs more restrictive, considering the large role that mobile sources fulfill in the emissions inventory, as well as other possible ways to reduce VOC emissions.

[18] CAA §182(b)(1) and 40 CFR 51.1310(a)(4).
[19] Proposed Moderate SIP, p. 112.
[20] Although Utah submitted a 15% RFP plan in the original 1-hour ozone NAAQS, EPA deemed the plan to be irrelevant during the redesignation process and never approved it. See 62 FR 28396, *Proposed Approval and Promulgation of Air Quality Implementation Plans; State of Utah; Salt Lake and Davis Counties Ozone Redesignation to Attainment, Designation of Areas for Air Quality Planning Purposes, Proposed Approval of Related Elements, Proposed Approval of Partial NOX RACT Exemption, and Proposed Approval of Weber County I/M Program*, p. 28398. For completeness, the SIP should mention this in §1.3.1 *1979 1-Hour Ozone Standard*, p. 11.
[21] 4/5/2003 AQB, meeting recording at 0:28:07.
[22] As an example, see 73 FR 15416, *Finding of Failure To Submit State Implementation Plans Required for the 1997 8-Hour Ozone NAAQS*.
[23] Proposed Moderate SIP, p. 17.

As of this writing, UDAQ recently posted an advance notice of proposed rulemaking for 2-stroke lawn and garden equipment.[24] According to the SIP, this rule will fulfill a significant portion of the RFP gap.[25] However, the draft rule provides no information about enforcement and includes compliance dates far in the future, not within the design value period to determine attainment at the Moderate level. We question both the implementation timing and the effectiveness of the rule and whether EPA will consider emission reductions under the rule as creditable to the SIP RFP requirements.

The absence of robust discussions on achieving the 15% RFP goal provides no confidence to the regulated community and other stakeholders that Utah has a strategy to meet the requirements, thus fostering concerns about pending sanctions and a FIP. Additionally, the lack of a strategy leaves the regulated community in a state of uncertainty about "surprise" demands for additional controls to be installed in short order and, consequently, at unreasonably high cost.

V. The SIP fails to provide an adequate contingency plan.

Although the proposed Moderate SIP identifies NOx controls as CM, NOx may not be used for CM at this stage of the SIP process. The proposed Moderate SIP states, "Unlike the RFP requirements of a Moderate SIP, emission reductions associated with contingency measures can consist entirely, or in part, of NOx emission reduction strategies,"[26] and attributes this to the implementation rule for the 2015 ozone standard.[27] However, the proposed Moderate SIP misquotes the referenced 2015 Implementation Plan, which states,

> *. . . the EPA is continuing to allow contingency measure emissions reductions to be based entirely or in part on NOX controls* ***if the area has completed the initial 15 percent ROP[28] VOC reduction*** *required by CAA section 182(b)(1)(A)(i) and an air agency's analyses have demonstrated that NOX substitution (entirely or in part) would be effective in bringing the area into attainment.[29]* [emphasis added]

In other words, NOx may not be used for CM in this Moderate SIP unless and until the SIP establishes the required 15% VOC reduction for RFP and the required demonstration regarding NOx substitution.[30]

In addition, CM must be measures that are not already required. CM must be triggered by an EPA ***finding*** (i.e., a final Federal Register notice) of failure to meet the 15% VOC reduction or ***finding*** of failure to attain.[31] CM must be implemented within 60 days of the finding with no

[24] See https://deq.utah.gov/air-quality/reducing-2-stroke-lawn-equipment-emissions (accessed July 6, 2023).
[25] Proposed Moderate SIP, p. 102.
[26] Proposed Moderate SIP, p. 154.
[27] 83 Fed. Reg. 62998, *Implementation of the 2015 National Ambient Air Quality Standards for Ozone: Nonattainment Area State Implementation Plan Requirements* ("2015 Implementation Plan").
[28] "ROP" or "Rate of Progress" is used interchangeably with RFP for the 15% VOC reduction.
[29] 2015 Implementation Plan, p. 64036.
[30] As summarized above, the attached Ramboll report calls into question the effectiveness of NOx reductions discussed in the proposed Moderate SIP, Section 7.4.1, pp. 114-115.
[31] The AQB 4/5/2023 narrative incorrectly states that the attainment date is the triggering date. Meeting recording at 0:31:40.

additional state or EPA action.[32] The 2015 Implementation Plan discusses the circuit split between the Ninth Circuit in Bahr and an earlier Fifth Circuit decision allowing "early triggered" measures and indicates that states outside the Ninth Circuit may rely on the Fifth Circuit decision.[33] However, EPA reversed this position in its March 2023 proposed CM guidance, indicating that EPA will follow the Ninth Circuit decision everywhere:

> *EPA now draws from this case that **the statute prohibits approval as CMs any measures that the state has already implemented**, and that will already be in place and achieving emissions reductions, regardless of whether there is ever a future triggering event for CMs such as a finding of failure to meet RFP or finding of failure to attain.* States must have CMs that are structured and worded so that they are both conditional and prospective*, to take effect only in the event of a future triggering event.*[34] [emphasis added]

Additionally, the language of the CAA indicates that CM must take effect after an EPA finding that the area fails to make reasonable further progress, or to attain the NAAQS by the attainment date:

> *Contingency Measures.— Such plan shall provide for the implementation of specific measures **to be undertaken if the area fails** to make reasonable further progress, or to attain the national primary ambient air quality standard by the attainment date applicable under this part. Such measures shall be included in the plan revision as contingency measures to take effect in any such case without further action by the State or the Administrator.*[35] [emphasis added]

The proposed Moderate SIP includes the following CMs:

- NOx reductions from boilers, final rules approved at the May 2023 AQB meeting but not contingent on an EPA finding – these rules would not be approvable as CM because they address NOx prior to meeting the 15% VOC RFP and they will be implemented without a triggering EPA finding.
- VOC reductions from US Magnesium (currently located outside the nonattainment area) – these requirements would not be approvable as CM because they are not contingent on an EPA finding.
- NOx emission reductions due to already-required vehicle fleet turnover and market penetration of Tier 3 gasoline – these reductions would not be approvable because they are NOx reductions rather than VOC and not triggered by an EPA finding.

By way of example, EPA recently published a final disapproval of CM for the Sacramento area because the measures were not contingent on the appropriate EPA finding. Although the disapproval discusses the Ninth Circuit decision in *Bahr*, which is applicable in Sacramento, it makes no mention of the circuit split. The disapproval starts the FIP and sanctions clocks.[36]

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[32] See discussion of Bahr v. EPA, 836 F.3d 1218 (9th Cir. 2016), in *DRAFT: Guidance on the Preparation of State Implementation Plan Provisions that Address the Nonattainment Area Contingency Measure Requirements for Ozone and Particulate Matter*, 3/17/23 ("Proposed CM Guidance"), pp. 17-18.
[33] 2015 Implementation Plan, p. 63026.
[34] Proposed CM Guidance, p. 18.
[35] CAA §172(c)(9).
[36] 88 FR 39179, *Disapproval of Clean Air Plans; Sacramento metro, California; Contingency Measures for 2008 Ozone Standards.*

Therefore, the CM included in the proposed Moderate SIP will not be approvable by EPA and must be replaced by measures that will be triggered by an appropriate EPA finding. It is not enough to project that the RFP has not been met or that the area will not attain; EPA must make the finding to trigger the CM. Furthermore, all applicable CM must be VOC reductions and not NOx reductions unless the Moderate SIP can first be revised to fulfill the 15% VOC RFP requirement.

VI. The SIP implies the added NOx controls to be required of Chevron and Marathon Petroleum are RACT, but these controls cannot be RACT.

The proposed Moderate SIP and the proposed revisions to Part H of the SIP require added NOx controls of Chevron and Marathon ("added NOx controls"). In places, the SIP implies these controls to be RACT[37] and in other places, it describes the controls as "necessary to demonstrate attainment as expeditiously as practicable."[38] Are the controls RACT or are they necessary to demonstrate attainment? The SIP blurs the distinctions between the two but fails to make either case. These comments address the two separate questions of:

- Why the controls are not RACT
- Why the controls have not been shown to be "necessary to demonstrate attainment as expeditiously as practicable"

The SIP has not shown the controls requested of Chevron and Marathon to be ***necessary*** as required by the definition of RACT:

> ***Reasonably available control technology (RACT)*** *means devices, systems, process modifications, or other apparatus or techniques that are* ***reasonably available*** *taking into account:*
> *(1)* ***The necessity of imposing such controls in order to attain and maintain a national ambient air quality standard****;*
> *(2) The social, environmental, and economic impact of such controls; and*
> *(3) Alternative means of providing for attainment and maintenance of such standard. (This provision defines RACT for the purposes of § 51.341(b) only.)*[39] [emphasis added]

As explained above, the Ramboll report estimates that these controls added together will reduce ozone by a mere 0.03 ppb, based on the source apportionment modeling obtained for the SIP. In other words, the controls reduce ozone only a miniscule amount and *do not contribute appreciably to attainment and maintenance of the standard, as required by the RACT definition*. This is the case considering these controls as they were proposed, in the absence of the very large NOx reductions needed as cited by the Ninneman paper and Jaffe CRC report, discussed above. As explained in the attached Ramboll report, the area is likely VOC sensitive during the morning ozone formation hours. Thus, NOx controls may not help and ***could actually provide a disbenefit,*** resulting in increased ozone.

[37] See Tables 25 and 41 in proposed Moderate SIP, beginning on pp. 39 and 70, respectively, for Chevron and Marathon.
[38] See pp. 44 and 74 for Chevron and Marathon, respectively, in the proposed Moderate SIP.
[39] 40 CFR 51.100(o). (Item 3 only applies to secondary NAAQS.)

UDAQ has not shown these controls to be necessary to attain and maintain the standard. It provided no modeling to show the effect of the controls and no other evidence. In fact, UDAQ has asked for the controls to be installed by May 2026[40] but provided no modeling for any year later than 2023, and stated as much in the proposal AQB meeting.[41]

EPA requires the RACT controls to be installed by December 31, 2022, but these controls cannot be installed by this due date, which occurred in the past.[42]

As explained in our RACT Selection Criteria letter, the cost for these controls far exceeds the range of RACT costs previously applied by other jurisdictions and even by UDAQ, and cannot be considered ***reasonable*** costs.[43] While the cost range for RACT may be subjective, costs must still be ***reasonable***. These costs exceed those typically seen for BACT, which carries a higher $/ton than RACT.[44]

In fact, the proposed Moderate SIP acknowledges that the controls fall outside of RACT cost thresholds. With respect to both Chevron and Marathon, the proposed Moderate SIP states, "While the financial feasibility of the identified controls may be beyond previously established RACT thresholds, the CAA provides states with "discretion to require beyond-RACT reductions from any source" if those reductions are necessary to "demonstrate attainment as expeditiously as practicable".[45] UDAQ should provide detailed written justification for choosing the high cost threshold for RACT, which are four times higher than prior RACT thresholds used nationwide.

UDAQ did not describe a uniformly systematic process to arrive at the added NOx controls and provided no explanation for choosing Chevron and Marathon for installing controls that far exceed RACT. Some major sources provided updated RACT analyses while others did not, leaving UDAQ to rely on previously submitted 2017 BACT analyses. To make RACT determinations in the absence of updated RACT analyses, the SIP and TSDs do not describe a systematic methodology for adapting the older BACT analyses performed for the Serious $PM_{2.5}$ SIP for some sources. For example, the $PM_{2.5}$ BACT and Moderate ozone RACT have different timing requirements. How did UDAQ resolve this for those who did not submit a current RACT analysis?

RACM controls for industrial bakeries present another example of inconsistency. The SIP rejects controls for these sources at $19,000/ton[46] but imposes controls at a much higher cost for

[40] Well after the required RACT installation date.
[41] AQB 4/5/2023: Upon questioning by a Board member about modeling of the additional requirements, "[T]hose have not been modeled because all of them will be implemented after this SIP timeline . . . so we've modeled up through 2023 which is our attainment date, we have not been able to model controls beyond that." Meeting recording at 0:29:34.
[42] See "Deadline for Installation of RACT Controls" in *UDAQ Preliminary RACT Determinations for Petroleum Refineries in the Northern Wasatch Front Ozone Nonattainment Area*, letter, Rikki Hrenko-Browning to Bryce Bird, March 10, 2023 ("Preliminary RACT Determinations letter", copy attached).
[43] *Criteria for Selection of Reasonably Available Control Technology*, letter, Rikki Hrenko-Browning to Bryce Bird, February 2, 2023 ("RACT Selection Criteria letter", copy attached).
[44] See Tables 1 and 2 in RACT Selection Criteria letter.
[45] Proposed Moderate SIP, p. 44 for Chevron and p. 74 for Marathon.
[46] Proposed Moderate SIP, Table 56, p. 96.

Chevron ($26,000/ton and $28,000/ton)[47] and Marathon ($24,000/ton).[48] A similar situation exists for commercial cooking at $20,000/ton[49] and for human and animal cremation at $15,000/ton.[50]

VII. The SIP describes the added NOx controls as "necessary to demonstrate attainment as expeditiously as practicable" but does not adequately demonstrate the necessity for these beyond-RACT controls.

The attached report "Legal comments on UDAQ O3 SIP Including B-RACT" (Attachment III) ("legal comments") provides an analysis of why these controls cannot be considered to be beyond-RACT ("B-RACT") and that the proposed SIP goes beyond what the CAA allows in attempting to adopt these controls as B-RACT. In summary:

- The authority for B-RACT controls stems from the interpretation included in the 2015 ozone NAAQS implementation rule, which requires that controls be ***reasonable***, yet by seeking controls with costs that are not reasonable, the SIP goes beyond this requirement.
- B-RACT controls must be able to be ***implemented by the attainment date***, but the SIP seeks these controls to be implemented in 2026, well beyond the August 3, 2024, attainment date for the NWF at Moderate.
- EPA references the $PM_{2.5}$ rulemaking in explaining B-RACT and the process to assess whether controls qualify as B-RACT. The process requires ***determining whether the control measure is economically reasonable and ensuring that the controls can be installed by the attainment date***.
- The proposed Moderate SIP fails to show that the added NOx control measures are necessary for attainment or if they even provide a marginal benefit or if they will advance attainment by one year or more, as required.
- Requiring the B-RACT controls (which will not be installed until after that date) is inconsistent with the claim that it has a "strong case that [Utah has] met the requirements for the statutory requirements for a moderate nonattainment area demonstration" by the attainment date.
- UDAQ's authority under the CAA to impose B-RACT is contingent on first complying with the mandatory 15% VOC reduction requirement for RFP, which, as discussed above, has not been fulfilled.

We include these legal comments in their entirety as part of these comments. Based on the reasoning in the legal comments, UDAQ should remove the B-RACT requirements from the SIP and the proposed Part H revisions.

Moreover, as discussed above, UDAQ has not explained why large reductions of NOx did not reduce ozone in recent years or why the result of reducing NOx would be different now than in

[47] See Chevron "SLC – UDAQ Ozone RACT Analysis", located on UDAQ website at https://documents.deq.utah.gov/air-quality/planning/DAQ-2023-001911.pdf (accessed on July 11, 2023), pp. 16 and 19.
[48] See "Tesoro Logistics Operations LLC Truck Loading Rack – UPDATED RACT 01-31-23", located on UDAQ website at https://documents.deq.utah.gov/air-quality/planning/DAQ-2023-001507.pdf (accessed on July 11, 2023), p. 29. Additionally, since the submittal of the preliminary cost analysis, Marathon has performed additional engineering analysis to improve the accuracy of the cost-effectiveness estimate and determined a cost-effectiveness of $42,700/ton.
[49] Proposed Moderate SIP, Table 56, p. 98.
[50] Proposed Moderate SIP, Table 56, p. 99 and Table 57, p. 101.

the recent past. Furthermore, the attached Ramboll report identifies inconsistencies between the modeling and other recent monitoring studies, calling into question SIP modeling results showing benefits of NOx reductions. Thus, we have no evidence that these small reductions will reduce ozone.

Furthermore, as explained above, the Ninneman S4S presentation shows that at least for the Utah Tech Center monitoring location ("UTC"), small to moderate reductions of NOx will have no effect on ozone concentrations, and reductions must be substantial, at least 75%, to make a difference in ozone. This is consistent with the Jaffe CRC study results at the Hawthorne monitor, as explained above. Again, UDAQ made no attempt to rationalize this difference from its contention that small reductions in NOx will benefit ozone reductions and are necessary to attain the NAAQS as soon as possible.

The SIP includes no modeling to demonstrate the effect of the added NOx controls. Nonetheless, we expect the effect to be small considering that anthropogenic emissions from throughout Utah account for only 14.5% of NWF ozone.[51] Point sources account for only 13% of NWF anthropogenic emissions with refineries contributing and even smaller portion, only 3%.[52] In other words, refineries contribute 3% of the NWF emissions that contribute 14.5% of the Utah-made ozone. Moreover, the added NOx controls would only reduce a rather small portion of NOx emissions from two of the refineries. This is consistent with Ramboll's estimate of 0.03 ppb benefit to ozone concentrations, 0.04% of the design value and a miniscule benefit at best.

In fact, the SIP modeling shows the controls as unnecessary for the attainment demonstration, with near attainment shown with the incorporation of wildfire exceptional events coupled with the attainment demonstration being fully achieved with the 179B(a) prospective demonstration.

See the attached legal comments, which are fully incorporated into these comments, for more detail. These legal comments demonstrate that the B-RACT controls should be removed from the SIP and proposed Part H revisions.

VIII. For the added NOx controls, the SIP and supporting technical documentation do not meet the legal bar established to adopt regulations that go beyond Federal Clean Air Act requirements.

As noted, and discussed elsewhere in these comments, the State asserts that it is proposing beyond-RACT controls pursuant to the CAA, in particular, sections 189(b) and 172(c)(6). We have explained that the proposed beyond-RACT controls are, in fact, inconsistent with and contrary to the CAA. While the Board does have the authority to engage in rulemaking that is more stringent than corresponding federal regulations, it has not provided notice of an intent to do so, nor has it made the necessary findings that it would be required to make before proceeding under this authority.

The added NOx controls do not meet the requirements of Utah Code 19-2-106 which addresses rulemaking authority and procedure. This section of the Code requires that the board "may make

[51] See, for example, proposed Moderate SIP, Figure 16, p. 129.
[52] Utah Division of Air Quality, *Marginal Ozone Inventory, Northern Wasatch Front, UT*, June 2020, available on UDAQ website at https://documents.deq.utah.gov/air-quality/planning/air-quality-policy/DAQ-2022-012149.pdf ("NWF 2017 Inventory") (accessed on March 6, 2023).

rules for the purpose of administering a program under the federal Clean Air Act different than the corresponding federal regulations which address the same circumstances if the board holds a public comment period . . . and a public hearing; and the board finds that the different rule will provide reasonable added protections to public health or the environment of the state or a particular regions of the state". *These findings must be in writing and must be based on evidence, studies, or other information contained in the record* that relates to the state of Utah and the type of source involved.

Beyond the fact that the notice of proposed rulemaking does not purport to be a rulemaking undertaken pursuant to 19-2-106, the rulemaking record includes no findings that the beyond-RACT controls would "provide reasonable added protections to public health or the environment." To the contrary, the State has forthrightly admitted that it does not know what affect the beyond-RACT controls would have:

> *Those have not been modeled because all of them will be implemented after this SIP timeline, if that makes sense. So, we've modeled up through 2023, which is our attainment date. We have not been able to model controls beyond that.*[53]

IX. Specific question #1: The appropriateness of cost thresholds for Reasonably Available Control Measures (RACM) and Reasonably Available Control Technology (RACT): Cost thresholds must be used.

As discussed in our attached letter on RACT, cost thresholds must be used.

First and foremost, the definition of RACT and the terms for B-RACT both call for ***reasonable*** costs. In the absence of cost thresholds, there is no transparency or validation that costs are held to reasonable levels.

Secondly, UDAQ has chosen $/ton levels that exceed typical RACT by a factor of four, without any explanation for such a high level. We expect that setting this high bar for doing business in Utah falls far outside the expectations of Utah elected officials as it discourages business growth, an undesirable situation. This high bar sets a standard for other states to follow Utah, equally undesirable.

Proceeding with the controls as proposed would position the state of Utah to set a new national threshold for RACT cost effectiveness four times higher than any existing threshold. The precedent being set in this SIP provides a disincentive for new manufacturing to locate in Utah and a direct threat to the state's economic growth.

Finally, the lack of systematic documentation on developing RACT for all sources leaves the regulated community and other stakeholders without an understanding of how these levels were systematically developed and applied uniformly.[54]

[53] AQB 4/5/2023, minute mark at 0:29:34.
[54] AQB 4/5/2023, Ryan Bares, "Lastly, the Division has made significant efforts to make any and all related technical supporting documentation associated with the development of the SIP available to view by the public at the earliest possible date through our website." Meeting recording at 0:03:56. However, the documentation mentioned has not been provided.

As explained in the attached RACT letters, the added NOx controls fall outside of appropriate and reasonable cost thresholds. The upper end of the range should be no more than $7,500 per ton and must certainly not exceed $10,000/ton, while the added NOx controls proposed in the SIP range from $24,000/ton to $28,000/ton.

X. Specific question #2: Whether NOX controls should be required in the absence of the demonstration of meeting the 15% Volatile Organic Compounds (VOC) reduction required by Reasonable Further Progress (RFP): <u>While NOx controls may be required as RACT and RACM, the added NOx controls may not be required prior to meeting the 15% VOC reduction required for RFP and, in light of other issues, is a moot question.</u>

The SIP may require NOx controls as part of the RACT and RACM analyses provided that the analysis meets the regulatory definitions and requirements. On the other hand, the SIP cannot require the added NOx controls until it meets the statutory burden of the required 15% VOC reduction for RFP, and then it may only require NOx controls shown to be needed for attainment. Thus, the added NOx controls may not be required at this time. The 15% VOC reduction for RFP has not yet been met, and the added NOx controls have not been shown to be needed for attainment.

Overriding this question, however, are the demonstrations above and detailed in the legal comments that the added NOx controls do not meet the definition of RACT, nor do they meet the terms of the CAA required for B-RACT controls. Because of these overriding issues, the question of requiring the added NOx controls in the absence of meeting the 15% VOC reduction required by RFP becomes moot.

XI. Specific question #3: Appropriateness of timelines requiring controls in the State Implementation Plan (SIP): <u>Timelines to install controls by May 2026 are not appropriate for the Moderate SIP.</u>

As explained in the Preliminary RACT Determination letter attached, and in the attached legal comments, there is no basis to require controls in the Moderate SIP past the January 1, 2023, RACT installation date or past the August 3, 2024, attainment date when B-RACT must be implemented. Moreover, even if not considered to be RACT, no basis has been established for the May 2026 installation date for the Moderate SIP, long after the Moderate attainment date by which B-RACT must be installed. Furthermore, as explained previously, controls of the extent requested may not be installed on this schedule, the schedule may not match refinery turnaround schedules, and thus could incur substantial lost profit opportunity and substantial costs and risks to install on an expedited schedule. Refineries did not consider disruptions to the normal planned turnaround schedule or lost profit opportunity in their cost effectiveness calculations in their RACT evaluations, nor did they think it would be necessary to do so because they did not anticipate being told to install controls with such high cost effectiveness values (even without accounting for these additional costs) and within a short time window.

XII. Specific question #4: Whether optional components should be included in the State Implementation Plan (SIP) submission: Yes, the 179B(a) demonstration should be included as a necessary part of the SIP.

This question speaks specifically to including the 179B(a) prospective demonstration. This 179B(a) prospective demonstration ***must*** be included in the SIP. The Ramboll review identifies deficiencies in the CAMx photochemical modeling and draws uncertainties to the results. The wildfire analysis shows that the area can come close to attainment but not that it can reach attainment. The 179B(a) demonstration provides important weight of evidence ("WOE") and is consistent with scientific studies cited in the proposed Moderate SIP.[55]

The demonstration provides important context to the difficulties in achieving attainment for the NWF. As shown on the right side of Figure 20 in the proposed Moderate SIP, the SIP modeling indicates that international anthropogenic sources contribute 6.5% of the ozone to the NWF, episode average. This is a substantial contribution in any event and especially so when compared to the 14.5% ozone contributed by Utah anthropogenic sources.[56] In other words, international anthropogenic sources contribute an amount of ozone equivalent to 45% of the entire Utah anthropogenic contribution.

Congress included §179B in the CAA for situations like the NWF, for areas that would attain but for the influence of international emissions. A nonattainment area cannot be responsible for emissions that did not come from within the area. In the case of international emissions, the EPA cannot be responsible for these emissions either. Thus, §179B provides a reasonable alternative for areas suffering from large international contributions.

Failure to use all the tools of the CAA including both §179B and exceptional events, as applicable, would unnecessarily and inappropriately hamstring the NWF compared to Congress' intent and compared to the use of these tools in other NAAs nationwide, by making Utah responsible for ozone from emissions over which neither Utah nor the EPA has control.

Furthermore, while 179B is "optional" in the CAA, it is ***not optional for Utah***, where rulemaking may only go beyond CAA requirements if the rulemaking meets all the criteria in the Utah Code as discussed above for rules that go beyond the CAA. In other words, the analysis for adding rules beyond those required by the CAA may not ignore the benefits of tools such as CAA §179B provided by Congress. Congress provided CAA §179B because states cannot be responsible for pollution caused by other countries. Utah must employ this tool to ensure that it is not requiring controls that go beyond what would otherwise be required. This must be done to comply with the Utah Code 19-2-106.

XIII. UDAQ must focus on a 179B(b) retrospective analysis as its next step, after the 2023 summer ozone season.

Under the requirements of Utah Code 19-2-106, UDAQ must focus on demonstrating attainment after the 2023 ozone season based on appropriate exceptional events demonstrations and a showing that the area would have attained but for the influence of international emissions. In other words, UDAQ should prepare a 179B(b) retrospective analysis after the completion of the

[55] See proposed Moderate SIP, pp. 13, 22, and 131.
[56] Proposed Moderate SIP, p. 146.

2023 ozone season, which is the last ozone season during the three-year period for determining attainment at Moderate. Unless and until UDAQ conducts this analysis, it cannot claim that additional controls are needed. UDAQ should undertake this endeavor prior to seeking any new emission control requirements other than those VOC reductions needed to meet the 15% VOC RFP obligation.

If the area can be shown to have attained at the end of 2023 based on exceptional events and but for international emissions, UDAQ is obligated to submit a 179B(b) retrospective demonstration.

Significant scientific and technical evidence exists to support this direction:

- In the 2021 Jaffe CRC report, Dr. Dan Jaffe showed that Salt Lake incurs up to 4 ppb of wildfire smoke impact on its ozone design value.[57]
- The SAMOZA study, funded with S4S grants, shows modest wildfire influence in 2022 with about a third of the exceedance days exhibiting the influence.[58]
- The Ramboll modeling included in the May 2021 179B demonstration showed 9.9 ppb of international influence on local ozone.
- The more specific modeling results provided in this proposed Moderate SIP show reductions of up to 4.5 ppb due to international influence.[59]
- The international influence shown in the Ramboll and SIP modeling are consistent with other prior studies by EPA.

