# Texas Commission on Environmental Quality
## Interoffice Memorandum

**To:** Commissioners **Date:** May 15, 2024

**Thru:** Laurie Gharis, Chief Clerk
Kelly Keel, Executive Director

**From:** Richard C. Chism, Director *RCC*
Office of Air

**Docket No.:** 2024-0784-MIS

**Subject:** Commission Approval of the 2025 Regional Haze Progress Report for the Second Planning Period

2025 Regional Haze Progress Report
Non-Rule Project No. 2024-007-OTH-NR

**Background and reason(s) for the progress report:**
Federal Clean Air Act (FCAA), §169A requires the U.S. Environmental Protection Agency (EPA) to adopt regulations to reduce visibility impairment resulting from anthropogenic air pollution in 156 mandatory Class I Federal areas (Class I areas). Big Bend and Guadalupe Mountains National Parks are the two Class I areas in Texas. The commission adopted the 2021 Regional Haze State Implementation Plan (SIP) Revision for the Second Planning Period (2021 Plan) on June 30, 2021 (2019-112-SIP-NR), which established reasonable progress goals (RPG) for each Class I area in Texas and any Class I area outside Texas that may be affected by emissions from within Texas; the 2021 Plan encompassed the decade from 2019 through 2028. The 2021 Plan found that both Big Bend and Guadalupe Mountains National Parks are projected to be below the adjusted glidepath at the end of the second planning period, and through the required control analyses, the commission determined that no new emission control measures are needed for the second regional haze planning period. EPA has not taken any action on the 2021 Plan.

As provided in 40 Code of Federal Regulations (CFR) §51.308(g), states must submit a report to EPA describing the progress made toward the RPGs established in the state's 2021 Plan by January 31, 2025. This progress report is not required to be submitted as a SIP revision.

**Scope of the progress report:**
Information contained in this progress report for the second planning period assesses the status of the RPGs adopted in the 2021 Plan.

**A.) Summary of what the progress report will do:**
This progress report addresses the regional haze requirements of FCAA, §169A for Big Bend and Guadalupe Mountains National Parks and Class I areas located outside of Texas that may be affected by emissions from Texas. This progress report contains the core federal Regional Haze Rule (40 Code of Federal Regulations (CFR) §51.308) requirements, including: the status of the state's implementation of all measures included in the 2021 plan for achieving RPGs; a summary of the emissions reductions achieved; an analysis tracking the changes since the previous regional haze plan; assessment of significant changes in anthropogenic emissions; and a determination of the adequacy of the current implementation plan elements and strategies and a declaration to EPA that a state implementation plan (SIP) revision is or is not needed. In accordance with 40 CFR §51.308(i), the commission must provide Federal Land Managers (FLM) an opportunity for consultation on the draft progress report no less than 60 days prior to the public comment period. The progress report submitted to EPA must include a description of how any FLM comments were addressed. The draft progress report will be made available for public inspection and comment for a 30-day period prior to submittal to EPA.

Re: Docket No. 2024-0784-MIS

**B.) Scope required by federal regulations or state statutes:**
This progress report addresses the regional haze requirements of FCAA, §169A and the federal progress report requirements in 40 CFR §51.308.

**C.) Additional staff recommendations that are not required by federal rule or state statute:**
None.

**Statutory authority:**
The authority to adopt progress report is derived from the Texas Water Code (TWC), §5.102, General Powers, and TWC, §5.105, General Policy, which provide the commission with the general powers to carry out its duties under the TWC; and TWC, §5.013, General Jurisdiction of Commission, which states the commission's authority over various statutory programs. This progress report is also adopted under Texas Health & Safety Code (THSC), §382.002, Policy and Purpose, which establishes the commission's purpose to safeguard the state's air resources consistent with the protection of public health, general welfare, and physical property; THSC, §382.011, General Powers and Duties, which authorizes the commission to control the quality of the state's air; and THSC, §382.012, State Air Control Plan, which authorizes the commission to develop a general, comprehensive plan for the control of the state's air.

**Effect on the:**

**A.) Regulated community:**
None.

**B.) Public:**
The general public throughout the state may benefit from Texas reaching the goal of natural conditions. Visitors to Big Bend and Guadalupe Mountains National Parks may benefit from more distant scenic views.

**C.) Agency programs:**
No additional burden on agency programs is anticipated as a result of this progress report.

**Stakeholder meetings:**
TCEQ will provide the opportunity for a 60-day consultation period with FLMs concerning the draft progress report, which is scheduled to begin May 28, 2024. The opportunity for FLM consultation will be followed by a 30-day opportunity for the public to review and comment on the draft progress report.

**Public Involvement Plan**
Yes.

**Alternative Language Requirements**
Yes. Spanish.

**Will this progress report affect any current policies or require development of new policies?**
No.

**What are the consequences if this progress report does not go forward? Are there alternatives to progress report?**
TCEQ could choose not to comply with the requirements to develop and submit this progress report to EPA by the required January 31, 2025 deadline. However, if a regional haze progress

report is not submitted to EPA, it could impose sanctions, including loss of highway funding, as a result of a failure to submit the progress report; however, sanctions are not mandatory.

**Key points in the progress report schedule:**

**FLM Consultation:** May 28, 2024 through July 29, 2024
**Public Comment Period:** August 2, 2024 through September 3, 2024
**Anticipated agenda date:** December 18, 2024
**EPA due date:** January 31, 2025

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2025 REGIONAL HAZE PROGRESS REPORT FOR THE SECOND PLANNING PERIOD


TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
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**2025 REGIONAL HAZE PROGRESS REPORT**

PROJECT NUMBER 2024-007-OTH-NR

Adoption
December 18, 2024

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## EXECUTIVE SUMMARY

The federal Clean Air Act (FCAA), §169A requires the U.S. Environmental Protection Agency (EPA) to adopt regulations to reduce visibility impairment resulting from anthropogenic air pollution in 156 mandatory Class I Federal areas (Class I areas). Big Bend and Guadalupe Mountains National Parks are the two Class I areas in Texas. States are required to submit periodic plans demonstrating how they made, and will continue to make, progress towards achieving their visibility improvement goals. On June 30, 2021, the Texas Commission on Environmental Quality (TCEQ) adopted the 2021 Regional Haze State Implementation Plan (SIP) Revision for the Second Planning Period (2021 Plan) (Project No. 2019-112-SIP-NR), which examined measures to reduce Texas' visibility impacts in Class I areas in and around Texas. That SIP revision was submitted to EPA on July 20, 2021, but no action has been proposed or finalized concerning its approval.

As provided in 40 Code of Federal Regulations (CFR) §51.308(g), Texas must submit a report describing the progress made toward the reasonable progress goals established in the state's 2021 Plan by January 31, 2025. Information contained in this 2025 progress report for the second planning period assesses the status of the reasonable progress goals adopted in the 2021 Plan.

Texas' Class I areas, and Class I areas in other states that may potentially be impacted by Texas' emissions, continue to make reasonable progress towards the goal of natural visibility conditions. In addition to nitrogen oxides ($NO_X$) emissions reductions from energy efficiency and renewable energy efforts, this progress report documents an overall trend of $NO_X$, sulfur dioxide ($SO_2$), and volatile organic compounds (VOC) emissions reductions of 68,685 tons per year (tpy) between 2017, the latest national emissions inventory (NEI) year included in the 2021 Plan, and 2020, the latest NEI currently available. Since the 2023 NEI is due in January 2025 for the point source and mobile source emissions inventories (EI) and in March 2025 for the area source EI, 2020 is the most recent NEI year at the time of this progress report. The 2021 Plan identified $NO_X$ and $SO_2$ emissions as the anthropogenic emissions that primarily affect visibility in Class I areas in Texas and neighboring states, and collectively those emissions decreased by 305,072 tpy between 2017 and 2020. Texas considers these net emissions reductions and the large reductions in the emissions with the greatest impact on visibility will provide for continued visibility improvement in Class I areas in Texas and for Class I areas outside the state that may be impacted by Texas sources.

To address 40 CFR §51.308(h) requirements, Texas declares that no revision to its second planning period regional haze SIP, the 2021 Plan, is required. This progress report also documents consultation with and receipt of comments from Federal Land Managers in accordance with 40 CFR §51.308(i) requirements.