For these reasons, we urge UDAQ to pursue another 179B(b) retrospective demonstration at Moderate, before embarking heavily on Serious SIP requirements. Pursuing the 179B(b) demonstration will also require resolving the RFP and CM shortcomings of the Moderate SIP.[60]

XIV. The SIP needs a number of editorial corrections.

Attachment IV lists several recommended editorial corrections for the Moderate SIP.

[57] Table 9, CRC Report Number A-124, Evaluation of Ozone Patterns and Trends In 8 Major Metropolitan Areas In The U.S., March 2021, prepared by Danial A Jaffe, available on the CRC website at: https://crcao.org/wp-content/uploads/2021/04/CRC-Project-A-124-Final-Report_Mar2021.pdf (accessed on May 18, 2023).

[58] Presentation by Dan Jaffe at 2023 S4S conference, "The Challenge of O3 and PM in the Western US: How Low Can We Go?", https://byu.app.box.com/s/v2cm42e4i73s0l1fhbn1301zi6dt5gtv/file/1200205944830 (accessed July 11, 2023).

[59] Table 74, p. 148, Proposed NWF Ozone Moderate SIP.

[60] See CAA §179B(a) and (a)(1): "Notwithstanding any other provision of law, an implementation plan or plan revision required under this Act shall be approved by the Administrator ***if (1) such plan or revision meets all the requirements applicable to it under the Act other than a requirement that such plan or revision demonstrate attainment and maintenance*** of the relevant national ambient air quality standards by the attainment date specified under the applicable provision of this Act, or in a regulation promulgated under such provision . . ." [emphasis added]

XV. Conclusions

In conclusion, UDAQ should remove the added NOx controls because they do not constitute RACT – as UDAQ readily acknowledges – nor do they qualify as B-RACT as explained in the attached legal comments.
UDAQ must focus its energies on addressing the gaps in the Moderate SIP needed to make it approvable, namely the 15% VOC RFP obligation and approvable CMs. Under the CAA, these gaps need to be closed for approvability of the 179B(a) prospective demonstration.

Additionally, improvements to the modeling are needed to ensure that the modeling provides a good basis for identifying those controls that will move the needle to reduce ozone concentrations in the NWF. Specifically, the modeling should more closely match the monitoring studies showing the area to be VOC-limited during critical morning ozone formation hours.

Finally, we urge UDAQ to evaluate a 179B(b) retrospective demonstration coupled with wildfire exceptional event analyses after the conclusion of the 2023 ozone season in light of all the evidence that the area would attain with wildfire exceptional events removed and but for the influence of international emissions. According to Utah Code, this demonstration must be evaluated before proceeding to a Serious SIP because an approved demonstration would prevent the NWF from ever being reclassified to Serious and thus would preclude the need for a Serious SIP.

Without the necessary changes to shore up the SIP to meet statutory and regulatory requirements, the NWF remains at risk of EPA imposing a FIP and highway sanctions.

Sincerely,

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Attachments:

- Attachment I, Comments on State Implementation Plan for the 2015 Ozone NAAQS Northern Wasatch Front Moderate Nonattainment Area, Section IX Part D.11 prepared by Ramboll
- Attachment II, Letters to UDAQ from UPA Regarding RACT: Preliminary RACT Determinations Letter (March 10, 2023) and RACT Selection Criteria Letter (February 2, 2023)

- Attachment III, Utah Petroleum Association Legal Comments on Proposed Rulemaking for Northern Wasatch Front Moderate Nonattainment Area: Proposed Amendment to R-307-110-13, Section IX, Control Measures for Area and Point Sources, Part D, Ozone; Proposed Amendment to R-307-110-17, Section IX, Control Measures for Area and Point Sources, Part H, Emission Limits. Published in Utah State Bulletin, June 01, 2023, Vol. 2023, No. 11 at 68- 72
- Attachment IV, Editorial Suggestions

Attachment I

Comments on State Implementation Plan for the 2015 Ozone NAAQS Northern Wasatch Front Moderate Nonattainment Area, Section IX Part D.11, prepared by Ramboll

Comments on

State Implementation Plan for the 2015 Ozone NAAQS Northern Wasatch Front Moderate Nonattainment Area, Section IX Part D.11

Ramboll reviewed the Utah Division of Air Quality (UDAQ) State Implementation Plan (SIP) with particular focus on chapters and technical support documents (TSD) related to the air quality modeling components of the analysis. Our comments stemming from the review are provided below.

Summary of Key Points

Model Performance Evaluation

- There is little shown or explained in the main SIP document that supports UDAQ's claim that "the CAMx model performs well at simulating ozone at all sites." Maximum daily 8-hour average (MDA8) ozone performance over all days is consistently under predicted by a large margin and reported normalized mean bias is at the outer end of referenced performance criteria. Bias and correlation are worse when considering only days when observed MDA8 ozone exceeds 60 ppb.

- The claim that "model performance statistics suggest that the model performs well" is questionable and inaccurate. Reported statistics just within benchmark criteria indicate that the model performs somewhat better than the worst third of US photochemical modeling applications over past 15-20 years. Important contextual information about the purpose of benchmarks should be stated in Section 8.2.1. The statistical performance criteria are neither derived nor recommended by EPA; we suggest deleting any such references alluding to EPA acceptance criteria.

- The contention that regional background is well characterized by better ozone performance at the Gothic, Colorado monitoring site could be bolstered (or weakened) by showing results at other rural sites throughout the Great Basin.

- Additional information on precursor performance should be included in the main SIP document to support UDAQ's argument that the modeled ozone is well simulated, and to present likely root causes for the ozone under prediction tendency.

  - The TSD shows large NOx overestimates during morning commute hours. UDAQ's sensitivity test altering vertical diffusion rates may be too subtle. Perhaps the issue is more related to temporal allocation of mobile source emissions, that more NOx should be allocated away from morning commute hours and into midday hours when ozone chemistry is more efficient.

  - Key reactive VOCs such as formaldehyde and benzene are under predicted, suggesting a lack of secondary photochemical production of formaldehyde and a shortage of radicals (oxidants) as fuel for ozone production.

  - Morning isoprene concentrations are largely over predicted. UDAQ's reference to mobile source isoprene emissions is confusing and suggests that they contribute most to ambient isoprene concentrations. Rather, most isoprene is biogenic, yet biogenic emission models remain inadequate in characterizing western US environments.

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- Poor model performance degrades confidence that it will respond appropriately to emission changes. Under prediction of local ozone production leads to a less responsive model and thins the margin for effectiveness of emission controls.

Analysis of PBL heights

- UDAQ should include their rationale for selecting different planetary boundary layer (PBL) techniques to define vertical mixing in the WRF meteorological model and CAMx. It would be helpful to conduct sensitivity tests with WRF and/or CAMx using different PBL schemes, or at least describe why the specific options for each model were selected.

- UDAQ references data from ceilometer instruments in comparing PBL heights between WRF and CAMx. Caution and context should be included when comparing PBL heights among WRF, CAMx, and ceilometers.

- There are some key uncertainties that should be addressed: (1) ceilometers do not specifically measure PBL heights; (2) PBL differences between WRF and CAMx are most likely related to the use of different PBL approaches in each model.

Subgrid Convection

- UDAQ mentions that excessive simulated cloudiness may be a cause for large ozone under predictions on certain days. It would be helpful to show a sensitivity test that entirely removes sub-grid (or all) clouds to confirm this hypothesis.

Evaluation of NOx and VOC Sensitive Ozone Production from Source Apportionment Results

- NOx sensitivity indicated by the CAMx modeling results do not agree with a conceptual model for VOC sensitivity indicated by monitoring studies. UDAQ uses NOx sensitivity suggested by the modeling as justification for NOx controls despite not meeting VOC reduction requirements. NOx controls under VOC-limited conditions may result in higher ozone, or a "NOx disbenefit".

- Ozone source apportionment modeling indicates that 54% of ozone is attributable to NOx while 46% is attributable to VOC at Hawthorne. Model sensitivity to NOx and VOC changes (and by extension source apportionment) are dependent on the model's ability to correctly replicate conditions that actually occurred.

- Daily VOC:NOx ratios from a 2021 UDAQ monitoring study (Sghiatti and Daher, 2022) indicate that ozone at Hawthorne forms in a transitional regime (NOx and VOC sensitive). However, results from using reactivity-weighted VOC show a stronger tendency toward VOC sensitive conditions, which should be emphasized given the abundance of reported higher-reactivity alkene, aromatic and aldehyde compounds.

- The Sghiatti and Daher (2022) study also presents a weekday-weekend analysis that indicates statistically significant ozone increases during 2021 summer weekends relative to weekdays as a result of reduced mobile source NOx emissions. The authors correctly suggest that this "points to a VOC-limited regime" during 2021.

- A recent 2022 Science for Solutions monitoring study (Ninneman et al., 2023) shows ozone production increasing during the morning hours and peaking around noon, after which ozone destruction processes dominate. Therefore, VOC:NOx ratio is best evaluated during the morning hours (e.g., 6 AM to 12 PM), when results from the 2021 UDAQ study indicate a more VOC-limited regime regardless of reactivity weighting. Box modeling showed strong responses to VOC and little response to NOx, supporting a VOC-limited conditions.

- Both modeling and monitoring techniques are associated with uncertainties, and these are likely at play to various extents. However, the documented CAMx performance issues weaken conclusions drawn from the modeling that suggest NOx-sensitive conditions and strengthen conclusions drawn from two monitoring studies that suggest VOC-sensitive conditions.

<u>Estimated Impacts from Required Refinery Emission Reduction Measures</u>

- We applied UDAQ's ozone source apportionment results to estimate the impact from specific required control measures at two refineries (Chevron in Davis County and Tesoro/Marathon in Salt Lake County) on the 2023 ozone design value (DV) at Hawthorne.

  - Tesoro/Marathon NOx reduction of 87.5 TPY is 7.0% of 2017 Salt Lake County "other point source" emission sector (with Rio Tinto Kennecott off-highway mine trucks removed), while VOC reduction of 12.3 TPY is 0.9%.

  - Chevron NOx reduction of 8.9 TPY is 1.3% of 2017 Davis County "other point source" emission sector.

  - According to source apportionment results at Hawthorne, over the top 10 simulated MDA8 ozone days in 2023, "other point sources" in Salt Lake County contribute 0.30 ppb and 0.04 ppb from NOx and VOC sensitive chemistry, respectively. "Other point sources" in Davis County contribute 0.18 ppb from NOx sensitive chemistry, respectively.

  - Combining emission reductions from Tesoro/Marathon (NOx and VOC) and Chevron (NOx) with source apportionment results, we find that the total simulated 2023 ozone DV reduction from required refinery controls is 0.03 ppb at Hawthorne.

  - Conceivably this impact would be smaller if the model simulated a VOC-sensitive environment rather than NOx-sensitive, as indicated by monitoring studies.

1. Model Performance Evaluation

In Section 8.2.1, page 121 of the main SIP document, UDAQ states, "… the CAMx model performs well at simulating ozone at all sites." There is little shown or explained in the main SIP document that supports this claim. From the stated statistical results and associated tables and figures in this section, MDA8 ozone performance over all days is consistently under predicted by a large margin and reported normalized mean bias is at the outer end of the referenced performance criteria. Bias and correlation are worse when considering only days when observed MDA8 ozone exceeds 60 ppb. UDAQ appropriately acknowledge deficiencies in local emission estimates and simulated meteorology as likely causes for the performance issues.

In the same paragraph, UDAQ states, "These performance statistics suggest that the model performs well at simulating MDA8 ozone concentrations." This claim is questionable and in fact the specific statement about the statistics is inaccurate. Rather, statistics that are just within benchmark criteria indicate that agreement between modeled and observed ozone is somewhat better than the worst third of US photochemical modeling applications over past 15-20 years (Emery et al., 2016). The benchmark criteria do not define a pass/fail test, but rather provide context relative to a large population of past ozone modeling. This important contextual information about the purpose of benchmarks should be stated in Section 8.2.1. Later, in Section 8.3.2, page 127 of the main SIP document, UDAQ incorrectly states that the photochemical modeling results "… meet EPA performance metrics…"[1] The statistical performance criteria are neither derived nor recommended by EPA. Quite oppositely, it is important to stress that EPA (2018) modeling guidance warns against the use of statistical performance benchmarks to define a good or acceptable model[2]. We suggest deleting any such references alluding to EPA acceptance criteria. We note, however, that the photochemical modeling TSD properly does not mention meeting "EPA performance metrics".

UDAQ mentions better ozone performance at the high altitude CASTNET site at Gothic, Colorado, which arguably represents regional background ozone over the intermountain west. The contention that regional background is well characterized could be bolstered (or weakened) by showing additional results at other rural CASTNet sites[3] throughout the Great Basin (e.g., at National Parks and Wilderness area in Utah and Nevada).

1b) NOx Evaluation

Additional information on precursor performance should be included from the photochemical modeling TSD to help shed additional light on UDAQ's argument that the modeled ozone is well simulated, and additionally to present likely root causes for the ozone under prediction tendency. The TSD shows large NOx overestimates during morning commute hours. Such high NOx likely squelches early ozone production, making it difficult for ozone to "catch up" later in the day. Based on the "box plots" in Figures 22 and 23 in the TSD, this is a common feature that may be influencing ozone performance.

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[1] A similar statement is repeated in Section 9.5, page 148.

[2] EPA (2018) photochemical modelling guidance, page 69: "…it is not appropriate to assign 'bright line' criteria that distinguish between adequate and inadequate model performance. In this regard, the EPA recommends that a "weight of evidence" approach be used to determine whether a particular modeling application is valid for assessing the future attainment status of an area."

[3] https://www.epa.gov/castnet

While the TSD mentions sensitivity testing with KVPATCH that alters NOx but has no impact on MDA8 ozone, that testing may be too subtle. Perhaps the issue is more related to temporal allocation of mobile source emissions, that more NOx should be allocated away from morning commute hours, when chemistry is NOx-rich and VOC-sensitive, and into midday hours when chemistry is efficient and more NOx-sensitive.

1c) VOC Evaluation

Key reactive VOCs such as formaldehyde and benzene are under predicted (TSD Figures 29 and 31), suggesting a lack of secondary photochemical production of formaldehyde and a shortage of radicals (oxidants) as fuel for ozone production. This could be related to the heavy NOx burden.

In TSD Section 4.7.3, page 27, UDAQ states, "Modeled isoprene displayed high values during early morning-midday hours (8 am - 12 pm)." The average morning peak isoprene in Figure 27 of the TSD shows modeled concentrations reaching almost 2 ppb. UDAQ goes on to say in the same paragraph, "Measured isoprene, on the other hand, peaked much earlier in the morning (between 6 and 9 am), potentially consistent with primary mobile source emissions." The average morning peak isoprene in Figure 28 of the TSD shows measured concentrations reaching only 0.5 ppb. The reference to mobile emissions is confusing and suggests that mobile source emissions contribute most to isoprene emissions. Rather, the majority of isoprene is biogenic, with only minor contributions from mobile sources. Therefore, it is most likely that the over predicted morning isoprene stems from a poor characterization of the BEIS biogenic emissions model.

As described in UDAQ's photochemical modeling TSD, the different versions of BEIS produce very different characterizations of biogenic VOC as depicted by the sensitivity for isoprene concentrations (Figure 3, page 10 of the TSD). We have also noted significant variability in rural and urban biogenic VOC emissions among the last 3 versions of BEIS (v3.6 through 4.0) applied in Denver and Las Vegas. We have seen that BEIS3.6 generates too little urban biogenic emissions but large over estimates of rural emissions; BEIS3.7 generates too much urban emissions but adequate amounts of rural emissions, and BEIS4 generates much less urban and rural emissions than either predecessor. All of this indicates that models for this source sector remain inadequate in characterizing western environments.

1d) UDAQ's conclusions

UDAQ concludes at the end of Section 8.2.1 of the main SIP document, "These results provide confidence in the ability of the modeling platform to provide a reasonable projection of future year ozone concentrations and source contributions in the NWF NAA." This is a strong statement given the lack of evidence in this section and the precursor assessment in the TSD. The concern about ozone performance, and the reason why it is a key part of SIP modeling, is that relatively poor performance degrades confidence that the model will respond appropriately to emission changes. In other words, the model may look mostly right but for the wrong reasons. It is possible that under prediction of local ozone production thins the margin for ozone reductions from controls and leads to a less responsive model in the relative response factor (RRF) calculation used in the design value projection. For example, under predictions of ozone might be caused by excessive NOx that inhibits ozone formation, and NOx controls may lift that inhibition and lead to higher ozone (a "NOx disbenefit" condition). Ozone underpredictions may also be associated with insufficient VOC, which may reduce effectiveness of VOC emission controls. UDAQ acknowledges this at the top of the weight of evidence section (8.3.2, page

127 of the main SIP document), by stating that model uncertainties "… may result in an overestimation in future predicted ozone concentrations."

2. Meteorological Inputs and Analysis

2a) Pressure Units

Pressure units are labelled as millibars (mb) in the photochemical and meteorological modeling TSDs, but the pressure values tabulated in both documents indicate units are Pascals (Pa = 100 x mb).

2b) Analysis of PBL heights

The treatment of the planetary boundary layer (PBL) and associated vertical mixing (or diffusion) is a critically sensitive component in both WRF and CAMx. In Section 4.2, page 6 of the photochemical modeling TSD, UDAQ states that vertical diffusivities (Kv) were calculated for CAMx using the "YSU" planetary boundary layer (PBL) method. The meteorological modeling TSD states that WRF was run using the "MYNN Level 2.5" PBL method (Section 1.2.2, Table 1.3, page 14). WRF includes the YSU algorithm, and the WRFCAMx interface program allows Kv fields to be calculated using turbulent kinetic energy data generated by the MYNN Level 2.5 algorithm. So a consistent PBL approach could have been used in both models (both MYNN or both YSU). UDAQ should include their rationale for selecting the MYJNN approach in WRF relative to the many other options available (including YSU), and why a different approach was used in CAMx. It would be helpful to conduct sensitivity tests with WRF and/or CAMx using different PBL schemes, or at least describe why these specific options for each model were selected.

In Section 4.7.2, page 24 of the photochemical modeling TSD, UDAQ states that the NOx over prediction bias "… is potentially related to an underestimation in the planetary boundary layer (PBL) depth during these overnight hours, as indicated by a comparison between modeled PBL height from wrfcamx and observed PBL height …" (referencing Figure 24 of the TSD). There are some key points that should be addressed in the TSD. First, the referenced ceilometer-derived PBL heights are not necessarily indicative of the actual PBL depth because they do not measure actual turbulent energy but rather backscatter from often unrelated features such as cloud base and aerosol layers. Second, PBL differences between WRF and CAMx (the latter is also incorrectly referred to as "wrfcamx" in the TSD) are most likely related to the use of different PBL approaches in each model, as noted above.

It is important that the TSD explain which PBL information is actually used within CAMx. The rate of vertical mixing in CAMx is quantified using Kv diffusivity fields. PBL heights are not used directly in CAMx but are simply reported for informational purposes (e.g., quality assurance). Reported CAMx PBL heights may vary from the PBL reported by WRF, but this has no effect on model results. Therefore, caution and context should be included when comparing PBL heights among WRF, CAMx, and ceilometers.

2c) Subgrid Convection

In Section 4.2, page 6 of the photochemical modeling TSD, UDAQ states, "Kain-Fritsch subgrid convection and subgrid stratiform cloud options were also invoked." This is one of two options in WRFCAMx that diagnose the amount of sub-grid cloudiness in each grid column. If none of the options are selected, no sub-grid cloudiness is calculated. There is no indication in the TSD about whether this

option was applied for all grids or for just the larger grids. It is likely that this option generates excessive cloudiness at the 1.333 km grid scale as clouds should be well-resolved by WRF at such resolution. UDAQ mentions in the model performance evaluation that excessive simulated cloudiness may be a cause for large ozone under predictions on certain days. It would be helpful to show a sensitivity test that entirely removes sub-grid (or all) clouds to see if they are primarily responsible for the consistent ozone under prediction tendency.

3. Evaluation of NOx and VOC Sensitive Ozone Production from Source Apportionment Results

In section 7.4.1, pages 114-115 of the main SIP document, UDAQ discusses the rationale for the effectiveness of NOx controls within the NWF NAA. Figure 6 on page 115 of the SIP shows results from ozone source apportionment modeling, which tracks ozone formed separately under NOx and VOC limited (or sensitive) conditions, which indicates that 54% of ozone is attributable to NOx limited chemistry while 46% is attributable to VOC limited at Hawthorne when averaged over all days of the modeling episode. A similar breakdown is shown at Bountiful. As stated above, model sensitivity to NOx and VOC changes (and by extension source apportionment) are dependent on the model's ability to correctly replicate conditions that actually occurred. As we discuss below, NOx sensitivity indicated by the CAMx modeling results do not agree with a conceptual model for VOC sensitivity indicated by monitoring studies. UDAQ uses NOx sensitivity suggested by the modeling as justification for NOx controls despite not meeting VOC reduction requirements.

On page 114, UDAQ states that "the findings are consistent with those from a VOC/NOx ratio analysis conducted by the UDAQ which utilized NOx and VOC measurements collected at the Hawthorne monitoring site during the summer of 2021" (Sghiatti and Daher, 2022). The reference includes plots of VOC:NOx ratio calculated with and without consideration of VOC reactivity (reproduced in Figure 1 below). VOC:NOx < 5 indicates VOC-limited (sensitive) chemistry, VOC:NOx > 15 indicates NOx-limited chemistry, and values between 5 and 15 indicate transitional chemistry that responds to changes in both. Based on results shown in Figure 1, presumably by visually averaging hourly results over all daytime hours, Sghiatti and Daher conclude that ozone at Hawthorne forms in a transitional regime. The reactivity-weighted figure shows a tendency toward more VOC-limited conditions, and perhaps more emphasis should be given to that figure given the abundance of higher-reactivity alkene, aromatic and aldehyde compounds according to measurements shown by Sghiatti and Daher, as well as Ninneman et al. (2023).

Sghiatti and Daher (2022) also present a weekday-weekend analysis of monitored ozone that indicates statistically significant ozone increases during 2021 summer weekends as a result of reduced mobile source NOx emissions. The authors correctly suggest that this "points to a VOC-limited regime" during 2021. In previous years spanning 2017-2020, weekday-weekend ozone differences were not statistically significant. The authors offer no potential reasons for the unique conditions analyzed in 2021, but the results suggest recently lower VOC relative to NOx in the Hawthorne area (i.e., a lower VOC:NOx ratio).

Under a Science for Solutions grant, Ninneman et al (2023) conducted photochemical box model simulations constrained by 2022 precursor and meteorological measurements at the Utah Technical Center during days influenced by wildfire smoke and on smoke-free days. The box model showed ozone production increasing during the morning hours and peaking around noon, after which ozone destruction processes dominated (Figure 2 below).

Therefore, VOC:NOx ratio is best evaluated during the morning hours (e.g., 6 AM to 12 PM), when Figure 1 indicates a more VOC-limited regime regardless of reactivity weighting. Box model sensitivity tests in which VOC and NOx precursor concentrations were systematically reduced separately and together showed strong responses to VOC and little response to NOx until very deep NOx reductions were applied (Figure 3 below) or reductions were applied collectively. Thus, results clearly show VOC-sensitive conditions at the Utah Technology Center, although that site measures some of the highest NOx in the area and so results in Figure 3 are not surprising.

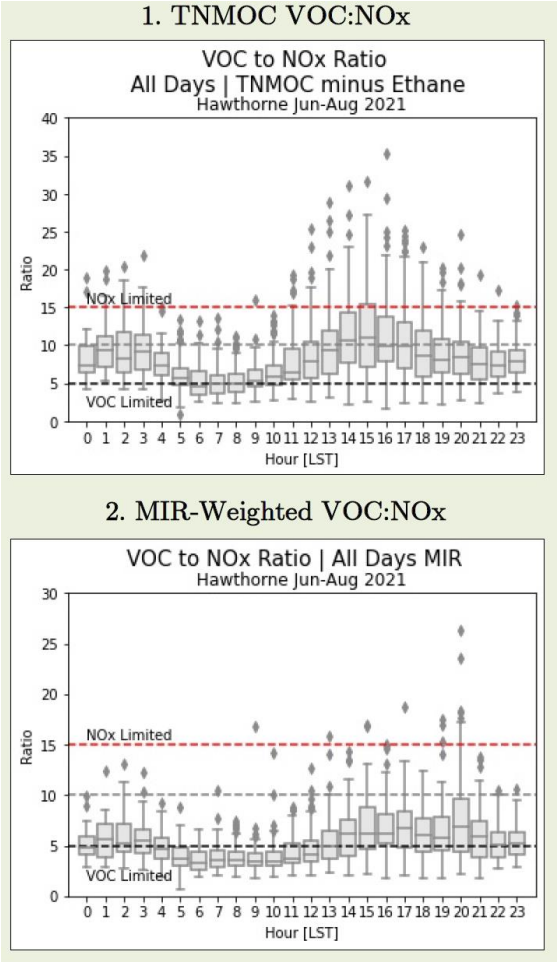

Figure 1. Monitored VOC:NOx ratios at Hawthorne using two different techniques using total non-methane hydrocarbons (TNMOC; top) and maximum incremental reactivity (MIR) weighted VOCs (bottom). Figure from Sghiatti and Daher (2022).

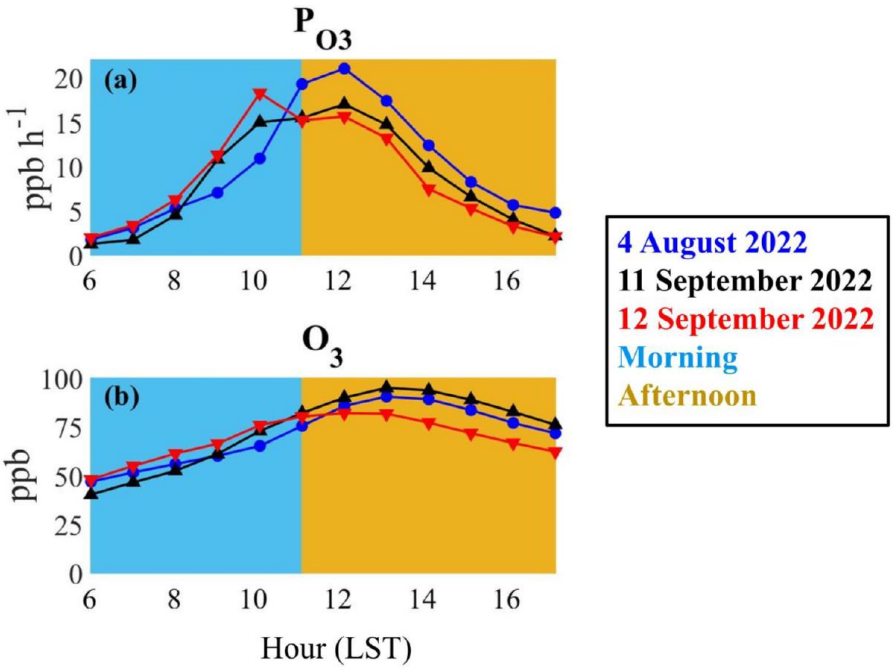

Figure 2. Diurnal profiles of ozone production rate (top) and total ozone concentration (bottom) simulated by a box model run using data from the Utah Technology Center on 3 days in 2022: smoke-influenced days (11 and 12 September) and a smoke-free day (4 August). Figure from Nenniman et al. (2022).