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| | |
|---|---|
| AEDT | Aviation Environmental Design Tool |
| AERR | Air Emissions Reporting Requirements |
| APU | auxiliary power unit |
| CAMD | Clean Air Markets Division |
| CEER | Center for Energy and Environmental Resources at University of Texas |
| CenSARA | Central States Air Resource Agencies |
| CFR | Code of Federal Regulations |
| CMV | commercial marine vessel |
| CO | carbon monoxide |
| CSAPR | Cross-State Air Pollution Rule |
| DERI | Diesel Emissions Reduction Incentive |
| DFW | Dallas-Fort Worth |
| dv | deciview |
| EE | energy efficiency |
| EGU | electric generating unit |
| EI | emissions inventory |
| EIA | United States Energy Information Administration |
| EPA | United States Environmental Protection Agency |
| ERCOT | Electric Reliability Council of Texas |
| ERG | Eastern Research Group, Inc. |
| ESL | Energy Systems Laboratory at Texas A&M University |
| FAA | Federal Aviation Administration |
| FCAA | Federal Clean Air Act |
| FLM | Federal Land Manager |
| FR | *Federal Register* |
| FS | United States Forest Service |
| FWS | United States Fish and Wildlife Service |
| FY | fiscal year |
| GSE | ground support equipment |
| GW | gigawatts |
| HB | House Bill |
| HGB | Houston-Galveston-Brazoria |
| IMPROVE | Interagency Monitoring of Protected Visual Environments |
| LTS | long-term strategy |
| MMBtu | one million British thermal units |
| MOVES | Motor Vehicle Emissions Simulator |
| MW | megawatt |
| MWh/yr | megawatt-hour/year |

| | |
|---|---|
| NAAQS | National Ambient Air Quality Standard |
| NASA | National Aeronautics and Space Administration |
| NEI | National Emissions Inventory |
| $NH_3$ | ammonia |
| $NO_2$ | nitrogen dioxide |
| non-EGU | non-electrical generating unit |
| $NO_X$ | nitrogen oxides |
| NPS | National Park Service |
| PM | particulate matter |
| $PM_{10}$ | particulate matter with aerodynamic diameters less than 10 microns |
| $PM_{2.5}$ | particulate matter with aerodynamic diameters less than 2.5 microns |
| ppm | parts per million |
| RE | renewable energy |
| RH | Regional Haze |
| SB | Senate Bill |
| SECO | State Energy Conservation Office |
| SEIA | Solar Energy Industries Association |
| SIP | state implementation plan |
| $SO_2$ | sulfur dioxide |
| TAC | Texas Administrative Code |
| TCEQ | Texas Commission on Environmental Quality |
| TDM | travel demand model |
| TERP | Texas Emissions Reduction Plan |
| TexN | Texas NONROAD model |
| THSC | Texas Health and Safety Code |
| tpy | tons per year |
| TTI | Texas Transportation Institute |
| U.S. | United States |
| VMT | vehicle miles traveled |
| VOC | volatile organic compounds |

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# REGIONAL HAZE PROGRESS REPORT

## 1. INTRODUCTION

Section 169A of the federal Clean Air Act (FCAA) "declares as a national goal the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I Federal areas which impairment results from manmade air pollution." Mandatory Class I Federal areas (Class I areas) consist of national parks greater than 6,000 acres, wilderness areas and national memorial parks greater than 5,000 acres, and international parks, all of which were in existence as of August 7, 1977. Visibility was found to be an important value at 156 of these areas.

The FCAA directed the U.S. Environmental Protection Agency (EPA) to promulgate regulations aimed at meeting the goals of Section 169A. To this end, EPA originally finalized the Regional Haze Rule in 1999. The Regional Haze Rule was amended and revised in 2005 and 2017 and is codified under 40 Code of Federal Regulations (CFR) §§51.300 - 309. The overarching goal of the Regional Haze Rule is to achieve natural visibility conditions at Class I areas until natural conditions are reached. The Regional Haze Rule requires states to submit two types of regional haze planning documents: regional haze state implementation plan (SIP) revisions, each of which covers a 10-year planning period; and progress reports, which are typically submitted at the mid-point of each planning period. Regional haze SIP revisions must include the core federal Regional Haze Rule requirements, including calculations of baseline; current and natural visibility conditions; progress-to-date and the uniform rate of progress; a long-term strategy for regional haze; reasonable progress goals; a monitoring strategy; and a statewide emissions inventory (40 CFR §51.308). Regional haze SIP revisions are also required to serve as periodic progress reports and to meet 40 CFR §51.308(g)(1-5) requirements concerning the periodic reporting of progress toward a state's reasonable progress goals. Regional haze progress reports are required to assess a state's progress towards the reasonable progress goals included in its periodic regional haze SIP submittals.

The Texas Commission on Environmental Quality (TCEQ) adopted the 2021 Regional Haze State Implementation Plan Revision for the Second Planning Period (2021 Plan) (Non-Rule Project No. 2019-112-SIP-NR) on June 30, 2021, and submitted it to EPA on July 20, 2021. No action has been proposed or finalized by EPA concerning its approval.

This regional haze progress report assesses Texas' progress toward meeting its goals for the 2021 Plan, covering 2019 to 2028. This report addresses the following provisions in 40 CFR §51.308(g):

- reporting on the implementation status of measures included in the 2021 Plan (§51.308(g)(1));
- summarizing the emissions reductions achieved through implementation of measures included in the 2021 Plan (§51.308(g)(2));
- assessing the visibility conditions and changes since the period assessed in the 2021 Plan (§51.308(g)(3));
- analyzing the emissions of pollutants contributing to visibility impairment since the period assessed in the 2021 Plan (§51.308(g)(4));

- evaluating any changes in anthropogenic emissions that have occurred since the evaluation in the 2021 Plan (§51.308(g)(5)); and
- an assessment of whether the elements and strategies in the 2021 Plan enable Texas, or any other state with a mandatory Class I Federal area affected by emissions from Texas, to meet the reasonable progress goals for the period covered by the 2021 Plan (§51.308(g)(6)).

TCEQ determined that §51.308(g)(7) and §51.308(g)(8) were not applicable for this progress report as no changes were made to the visibility monitoring strategy ((g)(7)) or Texas' smoke program ((g)(8)) for this period.

Based on the required assessment, Texas affirms that the 2021 Plan remains adequate for making reasonable progress towards achieving natural visibility conditions at Class I areas as required by the federal Regional Haze Rule. This affirmation is intended to address 40 CFR §51.308(h) requirements.

## 2. STATUS OF IMPLEMENTED MEASURES

Title 40 CFR §51.308(g)(1) requires that states describe "the status of implementation of all measures included in the implementation plan for achieving reasonable progress goals for mandatory Class I Federal areas both within and outside the state." Control measures were adopted into Texas' long-term strategy (LTS) as permanent and enforceable measures. Those measures and their original implementation are described in detail in Chapter 7: *Long-Term Strategy to Establish Reasonable Progress Goals* of Texas' 2021 Plan. The air pollution control programs included in the 2021 Plan remain fully implemented, and updates for specific programs and measures are provided in this section.

This section also discusses additional measures that may further reduce visibility impairing pollution at Class I areas in and outside of Texas. Any estimated past emission reductions provided for voluntary measures included in this section are for informational purposes and do not represent any commitment by Texas toward future reductions.

### 2.1. Federal Measures

Several ongoing federal programs are expected to achieve reductions in nitrogen oxides ($NO_x$), sulfur dioxide ($SO_2$), and particulate matter (PM) emissions. These programs were discussed in Section 7.4: *Federal Programs that Reduce Stationary Source Emissions* and Section 7.5: *Federal Programs that Reduce Mobile Source Emissions* in the 2021 Plan. The commission has no updates to that discussion at this time.

### 2.2. State Measures Updated

#### 2.2.1. $NO_x$ Controls

Since the 2021 Plan, Texas revised rules in 30 Texas Administrative Code (TAC) Chapter 117: *Control of Air Pollution from Nitrogen Oxides*. On March 7, 2020, TCEQ adopted revisions to the SIP and an associated rulemaking to address EPA's reclassification to serious for the 2008 Eight-Hour Dallas-Fort Worth Ozone Nonattainment Area (DFW area) (Project Nos. 2019-078-SIP-NR and 2019-074-117-AI). The SIP revision and associated rulemaking included revisions to 30 TAC Chapter 117