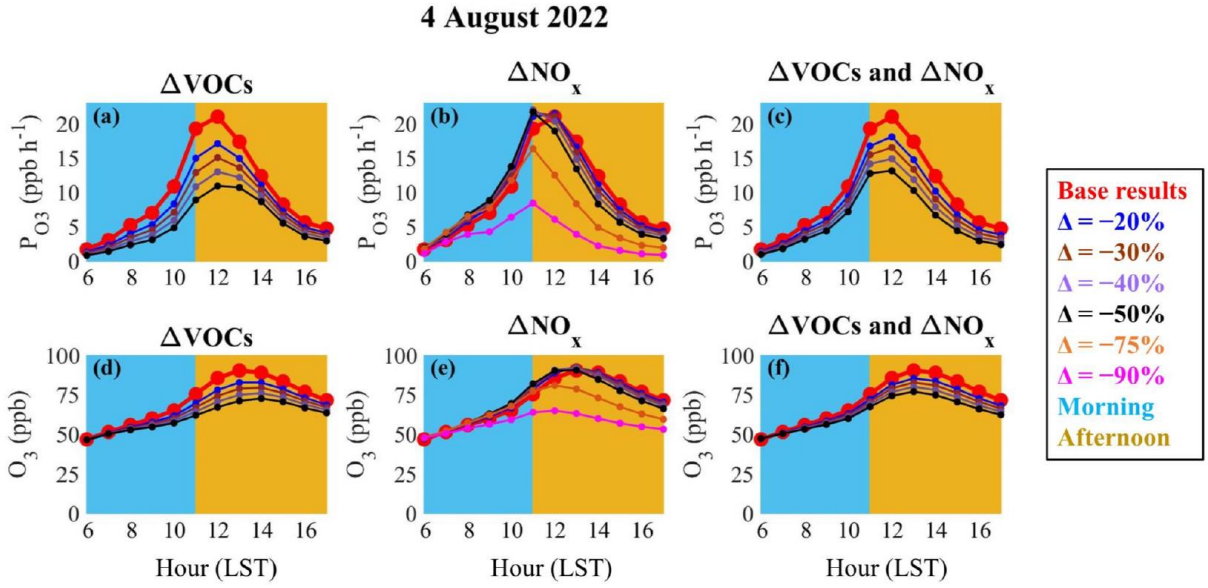

Figure 3. Diurnal profiles of ozone production rate (top) and total ozone concentration (bottom) simulated by a box model on the smoke-free day of August 4. Results from 6 NOx and VOC emission reduction scenarios are also plotted, indicating strong VOC sensitivity and little NOx sensitivity. Figure from Nenniman et al. (2022).

In summary, recent ozone and precursor analyses at two different monitoring sites indicate a stronger tendency toward VOC-limited photochemistry during hours of increasing and maximum ozone production, while CAMx shows a stronger tendency toward NOx-limited photochemistry. There are several possible reasons for this, as both techniques are associated with uncertainties: (1) since the model is not constrained by measured values (as box modeling is), error propagation stemming from uncertainties in emissions (values, time/space allocation) or meteorological inputs (chemical kinetics, vertical mixing, transport patterns) may cause an improper characterization of chemical sensitivity; (2) point measurements at monitoring sites sense local conditions but cannot provide information on how ozone is formed in other areas of the NWF NAA that are transported into the local monitored area. Both issues are likely at play to various extents, however, the documented CAMx performance issues throughout the modeling period weaken conclusions drawn from the modeling about NOx-sensitive conditions and strengthen conclusions about VOC-sensitive conditions drawn from the monitoring studies.

4. Estimated Impacts from Required Refinery Emission Reduction Measures

The SIP lists a number of control measures, mostly to address the Moderate Area requirement for Reasonably Available Control Technology (RACT) applied to stationary permitted sources. We applied UDAQ's ozone source apportionment technology (OSAT) results to estimate the impact on the 2023 ozone design value (DV) at the Hawthorne monitoring site from specific refinery emission control measures at two refineries:

1. Chevron (Davis County): ultra-low NOx burners on 2 crude heaters (8.9 TPY total NOx reduction)[4]
2. Tesoro/Marathon (Salt Lake County):
   a. Selective Catalytic Reduction (SCR) on co-generation turbines (87.5 TPY total NOx reduction);
   b. Second seal on Tank 321 and closed vent with carbon absorption on wastewater system (12.3 TPY total VOC reduction)

Strictly speaking, OSAT is not equivalent to a "sensitivity analysis" with which to estimate effects of emission reductions on ozone concentrations. This is because ozone chemistry responds non-linearly to emission changes. OSAT reports an estimate of attribution under the specific environmental and emission conditions that are given to the model. When those conditions change (e.g., to simulate impacts from a control measure), attribution can change non-linearly, either positively or negatively. However, the ozone response approaches linearity as emission changes or ozone attribution decrease. In this case, both the emission reductions relative to county-level totals and their ozone contributions at Hawthorne are rather small, affording us to use OSAT results to estimate first-order (linear) ozone impacts from the emission reductions above.

[4] Section 4.4.5, Page 44 of the main SIP document states this is a 62% NOx reduction for process heaters, but according to the 2017 Emission Inventory (https://deq.utah.gov/air-quality/2017-statewide-emissions-inventories) process heaters emit 122 TPY (8.9 TPY reduction is 7%). We could not find an equivalent 2023 process-level inventory among UDAQ's SIP material or the referenced website. We have assumed that the stated NOx TPY reduction is correct.

UDAQ tracked many different source categories with OSAT for the 2023 future year base case (i.e., 2023 projected emission inventory reflecting measures currently "on-the-books" and implemented by 2023). Refinery emissions were contained along with many other miscellaneous source types within a sector referred to as "other point sources". OSAT tracked emissions from this sector for each county within the NWF NAA. For our calculations, we needed a county- and process-specific emission inventory for 2023 but could only find such information for the 2017 base year.[5] We used the 2017 inventory for our purposes assuming that permitted point source emission rates have not changed significantly from 2017 to 2023.

Table 1 lists 2017 annual NOx and VOC emissions in Salt Lake and Davis Counties for sources comprising the "other point source" category, according to UDAQ's definition of those sources within the SIP and associated TSDs. Since the 2023 OSAT modeling tracked point sources associated with electric generating units, oil and gas sources, and off-highway mining trucks operating at the Rio Tinto Kennecott facility separately from the "other point source" category, those NOx and VOC emissions were removed from the Salt Lake and Davis County inventories. Additionally, the Rio Tinto Kennecott power plant did not operate in 2023, nor did the Davis County Landfill & Energy Recovery Facility (DCERF), so those emissions were also removed. Table 1 also shows the total absolute and percent emissions contributed by Tesoro/Marathon and Chevron facilities, respectively. Finally, the table shows the respective NOx and VOC reductions from the control measures listed above relative to the county totals. We assumed that annual emission rates are representative of emissions on any given summer day.

Table 1. County-level 2017 emissions reported by UDAQ for the "other point source" OSAT category containing the two refineries subject to required control measures as shown.

Salt Lake	**NOx (TPY)**	**VOC (TPY)**
Total "other point sources"	1256	1302
Tesoro/Marathon	313 (25%)	231 (18%)
Required Controls	87.5 (7.0%)	12.3 (0.9%)
Davis		
Total "other point sources"	665	1670
Chevron	254 (38%)	377 (23%)
Required Controls	8.9 (1.3%)	0 (0%)

We received UDAQ's model output files via disk transfer and processed raw hourly OSAT tracer concentrations to MDA8 ozone in local time. Figure 4(a) shows resulting time series of attribution for five aggregate source categories at Hawthorne, while Figure 4(b) shows the average over the top 10 highest simulated ozone days. Figure 5 is a copy of Figure 17, page 132 from the main SIP document. We extracted data from CAMx "receptor files", which report source apportionment results at pre-defined receptor coordinates defined by UDAQ. However, we could not replicate UDAQ's source apportionment results; while exhibiting similar patterns, our results tend to be higher during peak periods and the distribution of high days differ.

[5] 2017 EI website: https://deq.utah.gov/air-quality/2017-statewide-emissions-inventories

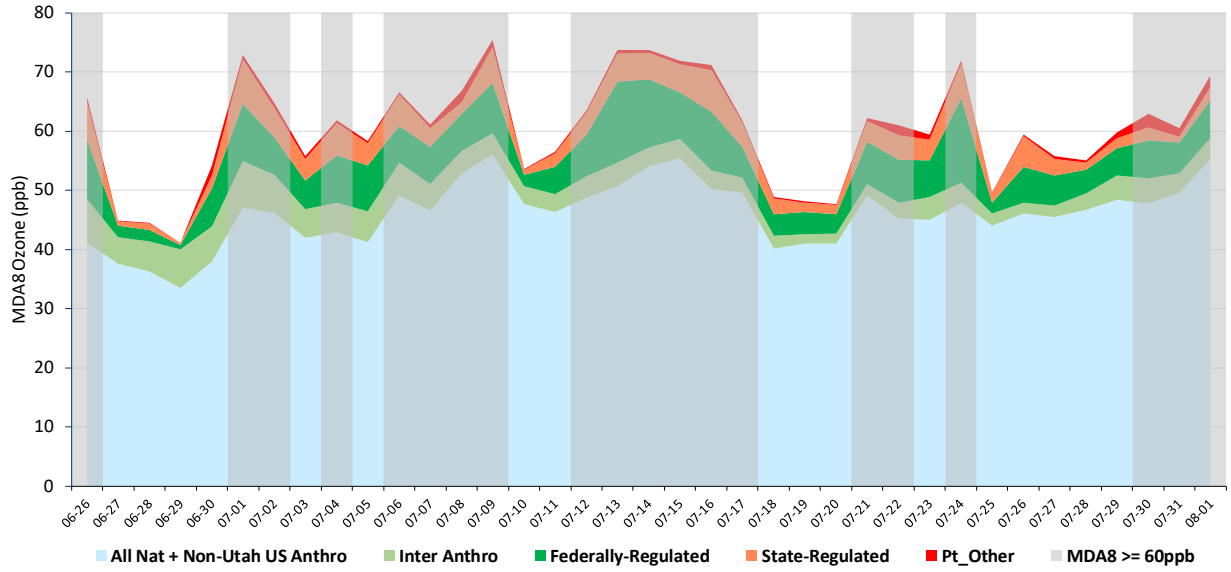

Figure 4(a). Time series of Ramboll's processing of MDA8 ozone contribution at Hawthorne from 5 aggregated sources/regions: all global natural and non-Utah US anthropogenic (blue); all international anthropogenic (light green); all Utah federally regulated (dark green); Utah state-regulated "other point sources" (red); all remaining Utah state-regulated (orange).

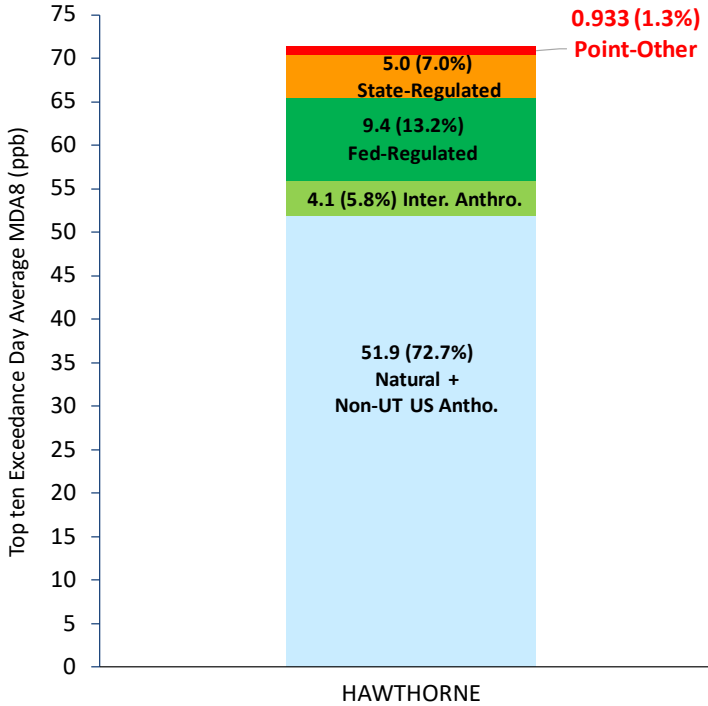

Figure 4(b). Average of Ramboll's processing of MDA8 ozone contribution at Hawthorne over the top 10 days shown in Figure 4(a) from 5 aggregated sources/regions: all global natural and non-Utah US anthropogenic (blue); all international anthropogenic (light green); all Utah federally regulated (dark green); Utah state-regulated "other point sources" (red); all remaining Utah state-regulated (orange).

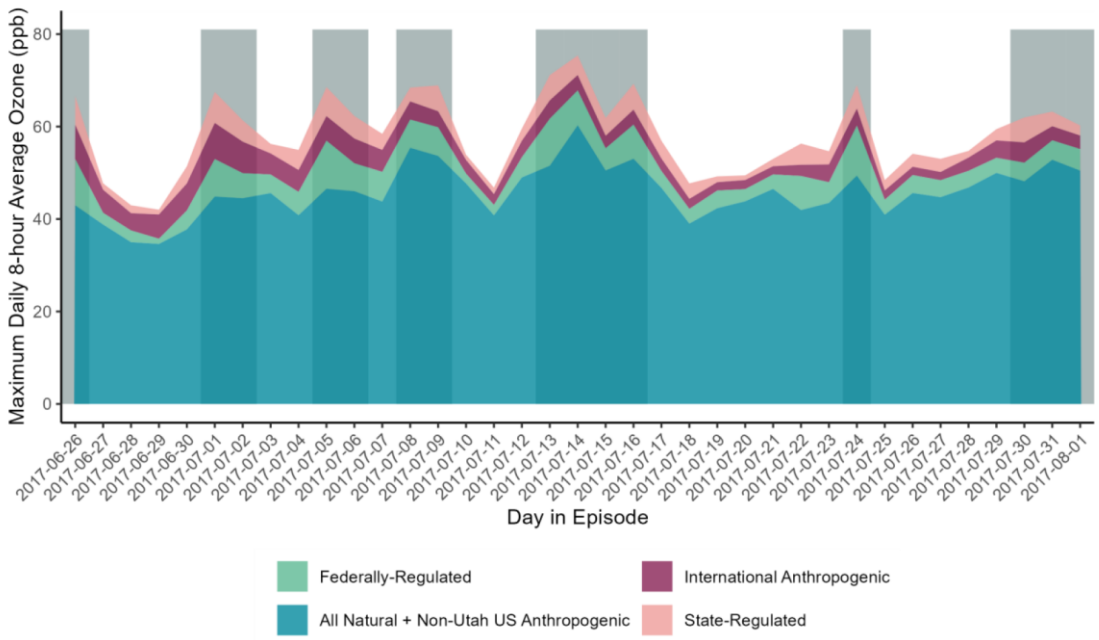

Figure 5(a). Time series of UDAQ's MDA8 ozone contribution at Hawthorne from 4 aggregated sources/regions:[6] all global natural and non-Utah US anthropogenic (blue); all international anthropogenic (red); all Utah federally regulated (green); all Utah state-regulated (pink).

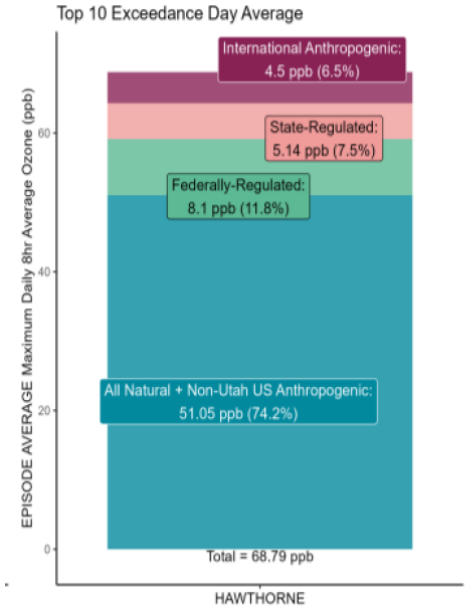

Figure 5(b). Average of UDAQ's MDA8 ozone contribution at Hawthorne over the top 10 days shown in Figure 5(a) from 4 aggregated sources/regions[6]: all global natural and non-Utah US anthropogenic (blue); all international anthropogenic (red); all Utah federally regulated (green); all Utah state-regulated (pink).

[6] From Figure 17, page 132 of main SIP document.

We conducted substantial quality assurance checks of our approach at each processing step and tested numerous possible causes. This included confirming that we could achieve identical results by extracting data from raw gridded data (rather than receptor files) and confirming that total ozone simulated by the core model at Hawthorn matched the sum of all tracers shown in Figure 4. We also extensively interacted with UDAQ staff to find possible reasons of discrepancies at each step of processing but could not identify a specific cause. Based on our substantial checks, we are certain that our results are correct.

According to our results, the "other point source" category that contains refineries contributes a total of 0.9 ppb over the top 10 simulated MDA8 ozone days. Figure 6 shows a breakout of the 0.9 ppb contribution from "other point sources" by NOx (O3N) and VOC (O3V) sensitive ozone production, and from Salt Lake County, Davis County, and other areas outside the two counties. Point sources in Salt Lake County contribute 0.30 ppb (32%) and 0.04 ppb (4%) from NOx and VOC sensitive chemistry, respectively. Point sources in Davis County contribute 0.18 ppb (19%) and 0.10 ppb (11%) from NOx and VOC sensitive chemistry, respectively. For both counties, results indicate more NOx-sensitive ozone formation from point sources. All other point sources located throughout the remainder of the 4/1.33 km modeling domains contribute 0.32 ppb (34%) and <0.01 ppb (0.4%) from NOx and VOC sensitive chemistry, respectively. The stronger NOx-sensitive response from the outside point sources makes sense as they are mostly removed from the central urbanized area of the NAA, and thus ozone formation occurs in more NOx-lean and relatively biogenic VOC-rich suburban and rural areas.

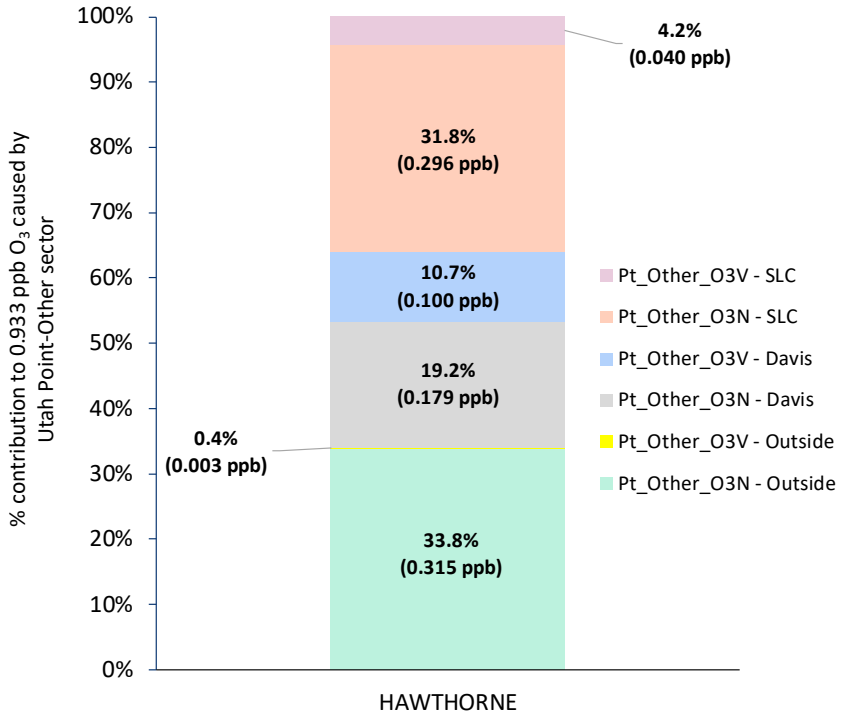

Figure 6. Average of Ramboll's processing of MDA8 ozone contribution at Hawthorne over the top 10 days shown in Figure 4(a) from 6 aggregated "other point source" tracers. Contributions are split by whether ozone was generated by NOx (O3N) or VOC (O3V) sensitivity photochemistry.

We estimated the ozone impacts from simulated refinery control measures in 2023 at Hawthorne by multiplying contributions from Figure 6 by the relative emission reductions shown in Table 1. Results are shown in Table 2. The total simulated MDA8 ozone reduction from refinery measures averaged over the highest modeled ozone days is 0.02 ppb. Conceivably this impact would be smaller if the model simulated a VOC-sensitive environment rather than NOx-sensitive, as indicated by monitoring studies.

Table 2. County-level refinery emission reductions (Table 1) applied to modeled MDA8 O3N and O3V from "other point sources" averaged over the top 10 modeled ozone days (Figure 6), resulting in total MDA8 ozone impact at Hawthorne. Estimated average ozone reductions by individual control measure at each refinery are highlighted in yellow.

Salt Lake	**NOx Reduction**	**Total O3N**	**O3N Reduction**	**VOC Reduction**	**Total O3V**	**O3V Reduction**
Tesoro	7.0%	0.30	0.021	0.9%	0.04	0.00036
Davis						
Chevron	1.3%	0.18	0.0023	0 (0%)	0.10	0
Subtotal		0.48	0.0233		0.14	0.0036
Total Ozone Reduction	0.0269 ppb (O3N reduction + O3V reduction)					

We then projected the total refinery ozone reduction estimate to the 2023 base ozone DV by scaling by the ratio of the 2023 projected DV to the mean modeled ozone over the top 10 modeled days (71.4 ppb, Figure 4(b)), in parallel to the procedure employed by the Software for Modeled Attainment Test (SMAT; EPA, 2018). We did this calculation twice with different 2023 base projected DVs: once with wildfire-flagged days not excluded by UDAQ (74 .3 ppb[7]) and once with wildfire days excluded by UDAQ (72.7 ppb[7]). Table 3 shows the projected 2023 ozone DV reductions from combining control measures from Tesoro/Marathon (NOx and VOC) and Chevron (NOx). Since the modeled highest 10-day average ozone is just slightly lower than the projected 2023 DVs in both cases, the projected total refinery ozone DV impacts from required controls are consistently 0.03 ppb.

Table 3. Projected 2023 ozone DV impact at Hawthorne from all combined refinery control measures (Table 2) on Tesoro/Marathon (NOx and VOC) and Chevron (NOx).

	All Days in DV Calculation	**Wildfire-flagged Days Removed in DV Calculation**
2023 Projected DV[5]	74.3 ppb	72.7 ppb
Relative Response Factor	1.041 (74.3/71.4)	1.018 (72.7/71.4)
2023 Projected DV RACT Impact	0.0280 ppb	0.0273 ppb

[7] Table 68, page 126, main SIP document.

References

Emery, C.E., Z. Liu, A.G. Russell, M.T. Odman, G. Yarwood, N. Kumar, 2016. Recommendations on statistics and benchmarks to assess photochemical model performance. *J. of the Air and Waste Management Assoc.*, 67/5, DOI: 10.1080/10962247.2016.1265027. https://www.tandfonline.com/doi/full/10.1080/10962247.2016.1265027.

EPA, 2018. Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM2.5, and Regional Haze (EPA 454/R-18-009, November 2018). Prepared by the U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Policy Division, Research Triangle Park, NC. https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling_Guidance-2018.pdf.

Ninneman, M., M. Mansfield, S. Lyman, L. Hu, D. Jaffe, 2023. Investigation of Ozone Formation Chemistry During the Salt Lake Regional Smoke, Ozone, and Aerosol Study (SAMOZA). Presented at the 7th Annual Science for Solutions Conference, March 30, 2023. https://byu.app.box.com/s/v2cm42e4i73s0l1fhbn1301zi6dt5gtv/file/1200206266091.

Sghiatti, M. and N. Daher, 2022. Summertime Ozone Production and its Sensitivity to NOx and VOCs in the Salt Lake Valley. Poster presentation at the 6th Annual Science for Solutions Conference, April 7, 2022. https://harbor.weber.edu/Airqualityscience/docs/conferences/AQSfS-2022/AQSfS2022Posters/sghiatti_sci_4_sol_poster_2022.pdf.

Attachment II

Letters to UDAQ from UPA Regarding RACT: Preliminary RACT Determinations Letter (March 10, 2023) and RACT Selection Criteria Letter (February 2, 2023)

Utah Petroleum Association

6905 S. 1300 E. #288, Cottonwood Heights, UT 84047-1817

FUELING UTAH'S GROWTH & PROSPERITY

March 10, 2023

Bryce Bird
Utah Division of Air Quality
P.O. Box 144820
Salt Lake City, Utah 84114-4820

Submitted by email to bbird@utah.gov

Subject: UDAQ Preliminary RACT Determinations for Petroleum Refineries in the Northern Wasatch Front Ozone Nonattainment Area

Dear Bryce:

The Utah Petroleum Association ("UPA") sends this letter about recent Utah Division of Air Quality ("UDAQ") determinations of Reasonably Available Control Technology ("RACT") provided to some of our member company petroleum refineries operating within the Northern Wasatch Front ozone nonattainment area ("NWF"). In short, we are concerned that the determinations are inconsistent with applicable legal and regulatory requirements, will not assist in advancing the goal of attainment, are based on incomplete and inaccurate information, and are being developed on a fast-track schedule that does not provide adequate time for the normal exchanges of information that typically take place between affected sources and UDAQ. We detail our concerns here for inclusion in the record.

In good faith, our member companies submitted updated RACT evaluations to UDAQ to ensure that the RACT determinations for the NWF Moderate State Implementation Plan ("SIP") would be based on more accurate, up-to-date information to the extent this could be prepared in the short time available, rather than pulling from five-year-old evaluations of Best Available Control Technology ("BACT") developed for the $PM_{2.5}$ SIP.[1] UDAQ subsequently notified some of the refineries that they must install additional nitrogen oxide ("NOx") controls before the summer ozone season of 2026, stating that the "additional control technologies are considered RACT."

While UDAQ indicated that it has determined these controls to constitute RACT, it offered no basis for that determination. For example, it did not address considerations related to cost

[1] While the updated information was better than the five-year old information, companies were still required to provide it on a relatively expedited basis. This resulted in information and assumptions that, while the best available given the time constraints, was nonetheless itself incomplete and likely conservative in that it tended to underestimate total control cost. Companies nonetheless believed this information to be sufficient for the purpose in that the estimates showed cost effectiveness significantly higher than what has been understood to constitute RACT (and even BACT). Accordingly, companies considered the precision of the estimates to be sufficient for screening out certain controls from further consideration as RACT.

effectiveness[2] or timing for the installation of the controls.[3] Nor did it address the necessity (or even the potential for marginal benefit) of the controls in bringing about attainment, an especially egregious oversight in view of the particular parameters of the airshed such as, for example, the contribution of international transport to nonattainment. We explain below.

UDAQ's Proposed RACT Does Not Comply with the Requirements of the Clean Air Act and the Corresponding Federal Regulations

The Clean Air Act ("CAA") and SIP rules for various National Ambient Air Quality Standards ("NAAQS") call for implementing RACT level of control.[4] Additionally, states often apply RACT for Regional Haze SIPs. The regulations for procedural requirements for SIPs define RACT as follows:

> *Reasonably available control technology (RACT) means devices, systems, process modifications, or other apparatus or techniques* ***that are reasonably available*** *taking into account:*
>
> *(1) The necessity of imposing such controls in order to attain and maintain a national ambient air quality standard;*
>
> *(2) The social, environmental, and economic impact of such controls; and*
>
> *(3) Alternative means of providing for attainment and maintenance of such standard. (This provision defines RACT for the purposes of § 51.341(b) only.)*[5] [emphasis added]

An important aspect of this definition is that the controls be *reasonably available*. Rather than applying the regulatory RACT criteria, UDAQ appears instead to have acted in an arbitrary, ad hoc manner to impose controls under the guise of RACT. One of the hallmarks of administrative rulemaking is that an agency such as UDAQ provide a reasoned explanation for its proposed action. UDAQ has done no such thing, instead, simply announcing its conclusion without providing any supporting rationale.

Cost Criteria

Cost effectiveness has long been a key criterion in making determinations of what controls are appropriate under various Clean Air Act programs. These include BACT for Prevention of Significant Deterioration ("PSD") review, BACT for SIPs, RACT for SIPs and the Regional Haze Program, MACT under the hazardous air pollutant program, and Lowest Achievable Emission Rate ("LAER") under the major nonattainment New Source Review ("NSR") program. As

[2] The UDAQ RACT determinations have cost-effectiveness ranging between $24,000 and $28,000 per ton of NOx emissions reduced. These values fall ***far*** outside of the upper range that has typically been considered to be cost effective for RACT.

[3] UDAQ is requiring that the controls be installed by the summer of 2026. While it is not clear that the controls can even be installed by that deadline – additional analysis would be required to understand when such controls could be installed assuming that they were, in fact, determined to constitute RACT – they certainly cannot be installed by the regulatory deadline for RACT for the NWF nonattainment area which is January 1, 2023.

[4] See, for example, CAA §182(b)(2), CAA §182(f), and 40 CFR §51.1312 for ozone nonattainment areas; CAA §189(a)(1)(C) and 40 CFR 51.1009(a)(4) for particulate matter nonattainment areas.

[5] 40 CFR Part 51 Subpart F Procedural Requirements §51.100(o).

explained in our February 2023 letter, the maximum cost-effectiveness threshold indicated for ozone RACT should be no greater than $5,000 to $7,500 per ton of emission reduced (copy of February letter attached).[6] Any higher level of control would not be *reasonably available*. The controls being suggested as RACT by UDAQ's recent e-mail communications have cost effectiveness of $24,000 per ton and greater and, therefore, cannot be deemed to be "reasonably available." In fact, the UDAQ RACT determinations are ***three to four times more costly than appropriate*** and even exceed levels typically used for the higher level of control for BACT determinations, as shown in the February 2023 letter.

No justification exists to make RACT determinations at such high cost effectiveness levels. While we understand that UDAQ may be reluctant to offer an exact cost effectiveness threshold, there must be some reasonable upper-bound cost effectiveness that guides its decision making. We find no other examples of RACT determinations approaching this cost effectiveness threshold. Moreover, setting the cost effectiveness level this high – and significantly higher than other similarly-situated states – sets a discouraging precedent for those that do, or might seek to do, business in Utah. Such a precedent will discourage business and industry from relocating to Utah or from investing further within Utah due to the high costs of emission controls.[7] The precedent would carry into future SIPs and even into minor NSR BACT determinations for air permitting.

Deadline for Installation of RACT Controls

Furthermore, the installation deadline provided to the refineries (summer 2026) for the new controls fails to consider (i) the regulatory timeline requirement for RACT installation or (ii) whether the work could be done within the existing refinery planned turnaround schedule or even whether the engineering and procurement can be completed on time.

EPA's recently published Determination of Attainment by Attainment Date ("DAAD") for the 2015 ozone NAAQS established an installation date of January 1, 2023, for installation of all VOC and NOx RACT controls:

> *SIP revisions required for the newly reclassified Moderate areas must be submitted no later than January 1, 2023, and RACM/RACT for these areas must be implemented as expeditiously as practicable, but* ***no later than the same date***.[8, 9] [emphasis added]

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[6] Letter, Rikki Hrenko-Browning to Bryce Bird, *Criteria for Selection of Reasonably Available Control Technology*, February 2, 2023 ("February 2023 Letter")

[7] We are assuming that UDAQ is applying its cost effectiveness threshold equally across all industries and not singling out the refineries for disparate treatment. A central purpose of cost effectiveness is to create a level playing field so that all sources and industries are treated equally.

[8] 87 FR 60897, *Determinations of Attainment by the Attainment Date, Extensions of the Attainment Date, and Reclassification of Areas Classified as Marginal for the 2015 Ozone National Ambient Air Quality Standards* ("DAAD"), p. 60907/1.

[9] This RACT installation date set in the DAAD comports with the requirements of the SIP implementation rule for the 2015 ozone standard:

> *For RACT required pursuant to reclassification, the state shall provide for implementation of such RACT as expeditiously as practicable, but* ***no later than the start of the attainment year ozone season associated with the area's new attainment deadline****, or January 1 of the third year after the associated SIP revision submittal deadline,* ***whichever is earlier****;* ***or the deadline established by the Administrator in the final action issuing the area reclassification****. (*40 CFR Part 51 Subpart CC §51.1312(a)(3)(ii)) [emphasis added]

UDAQ has not explained how these controls can be justified as RACT if such a clear, unambiguous deadline requirement cannot possibly be satisfied. We are unaware of any authority that would allow UDAQ to ignore the regulatory requirement under which it purports to be acting pursuant to.

Even assuming that UDAQ had a basis for ignoring the legal deadline for RACT installation, the arbitrary summer of 2026 deadline that it would substitute is flawed for several reasons. First, we are unaware of any analysis – by the subject companies or UDAQ – that has been completed to determine if the installation of these control systems could be accomplished that date. The engineering, design, procurement, contracting, and scheduling associated with such significant projects is extensive and, at present, there is no basis for concluding that UDAQ's summer 2026 deadline is feasible.

An additional consideration impacting scheduling relates to refinery "turnaround" schedules. Due to the integrated operating nature of refineries, projects of this magnitude are typically planned for a refinery's scheduled turnaround. Refineries establish their turnaround schedules years in advance to accommodate extensive engineering, maintenance, equipment codes, upgrades, product delivery commitments, and other factors, and typically spend years planning the myriad of details so they can procure the necessity parts and equipment including long-delivery items and execute the turnaround safely, on time, on budget, and without incident. Disruptions to the schedule and inadequately planned turnarounds risk the safety of those involved as well as cost and schedule overruns and can lead to incidents including environmental incidents.

Requiring installation of controls without accounting for the established turnaround schedule could add millions of dollars to the installation cost based on the duration of the required additional turnaround and the lost profit opportunity associated with the additional turnaround. Refineries did ***not*** consider disruptions to the normal planned turnaround schedule or lost profit opportunity in their cost effectiveness calculations in their RACT evaluations, nor did they think it would be necessary to do so because they did not anticipate being told to install controls as RACT with such high cost effectiveness values (even without accounting for these additional costs) and within a short time window.

Thus, the controls in the RACT determinations cannot be installed by the regulatory time frame – which has passed. Nor can they be installed by the (unexplained) summer of 2026 deadline that UDAQ proposed.

Necessity of Controls to Attain/Maintain NAAQS

As noted, the definition of RACT specifically provides for taking into consideration, "[t]he necessity of imposing such controls in order to attain and maintain a national ambient air quality standard." UDAQ has not shown if or how the controls in the RACT determinations would support the

EPA initially designated the NWF as nonattainment in 2018 with an effective date of August 3, 2018 (83 FR 25776). Based on the effective initial designation date, the attainment date for the NWF at Moderate is six years later, in other words August 3, 2024 (See Table 1 of 40 CFR §51.1303). EPA considers the "attainment year" to be the last full calendar year prior to the attainment date, and thus 2023 is the attainment year for the NWF at Moderate. Thus, the installation date for RACT for the NWF, per the 2015 ozone NAAQS implementation rule, must be set no later than the start of the ozone season in 2023. The date set in the DAAD for RACT installation – January 1, 2023 – comports with the SIP implementation requirements.

attainment demonstration at Moderate. Furthermore, in UDAQ's industry stakeholder meeting held on February 15, 2023, UDAQ explained that they can provide a successful attainment demonstration by accounting for the combination of exceptional events and international emissions.[10] Thus, the controls included in the RACT determinations are not necessary for the attainment demonstration.

UPA Supports Controls Shown to be Cost Effective Towards Lowering Ozone

UPA and its member companies support installing those controls shown to be cost effective towards lowering NWF ozone levels. We demonstrated our support for improving air quality through the voluntary implementation of Tier 3 gasoline in Utah, installation of controls that have been effective towards reducing $PM_{2.5}$ concentrations, and decades of cooperation with UDAQ to improve local air quality under other State Implementation Plans ("SIPs").

As shown in part A of the figure below, UDAQ's source apportionment modeling study shows that only 14% of the ozone during an episode (episode average) results from anthropogenic emissions *throughout Utah* (including point sources located in the NWF).[11] The remaining 86% of NWF ozone arises from additional sources that ***cannot be controlled within Utah*** including the following:

- Anthropogenic sources located outside Utah including other states and international sources
- Various local and non-local natural sources (including biogenic emissions)

Furthermore, the 14% of ozone arising from anthropogenic sources throughout Utah includes onroad and off-road motor vehicle emissions. Utah has no control over the motor vehicle emissions; the federal government controls these sources. Yet they comprise 77% and 46% of NWF NOx and VOC emissions, respectively (61% of total NWF emissions as shown in part B of the figure).[12] In other words, Utah can only control a fraction of the 14% of ozone during an episode that arises from anthropogenic emissions in Utah, that portion which does not come from on or off-road mobile sources.

Point sources generate only a small portion of NWF ozone and the four major source petroleum refineries account for only a small portion of that, as shown in part B of the figure. The modeling study indicates that all point source emissions in the NWF account for approximately only 1 ppb of NWF ozone.[13] Presumably, this includes point source volatile organic compound ("VOC") and NOx emissions. The result is not surprising, for the following reasons:

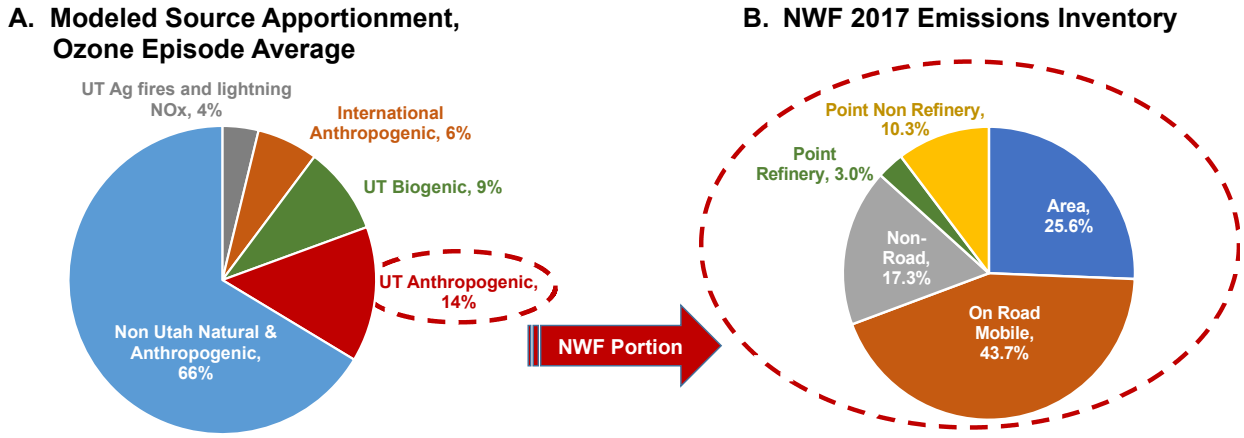
[10] In view of UDAQ's findings in this regard, it would seem that UDAQ would be persuaded towards a lower – not higher – cost effectiveness threshold for making RACT determinations; or at least a threshold that is in keeping with norms.
[11] See *Northern Wasatch Front, O3 State Implementation Plan: Modeling Updates*, presented by UDAQ's Technical Analysis Section on February 15, 2023 ("Modeling Update"), slide 11.
[12] Utah Division of Air Quality, *Marginal Ozone Inventory, Northern Wasatch Front, UT*, June 2020, available on UDAQ website at https://documents.deq.utah.gov/air-quality/planning/air-quality-policy/DAQ-2022-012149.pdf ("NWF 2017 Inventory") (accessed on March 6, 2023).
[13] See Modeling Update, slide 13. (The slide does not indicate if the point source contribution shown represents an average modeled day, episode average day, or exceedance day.)

- UDAQ's NWF emission inventory for 2017 indicates that point sources account for only 21% of NWF anthropogenic NOx emissions and only 6% of NWF anthropogenic VOC emissions, or 13% of all NWF anthropogenic emissions.[14]

- The point source inventory for 2017 indicates that the four major source petroleum refineries account for 11% of the NWF point source NOx, corresponding to only 2.4% of the NWF anthropogenic NOx emissions (11% of 21%).

- While the major source petroleum refineries account for 53% of NWF anthropogenic point source VOC emissions, that amount equates to only 3.2% of all NWF anthropogenic VOC emissions (53% of 6%).[15]

In other words, ***the petroleum refineries emit only a very small portion of NWF anthropogenic emissions and therefore account for only a very small fraction of locally formed ozone***.



We are also not surprised that the RACT evaluations submitted by our member companies did not identify very many additional controls that would qualify as RACT or very large emission reductions as RACT. ***Our member company petroleum refineries are already very well controlled.*** The petroleum refineries comply with various federal rules under New Source Performance Standards ("NSPS") and Maximum Achievable Control Technology ("MACT"), including complying with the recent 2015 extensive revisions to petroleum refinery requirements.[16] The petroleum refineries have undergone decades of new source review air permitting. Furthermore, they have also installed controls for prior SIPs including most recently RACT and BACT for the $PM_{2.5}$ Moderate and Serious SIPs, respectively.

Considering the very small effect of the petroleum refineries on local ozone and the already high level of control on their operations, UDAQ has not demonstrated the need for the NOx emission reductions that they have called for.

[14] NWF 2017 Inventory.
[15] *Base Year Ozone SIP Point Source Inventory*, located on UDAQ website at https://documents.deq.utah.gov/air-quality/planning/DAQ-2023-001356.pdf (accessed on March 6, 2023).
[16] 80 FR 75178, *Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards*.

The Controls are Not Needed for Inclusion in the Moderate SIP

The proposed controls do not comport with the RACT determination requirements and will not contribute to the attainment demonstration for the Moderate SIP. The remaining Moderate SIP requirement for adding controls to existing sources is the requirement for Reasonable Further Progress ("RFP").

RFP for the NWF at Moderate requires reducing VOC by 15% from the 2017 baseline emissions inventory amount.[17] The requested controls will not help to fulfill the Moderate RFP requirements for the NWF because they would reduce NOx and would not contribute to the required *VOC reductions*.

Additional Discussion

We understand the difficulties in developing the Moderate SIP for the NWF, especially in light of the large effects of wildfire exceptional events and international emissions on NWF ozone, as shown in the Modeling update presented in February 2023.[18] Although EPA disapproved the retroactive 179B demonstration submitted by UDAQ in May 2021, we encourage UDAQ to prepare a new package with appropriate exceptional events justifications and a new 179B demonstration, a prospective demonstration this time, using UDAQ's much more refined photochemical modeling and other weight-of-evidence technical information such as EPA or peer-reviewed studies showing the effect of international emissions on ozone in the intermountain west. To its credit, UDAQ has shown through its modeling that the combination of exceptional events and international emissions accounts for the NWF not attaining the 2015 ozone NAAQS. These results and information should not be ignored.

Conclusion

As detailed above, the incremental controls deemed to be RACT by UDAQ do not meet the reasonableness or the timing requirements of RACT, and therefore cannot be RACT.[19]

We have further shown that these controls will not contribute to fulfilling any other Moderate SIP requirement and will not contribute to attaining and maintaining the NAAQS. We remind UDAQ of the terms of its rulemaking authority. Any controls that go beyond federal requirements must have written justification meeting certain requirements.[20]

Considering the relatively large effects of exceptional events plus international anthropogenic emissions on the NWF compared to the relatively small portion of NWF ozone produced by NWF anthropogenic emissions, there is no prospect for bringing the area into attainment in the near term. We encourage UDAQ to utilize the tools provided in the CAA, namely exceptional events and 179B for international emissions, to help to fulfill the SIP requirements at this time. When Congress amended the CAA in 1990, they provided these tools for areas like the NWF that are

[17] See 40 CFR 51.1310(a)(4)(i). Note that EPA also uses the term "ROP", Rate of Progress, instead of RFP.
[18] See Modeling Update, slides 15 through 17.
[19] Consistent with UDAQ's communications, we understand that the controls are being proposed as satisfying the RACT requirements for Utah's Moderate ozone SIP for the NWF nonattainment area. If UDAQ is assuming some other legal authority for its proposal, we request that UDAQ promptly disclose such authority so that we may evaluate it.
[20] See Utah Code 19-2-106.

impacted by ozone concentrations that are effectively beyond their control. Using these tools would allow UDAQ more time to study appropriate ways to achieve beneficial emission reductions that will improve air quality and to work with sources to implement reductions on appropriate and achievable timelines. Forcing the petroleum refineries to implement unjustified controls under the pretense of RACT will not achieve the goal of attainment and only serves to divert technical and financial resources from the only path that will reasonably satisfy the SIP requirements.

We re-emphasize that our member company petroleum refineries are already very well controlled, through a litany of other requirements. Both the model and emission inventory evidence discussed above validate this point, demonstrating that the petroleum refineries contribute only a small fraction of a ppb to local ozone during an episode.

Finally, for all the reasons stated the requested controls are not RACT and so are not appropriate at this time, but nonetheless we remain committed to working with UDAQ on potential solutions that have a demonstrated air quality benefit.

Sincerely,

Rikki Hrenko-Browning
President, Utah Petroleum Association

cc: Gordon Larson - gordonlarsen@utah.gov
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Brian Somers - bsomers@utahmining.org

Attachment: February 2023 letter (Rikki Hrenko-Browning to Bryce Bird, Criteria for Selection of Reasonably Available Control Technology, February 2, 2023)

Attachment I.
February 2023 Letter

Rikki Hrenko-Browning to Bryce Bird, *Criteria for Selection of Reasonably Available Control Technology*, February 2, 2023

Utah Petroleum Association

6905 S. 1300 E. #288, Cottonwood Heights, UT 84047-1817

FUELING UTAH'S GROWTH & PROSPERITY

February 2, 2023

Bryce Bird
Utah Division of Air Quality
P.O. Box 144820
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Submitted by email to bbird@utah.gov

Subject: Criteria for Selection of Reasonably Available Control Technology

Dear Bryce:

In a recent meeting between the Utah Petroleum Association (UPA) and staff members from the Utah Division of Air Quality (UDAQ), we discussed the question of objective criteria for establishing cost-effectiveness thresholds in Reasonably Available Control Technology (RACT) for the ozone Moderate State Implementation Plan (SIP). Staff were not certain how the RACT cost-effectiveness thresholds would be established for the case-by-case facility RACT analyses.

RACT cost-effectiveness thresholds should be selected on objective measures comparable to RACT cost-effectiveness thresholds in other jurisdictions. Towards that end, this memo summarizes some research on RACT decisions in other jurisdictions nationwide. Based on this research, ***we recommend that the RACT cost-effectiveness thresholds for the Moderate ozone SIP be selected in a range no higher than $5,000 to $7,500 per ton of emissions reduced.***

The Clean Air Act (CAA) and SIP rules for various National Ambient Air Quality Standards (NAAQS) call for implementing the RACT level of control.[1] Additionally, states often apply RACT for Regional Haze SIPs. The regulations for procedural requirements for SIPs define RACT as follows:

> *Reasonably available control technology (RACT) means devices, systems, process modifications, or other apparatus or techniques* ***that are reasonably available*** *taking into account:*
>
> *(1) The necessity of imposing such controls in order to attain and maintain a national ambient air quality standard;*

[1] See, for example, CAA §182(b)(2), CAA §182(f), and 40 CFR §51.1312 for ozone nonattainment areas; CAA §189(a)(1)(C) and 40 CFR 51.1009(a)(4) for particulate matter nonattainment areas.

(2) The social, environmental, and economic impact of such controls; and

(3) Alternative means of providing for attainment and maintenance of such standard. (This provision defines RACT for the purposes of § 51.341(b) only.)[2] [emphasis added]

The NOx Supplement to the General Preamble indicates that, "decisions on RACT may be made on a case-by-case basis, considering the technological and economic circumstances of the individual source."[3]

Generally, states have made decisions on RACT cost-effectiveness thresholds by evaluating the cost (dollars) per ton of emission reduced and comparing that to a threshold value deemed to be economically reasonable.

Our research, provided in Table 1, shows that states have recently generally selected the RACT level of control at about $3,000 per ton of emission reduced and no higher than $5,500 per ton for RACT applied outside of Regional Haze SIPs. The highest RACT values that we identified, $10,000 per ton, were selected for Regional Haze by Utah and Oregon.

Based on this research, ***we recommend that Utah select RACT for the Moderate ozone SIP in a range no higher than $5,000 to $7,500 per ton***, which would put Utah at the high end of non-Regional Haze RACT evaluations among the states identified.

For comparison purposes, we also researched Best Available Control Technology (BACT). BACT is defined as follows:

Best Available Control Technology means an emissions limitation (including a visible emission standard) based on the ***maximum degree of reduction*** *for each pollutant subject to regulation under the Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR part 60, 61, or 63. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results.*[4] [emphasis added]

BACT provides a higher level of control than RACT, evidenced by the "maximum degree of reduction" for BACT compared to controls that are "reasonably available" for RACT in the regulatory definitions noted above. For example, the $PM_{2.5}$ SIP implementation rule requires

[2] 40 CFR Part 51 Subpart F Procedural Requirements §51.100(o).
[3] 57 FR 55624/3.
[4] 40 CFR §52.21(b)(12).

RACT for Moderate nonattainment areas and BACT for Serious nonattainment areas.[5] Furthermore, RACT for both ozone and $PM_{2.5}$ considers controls that are reasonably available but, on the other hand, EPA considers BACT, a concept included for $PM_{2.5}$ SIPs but not included for ozone SIPs, to be generally independent of achieving attainment.[6] BACT is also considered in New Source Review for major precursors of both ozone and $PM_{2.5}$.

As provided in Table 2, our research shows that, outside of a few outliers, states have generally applied BACT at control levels ranging from $10,000 to $20,000 per ton of emissions reduced. Considering that BACT is a higher level of control than RACT, these values further substantiate our conclusion and recommendation above, that ***RACT should be chosen no higher than the range of $5,000 to $7,500 per ton.***

We hope that you will find our research into objective measures for RACT to be useful. Please do not hesitate to contact me if you have any questions or feedback.

Sincerely,

Rikki Hrenko-Browning
President, Utah Petroleum Association

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[5] See 40 CFR Part 51 Subpart Z "Provisions for implementation of $PM_{2.5}$ National Ambient Air Quality Standards".
[6] See, for example, 81 FR 58081.

Table 1. Regional Haze and RACT Cost-Effectiveness Determinations

Agency	Year	NO_x Cost-Effectiveness ($/ton)	Regulatory Driver	Type of Determination	Source
Colorado – Department of Public Health and Environment	2021	5,000	Regional Haze	Threshold	1
	2019				2
	2011				3
Illinois – Environmental Protection Agency	2020	2,500 - 3,000	RACT	Threshold	4
	2016				5
	2007	2,500			6
Maryland – Department of Environment	2020	3,500 - 5,000	RACT	Threshold	4
	2016				5
New York – Department of Environmental Conservation	2020	5,000 - 5,500	RACT	Threshold	4
	2016				5
	1994	3,000			7
Ohio – Environmental Protection Agency	2020	5,000	RACT	Threshold	4
	2016				5
	2007				6
Pennsylvania – Department of Environmental Protection	2020	2,800	RACT	Threshold	4
	2016				5
	2016	3,500	Regional Haze		8
Wisconsin – Department of Natural Resources	2020	2,500	RACT	Threshold	9
	2016				5
	2010				10
	2007				6
Texas – Texas Commission on Environmental Quality	2021	5,000	Regional Haze	Threshold	11
Oregon – Department of Environmental Quality	2021	10,000	Regional Haze	Threshold	12
Minnesota – Minnesota Pollution Control Agency	2022	7,600	Regional Haze	Threshold	13
Utah – Department of Environmental Quality	2022	10,000	Regional Haze	Threshold	14
Maine – Department of Environmental Protection	2010	<7,360	Regional Haze	Project Determination	15

[1] [EPA–R08–OAR–2020–0114; FRL–10019–22–Region 8]

[2] 5 CCR 1001-9 XVII.E.3.a.(ii)

[3] Colorado Visibility and Regional Haze State Implementation Plan for the Twelve Mandatory Class I Federal Areas in Colorado

[4] EPA–R03–OAR–2019–0657; FRL–10014–53–Region 3

[5] "Responses to Frequently Asked Questions" Final Rulemaking Additional RACT Requirements for Major Sources of NOx and VOCs 25 Pa. Code Chapters 121 and 129 46 Pa. B. 2036 (April 23, 2016)

[6] Order of the State of Wisconsin Natural Resource Board Amending and Creating Rules. State Implementation Plan

[7] DAR-20:Economic and Technical Analysis for Reasonably Available Control Technology (RACT) Networks (August 8, 2013)

[8] RACT II Overview and Implementation Presentation

[9] [EPA–R05–OAR–2020–0097; EPA–R05–OAR–2020–0199; EPA–R05–OAR–2020–0200; FRL–10011–90–Region 5]

[10] [EPA–R05–OAR–2007–0587; EPA–R05–OAR–2009–0732; FRL–9205–8]

[11] Texas Commission on Environmental Quality Agenda Item Request For Proposed State Implementation Plan Revision

[12] Oregon Regional Haze State Implementation Plan

[13] Minnesota Draft SIP

[14] Technical Support Document for Proposed Action on Area Source Rule Revisions

[15] 2010 Departmental Finding of Fact and Order Regional Haze Best Available Retrofit Technology Determination

Table 2. BACT Cost-Effectiveness Determinations

Agency	Applicability	NAAQS Designation (Applicable NAAQS)	Year	NO_x Cost-Effectiveness ($/ton)	Type of Determination	Source
California - San Diego County Air Pollution Control District	Local	Moderate Nonattainment (1997 Ozone)	2011	12,000	Threshold	1
California - San Joaquin Valley Air Quality District	Local	Extreme Nonattainment (1997 Ozone); Serious (1997, 2006, 2012 $PM_{2.5}$)	2022	18,000	Threshold	2
California - Bay Area Air Quality District	Local	Marginal Nonattainment (2008 Ozone); Moderate (2006 $PM_{2.5}$)	2016	17,500	Threshold	3
California - South Coast Air Quality District	Local	Extreme Nonattainment (all Ozone) and Serious (2006, 20012 $PM_{2.5}$)	2022	38,575	Threshold	4
Massachusetts - Massachusetts Department of Environmental Protection	Federal	Marginal Nonattainment (2008 Ozone); Moderate (1997 Ozone)	2011	11,000-13,000	Threshold	5
Alaska - Alaska Department of Environmental Conservation	Federal	Attainment	2022	7,133 < Threshold < 10,123	Project Determinations	6
	Federal	Attainment	2021			7
	Federal	Attainment	2020			8
Alabama - Alabama Department of Environmental Management	Federal	Attainment	2021	<20,400	Project Determinations	9
Minnesota - Minnesota Pollution Control Agency	Federal	Attainment	2007	3,201 < Threshold < 12,727	Project Determinations	10
	Federal	Attainment	2015			11
Washington - Washington Department of Ecology	Federal	Attainment	2018	10,000	Threshold	12

[1] June 2011 "New Source Review Requirements for Best Available Control Technology BACT"
[2] April 28, 2021, BACT Policy Updates
[3] September 2016 "BAAQMD New Source Review Permitting"
[4] 2022 South Coast Air Quality Management District BACT Maximum Cost Effectiveness Value ($/ton)
[5] June 2011 "Best Available Control Technology (BACT) Guidance"
[6] July 2022 Technical Analysis Report for Construction Permit AQ1539CPT01
[7] March 2021 Technical Analysis Report for Construction Permit AQ0083CPT07
[8] August 2020 Technical Analysis Report for Construction Permit AQ1524CPT01
[9] 2021 Preliminary Determination Tennessee Valley Authority (TVA) – Colbert
[10] October 2007 Minnesota Public Utilities Commission Staff Briefing
[11] May 2015 Air Emission Permit NO. 14100071-001
[12] Pollution Control Hearings Board State of Washington PCHB No. 17-055c

Attachment III

Utah Petroleum Association Legal Comments on Proposed Rulemaking for Northern Wasatch Front Moderate Nonattainment Area: Proposed Amendment to R-307-110-13, Section IX, Control Measures for Area and Point Sources, Part D, Ozone; Proposed Amendment to R-307-110-17, Section IX, Control Measures for Area and Point Sources, Part H, Emission Limits. Published in Utah State Bulletin, June 01, 2023, Vol. 2023, No. 11 at 68- 72

Utah Petroleum Association Legal Comments on Proposed Rulemaking for Northern Wasatch Front Moderate Nonattainment Area: Proposed Amendment to R-307-110-13, Section IX, Control Measures for Area and Point Sources, Part D, Ozone; Proposed Amendment to R-307-110-17, Section IX, Control Measures for Area and Point Sources, Part H, Emission Limits. Published in Utah State Bulletin, June 01, 2023, Vol. 2023, No. 11 at 68-72.