to implement reasonably available control technology for $NO_X$ requirements for Wise County. Annual $NO_X$ emissions reductions were estimated to equal approximately 91 tons. The rule revisions included new pollutant standards for heaters, reciprocating engines, and gas turbines located at major stationary sources of $NO_X$ in Wise County. TCEQ also adopted previous rule revisions to address $NO_X$ emissions in the DFW and Houston-Galveston-Brazoria ozone nonattainment areas as part of earlier revisions to the SIP to address ozone nonattainment due to either earlier ozone National Ambient Air Quality Standard (NAAQS), previous less stringent nonattainment classifications, or both. These state rule requirements for control of $NO_X$ emissions from both major and minor stationary sources of $NO_X$ assisted in the reduction of and continued control of $NO_X$ emissions from affected sources.

## 2.3. Additional Measures

### 2.3.1. Texas Emissions Reduction Plan (TERP)

Texas' 2021 Plan included *Texas Emissions Reduction Plan Biennial Report to the 87th Texas Legislature*, 2019 through 2020. This 2025 progress report includes the most recent updates, with details provided in Appendix C: *Texas Emissions Reduction Plan Biennial Report to the 88th Texas Legislature, 2021 through 2022*.

Total revenue deposited to the TERP Trust during fiscal year (FY) 2022 through the 2023 biennium exceeded $526 million. More than $341 million was available for TERP programs and administration after the statutorily required transfer of no less than 35% of the fund to the Texas Highway Fund for the Texas Department of Transportation (TxDOT) to implement congestion mitigation projects. TxDOT utilized TERP funds to support six projects in Texas NAAQS nonattainment areas, including freeway expansion, overpass installation, ramp revisions, and other intersection and roadway improvements meant to reduce traffic and idling emissions.

Since 2001, the Texas Legislature has funded and expanded the TERP programs. The TERP Trust became active in FY 2022 to allow all TERP revenue received each fiscal biennium to be used for TERP programs and administration, with a percentage allocated for congestion mitigation projects implemented by TxDOT.

TERP programs are voluntary and may improve visibility as either an existing $NO_X$ emission reduction or any activity that is expected to further reduce $NO_X$, $SO_2$, or PM levels in NAAQS nonattainment areas. The Texas Clean School Bus program, also funded under TERP, helps reduce diesel exhaust, which contains PM, and is available in all 254 counties in Texas (TCEQ, 2024).

TERP programs continue to provide significant incentives encouraging the build-out of alternative fueling facilities in Texas, as electric and other alternative technologies expand in the state's private and commercial transportation sectors.

Finally, TERP funding for electricity storage, oil and gas emissions reductions, and other stationary source emissions reductions continues to encourage innovation that can enhance the state's electric and energy markets. TERP continues to support emissions reductions that could improve visibility in Texas and in other states potentially impacted by Texas (TCEQ, 2022).

As discussed in Appendix D: *TERP Annual Report, December 2023* for FY 2022 through FY 2023, the Texas Diesel Emissions Reduction Incentive (DERI) program awarded $210,369,242, with a projected $NO_x$ reduction of 4,994 tons (TCEQ, 2023).

From 2001 until 2019, TERP has estimated to have reduced $NO_x$ emissions by over 189,000 tons and invested over $1.4 billion in reducing emissions in Texas (TCEQ, 2023).

### 2.3.2. Foreign Emissions and Exceptional Events Research

In 2017, the 85th Texas Legislature amended Texas Health and Safety Code (THSC) Chapter 386 to allow grants for research on the impact of foreign emissions and exceptional air quality events using TERP funds. TCEQ anticipates research regarding international emissions and wildfires may help the state understand visibility issues in the two Texas Class I areas.

Ten research projects, totaling $2,185,000, were funded in FY 2022 and focused on:

- supporting an FCAA, §179B demonstration showing that El Paso is impacted by international emissions;
- monitoring studies of chemical tracers for wildfires, biomass burning, and international emissions;
- developing smoke tracking algorithms and stratospheric ozone intrusion tools using satellite imagery;
- refining the emissions inventories of wildfires and Mexican electric generating units (EGU); and
- improving the understanding and modeling of meteorological and chemical conditions that may be influenced by biomass burning and/or foreign emissions.

Funding in FY 2023 expanded on these research projects.