I. SUMMARY

UDAQ has misconstrued the Clean Air Act's (or "Act") authority for imposing beyond-RACT (or "B-RACT") control measures in fundamental ways. This has led UDAQ to, by its own admission, disregard the economic feasibility or reasonableness of the control measures it has proposed for two refineries pursuant to the Act's beyond-RACT authority. In fact, UDAQ acknowledges that the cost effectiveness for the proposed refinery beyond-RACT control measures exceeds what it deems to be reasonable. But as explained below, disregarding the economic feasibility of control measures is contrary to the Clean Air Act. EPA has made clear that B-RACT controls must be reasonable; that is, cost effective.

Additionally, UDAQ has acknowledged that the beyond-RACT controls proposed for the two refineries cannot be installed by the attainment-date deadline of August 3, 2024. Again, EPA has made clear that this is a fundamental criterion for B-RACT controls.

Furthermore, even if the proposed beyond-RACT controls were deemed to be economically feasible and could be implemented by the attainment-date deadline, UDAQ has failed to show that such controls are necessary for expeditiously attaining the NAAQS. In fact, while UDAQ acknowledges that such a showing is required, it makes no attempt to understand the affect the proposed B-RACT controls would have on ambient ozone concentrations, contrary to the requirements of the Act. Additionally, UDAQ claims that it has made a strong and compelling attainment demonstration that does not rely on the proposed B-RACT controls, belying any claim that such controls are, in fact, necessary.

Finally, UDAQ's Proposed SIP does not comply with the mandatory Reasonable Further Progress (15% VOC reduction) requirement that is a prerequisite to the State being able to impose beyond-RACT controls.

This comment will begin by outlining UDAQ's explanation of its basis for imposing B-RACT controls, focusing on the B-RACT proposal for the refineries. It next examines the legal basis and requirements under the Clean Air Act for imposing B-RACT control measures, relying principally on EPA's explanation of the Act's B-RACT authority as set forth in the Implementation Rule for the 2015 O3 NAAQS and other, relevant EPA rulemakings. This examination shows that UDAQ's rationale for imposing B-RACT controls on the refineries is contrary to the requirements of the Clean Air Act.

II. UDAQ'S STATED AUTHORITY FOR IMPOSING B-RACT

In the introduction to the chapter on RACT controls in the Proposed O3 SIP,[1] UDAQ quotes from the preamble to the Implementation Rule for the ***2008*** ozone NAAQS as the basis for imposing beyond-RACT controls: "States may require VOC and NOX reductions that are 'beyond RACT' if such reductions are needed to provide for timely attainment of the ozone NAAQS."[2] The quote is accurate as far as it goes, but is misleadingly incomplete in addressing the authority for imposing controls that go "beyond RACT."

In the source-specific RACT control evaluations for the refineries, UDAQ concludes that all of the current controls at the refineries constitute RACT and that, "no other additional add-on controls or limitations are technically or economically feasible options at this time."[3] Notwithstanding this determination, UDAQ proposes to require the installation of controls that it considers not to be economically feasible.[4] While acknowledging that the costs of the proposed beyond-RACT controls exceed what can properly qualify as reasonable for RACT, UDAQ attempts to justify imposing these extraordinary controls pursuant to its beyond-RACT authority:

> The UDAQ has determined that these controls are necessary for the NWF NAA to demonstrate attainment of the 2015 8-hour ozone NAAQS as expeditiously as practicable. While the financial feasibility of the identified controls may be beyond previously established RACT thresholds, the CAA provides states with "discretion to require ***beyond-RACT*** reductions from any source" if those reductions are necessary to "demonstrate attainment as expeditiously as practicable".[5]

In attempting to justify the beyond RACT controls for the refineries, UDAQ again references the Implementation Rule for the 2008 ozone NAAQS as the basis for its authority, but also includes a general reference to the directly applicable Implementation Rule for the 2015 ozone NAAQS.[6] Unfortunately, UDAQ ignores the very rulemakings that it references. Far from supporting UDAQ's proposal, these rulemakings make clear that UDAQ exceeded its authority to impose B-RACT controls.

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[1] Utah Division of Air Quality State Implementation Plan, 2015 Ozone NAAQS Northern Wasatch Front Moderate Nonattainment Area, 2023, Section IX Part D.11 (hereinafter "Proposed SIP").

[2] Proposed SIP at 33 (quoting EPA's preamble to the Implementation Rule for the 2008 ozone NAAQS, 80 Fed. Reg. 12,264, 12,279 (Mar. 6, 2015)). The subject of UDAQ's current rulemaking relates to the ***2015*** ozone NAAQS (70 ppb) and not the ***2008*** ozone NAAQS (75 ppb). As discussed in these comments, the directly applicable ***2015*** NAAQS rulemaking provides a more complete explanation of the scope and meaning of beyond-RACT controls.

[3] *See* Proposed SIP at 44 ("The emission units/activities examined in this RACT analysis indicates that all activities currently meet all RACT requirements, and all other existing controls and emissions limitations are considered RACT for the Chevron Refinery. No other additional add-on controls or limitations are technically or economically feasible options at this time.") *See also* Proposed SIP at 74 (addressing Marathon Refinery in similar terms).

[4] *See* Proposed SIP at 44 (imposing ULNB on crude heaters that UDAQ has determined to be economically infeasible); *Id*. at 73-74 (imposing SCR on cogens that UDAQ has determined to be economically infeasible).

[5] Proposed SIP at 74 (emphasis added). *See* also Proposed SIP at 44.

[6] *See* footnote 65 on page 74 of the Proposed SIP; footnote 54 on page 44 of the Proposed SIP.

As discussed in detail below, UDAQ's assertion that it can impose controls pursuant to its beyond-RACT authority without regard to economic feasibility is wrong. Additionally, UDAQ has failed to address the fact that the proposed beyond-RACT controls cannot be implemented by the August 3, 2024, attainment deadline, another basic requirement for B-RACT controls. Finally, the requirement – recognized by UDAQ – that beyond-RACT controls must be shown to be necessary to demonstrate attainment as expeditiously as practicable requires, in fact, a showing. UDAQ has provided none; to the contrary, it admits that it does not know what the effect of the beyond-RACT controls would have on air quality.

UDAQ's incomplete and incorrect understanding of its beyond-RACT authority results in it effectively and erroneously claiming the authority to impose ***any*** control that might have ***any*** beneficial effect on reducing ozone regardless of when it can be implemented. As discussed below, UDAQ has no authority to impose the B-RACT controls it proposes. EPA has made clear that beyond-RACT authority does not mean beyond reasonable; it does not do away with cost effectiveness; it does not allow UDAQ to override a RACT determination that concludes a particular control exceeds costs considered "reasonable"; it does not allow UDAQ to impose a control that cannot be installed by the August 3, 2024 attainment date; it does not allow UDAQ to impose a control without a showing that the control is necessary for expeditiously achieving attainment.

III. EPA'S EXPLANATION OF BEYOND RACT AUTHORITY

A. Summary

In the Implementation Rule for the 2015 O3 NAAQS[7] and other referenced rulemakings, EPA explains the basis for, and extent of, the beyond-RACT authority. Key points from EPA's explanation include:

i. Beyond-RACT authority derives from Section 172(c)(6) of the CAA.

ii. Beyond-RACT does not mean controls that are beyond reasonable. B-RACT controls (just like RACT controls) must be "reasonable," including from a cost perspective.

iii. The "beyond" in beyond-RACT does not mean imposing controls that are more stringent than RACT on sources that have already been subject to a RACT analysis; rather, it refers to imposing RACT-like (that is, reasonable) controls on sources that are not *per se* subject to RACT requirements but otherwise meet the technological and economic feasibility criteria to make them reasonable. This may include sources that fall outside of the formally designated nonattainment area ("NAA") but still have an impact on the NAA itself; or controls that cannot be installed by the deadline for installing RACT controls (January 1, 2023) but can be installed before the attainment date (August 3, 2024). It is in this sense that the controls are ***beyond***-RACT, and not in the sense that B-RACT controls may be beyond reasonable.

[7] The Implementation Rule for the 2015 O3 NAAQS (70 ppb) is directly applicable to UDAQ's Proposed SIP.

iv. B-RACT controls must be able to be implemented by no later than the attainment date which, in the case of the NWF NAA, is August 3, 2024.

v. B-RACT controls must be shown to be necessary to attain the NAAQS expeditiously.

A review of the above criteria against UDAQ's proposed rulemaking to require Marathon and Chevron to install ***economically infeasible*** controls pursuant to the Clean Air Act's beyond-RACT authority shows that that proposal fails to satisfy at least three of the criteria outlined above:

> *Controls Must be Reasonable/Cost Effective (point ii)*: UDAQ fails to even acknowledge the requirement that B-RACT controls must be reasonable/economically feasible; however, UDAQ readily admits that its B-RACT proposals for the refineries are not reasonable or cost effective.
>
> *B-RACT Controls Must be Capable of Being Implemented by the Attainment Date – August 3, 2024 (point iv.)*: UDAQ identifies the installation date for the B-RACT controls proposed for the refineries as May 1, 2026, which exceeds the deadline for a control to qualify as B-RACT.
>
> *B-RACT controls must be shown to be necessary for attainment (point v.)*: While UDAQ passingly acknowledges this requirement, it fails to make a demonstration that the B-RACT controls are necessary for achieving the NAAQS. In fact, UDAQ forthrightly admits that it does not know what the impact of the B-RACT controls will be on ambient ozone concentrations. At the same time (and contrary to its claim that the B-RACT controls are necessary for bringing about attainment), UDAQ represents that it has made a compelling and strong attainment demonstration without the B-RACT controls.

A more detailed review of the State's beyond-RACT authority is provided below, beginning with the directly applicable 2015 O3 NAAQS Implementation Rulemaking and followed by the PM2.5 NAAQS Implementation Rulemaking (that EPA specifically references in the O3 NAAQS rulemaking for additional background on beyond-RACT authority).

B. 2015 O3 NAAQS IMPLEMENTATION RULE

The 2015 O3 NAAQS Implementation Rulemaking is, of course, the most applicable rulemaking to UDAQ's Proposed SIP since it is the 2015 O3 NAAQS of 70 ppb that is the subject of the instant SIP rulemaking. While UDAQ's proposal drops a footnote reference to this rule as supporting its beyond-RACT authority,[8] it does not provide any substantive discussion of the rulemaking itself. This is unfortunate because EPA's rulemaking provides instructive discussion on beyond-RACT authority:

> CAA section 172(c)(6) requires that SIP provisions include enforceable emission limitations and other control measures, means or techniques as may be ***necessary or appropriate to attain a standard by the applicable attainment date***. The EPA interprets this provision to include "additional ***reasonable*** measures," which are

[8] *See* footnote 65 at page 74 and footnote 54 on page 44 of Proposed SIP. Additionally, UDAQ refers to the 2008 O3 NAAQS Implementation Rule as support for imposing B-RACT controls.

> those measures and technologies that can be applied to any emissions source within the state's jurisdiction, including those outside of a nonattainment area. Upwind sources within a state may have a significant impact on air quality in a downwind nonattainment area, and failure to consider and require, as appropriate, ***reasonable*** control measures for these sources may preclude attainment of a NAAQS by the attainment date. Though not directly a part of a nonattainment area RACM analysis, the EPA has addressed this "other control measures" provision in the preamble discussions for previous NAAQS implementation rulemakings,[fn34] and for clarity is codifying this interpretation in this final rule at 40 CFR 51.1312(c).[9]

Several points are worth noting from this concise discussion:

Terminology – Additional Reasonable Measures: EPA does not use the term "beyond-RACT" in this rulemaking. Instead, it uses the term, "additional ***reasonable*** measures." The term "beyond RACT reductions" appears only to be used in the preamble to the 2008 O3 NAAQS implementation rulemaking.[10] It is not used in other NAAQS implementation rulemakings.[11] We also note that EPA does not substantively elaborate on what it meant by beyond-RACT in the 2008 O3 implementation rulemaking. Our comments will continue to use the terminology "beyond RACT" or "B-RACT" since it is the term that UDAQ has chosen; however, and as explained below, its meaning is significantly more circumscribed than UDAQ's proposed rulemaking suggests.

Statutory Authority: The quoted excerpt notes that the underlying authority for B-RACT controls is Section 172(c)(6) of the CAA.[12] Section 172 of the CAA details the ***general*** nonattainment plan provisions that apply to all nonattainment areas. Subparagraph (c) identifies key required elements that must be included in a SIP for any nonattainment area. Subparagraph (c)(1) establishes the

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[9] 83 Fed. Reg. 62988, 63015 (Dec. 6, 2018) (final Implementation Rule for the 2015 O3 NAAQS) (emphasis added).

The footnote reference within the text (shown as "fn34") lists implementation rulemakings related to the 8-hour ozone NAAQS and the PM2.5 NAAQS. The 8-hour O3 NAAQS rulemaking provides little explanation and simply make passing reference to the underlying statutory authority found in section 172(c)(6) of the CAA. The implementation rulemaking for PM2.5 includes a more substantive discussion which is address later in these comments. The complete text of the footnote is as follows:

> *See* the Phase 2 proposed rulemaking (68 FR 32829; June 2, 2003) and final rule to implement the 8-hour ozone NAAQS (70 FR 71623; November 29, 2005), and the final rule to implement the PM2.5 NAAQS (81 FR 58035; August 24, 2016).

83 Fed. Reg. footnote 34 at 63015.

[10] *See* 80 Fed. Reg.12264, 12279 (Mar. 6, 2015).

[11] We suspect that the reason for EPA not carrying the term "beyond-RACT" forward into other rulemakings may have to do with the potentially misleading connotation that might be conveyed by that term. In fact, it appears that UDAQ incorrectly interpreted beyond-RACT to mean ***beyond reasonable***.

[12] CAA § 172(c)(6) provides in its entirety:

> Such plan provisions shall include enforceable emission limitations, and such other control measures, means or techniques (including economic incentives such as fees, marketable permits, and auctions of emission rights), as well as schedules and timetables for compliance, as may be necessary or appropriate to provide for attainment of such standard in such area by the applicable attainment date specified in this part.

general RACM/RACT requirement. As noted, subparagraph (c)(6) provides the authority for B-RACT controls.

Beyond-RACT does Not Mean Beyond Reasonable: The authority that section 172(c)(6) provides for B-RACT controls does not jettison the requirement that controls must be reasonable; that is, technologically and economically feasible. As the agency explains, "[t]he EPA interprets this provision to include 'additional ***reasonable*** measures.'" As discussed below in more detail, EPA explains that these are measures "that can be applied at sources in the nonattainment area that are otherwise technologically and ***economically feasible***." As noted, UDAQ has concluded that the B-RACT controls it is proposing for Marathon and Chevron are not economically feasible and, therefore, cannot be considered RACT. That determination is also necessarily conclusive to evaluating the reasonableness of the controls under the B-RACT authority of CAA § 172(c)(6).

In its determination to impose B-RACT measures, UDAQ provides no explanation whatsoever as to how it can disregard its own conclusion that the beyond-RACT controls it is proposing for Marathon and Chevron exceeds its own threshold for being considered reasonable. In fact, UDAQ has offered no criterion for proposing B-RACT controls besides its recognition that such controls must be shown to be necessary to attain the standard (which it fails to do). For example, UDAQ has not indicated how it identified emission units as beyond-RACT candidates, if there is any cost that is too high for B-RACT, or if there is any deadline for when a B-RACT control must be installed.

Beyond-RACT Refers to Sources that are Not Directly Subject to RACT but May Nonetheless be Subject to Reasonable Controls Pursuant to the Authority of CAA § 172(c)(6): As suggested from the previous point, beyond-RACT does ***not*** refer to controls on RACT-eligible sources that go beyond what is considered RACT (that is, beyond reasonable); rather, it is the imposition of ***reasonable*** controls on sources that are not directly subject to RACT review based, principally, on location or the timing for installing the controls. In other words, the "beyond" in beyond-RACT refers to imposing ***reasonable*** controls on sources that are not *per se* subject to RACT requirements, because, for example, they are located outside of the NAA or the required controls cannot be implemented by the deadline for RACT controls but otherwise meet the technological and economic feasibility criteria to make them reasonable. The 2015 O3 NAAQS Implementation rulemaking was focused on sources located outside of the NAA.[13] Additionally, as EPA has made clear in other implementation rulemakings (discussed below), another important category of sources eligible for B-RACT relates to the timing for when a control can be installed.

The salient point is that the B-RACT authority of CAA 172(c)(6) does not negate the requirement that controls be "reasonable," it does not allow an agency to reject a specific conclusion that a control is not reasonable based on cost effectiveness. At no time does EPA suggest that this authority can be wielded to impose controls that are not "reasonable." The B-RACT authority simply allows an agency to evaluate the application of other reasonable control measures that are shown to be necessary to expeditiously achieve attainment that are not otherwise directly subject to RACT due to a source's location outside of the NAA or the timing for the installation of controls.

[13] In fact, EPA explicitly codified this aspect of the B-RACT authority in the Implementation Rulemaking for the 2015 O3 NAAQS. *See* 40 CFR 51.1312(c).

B-RACT Controls Must be Able to be Implemented by the Attainment Date. As the 2015 O3 NAAQS Implementation Rulemaking makes clear, B-RACT controls must be capable of being implemented "by the applicable attainment date." UDAQ has acknowledged that this is not possible for the proposed B-RACT controls for Marathon and Chevron and has proposed installation of the controls by May 1, 2026,[14] well beyond the attainment-date deadline of August 3, 2024.

B-RACT Controls Must be Shown to be Necessary to Attain the NAAQS Expeditiously: Although UDAQ acknowledges this requirement, UDAQ fails to show that its suite of B-RACT controls satisfy this requirement; in fact, it acknowledges that it has not evaluated the effect that B-RACT controls would have on ambient ozone concentrations. Furthermore, as discussed below, UDAQ has asserted that it has made a strong and compelling attainment demonstration that does not rely on the B-RACT controls, belying any claim that such controls are necessary for achieving attainment.

Additional References Provided: EPA's discussion of B-RACT authority in the 2015 O3 NAAQS Implementation Rule, while brief, is packed with information that informs the scope of this authority. For a more in-depth discussion of the B-RACT authority, EPA references past implementation rulemakings that have expounded more fully on this authority. The most recent and substantive of these rulemakings referenced by EPA is the PM2.5 NAAQS implementation rulemaking from 2016. This rulemaking is examined in the next section of these comments.

C. PM2.5 NAAQS IMPLEMENTATION RULEMAKING

In support of its beyond-RACT authority, UDAQ properly cites to the 2015 O3 NAAQS Implementation Rule as the basis for its authority. As discussed in the preceding section of these comments, while that rulemaking provides a relatively brief (but informative) instruction on the scope of the authority for imposing B-RACT control measures, it includes references to other NAAQS implementation rulemakings that provide a more fulsome discussion of the B-RACT authority: "EPA has addressed this 'other control measures' provision in the preamble discussions for previous NAAQS implementation rulemakings."[15] In particular, EPA cites to the implementation rule for the PM2.5 NAAQS. That rulemaking provides one of the most complete discussions of the scope of the B-RACT authority.

In the PM2.5 Implementation rulemaking, EPA methodically lays out the requirements for an attainment plan strategy, including requirements for B-RACT. EPA begins with an overview of RACM/RACT requirements. The Agency explains that, "RACT has historically been defined as the lowest emission limit that a source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility."[16] It explains that RACM/RACT authority derives from both the general NAA planning requirements contained in section 172(c)(1) of the CAA and specific particulate matter NAA planning

[14] UPA understands that even an installation date of May 1, 2026, may not be feasible for installing the proposed beyond-RACT controls.

[15] *See* 83 Fed. Reg. at 63015/2.

[16] 81 Fed. Reg. 58034/2.

requirements contained in section 189(a)(1)(C).[17] "The EPA reads CAA sections 172(c)(1) and 189(a)(1)(C) together to require that attainment plans for Moderate nonattainment areas must provide for the implementation of RACM and RACT for existing sources of PM2.5 and PM2.5 precursors in the nonattainment area as expeditiously as practicable but ***no later than 4 years after designation***."[18] The requirement that a control qualifies as RACM/RACT only if it can be employed "no later than 4 years after designation" derives from CAA 189(a)(1)(C). As will be discussed, this deadline constitutes a dividing line for whether ***reasonable*** controls are considered RACT or whether they may qualify as beyond-RACT controls.

EPA next sets forth the methodology for determining RACM/RACT and beyond-RACT control measures.

> [T]he state should follow a process by which it first identifies ***all sources of emissions*** of direct PM2.5 … and all PM2.5 precursors in the nonattainment area, and all ***potential control measures*** to reduce emissions from those source categories. The state next determines if any of the identified potential control measures are not technologically feasible and whether any of the identified technologically feasible control measures are not ***economically feasible***. Measures that are not necessary for attainment need not be considered as RACM/RACT.[19]

This results in the state identifying all sources and controls that are potential RACM/RACT or B-RACT candidates. To this point, this is the methodology generally followed by UDAQ for selecting RACM/RACT. In particular, UDAQ's RACT determinations are based on a determination of technological and economic feasibility. But as UDAQ moves from RACM/RACT to B-RACT, it radically departs from the law as explained by EPA. UDAQ misconstrues its authority to such an extent that it effectively concludes that it has the authority to impose controls that are beyond reasonable.

Recognizing that RACM/RACT must statutorily be implemented no later than 4 years after an area is designated as moderate nonattainment, but that there may be some technologically and economically feasible control measures that can be installed after that date that can contribute to attainment ***by the attainment date***, EPA explains that such measures may potentially be imposed pursuant to the B-RACT authority of CAA 172(c)(6):

> Measures that can only be implemented ***after the 4-year deadline for RACM and RACT, but before the end of the sixth calendar year following designation***, are defined in the final rule as "***additional reasonable measures***."[fn72] The EPA has created this new definition based on the recognition that in some areas there could be emission reduction strategies that still could be implemented beginning 4 years

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[17] Title I of the CAA contains most of the Act's foundational air quality programs including the nonattainment planning provisions which are found in Part D of Title I. Part D is subdivided into subparts. Subpart 1 includes overarching, general provisions that apply to all nonattainment areas. Section 172 is found in subpart 1. Subpart 4 contains provisions that apply specifically to areas that are nonattainment for particulate matter. Section 189 is found in subpart 4.

[18] 81 Fed. Reg. at 58034/1 (emphasis added).

[19] *Id*. 58035/1 (internal footnotes omitted) (emphasis added).

> after designation through the attainment date that could help to improve air quality and attain the standard expeditiously in the area.[20]

Importantly, these "additional reasonable measures" are measures that a state has determined to be both technologically and economically feasible. The only limitation is on the timing for when a control can be implemented; those that can be implemented within 4 years of the date an area is designated as moderate nonattainment are properly considered to constitute RACT, while those that can only be implemented after that time may be considered as beyond-RACT measures. But in either case, ***the control must be economically feasible***.

In footnote 72 of the above excerpt, EPA explains that its authority for imposing "additional reasonable measures" is based on the so-called B-RACT authority of CAA 172(c)(6). In the ensuing pages of the preamble, EPA provides a methodical, step-by-step methodology for establishing control measures as RACM/RACT or as additional reasonable measures (that is, B-RACT measures). The steps are identified by EPA as follows:

> Step 1: Identify Sources of Emissions
>
> Step 2: Identify Existing and Potential Control Measures
>
> Step 3: Determine Whether an Available Control Measure or Technology Is Technologically Feasible
>
> ***Step 4: Determine Whether an Available Control Measure or Technology Is Economically Feasible***
>
> ***Step 5: Determine the Earliest Date by Which a Control Measure or Technology Can be Implemented in Whole or in Part***
>
> Step 6: Evaluate the Collective Impact of Potential Control Measures To Determine Whether the Area Can Attain Expeditiously or Whether it is Impracticable to Attain by the Attainment Date, and Adopt the Appropriate Set of Control Measures

EPA provides an in-depth discussion of each of these steps.[21] As indicated by Step 4, a critical element to imposing a control measure – whether it be RACT or B-RACT – is that the measure be shown to be economically feasible:

> The EPA believes that it is appropriate for states to give substantial weight to cost effectiveness in evaluating the economic feasibility of an emission reduction measure or technology. The cost effectiveness of a measure is its annualized cost ($/year) divided by the emissions reduced (tons/ year) which yields a cost per amount of emission reduction ($/ton). Cost effectiveness provides a relative value

[20] *Id*. 58035 (emphasis added).

[21] *See* 81 Fed. Reg. 58035-048.

> for each emissions reduction option that is comparable with other options and, in the case of control technologies, other facilities.[22]

In Step 5 EPA explains how control measures are categorized as either RACT or B-RACT based on a control measure's implementation date. EPA explains that RACM/RACT must be capable of being implemented no later than 4 years after designation.[23] But even if a control measure cannot be implemented within that timeframe, it might still be required as a B-RACT control measure:

> In addition, a state must separately identify those technologically and ***economically feasible*** control measures that can only be implemented after the statutory window for implementing RACM and RACT, but before the attainment date. The statutory 4-year timing requirement for implementing RACM and RACT under CAA section 189(a)(1)(C) limits the control measures and technologies that can qualify as RACM and RACT for a Moderate PM2.5 nonattainment area. However, the statutory requirement of ***CAA 172(c)(6)*** also requires states to implement "other measures" necessary to provide for timely attainment in an area. The EPA interprets this provision to include "***additional reasonable measures***," which are those measures and technologies that can be applied at sources in the nonattainment area that are ***otherwise technologically and economically feasible*** but can only be implemented in whole or in part later than 4 years after designation.[24]

As EPA makes clear, the authority provided by Section 172(c)(6) of the Act to impose beyond-RACT control measures does not dispense with the requirement for these measures to be economically feasible.

Consistent with the foregoing explanation, EPA codified in the regulation its interpretation of B-RACT authority when it defined the term "additional reasonable measures":

> *Additional reasonable measure* is any control measure that ***otherwise meets the definition of "reasonably available control measure"*** (RACM) but can only be implemented in whole or in part during the period beginning 4 years after the effective date of designation of a nonattainment area and no later than the end of the sixth calendar year following the effective date of designation of the area.[25]

Again, this makes clear that B-RACT measures must meet the technological and economic feasibility criteria for RACT.[26]

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[22] *Id*. at 58042/2.

[23] *Id*. at 58043/2.

[24] *Id*. at 58043/3 (emphasis added).

[25] 40 CFR 51.1000.

[26] While the definition refers only to RACM, the definition of RACM expressly includes RACT. *See* 40 CFR 51.1000 (definition of reasonably available control measure).

IV. UDAQ'S PROPOSAL TO REQUIRE B-RACT CONTROLS ON MARATHON AND CHEVRON DOES NOT COMPLY WITH BEYOND-RACT CRITERIA AS ARTICULATED BY EPA

A. THE PROPOSED B-RACT CONTROLS ARE NOT "REASONABLE"; THAT IS, ECONOMICALLY FEASIBLE

UDAQ forthrightly acknowledges that the proposed B-RACT controls for Marathon and Chevron are not economically feasible and, for this reason, rejects those controls as qualifying as RACT.[27] As EPA has made clear, B-RACT controls are not beyond reasonable. Economic feasibility remains a key criterion. Furthermore, as EPA's step-by-step methodology set forth in the Implementation Rulemaking for the PM2.5 NAAQS makes clear, the assessment of economic feasibility for a control is the same for B-RACT as it is for RACT. In other words, a determination that a control is not economically feasible for RACT is conclusive for beyond-RACT.[28] And this makes sense when one understands that B-RACT refers to additional ***reasonable*** controls that do not qualify for RACT due to their location (outside of the formally designated nonattainment area) or the timing for their installation (that is, after the RACT deadline but before the attainment date).

B. B-RACT Controls Must be Capable of Being Installed by No Later Than the Attainment Date – August 3, 2024

Perhaps the clearest demonstration that UDAQ's proposed B-RACT control measures for Marathon and Chevron are not authorized by the beyond-RACT authority of the CAA, is the fact that such controls cannot be implemented by the attainment-date deadline of August 3, 2024. UDAQ's own proposal identifies the installation date for the B-RACT controls for the two refineries as May 1, 2026.[29] Even assuming that installation by that date would be possible, that would be beyond the August 3, 2024 deadline required for B-RACT controls.

As EPA explains in the Implementation Rule for the 2015 O3 NAAQS, "CAA section 172(c)(6) requires that SIP provisions include [B-RACT] as may be necessary or appropriate to attain a standard ***by the applicable attainment date***."[30] Similarly, in the PM2.5 NAAQS Implementation rulemaking (that EPA specifically references as authority for its B-RACT authority in the Implementation Rule for the 2015 O3 NAAQS),[31] EPA explains that B-RACT control measures

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[27] *See* Proposed SIP at 44 ("The emission units/activities examined in this RACT analysis indicates that all activities currently meet all RACT requirements, and all other existing controls and emissions limitations are considered RACT for the Chevron Refinery. No other additional add-on controls or limitations are technically or economically feasible options at this time."); *See also* Proposed SIP at 73-74 (concluding that Marathon has implemented all technically and economically feasible controls). Indeed, the cost of such controls would not only significantly exceed typical cost-effectiveness thresholds applied for RACT but also the (higher) cost-effectiveness thresholds deemed feasible for BACT. *See* Letter from Rikki Hrenko-Browning, Utah Petroleum Association, to Bryce Bird, UDAQ, regarding, Criteria for Selection of Reasonably Available Control Technology (Feb. 2, 2023).

[28] This can be contrasted to the fact that BACT is generally considered to support a higher cost-effectiveness threshold than RACT.

[29] *See* Proposed SIP at 41 and 71.

[30] 83 Fed. Reg. 62988, 63015 (Dec. 6, 2018) (final Implementation Rule for the 2015 O3 NAAQS) (emphasis added).

[31] *Id*. at 63015, footnote 34.

are "those technologically and economically feasible control measures that can only be implemented after the statutory window for implementing RACM and RACT, ***but before the attainment date***."[32]

EPA established the attainment date for the NWF NAA as August 3, 2024.[33] Accordingly, since the B-RACT controls cannot be installed by this date, they cannot be considered as viable control measures (either as RACT or B-RACT) in the current, Moderate SIP. [34]

C. UDAQ has Failed to Show that the Control Measures Proposed for Beyond RACT are Necessary for Attainment of the NAAQS – or if They Will Even Provide a Marginal Benefit

In attempting to justify the B-RACT controls for the refineries, UDAQ asserts that, "[w]hile the financial feasibility of the identified controls may be beyond previously established RACT thresholds, the CAA provides states with 'discretion to require beyond-RACT reductions from any source' ***if those reductions are necessary to 'demonstrate attainment as expeditiously as practicable***.'"[35] As discussed above in these comments, this statement provides only a partial statement of the demonstration that must be made before beyond-RACT control measures may be imposed. In particular, such controls must be reasonable, including cost effective and must be able to be installed by the attainment date.

But even putting those legal limitations on UDAQ's authority aside for arguments sake, and assuming that UDAQ could impose ***any*** additional control without regard to "reasonableness" or when a control could be installed, UDAQ must still satisfy its own standard; that is, the reductions must be shown to be "needed in order to provide for timely attainment of the ozone NAAQS." By UDAQ's own admission, that standard has not been met. To the contrary, UDAQ has forthrightly admitted that it has not evaluated what, if any, impact the suite of B-RACT measures will have on ambient ozone concentrations.

While the Proposed SIP asserts that, "UDAQ has determined that these controls are necessary for the NWF NAA to demonstrate attainment of the 2015 8-hour ozone NAAQS as expeditiously as practicable,"[36] such assertion is belied by what UDAQ staff forthrightly acknowledged during the April 5th Air Quality Board meeting. Under questioning by Board members of what analysis UDAQ had undertaken to determine that the B-RACT control measures are, in fact, necessary for the NWF NAA to demonstrate attainment of the ozone NAAQS as expeditiously as practicable, staff responded that the effect of the B-RACT measures "***have not been modeled*** because all of

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[32] *See* 81 Fed. Reg. at 58043/3 (emphasis added).

[33] *See* 87 Fed. Reg. 60897 (Oct. 7, 2022) (EPA rulemaking reclassifying NWF NAA to moderate status); Proposed SIP at 141).

[34] We note that it is irrelevant as to whether SCR for Marathon's cogens might be a viable control measure as part of a ***Serious*** SIP control measure (should the NWF NAA eventually be reclassified to that status) since the ***current rulemaking*** is being undertaken as part of the ***Moderate*** SIP rulemaking. *See* Utah State Bulletin (Jun. 1, 2023) at 68 (Notice of Proposed Rule, explaining that the B-RACT controls being proposed by UDAQ is being done "to comply with the Clean Air Act Section 182(b) requirements for ***moderate*** ozone nonattainment areas.").

[35] *See* Proposed SIP at 74 (emphasis added); *see also* Proposed SIP at 44.

[36] *Id*.

them will be implemented after this SIP timeline …. So, we've modeled up through 2023, which is our attainment date. ***We have not been able to model controls beyond that***."[37] This begs the question of how, without any analytical assessment whatsoever, UDAQ can take the position that the B-RACT controls are "needed in order to provide for timely attainment of the ozone NAAQS."

UDAQ seems to be taking the position that the beyond-RACT authority allowed by Section 172(c)(6) of the Act conveys unfettered authority to impose any controls regardless of what effect it will have on the airshed. When asked at the Board meeting to explain how the State determined that the proposed beyond-RACT controls were determined to be necessary for attaining the NAAQS if no modeling of those controls was completed, staff essentially shrugged it off, implying that UDAQ could impose any control it wishes to impose regardless of what its modeling shows: "We have a statutory obligation to attain the standard as expeditiously as practicable regardless of what our modeling demonstration shows."[38]

Still trying to understand the extent of the State's beyond-RACT authority, one Board member followed up and asked for an explanation of what the guiding principles were for UDAQ to exercise this discretion: "Does that mean that [UDAQ] can just implement anything at any time or does that mean it has to come before the board, or what does discretion mean?" In response, UDAQ offered no explanation of a methodology or criteria that guided its beyond-RACT determinations, saying only that pursuant to that authority, "we don't have to completely confine to what other areas have done or a traditionally established threshold, for instance. It gives us a little more leeway to consider the position we're in and the reduction requirements that we really need in order to attain the standard."[39]

In fact, as discussed elsewhere in these comments, the State is not free to dispense with reasonable economic feasibility thresholds or the timing for installation of the controls when assessing what constitutes beyond-RACT measures. Furthermore, the implication that the State's authority under section 172(c)(6) of the Act can be exercised without regard to a modeling analysis that shows that the beyond-RACT measures are necessary for achieving expeditious attainment is contradicted by the NAAQS Implementation Rule for the 2015 O3 NAAQS and other longstanding EPA guidance.

In explaining a state's obligation to adopt RACM/RACT and beyond-RACT measures, EPA instructs that,

> The EPA is retaining our existing general RACM requirements for purposes of the 2015 ozone NAAQS, as codified at 40 CFR 51.1312(c). The EPA interprets the RACM provision to require a demonstration that an air agency has adopted all reasonable measures (including RACT) to meet RFP requirements and to demonstrate attainment as expeditiously as practicable and, thus, that no additional measures that are reasonably available will advance the attainment date or contribute to RFP for the area. Further, the EPA requires that air agencies consider

[37] April 5, 2023, Utah Air Quality Board Meeting audio recording at 0:29:35 minute mark (hereinafter ("AQB Hearing"). Recording available at Apr_5_2023_Audio.mp3 - 4/7/23 10:05 AM.

[38] AQB Hearing at 0:30:08.

[39] AQB Hearing at 0:33:35.

> ***all available measures***, including those being implemented in other areas, but must adopt measures for an area ***only if those measures are economically and technologically feasible*** and ***will advance the attainment date***, or if those measures are necessary for RFP. The EPA is retaining our existing general RACM requirements for the 2015 ozone NAAQS based on the current rationale and approach articulated in the final 2008 Ozone NAAQS SIP Requirements Rule, and the requirements of CAA section 172(c)(6).[40]

In addition to reiterating that the beyond-RACT measures must be economically feasible, EPA adds that such measures must "advance the attainment date." The phrase, "advance the attainment date" has a very definite meaning in this context.

In the PM2.5 NAAQS Implementation Rulemaking,[41] EPA explains that if a group of control measures "would not enable the area to attain the standard at least 1 year earlier (i.e., 'advance the attainment date' by 1 year)," they are not required.[42] Continuing, the Agency states that, "[t]he EPA has long applied this particular test to satisfy the statutory provision related to an area demonstrating attainment 'as expeditiously as practicable.'"[43]

Less there be any doubt that modeling is the tool utilized to determine the need for control measures, EPA explains that, "one of the key features of attainment demonstration modeling and related analysis is that they provide a means of synthesizing the effects of emissions reductions from all existing and potential new control measures identified for sources …."[44]

In summary, in addition to disregarding the economic feasibility and the timing for implementation of the proposed beyond-RACT measures, UDAQ has failed to provide any analysis of the air quality impact of the reductions from the proposed beyond-RACT controls and certainly has not assessed whether they would collectively advance attainment expeditiously (that is, advance attainment by 1 year or more).

D. Requiring Beyond-RACT Controls is Inconsistent with UDAQ's Claim that it has "a strong case that [Utah has] met … the statutory requirements for a moderate nonattainment area demonstration."

Perhaps what most directly undercuts UDAQ's claim that the B-RACT measures "are necessary for the NWF NAA to demonstrate attainment," is UDAQ's own position to the contrary. As noted, UDAQ's predicate for imposing B-RACT controls is that they are necessary to demonstrate attainment as expeditiously as practicable: "The UDAQ has determined that these controls are necessary for the NWF NAA to demonstrate attainment of the 2015 8-hour ozone NAAQS as

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[40] 83 Fed. Reg. at 63007-08 (footnotes omitted) (emphasis added).

[41] EPA specifically references the PM2.5 NAAQS rulemaking in the 2015 NAAQS Implementation Rulemaking for a more in-depth discussion of beyond-RACT authority. *See, e.g.*, 83 Fed. Reg. at footnote 34 at 63015.

[42] 81 Fed. Red. at 58035.

[43] *Id.*

[44] *Id*. at 58044/2.

expeditiously as practicable."[45] But contrary to this assertion, UDAQ admits that even without the B-RACT measures,[46] it has made a "strong case that [its] attainment demonstration adequately demonstrates the NWF NAA attaining the 8-hour ozone NAAQS by the attainment date of August 3, 2024."[47] And during the April 5th Board meeting, UDAQ further represented that it has met the statutory requirements for a moderate nonattainment demonstration:

> So, the Clean Air Act does allow us to also provide what's called a Weight of Evidence Analysis. And this is essentially additional information to be taken into consideration, one, considering whether or not an area is modeling or demonstrating attainment. So, within our Weight of Evidence Analysis we provided additional pieces of information that weren't directly included in the modeling analysis so these are things like emissions reductions associated with grant works or as well as interstate transport, things like that. And so, the state believes that between the fact that the model is performing within all the metrics and the guidance EPA has provided, we're demonstrating close to attainment and this additional weight of evidence that ***we're making a strong case that we've met … the statutory requirements for a moderate nonattainment area demonstration***.[48]

While acknowledging that the attainment demonstration is ultimately subject to EPA review and approval, Staff concluded that the State's position is that it has made a "strong compelling case" for its attainment demonstration.[49] Of course, all SIP elements are subject to EPA approval and the possibility that EPA might disagree with UDAQ's attainment demonstration is speculative and irrelevant. UDAQ is charged with making an attainment demonstration in the first instance and it has gone on the record that it has made a strong and compelling case for an attainment demonstration.

In summary, UDAQ has represented that it has made a strong and compelling case that it has made a viable attainment demonstration, directly contradicting a claim that additional, beyond-RACT measures are necessary for demonstrating attainment. And, even if UDAQ had not made such a demonstration, UDAQ does not have the authority to impose B-RACT controls that it has not shown to be necessary for achieving attainment, and UDAQ readily admits that it has not conducted the necessary analytical work to make such a showing.

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[45] Proposed SIP at 74.

[46] At the April 5th Board meeting, UDAQ staff acknowledged that they have not included the B-RACT reductions in the modeling. *See* AQB Hearing at 0:29:35. Nor does UDAQ reference the B-RACT controls as part of its WOE demonstration. *See* Section 8.3, *Weight of Evidence (WOE)* of proposed SIP.

[47] Proposed SIP at 141.

[48] AQB Hearing at 0:17:12.

[49] *Id*.

V. UDAQ'S AUTHORITY UNDER CAA § 172(C)(6) TO IMPOSE BEYOND-RACT CONTROL MEASURES IS CONTINGENT UPON THE STATE FIRST HAVING COMPLIED WITH THE MANDATORY 15% VOC REDUCTION REQUIREMENT – WHICH IT HAS NOT DONE

The authority to impose beyond-RACT controls is contingent upon the State first implementing the other, mandatory SIP elements required for Moderate ozone nonattainment areas including a requirement to reduce VOC emissions by 15 percent over baseline conditions. UDAQ has forthrightly acknowledged that it has not satisfied this prerequisite for requiring beyond-RACT controls. Failing to satisfy this threshold requirement precludes UDAQ from exercising the Act's beyond-RACT authority (even putting aside the other deficiencies noted in these comments).

A. The Clean Air Act's Prerequisite for Imposing "Other [Beyond-RACT] Control Measures"

To understand the authority granted by a statute, it is obviously important to read it in the context in which it appears: "[W]e … expect Congress to speak clearly if it wishes to assign to an agency decisions of vast economic and political significance. That clarity may come from specific words in the statute, but context can also do the trick. Surrounding circumstances, whether contained within the statutory scheme or external to it, can narrow or broaden the scope of a delegation to an agency."[50] EPA adhered to this canon of statutory construction when it interpreted the scope of authority granted by CAA §172(c)(6), concluding that, in context, "other" in the term "other control measures," is a reference to those measures which precede it, in particular the RACM/RACT requirement of §172(c)(1).

An important contextual aspect relevant to the section 172(c)(6) grant of authority is the requirements that proceed it which must be satisfied before the "other control measures" authority is properly exercised. Nonattainment area planning requirements are found in Part D of the Clean Air Act. General nonattainment planning provisions are found in subpart 1, which includes CAA §172(c) detailing the main nonattainment planning provisions. Subpart 2 of the Clean Air Act sets forth specific nonattainment plan provisions for ozone. Several of the key nonattainment provisions are addressed in both the general provisions of Subpart 1 and the specific provisions of Subpart 2, with the latter providing more detail.

For example, CAA subpart 1, section 172(c)(2) contains a general requirement that nonattainment SIPs must provide for reasonable further progress. Correspondingly, CAA section 182(b)(1) under subpart 2 contains a specific 15 percent VOC reduction requirement for Moderate ozone nonattainment areas.[51] Similarly, subpart 1, section 172(c)(1) establishes a generally applicable RACM/RACT requirement and subpart 2, section 182(b)(2) sets forth more specific RACT requirements for Moderate ozone nonattainment areas.

The so-called "beyond-RACT" authority is found in subpart 1, section 172(c)(6) of the Act (it has no corresponding provision in subpart 2). The actual language of this provision refers to "emission

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[50] *See, e.g., Biden v. Nebraska*, No. 22-506, slip. op. at 8-9 (Barrett concurring) (U.S. 2023).

[51] For an explanation of the interplay between Subparts 1 and 2, *see* 80 Fed. Reg. 12264, 12271 (Mar. 6, 2015) (Implementation Rule for 2008 O3 NAAQS).

limitations, and such ***other*** control measures, means or techniques … as may be necessary or appropriate to provide for attainment."[52]

The structure of the statute makes clear that "such other control measures" refer to measures that are ***beyond*** the other statutorily mandated requirements. While the other statutory requirement includes the RACM/RACT requirement, they are not limited to that requirement. In particular, they include the 15% RFP VOC reduction requirements. This can be seen by looking at the relevant provisions of section 172(c) in fuller context. An abbreviated version of this provision is as follows:[53]

> **(c) Nonattainment plan provisions**
>
> The plan provisions (including plan items) required to be submitted under this part shall comply with each of the following:
>
> **(1) In general**
>
> Such plan provisions shall provide for the implementation of all [RACM/RACT].
>
> **(2) RFP**
>
> ***Such plan provisions shall require reasonable further progress [that is, 15% VOC reduction].***
>
> **(3) Inventory**
>
> Such plan provisions shall include [inventory requirement].
>
> **(4) Identification and quantification**
>
> Such plan provisions shall expressly identify and quantify the emissions [associated with projects allowed in certain economic development zones].
>
> **(5) Permits for new and modified major stationary sources**
>
> Such plan provisions shall require [a major nonattainment New Source Review permit program].
>
> **(6) Other measures**
>
> Such plan provisions shall include enforceable emission limitations, and ***such other control measures***, means or techniques (including economic incentives such as fees, marketable permits, and auctions of emission

[52] As noted above, EPA has construed the term "other control measures" to mean "additional reasonable measures."

[53] This is an excerpted and abbreviated recitation of CAA § 172(c) for purposes of showing the context and intent of the Act's beyond-RACT authority.

> rights), as well as schedules and timetables for compliance, as may be necessary or appropriate to provide for attainment of such standard in such area by the applicable attainment date specified in this part.

In its full context, the "other measures" (beyond-RACT) authority is properly understood as bestowing authority to impose additional limitations and control measures as may be shown to be necessary ***only after*** imposing the "other" mandatory requirements found in section 172(c), including not just RACT but also the 15% RFP requirement.

B. UDAQ has Not Satisfied the Mandatory 15% VOC Reduction Requirement

UDAQ's Proposed SIP does a good job of explaining the mandatory requirement to reduce VOC emissions:

> CAA section 172(c)(2) requires emission reductions referred to as RFP. Section 182(b)(1)(A) of the CAA further details RFP requirements for moderate NAAs, which is a demonstrated 15% reduction specifically for VOC emissions, known as Rate of Progress (ROP). Since the NWF does not have a previously approved ROP plan related to ozone, ***the state must meet the 182(b)(1)(A) requirements for this moderate SIP***.[54]

UDAQ goes on to explain the difficulty of achieving the 15% VOC reduction and notes that after accounting for credible reductions, "the State of Utah still has 11.1% of its RFP requirements to fulfill, or 10.3 tpd of additional emission reductions required to fulfill the CAA sections 172(c)(2) and 182(b)(1)(A) requirements."[55] Finally, UDAQ forthrightly concludes that it will not be able to comply with the 15% VOC reduction requirement for the current, Moderate SIP but will seek to do so "during the state's submission of a potential serious SIP for the same NAA."[56]

UDAQ's forthright admission that it has not satisfied the mandatory 15% VOC reduction requirement shows that it has not satisfied the legal prerequisite for imposing "other [beyond-RACT] measures" pursuant to CAA § 172(c)(6) – even assuming that such measures were economically feasible, could be timely implemented by the attainment date, and were shown to be necessary for achieving expeditious attainment.

VI. UDAQ'S INTERPRETATION OF ITS BEYOND-RACT AUTHORITY DIRECTLY CONFLICTS WITH THE CLEAN AIR ACT'S GRADUATED AND STRUCTURED APPROACH TO ACHIEVING ATTAINMENT

The basic framework of the Clean Air Act, including establishing the NAAQS and associated attainment planning requirements, was established in 1970 and 1977. The original deadlines for attaining the NAAQS proved overly ambitious, especially for three NAAQS: ozone, carbon monoxide, and particulate matter. This led to Congress significantly overhauling the attainment strategy for these pollutants in the 1990 Clean Air Act Amendments. Those amendments

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[54] Proposed SIP at 110 (emphasis added).

[55] *Id*. at 112.

[56] *Id*. at 115.

established a classification system based on the severity of an area's nonattainment problem. The more serious the nonattainment problem, the longer the attainment deadlines and the more stringent the control measure requirements.

Particulate matter offers an illustrative example of this approach. Areas not attaining the particulate matter NAAQS are classified as either Moderate or Serious nonattainment with Serious nonattainment areas having more "work" to do to reach attainment. In terms of control requirements, Moderate nonattainment areas are subject RACM/RACT, whereas Serious nonattainment areas are subject to the more stringent control requirements of BACM/BACT.[57]

We know that the (beyond-RACT/beyond-BACT) authority of CAA § 172(c)(6) also applies in particulate matter nonattainment areas (whether an area is classified as Moderate or Serious nonattainment).[58] But, under UDAQ's interpretation of the beyond-RACT authority of CAA § 172(c)(6), the carefully crafted, graduated approach to escalating the stringency of controls from RACT to BACT when going from a Moderate to Serious classification would be obliterated. The state could, in fact, jump right to or ***even over BACT*** in fashioning its Moderate nonattainment area SIP control strategy in contradiction to the carefully calibrated, incremental approach codified by Congress.[59] This is necessarily so because UDAQ has by its own admission disregarded economic feasibility in interpreting its authority pursuant to CAA § 172(c)(6).

While the Act's ozone nonattainment area provisions do not have the same RACT to BACT bump-up in control technology when going from Moderate to Serious nonattainment as the particulate matter nonattainment provisions do, they do contain a graduated and increasingly stringent approach depending on the severity of an area's nonattainment status. In fact, the nonattainment provisions for ozone found in subpart 2 have ***five*** separate classifications for nonattainment compared to the two classifications found in subpart 4 for particulate matter.[60]

As noted, and as expected, the stringency of the requirements increases with the level of nonattainment classification. For example, the major NSR offset ratio increases from 1.1:1 (Marginal) to 1.15:1 (Moderate) to 1.2:1 (Serious) to 1.3 to 1 (Severe) to 1.5 to 1 (Extreme), as an area's classification increases through the five levels of nonattainment classification. Similarly, the major source threshold for RACT (and major NSR) purposes decreases from 100 tpy (Marginal and Moderate) to 50 tpy (Serious) to 25 tpy (Severe) to 10 tpy (Extreme). So, for example, a 75 tpy source that may have avoided RACT during an area's Moderate SIP rulemaking process would be subject to RACT should the area be reclassified to Serious. This is the carefully calibrated

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[57] *See* CAA §§ 189(a)(1)(C), (b)(1)(B).

[58] *See, e.g.*, 81 Fed. Reg. at 58083 (PM2.5 NAAQS Implementation Rule) ("EPA interprets the requirement under CAA section 172(c)(6) for a state to adopt 'other measures' needed for attainment to apply … whether the area is classified as Moderate or Serious ….").

[59] It is also noteworthy that EPA explains that whether part of the control strategy for a Moderate area (requiring RACT) or a Serious area (requiring BACT), imposing controls that go "beyond" RACT or BACT, as the case may be, requires an assessment of economic feasibility that is equivalent to RACT or BACT, respectively. *See, e.g.*, 40 CFR 51.1000 (definitions of "additional feasible measure" and "additional reasonable measure").

[60] *Compare* CAA § 188 (establishing Moderate and Serious classifications for particulate matter nonattainment areas) *with* CAA § 181 (establishing Marginal, Moderate, Serious, Severe, and Extreme classifications for ozone nonattainment areas).

approach that Congress designed. It is also noteworthy that none of the ozone nonattainment classifications require BACT.[61] It would surely be an odd statutory scheme for Congress to not mandate BACT for any of the nonattainment classifications for ozone, on the one hand, but to nonetheless provide beyond-RACT authority that – under UDAQ's reading of the law – would allow the State to not only exceed reasonable RACT controls but to go well beyond the more stringent level of BACT control.

VII. THE AIR QUALITY BOARD HAS NOT MADE THE FINDINGS NECESSARY TO IMPOSE THE PROPOSED BEYOND-RACT CONTROLS

The Notice of Proposed Rule states that the beyond-RACT controls are being proposed "to comply with the Clean Air Act Section 182(b) requirements for ***moderate*** ozone nonattainment areas."[62] As these comments demonstrate, however, the proposed beyond-RACT controls are inconsistent with and exceed this authority. Accordingly, should the Air Quality Board wish to proceed with the rulemaking as proposed, it must make a written finding "based on evidence, studies, or other information contained in the record that relates to the state of Utah and type of source involved" that the more stringent requirements "will provide reasonable added protections to public health or the environment of the state or a particular region of the state." UCA 19-2-106. The UAQB has not taken this step.

[61] However, Congress did provide states with the ***option*** of ratcheting up the level of control on existing major sources from RACT to BACT in Severe and Extreme nonattainment areas if they chose to in exchange for a reduction in the otherwise applicable NSR offset ratios. *See* CAA § 182(d)(2), (e)(1).

[62] Utah State Bulletin (Jun. 1, 2023) at 68.

Attachment IV

Suggested Editorial Corrections

Moderate Ozone SIP Proposal – Suggested Editorial Corrections

1. Footnotes have been flagged inconsistently, some inside the punctuation and some outside. All footnotes should be flagged consistently and outside any applicable punctuation.
2. Table of Acronyms – Add "EMP" for Enhanced Monitoring Plan (introduced on p. 20).
3. Tables that run onto two or more pages should have the header row(s) repeated for improved readability.
4. Page 11 - To better account for variable meteorological conditions that can influence ozone formation, a violation of the standard ~~occurs~~ occurred when the three-year average of the fourth-highest maximum value at a monitor ~~exceeds~~ exceeded the level of the federal standard.
5. Page 12 - This revision lowered the standard from 0.075 to 0.070 ppm for the 4th highest daily maximum 8-hour concentration (MDA8) averaged over three years.
6. Page 14 - Validated data in EPA's Air Quality System (AQS) shows a 3-year average of the 4th high maximum daily 8-hour ozone value at the NWF Bountiful monitor of 0.077 ppm, with exceedances also observed at all other monitoring sites in the NAA except Erda in Tooele County (Table 2).
7. Page 16, Table 3, 7th row - General offsets for VOCs and NOx increase to a ratio of 1.15 ~~to 1.0~~ from 1.1.
    a. Page 93, the statement, "This includes requirements that a major stationary source in the NWF NAA obtain a ratio of total actual emission reductions of VOCs compared to the emission increase of VOCs of at least 1.15:1 prior to commencement of operations and permitting by the UDAQ," should also be updated to include NOx.
8. Page 16, Table 3, 8th row - Emission reduction measures triggered if EPA makes a finding that the NAA ~~fails~~ failed to attain the standard by the attainment date or a finding that the SIP fails to meet RFP requirements.
9. Page 19 – remove the comma after "and UV radiation" in the second bullet.
10. Page 20, Table 4, caption and title. respectively – NWF 4th high MDA8 reported in ppm *and* NWF NAA Ozone 4th high MDA8 (ppm).
11. Page 22, Figure 3, caption – 4th high MDA8 in Wasatch Front.
12. Page 25 - . . . UDAQ has developed a projected emission inventory for 2023 based on the base year inventory described in Section 3.1.1. 2023 is the year prior to the required attainment ~~data~~ date of August 3, 2024 . . .
13. Page 27 - The VCPy framework features better ~~VCP~~ VOC emissions estimates than previous platforms . . .
14. Page 94 - These NAAs were selected for comparison since they have comparable climatic conditions to those experienced in the NWF NAA during summer and similar industrial ~~activates~~ activities present in the NWF NAA.
15. Page 102 – The following sentence will need to be updated to past tense for the final SIP since the boiler rules have now been adopted: "Additionally, the UDAQ has proposed for adoption administrative rules R307-315; NOx Emission Controls for Natural Gas-Fired Boilers 2.0-5.0 MMBtu and R307-316: NOx Emission Controls for Natural Gas-fired Boiler greater than 5.0 MMBtu."
16. Page 105 - I/M programs were adopted in the early 1980's in Utah as a required strategy to attain ~~the both~~ both the ozone and CO NAAQS.
17. Page 107, Table 60, caption and title – 2023 Salt Lake County Basic Performance Modeling.

18. Page 128 - . . . with the remaining 14.5% attributable to Utah anthropogenic emissions.
19. Page 131 - This range is well in line with those reported in the literature and is highly similar in scale when compared to inter-state transport contributions.
20. Page 137 - ~~Target~~ Targeted Air Shed Grants provide funds to reduce air pollution in the nation's NAAs with the highest levels of ozone and $PM_{2.5}$.
21. Page 137 - UDAQ expects these activities to reduce ~~the emission~~ emissions annually by 1.26 tons of Nonmethane Organic Gas (NMOG) and NOx and reduce lifetime emissions of NMOG and NOx by 11.17 tons (Table 72).
22. Page 143 – The first paragraph on section 9.2 includes a font change that should be updated to match the rest of the test. When doing so, "Table 73" on line 34 belongs with the paragraph that needs the font correction.
23. Page 146, end of first full paragraph – The paragraph ends in the middle of a sentence, "The resulting" and is missing some text.
24. Page 149, top of page - modeled ~~changed~~ change in ozone between a 2023 baseline and 2023 sensitivity modeling scenario that includes emissions from all sources except for international anthropogenic emissions.
25. Page 149 - In its document overviewing the disapproval of Utah's ~~prospective~~ retroscpective 179B(b) demonstration, EPA cited a lack of "sufficient technical information"165 to support the modeled conclusions including: a lack of emission data, observations, and meteorological analyses.
26. Page 155 – The sentence, "These rules are expected to be adopted by the Utah Air Quality Board in May of 2023, with an implementation beginning in May of 2024," will need to be updated to indicate the rules were adopted.
27. Page 157 - and facilitate the involvements of these potentially-~~affect~~ affected populations.

Exhibit C

Comments on

State Implementation Plan for the 2015 Ozone NAAQS Northern Wasatch Front Moderate Nonattainment Area, Section IX Part D.11

Ramboll reviewed the Utah Division of Air Quality (UDAQ) State Implementation Plan (SIP) with particular focus on chapters and technical support documents (TSD) related to the air quality modeling components of the analysis. Our comments stemming from the review are provided below.

Summary of Key Points

Model Performance Evaluation

- There is little shown or explained in the main SIP document that supports UDAQ's claim that "the CAMx model performs well at simulating ozone at all sites." Maximum daily 8-hour average (MDA8) ozone performance over all days is consistently under predicted by a large margin and reported normalized mean bias is at the outer end of referenced performance criteria. Bias and correlation are worse when considering only days when observed MDA8 ozone exceeds 60 ppb.

- The claim that "model performance statistics suggest that the model performs well" is questionable and inaccurate. Reported statistics just within benchmark criteria indicate that the model performs somewhat better than the worst third of US photochemical modeling applications over past 15-20 years. Important contextual information about the purpose of benchmarks should be stated in Section 8.2.1. The statistical performance criteria are neither derived nor recommended by EPA; we suggest deleting any such references alluding to EPA acceptance criteria.

- The contention that regional background is well characterized by better ozone performance at the Gothic, Colorado monitoring site could be bolstered (or weakened) by showing results at other rural sites throughout the Great Basin.

- Additional information on precursor performance should be included in the main SIP document to support UDAQ's argument that the modeled ozone is well simulated, and to present likely root causes for the ozone under prediction tendency.

  - The TSD shows large NOx overestimates during morning commute hours. UDAQ's sensitivity test altering vertical diffusion rates may be too subtle. Perhaps the issue is more related to temporal allocation of mobile source emissions, that more NOx should be allocated away from morning commute hours and into midday hours when ozone chemistry is more efficient.

  - Key reactive VOCs such as formaldehyde and benzene are under predicted, suggesting a lack of secondary photochemical production of formaldehyde and a shortage of radicals (oxidants) as fuel for ozone production.

  - Morning isoprene concentrations are largely over predicted. UDAQ's reference to mobile source isoprene emissions is confusing and suggests that they contribute most to ambient isoprene concentrations. Rather, most isoprene is biogenic, yet biogenic emission models remain inadequate in characterizing western US environments.

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- Poor model performance degrades confidence that it will respond appropriately to emission changes. Under prediction of local ozone production leads to a less responsive model and thins the margin for effectiveness of emission controls.

Analysis of PBL heights

- UDAQ should include their rationale for selecting different planetary boundary layer (PBL) techniques to define vertical mixing in the WRF meteorological model and CAMx. It would be helpful to conduct sensitivity tests with WRF and/or CAMx using different PBL schemes, or at least describe why the specific options for each model were selected.

- UDAQ references data from ceilometer instruments in comparing PBL heights between WRF and CAMx. Caution and context should be included when comparing PBL heights among WRF, CAMx, and ceilometers.

- There are some key uncertainties that should be addressed: (1) ceilometers do not specifically measure PBL heights; (2) PBL differences between WRF and CAMx are most likely related to the use of different PBL approaches in each model.

Subgrid Convection

- UDAQ mentions that excessive simulated cloudiness may be a cause for large ozone under predictions on certain days. It would be helpful to show a sensitivity test that entirely removes sub-grid (or all) clouds to confirm this hypothesis.

Evaluation of NOx and VOC Sensitive Ozone Production from Source Apportionment Results

- NOx sensitivity indicated by the CAMx modeling results do not agree with a conceptual model for VOC sensitivity indicated by monitoring studies. UDAQ uses NOx sensitivity suggested by the modeling as justification for NOx controls despite not meeting VOC reduction requirements. NOx controls under VOC-limited conditions may result in higher ozone, or a "NOx disbenefit".

- Ozone source apportionment modeling indicates that 54% of ozone is attributable to NOx while 46% is attributable to VOC at Hawthorne. Model sensitivity to NOx and VOC changes (and by extension source apportionment) are dependent on the model's ability to correctly replicate conditions that actually occurred.

- Daily VOC:NOx ratios from a 2021 UDAQ monitoring study (Sghiatti and Daher, 2022) indicate that ozone at Hawthorne forms in a transitional regime (NOx and VOC sensitive). However, results from using reactivity-weighted VOC show a stronger tendency toward VOC sensitive conditions, which should be emphasized given the abundance of reported higher-reactivity alkene, aromatic and aldehyde compounds.

- The Sghiatti and Daher (2022) study also presents a weekday-weekend analysis that indicates statistically significant ozone increases during 2021 summer weekends relative to weekdays as a result of reduced mobile source NOx emissions. The authors correctly suggest that this "points to a VOC-limited regime" during 2021.

- A recent 2022 Science for Solutions monitoring study (Ninneman et al., 2023) shows ozone production increasing during the morning hours and peaking around noon, after which ozone destruction processes dominate. Therefore, VOC:NOx ratio is best evaluated during the morning hours (e.g., 6 AM to 12 PM), when results from the 2021 UDAQ study indicate a more VOC-limited regime regardless of reactivity weighting. Box modeling showed strong responses to VOC and little response to NOx, supporting a VOC-limited conditions.

- Both modeling and monitoring techniques are associated with uncertainties, and these are likely at play to various extents. However, the documented CAMx performance issues weaken conclusions drawn from the modeling that suggest NOx-sensitive conditions and strengthen conclusions drawn from two monitoring studies that suggest VOC-sensitive conditions.

<u>Estimated Impacts from Required Refinery Emission Reduction Measures</u>

- We applied UDAQ's ozone source apportionment results to estimate the impact from specific required control measures at two refineries (Chevron in Davis County and Tesoro/Marathon in Salt Lake County) on the 2023 ozone design value (DV) at Hawthorne.

  - Tesoro/Marathon NOx reduction of 87.5 TPY is 7.0% of 2017 Salt Lake County "other point source" emission sector (with Rio Tinto Kennecott off-highway mine trucks removed), while VOC reduction of 12.3 TPY is 0.9%.

  - Chevron NOx reduction of 8.9 TPY is 1.3% of 2017 Davis County "other point source" emission sector.

  - According to source apportionment results at Hawthorne, over the top 10 simulated MDA8 ozone days in 2023, "other point sources" in Salt Lake County contribute 0.30 ppb and 0.04 ppb from NOx and VOC sensitive chemistry, respectively. "Other point sources" in Davis County contribute 0.18 ppb from NOx sensitive chemistry, respectively.

  - Combining emission reductions from Tesoro/Marathon (NOx and VOC) and Chevron (NOx) with source apportionment results, we find that the total simulated 2023 ozone DV reduction from required refinery controls is 0.03 ppb at Hawthorne.

  - Conceivably this impact would be smaller if the model simulated a VOC-sensitive environment rather than NOx-sensitive, as indicated by monitoring studies.

1. Model Performance Evaluation

In Section 8.2.1, page 121 of the main SIP document, UDAQ states, "… the CAMx model performs well at simulating ozone at all sites." There is little shown or explained in the main SIP document that supports this claim. From the stated statistical results and associated tables and figures in this section, MDA8 ozone performance over all days is consistently under predicted by a large margin and reported normalized mean bias is at the outer end of the referenced performance criteria. Bias and correlation are worse when considering only days when observed MDA8 ozone exceeds 60 ppb. UDAQ appropriately acknowledge deficiencies in local emission estimates and simulated meteorology as likely causes for the performance issues.

In the same paragraph, UDAQ states, "These performance statistics suggest that the model performs well at simulating MDA8 ozone concentrations." This claim is questionable and in fact the specific statement about the statistics is inaccurate. Rather, statistics that are just within benchmark criteria indicate that agreement between modeled and observed ozone is somewhat better than the worst third of US photochemical modeling applications over past 15-20 years (Emery et al., 2016). The benchmark criteria do not define a pass/fail test, but rather provide context relative to a large population of past ozone modeling. This important contextual information about the purpose of benchmarks should be stated in Section 8.2.1. Later, in Section 8.3.2, page 127 of the main SIP document, UDAQ incorrectly states that the photochemical modeling results "… meet EPA performance metrics…"[1] The statistical performance criteria are neither derived nor recommended by EPA. Quite oppositely, it is important to stress that EPA (2018) modeling guidance warns against the use of statistical performance benchmarks to define a good or acceptable model[2]. We suggest deleting any such references alluding to EPA acceptance criteria. We note, however, that the photochemical modeling TSD properly does not mention meeting "EPA performance metrics".

UDAQ mentions better ozone performance at the high altitude CASTNET site at Gothic, Colorado, which arguably represents regional background ozone over the intermountain west. The contention that regional background is well characterized could be bolstered (or weakened) by showing additional results at other rural CASTNet sites[3] throughout the Great Basin (e.g., at National Parks and Wilderness area in Utah and Nevada).

1b) NOx Evaluation

Additional information on precursor performance should be included from the photochemical modeling TSD to help shed additional light on UDAQ's argument that the modeled ozone is well simulated, and additionally to present likely root causes for the ozone under prediction tendency. The TSD shows large NOx overestimates during morning commute hours. Such high NOx likely squelches early ozone production, making it difficult for ozone to "catch up" later in the day. Based on the "box plots" in Figures 22 and 23 in the TSD, this is a common feature that may be influencing ozone performance.

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[1] A similar statement is repeated in Section 9.5, page 148.

[2] EPA (2018) photochemical modelling guidance, page 69: "…it is not appropriate to assign 'bright line' criteria that distinguish between adequate and inadequate model performance. In this regard, the EPA recommends that a "weight of evidence" approach be used to determine whether a particular modeling application is valid for assessing the future attainment status of an area."

[3] https://www.epa.gov/castnet

While the TSD mentions sensitivity testing with KVPATCH that alters NOx but has no impact on MDA8 ozone, that testing may be too subtle. Perhaps the issue is more related to temporal allocation of mobile source emissions, that more NOx should be allocated away from morning commute hours, when chemistry is NOx-rich and VOC-sensitive, and into midday hours when chemistry is efficient and more NOx-sensitive.

1c) VOC Evaluation

Key reactive VOCs such as formaldehyde and benzene are under predicted (TSD Figures 29 and 31), suggesting a lack of secondary photochemical production of formaldehyde and a shortage of radicals (oxidants) as fuel for ozone production. This could be related to the heavy NOx burden.

In TSD Section 4.7.3, page 27, UDAQ states, "Modeled isoprene displayed high values during early morning-midday hours (8 am - 12 pm)." The average morning peak isoprene in Figure 27 of the TSD shows modeled concentrations reaching almost 2 ppb. UDAQ goes on to say in the same paragraph, "Measured isoprene, on the other hand, peaked much earlier in the morning (between 6 and 9 am), potentially consistent with primary mobile source emissions." The average morning peak isoprene in Figure 28 of the TSD shows measured concentrations reaching only 0.5 ppb. The reference to mobile emissions is confusing and suggests that mobile source emissions contribute most to isoprene emissions. Rather, the majority of isoprene is biogenic, with only minor contributions from mobile sources. Therefore, it is most likely that the over predicted morning isoprene stems from a poor characterization of the BEIS biogenic emissions model.

As described in UDAQ's photochemical modeling TSD, the different versions of BEIS produce very different characterizations of biogenic VOC as depicted by the sensitivity for isoprene concentrations (Figure 3, page 10 of the TSD). We have also noted significant variability in rural and urban biogenic VOC emissions among the last 3 versions of BEIS (v3.6 through 4.0) applied in Denver and Las Vegas. We have seen that BEIS3.6 generates too little urban biogenic emissions but large over estimates of rural emissions; BEIS3.7 generates too much urban emissions but adequate amounts of rural emissions, and BEIS4 generates much less urban and rural emissions than either predecessor. All of this indicates that models for this source sector remain inadequate in characterizing western environments.

1d) UDAQ's conclusions

UDAQ concludes at the end of Section 8.2.1 of the main SIP document, "These results provide confidence in the ability of the modeling platform to provide a reasonable projection of future year ozone concentrations and source contributions in the NWF NAA." This is a strong statement given the lack of evidence in this section and the precursor assessment in the TSD. The concern about ozone performance, and the reason why it is a key part of SIP modeling, is that relatively poor performance degrades confidence that the model will respond appropriately to emission changes. In other words, the model may look mostly right but for the wrong reasons. It is possible that under prediction of local ozone production thins the margin for ozone reductions from controls and leads to a less responsive model in the relative response factor (RRF) calculation used in the design value projection. For example, under predictions of ozone might be caused by excessive NOx that inhibits ozone formation, and NOx controls may lift that inhibition and lead to higher ozone (a "NOx disbenefit" condition). Ozone underpredictions may also be associated with insufficient VOC, which may reduce effectiveness of VOC emission controls. UDAQ acknowledges this at the top of the weight of evidence section (8.3.2, page

127 of the main SIP document), by stating that model uncertainties "… may result in an overestimation in future predicted ozone concentrations."

2. Meteorological Inputs and Analysis

2a) Pressure Units

Pressure units are labelled as millibars (mb) in the photochemical and meteorological modeling TSDs, but the pressure values tabulated in both documents indicate units are Pascals (Pa = 100 x mb).

2b) Analysis of PBL heights

The treatment of the planetary boundary layer (PBL) and associated vertical mixing (or diffusion) is a critically sensitive component in both WRF and CAMx. In Section 4.2, page 6 of the photochemical modeling TSD, UDAQ states that vertical diffusivities (Kv) were calculated for CAMx using the "YSU" planetary boundary layer (PBL) method. The meteorological modeling TSD states that WRF was run using the "MYNN Level 2.5" PBL method (Section 1.2.2, Table 1.3, page 14). WRF includes the YSU algorithm, and the WRFCAMx interface program allows Kv fields to be calculated using turbulent kinetic energy data generated by the MYNN Level 2.5 algorithm. So a consistent PBL approach could have been used in both models (both MYNN or both YSU). UDAQ should include their rationale for selecting the MYJNN approach in WRF relative to the many other options available (including YSU), and why a different approach was used in CAMx. It would be helpful to conduct sensitivity tests with WRF and/or CAMx using different PBL schemes, or at least describe why these specific options for each model were selected.

In Section 4.7.2, page 24 of the photochemical modeling TSD, UDAQ states that the NOx over prediction bias "… is potentially related to an underestimation in the planetary boundary layer (PBL) depth during these overnight hours, as indicated by a comparison between modeled PBL height from wrfcamx and observed PBL height …" (referencing Figure 24 of the TSD). There are some key points that should be addressed in the TSD. First, the referenced ceilometer-derived PBL heights are not necessarily indicative of the actual PBL depth because they do not measure actual turbulent energy but rather backscatter from often unrelated features such as cloud base and aerosol layers. Second, PBL differences between WRF and CAMx (the latter is also incorrectly referred to as "wrfcamx" in the TSD) are most likely related to the use of different PBL approaches in each model, as noted above.

It is important that the TSD explain which PBL information is actually used within CAMx. The rate of vertical mixing in CAMx is quantified using Kv diffusivity fields. PBL heights are not used directly in CAMx but are simply reported for informational purposes (e.g., quality assurance). Reported CAMx PBL heights may vary from the PBL reported by WRF, but this has no effect on model results. Therefore, caution and context should be included when comparing PBL heights among WRF, CAMx, and ceilometers.

2c) Subgrid Convection

In Section 4.2, page 6 of the photochemical modeling TSD, UDAQ states, "Kain-Fritsch subgrid convection and subgrid stratiform cloud options were also invoked." This is one of two options in WRFCAMx that diagnose the amount of sub-grid cloudiness in each grid column. If none of the options are selected, no sub-grid cloudiness is calculated. There is no indication in the TSD about whether this

option was applied for all grids or for just the larger grids. It is likely that this option generates excessive cloudiness at the 1.333 km grid scale as clouds should be well-resolved by WRF at such resolution. UDAQ mentions in the model performance evaluation that excessive simulated cloudiness may be a cause for large ozone under predictions on certain days. It would be helpful to show a sensitivity test that entirely removes sub-grid (or all) clouds to see if they are primarily responsible for the consistent ozone under prediction tendency.

3. Evaluation of NOx and VOC Sensitive Ozone Production from Source Apportionment Results

In section 7.4.1, pages 114-115 of the main SIP document, UDAQ discusses the rationale for the effectiveness of NOx controls within the NWF NAA. Figure 6 on page 115 of the SIP shows results from ozone source apportionment modeling, which tracks ozone formed separately under NOx and VOC limited (or sensitive) conditions, which indicates that 54% of ozone is attributable to NOx limited chemistry while 46% is attributable to VOC limited at Hawthorne when averaged over all days of the modeling episode. A similar breakdown is shown at Bountiful. As stated above, model sensitivity to NOx and VOC changes (and by extension source apportionment) are dependent on the model's ability to correctly replicate conditions that actually occurred. As we discuss below, NOx sensitivity indicated by the CAMx modeling results do not agree with a conceptual model for VOC sensitivity indicated by monitoring studies. UDAQ uses NOx sensitivity suggested by the modeling as justification for NOx controls despite not meeting VOC reduction requirements.

On page 114, UDAQ states that "the findings are consistent with those from a VOC/NOx ratio analysis conducted by the UDAQ which utilized NOx and VOC measurements collected at the Hawthorne monitoring site during the summer of 2021" (Sghiatti and Daher, 2022). The reference includes plots of VOC:NOx ratio calculated with and without consideration of VOC reactivity (reproduced in Figure 1 below). VOC:NOx < 5 indicates VOC-limited (sensitive) chemistry, VOC:NOx > 15 indicates NOx-limited chemistry, and values between 5 and 15 indicate transitional chemistry that responds to changes in both. Based on results shown in Figure 1, presumably by visually averaging hourly results over all daytime hours, Sghiatti and Daher conclude that ozone at Hawthorne forms in a transitional regime. The reactivity-weighted figure shows a tendency toward more VOC-limited conditions, and perhaps more emphasis should be given to that figure given the abundance of higher-reactivity alkene, aromatic and aldehyde compounds according to measurements shown by Sghiatti and Daher, as well as Ninneman et al. (2023).

Sghiatti and Daher (2022) also present a weekday-weekend analysis of monitored ozone that indicates statistically significant ozone increases during 2021 summer weekends as a result of reduced mobile source NOx emissions. The authors correctly suggest that this "points to a VOC-limited regime" during 2021. In previous years spanning 2017-2020, weekday-weekend ozone differences were not statistically significant. The authors offer no potential reasons for the unique conditions analyzed in 2021, but the results suggest recently lower VOC relative to NOx in the Hawthorne area (i.e., a lower VOC:NOx ratio).

Under a Science for Solutions grant, Ninneman et al (2023) conducted photochemical box model simulations constrained by 2022 precursor and meteorological measurements at the Utah Technical Center during days influenced by wildfire smoke and on smoke-free days. The box model showed ozone production increasing during the morning hours and peaking around noon, after which ozone destruction processes dominated (Figure 2 below).

Therefore, VOC:NOx ratio is best evaluated during the morning hours (e.g., 6 AM to 12 PM), when Figure 1 indicates a more VOC-limited regime regardless of reactivity weighting. Box model sensitivity tests in which VOC and NOx precursor concentrations were systematically reduced separately and together showed strong responses to VOC and little response to NOx until very deep NOx reductions were applied (Figure 3 below) or reductions were applied collectively. Thus, results clearly show VOC-sensitive conditions at the Utah Technology Center, although that site measures some of the highest NOx in the area and so results in Figure 3 are not surprising.

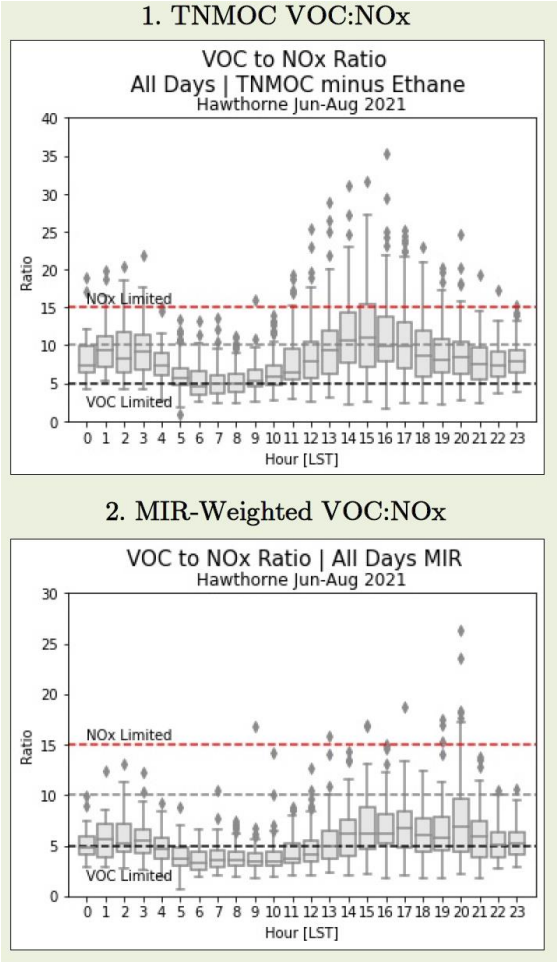

Figure 1. Monitored VOC:NOx ratios at Hawthorne using two different techniques using total non-methane hydrocarbons (TNMOC; top) and maximum incremental reactivity (MIR) weighted VOCs (bottom). Figure from Sghiatti and Daher (2022).

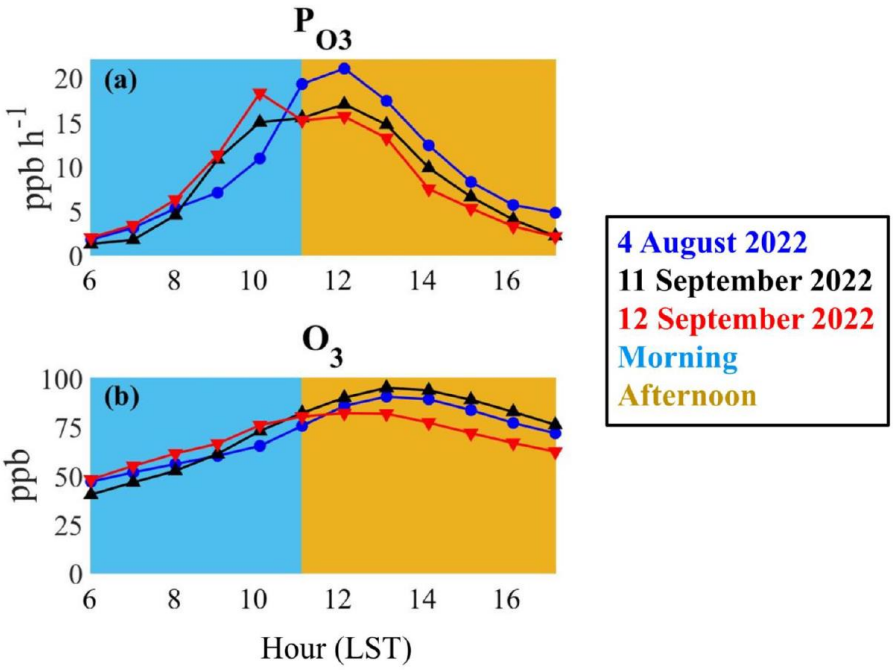

Figure 2. Diurnal profiles of ozone production rate (top) and total ozone concentration (bottom) simulated by a box model run using data from the Utah Technology Center on 3 days in 2022: smoke-influenced days (11 and 12 September) and a smoke-free day (4 August). Figure from Nenniman et al. (2022).

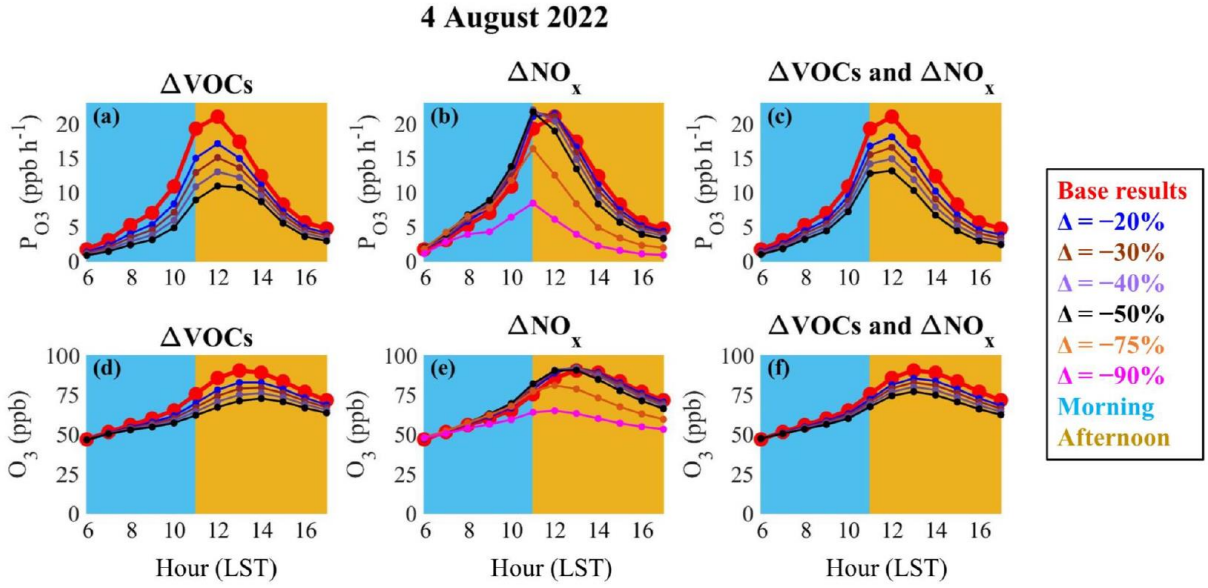

Figure 3. Diurnal profiles of ozone production rate (top) and total ozone concentration (bottom) simulated by a box model on the smoke-free day of August 4. Results from 6 NOx and VOC emission reduction scenarios are also plotted, indicating strong VOC sensitivity and little NOx sensitivity. Figure from Nenniman et al. (2022).

In summary, recent ozone and precursor analyses at two different monitoring sites indicate a stronger tendency toward VOC-limited photochemistry during hours of increasing and maximum ozone production, while CAMx shows a stronger tendency toward NOx-limited photochemistry. There are several possible reasons for this, as both techniques are associated with uncertainties: (1) since the model is not constrained by measured values (as box modeling is), error propagation stemming from uncertainties in emissions (values, time/space allocation) or meteorological inputs (chemical kinetics, vertical mixing, transport patterns) may cause an improper characterization of chemical sensitivity; (2) point measurements at monitoring sites sense local conditions but cannot provide information on how ozone is formed in other areas of the NWF NAA that are transported into the local monitored area. Both issues are likely at play to various extents, however, the documented CAMx performance issues throughout the modeling period weaken conclusions drawn from the modeling about NOx-sensitive conditions and strengthen conclusions about VOC-sensitive conditions drawn from the monitoring studies.

4. Estimated Impacts from Required Refinery Emission Reduction Measures

The SIP lists a number of control measures, mostly to address the Moderate Area requirement for Reasonably Available Control Technology (RACT) applied to stationary permitted sources. We applied UDAQ's ozone source apportionment technology (OSAT) results to estimate the impact on the 2023 ozone design value (DV) at the Hawthorne monitoring site from specific refinery emission control measures at two refineries:

1. Chevron (Davis County): ultra-low NOx burners on 2 crude heaters (8.9 TPY total NOx reduction)[4]
2. Tesoro/Marathon (Salt Lake County):
   a. Selective Catalytic Reduction (SCR) on co-generation turbines (87.5 TPY total NOx reduction);
   b. Second seal on Tank 321 and closed vent with carbon absorption on wastewater system (12.3 TPY total VOC reduction)

Strictly speaking, OSAT is not equivalent to a "sensitivity analysis" with which to estimate effects of emission reductions on ozone concentrations. This is because ozone chemistry responds non-linearly to emission changes. OSAT reports an estimate of attribution under the specific environmental and emission conditions that are given to the model. When those conditions change (e.g., to simulate impacts from a control measure), attribution can change non-linearly, either positively or negatively. However, the ozone response approaches linearity as emission changes or ozone attribution decrease. In this case, both the emission reductions relative to county-level totals and their ozone contributions at Hawthorne are rather small, affording us to use OSAT results to estimate first-order (linear) ozone impacts from the emission reductions above.

[4] Section 4.4.5, Page 44 of the main SIP document states this is a 62% NOx reduction for process heaters, but according to the 2017 Emission Inventory (https://deq.utah.gov/air-quality/2017-statewide-emissions-inventories) process heaters emit 122 TPY (8.9 TPY reduction is 7%). We could not find an equivalent 2023 process-level inventory among UDAQ's SIP material or the referenced website. We have assumed that the stated NOx TPY reduction is correct.

UDAQ tracked many different source categories with OSAT for the 2023 future year base case (i.e., 2023 projected emission inventory reflecting measures currently "on-the-books" and implemented by 2023). Refinery emissions were contained along with many other miscellaneous source types within a sector referred to as "other point sources". OSAT tracked emissions from this sector for each county within the NWF NAA. For our calculations, we needed a county- and process-specific emission inventory for 2023 but could only find such information for the 2017 base year.[5] We used the 2017 inventory for our purposes assuming that permitted point source emission rates have not changed significantly from 2017 to 2023.

Table 1 lists 2017 annual NOx and VOC emissions in Salt Lake and Davis Counties for sources comprising the "other point source" category, according to UDAQ's definition of those sources within the SIP and associated TSDs. Since the 2023 OSAT modeling tracked point sources associated with electric generating units, oil and gas sources, and off-highway mining trucks operating at the Rio Tinto Kennecott facility separately from the "other point source" category, those NOx and VOC emissions were removed from the Salt Lake and Davis County inventories. Additionally, the Rio Tinto Kennecott power plant did not operate in 2023, nor did the Davis County Landfill & Energy Recovery Facility (DCERF), so those emissions were also removed. Table 1 also shows the total absolute and percent emissions contributed by Tesoro/Marathon and Chevron facilities, respectively. Finally, the table shows the respective NOx and VOC reductions from the control measures listed above relative to the county totals. We assumed that annual emission rates are representative of emissions on any given summer day.

Table 1. County-level 2017 emissions reported by UDAQ for the "other point source" OSAT category containing the two refineries subject to required control measures as shown.

Salt Lake	**NOx (TPY)**	**VOC (TPY)**
Total "other point sources"	1256	1302
Tesoro/Marathon	313 (25%)	231 (18%)
Required Controls	87.5 (7.0%)	12.3 (0.9%)
Davis		
Total "other point sources"	665	1670
Chevron	254 (38%)	377 (23%)
Required Controls	8.9 (1.3%)	0 (0%)

We received UDAQ's model output files via disk transfer and processed raw hourly OSAT tracer concentrations to MDA8 ozone in local time. Figure 4(a) shows resulting time series of attribution for five aggregate source categories at Hawthorne, while Figure 4(b) shows the average over the top 10 highest simulated ozone days. Figure 5 is a copy of Figure 17, page 132 from the main SIP document. We extracted data from CAMx "receptor files", which report source apportionment results at pre-defined receptor coordinates defined by UDAQ. However, we could not replicate UDAQ's source apportionment results; while exhibiting similar patterns, our results tend to be higher during peak periods and the distribution of high days differ.

[5] 2017 EI website: https://deq.utah.gov/air-quality/2017-statewide-emissions-inventories

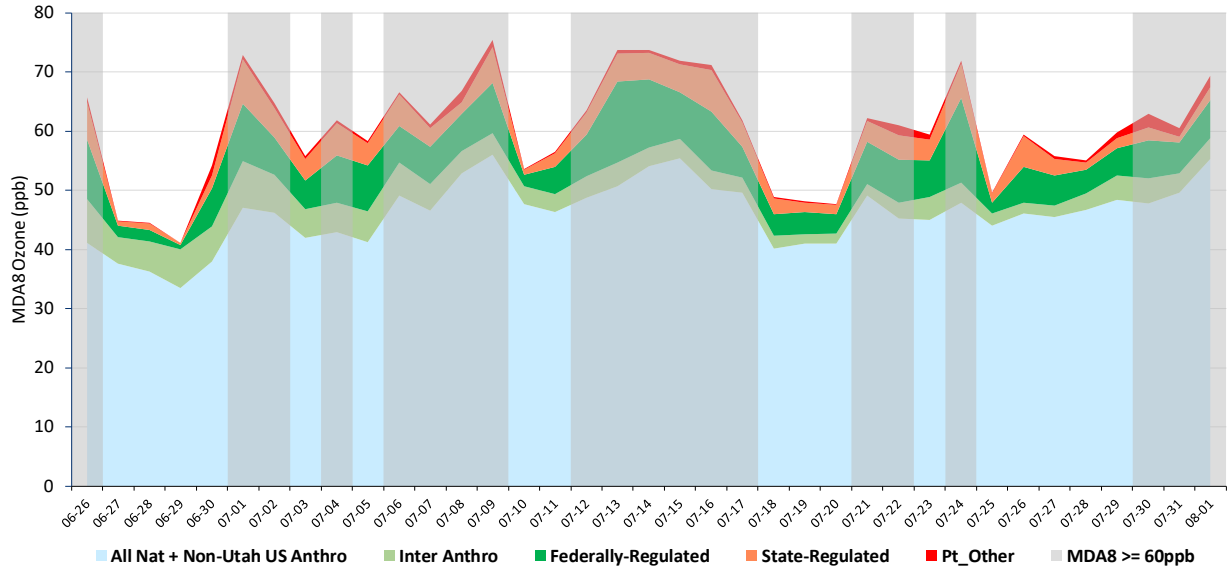

Figure 4(a). Time series of Ramboll's processing of MDA8 ozone contribution at Hawthorne from 5 aggregated sources/regions: all global natural and non-Utah US anthropogenic (blue); all international anthropogenic (light green); all Utah federally regulated (dark green); Utah state-regulated "other point sources" (red); all remaining Utah state-regulated (orange).

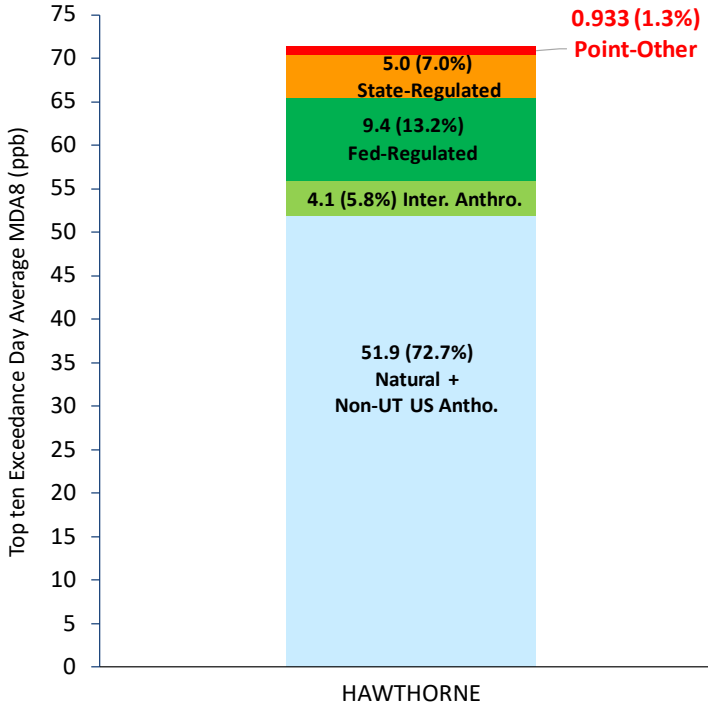

Figure 4(b). Average of Ramboll's processing of MDA8 ozone contribution at Hawthorne over the top 10 days shown in Figure 4(a) from 5 aggregated sources/regions: all global natural and non-Utah US anthropogenic (blue); all international anthropogenic (light green); all Utah federally regulated (dark green); Utah state-regulated "other point sources" (red); all remaining Utah state-regulated (orange).

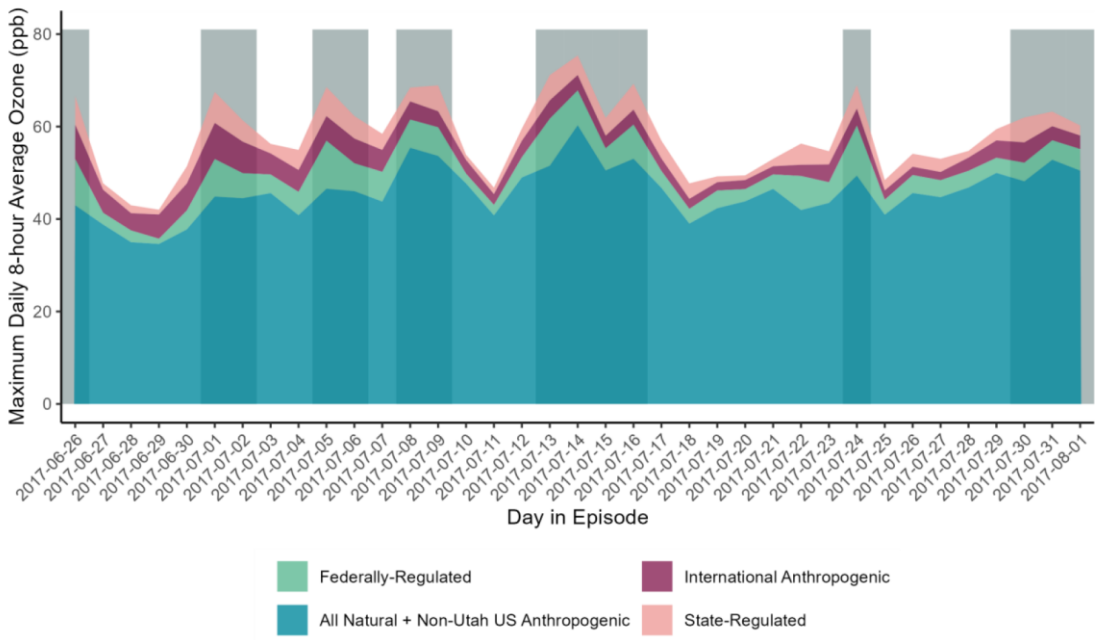

Figure 5(a). Time series of UDAQ's MDA8 ozone contribution at Hawthorne from 4 aggregated sources/regions:[6] all global natural and non-Utah US anthropogenic (blue); all international anthropogenic (red); all Utah federally regulated (green); all Utah state-regulated (pink).

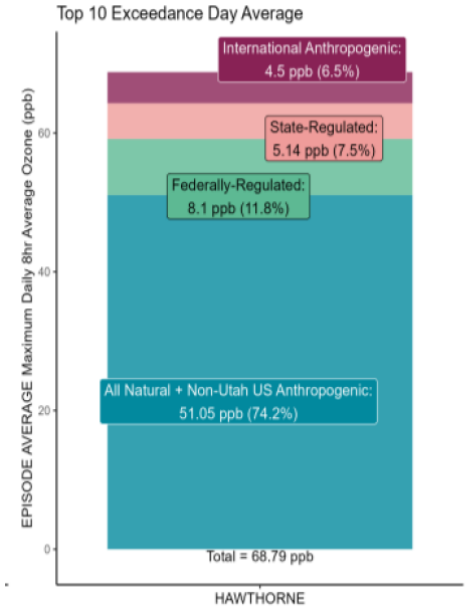

Figure 5(b). Average of UDAQ's MDA8 ozone contribution at Hawthorne over the top 10 days shown in Figure 5(a) from 4 aggregated sources/regions[6]: all global natural and non-Utah US anthropogenic (blue); all international anthropogenic (red); all Utah federally regulated (green); all Utah state-regulated (pink).

[6] From Figure 17, page 132 of main SIP document.

We conducted substantial quality assurance checks of our approach at each processing step and tested numerous possible causes. This included confirming that we could achieve identical results by extracting data from raw gridded data (rather than receptor files) and confirming that total ozone simulated by the core model at Hawthorn matched the sum of all tracers shown in Figure 4. We also extensively interacted with UDAQ staff to find possible reasons of discrepancies at each step of processing but could not identify a specific cause. Based on our substantial checks, we are certain that our results are correct.

According to our results, the "other point source" category that contains refineries contributes a total of 0.9 ppb over the top 10 simulated MDA8 ozone days. Figure 6 shows a breakout of the 0.9 ppb contribution from "other point sources" by NOx (O3N) and VOC (O3V) sensitive ozone production, and from Salt Lake County, Davis County, and other areas outside the two counties. Point sources in Salt Lake County contribute 0.30 ppb (32%) and 0.04 ppb (4%) from NOx and VOC sensitive chemistry, respectively. Point sources in Davis County contribute 0.18 ppb (19%) and 0.10 ppb (11%) from NOx and VOC sensitive chemistry, respectively. For both counties, results indicate more NOx-sensitive ozone formation from point sources. All other point sources located throughout the remainder of the 4/1.33 km modeling domains contribute 0.32 ppb (34%) and <0.01 ppb (0.4%) from NOx and VOC sensitive chemistry, respectively. The stronger NOx-sensitive response from the outside point sources makes sense as they are mostly removed from the central urbanized area of the NAA, and thus ozone formation occurs in more NOx-lean and relatively biogenic VOC-rich suburban and rural areas.

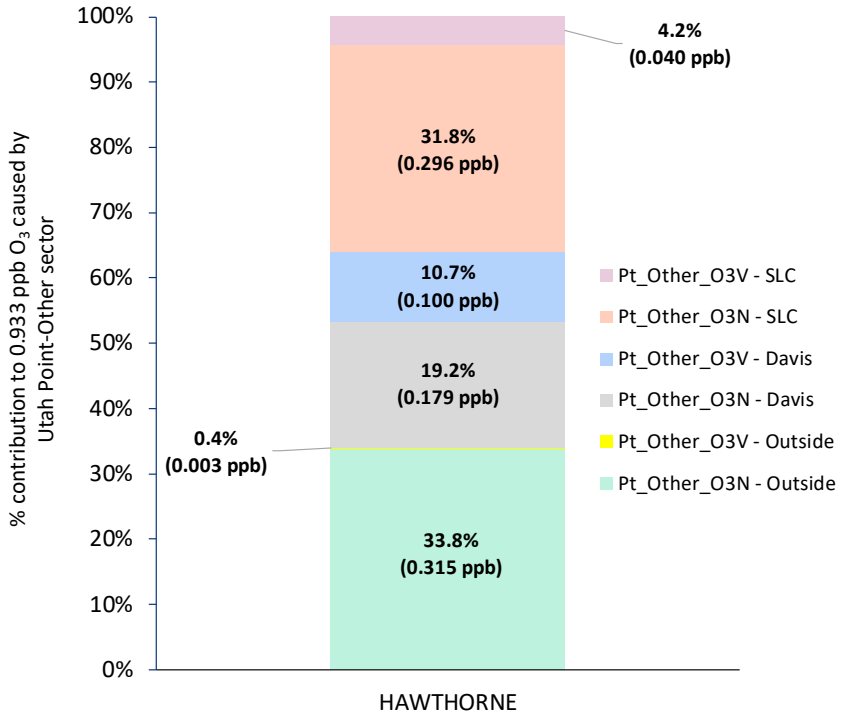

Figure 6. Average of Ramboll's processing of MDA8 ozone contribution at Hawthorne over the top 10 days shown in Figure 4(a) from 6 aggregated "other point source" tracers. Contributions are split by whether ozone was generated by NOx (O3N) or VOC (O3V) sensitivity photochemistry.

We estimated the ozone impacts from simulated refinery control measures in 2023 at Hawthorne by multiplying contributions from Figure 6 by the relative emission reductions shown in Table 1. Results are shown in Table 2. The total simulated MDA8 ozone reduction from refinery measures averaged over the highest modeled ozone days is 0.02 ppb. Conceivably this impact would be smaller if the model simulated a VOC-sensitive environment rather than NOx-sensitive, as indicated by monitoring studies.

Table 2. County-level refinery emission reductions (Table 1) applied to modeled MDA8 O3N and O3V from "other point sources" averaged over the top 10 modeled ozone days (Figure 6), resulting in total MDA8 ozone impact at Hawthorne. Estimated average ozone reductions by individual control measure at each refinery are highlighted in yellow.

Salt Lake	**NOx Reduction**	**Total O3N**	**O3N Reduction**	**VOC Reduction**	**Total O3V**	**O3V Reduction**
Tesoro	7.0%	0.30	0.021	0.9%	0.04	0.00036
Davis						
Chevron	1.3%	0.18	0.0023	0 (0%)	0.10	0
Subtotal		0.48	0.0233		0.14	0.0036
Total Ozone Reduction	0.0269 ppb (O3N reduction + O3V reduction)					

We then projected the total refinery ozone reduction estimate to the 2023 base ozone DV by scaling by the ratio of the 2023 projected DV to the mean modeled ozone over the top 10 modeled days (71.4 ppb, Figure 4(b)), in parallel to the procedure employed by the Software for Modeled Attainment Test (SMAT; EPA, 2018). We did this calculation twice with different 2023 base projected DVs: once with wildfire-flagged days not excluded by UDAQ (74 .3 ppb[7]) and once with wildfire days excluded by UDAQ (72.7 ppb[7]). Table 3 shows the projected 2023 ozone DV reductions from combining control measures from Tesoro/Marathon (NOx and VOC) and Chevron (NOx). Since the modeled highest 10-day average ozone is just slightly lower than the projected 2023 DVs in both cases, the projected total refinery ozone DV impacts from required controls are consistently 0.03 ppb.

Table 3. Projected 2023 ozone DV impact at Hawthorne from all combined refinery control measures (Table 2) on Tesoro/Marathon (NOx and VOC) and Chevron (NOx).

	All Days in DV Calculation	**Wildfire-flagged Days Removed in DV Calculation**
2023 Projected DV[5]	74.3 ppb	72.7 ppb
Relative Response Factor	1.041 (74.3/71.4)	1.018 (72.7/71.4)
2023 Projected DV RACT Impact	0.0280 ppb	0.0273 ppb

[7] Table 68, page 126, main SIP document.

References

Emery, C.E., Z. Liu, A.G. Russell, M.T. Odman, G. Yarwood, N. Kumar, 2016. Recommendations on statistics and benchmarks to assess photochemical model performance. *J. of the Air and Waste Management Assoc.*, 67/5, DOI: 10.1080/10962247.2016.1265027. https://www.tandfonline.com/doi/full/10.1080/10962247.2016.1265027.

EPA, 2018. Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM2.5, and Regional Haze (EPA 454/R-18-009, November 2018). Prepared by the U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Policy Division, Research Triangle Park, NC. https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling_Guidance-2018.pdf.

Ninneman, M., M. Mansfield, S. Lyman, L. Hu, D. Jaffe, 2023. Investigation of Ozone Formation Chemistry During the Salt Lake Regional Smoke, Ozone, and Aerosol Study (SAMOZA). Presented at the 7th Annual Science for Solutions Conference, March 30, 2023. https://byu.app.box.com/s/v2cm42e4i73s0l1fhbn1301zi6dt5gtv/file/1200206266091.

Sghiatti, M. and N. Daher, 2022. Summertime Ozone Production and its Sensitivity to NOx and VOCs in the Salt Lake Valley. Poster presentation at the 6th Annual Science for Solutions Conference, April 7, 2022. https://harbor.weber.edu/Airqualityscience/docs/conferences/AQSfS-2022/AQSfS2022Posters/sghiatti_sci_4_sol_poster_2022.pdf.