### 2.3.3. State Research Programs

The State of Texas Air Quality Research Program (AQRP) is administered by the University of Texas at Austin and is funded by TCEQ through TERP, which funds emission reduction projects in communities throughout Texas. In order to ensure that these emission reductions are as effective as possible in improving air quality, a fraction of TERP funding is used to improve scientific understanding of how emissions impact air quality in Texas. Texas air quality research priorities for the 2024 through 2025 biennium address additional research needs, which involve collection and analysis of field measurements, improvements to photochemical models, and improvements to emissions inventories. These research needs, the associated data collection, and model improvements may be addressed through multiple funding mechanisms. The next biennial funding cycle is approximately $1.25 million (Center for Energy and Environmental Resources (CEER), 2024). More information on AQRP and

the research it funds is available at the Air Quality Research Program website (https://aqrp.ceer.utexas.edu/).

### 2.3.4. TERP Legislative Update

In 2019, the 86th Texas Legislature passed House Bill (HB) 3745, which amended THSC §386 and allowed grants for research on the impact of foreign emissions and exceptional air quality events using TERP funds. Texas can use up to $2.5 million from TERP per year to fund research and other activities associated with making demonstrations to EPA, beginning in FY 2022.

In 2021, the 87th Texas Legislature, Regular Session, passed HB 4472, which amended THSC to:

- direct TCEQ to transfer no less than 35% of the TERP Trust Fund revenue to the state highway fund for TxDOT to administer congestion mitigation projects;
- require TxDOT to report emissions reductions and other information related to congestion mitigation projects to TCEQ;
- set the minimum percentage of annual hours of operation required for TERP-funded marine vessels or engines at 55% under the DERI program;
- add new technology projects that reduce flaring emissions and other site emissions to the list of projects to which TCEQ shall give preference when awarding grants; and
- allow New Technology Implementation Grant (NTIG) projects to fund the lease of necessary equipment and the costs for operating and maintaining the grant-funded system.

In September 2023, the 88th Texas Legislature, Regular Session, amended the TERP Trust Fund through HB 4885. House Bill 4885 revised certain allocation amounts of the TERP Trust, created a new Texas Hydrogen Infrastructure, Vehicles, and Equipment Program, and expanded NTIG's list of eligible oil and gas emissions reduction projects. All changes made by HB 4885 will be implemented in FY 2024 through FY 2025.

### 2.3.5. Energy-Efficiency Programs and Renewable Energy Measures

Energy efficiency programs through the State Energy Conservation Office (SECO) and multiple Texas state agencies working under Senate Bill (SB) 5 (77th Texas Legislature) and SB 7 (76th Texas Legislature) have reduced $NO_x$ emissions statewide. Those reductions allow TCEQ to consider the combined savings for planning purposes. Table 1: *Annual Electricity Savings in 2022* and Table 2: *Annual $NO_x$ Emissions Reductions (Calendar Year 2021 and 2022)* show the amount of energy saved in megawatt-hour/year (MWh/yr) and the amount of $NO_x$ emissions reduced in tons per year (tpy) for 2021 and 2022. The year 2018 was used for the baseline year to estimate emissions. These programs were calculated using estimated emissions factors for 2018 from EPA's eGRID database, which was specially prepared for this purpose. More details concerning this analysis are available in Appendix E: *Energy Efficiency/Renewable Energy Impact in the Texas Emissions Reduction Plan*, which was published in 2023 and is the most recent Energy Systems Laboratory (ESL) at Texas A&M University (TAMU) document available publicly (ESL TAMU, 2023).

In 2022, the integrated total electricity savings from all programs amounted to:

- an annual electricity savings of 60,176,008 MWh/year (Table 1), and
- an ozone season period electricity savings of 265,172 MWh/day, which would be 11,049 MW average hourly load reduction during the ozone season period (145.12 tons-$NO_x$/day).

By 2027, the integrated total electricity savings from all programs are forecasted to be:

- an annual electricity savings of 373,481,128 MWh/year (211,074 tons-$NO_x$/year), and
- an ozone season period electricity savings of 1,404,310 MWh/day, which would be equivalent to 58,513 MW average hourly load reduction during the ozone season period (748.83 tons-$NO_x$/day). (ESL TAMU, 2023).

**Table 1: Annual Electricity Savings in 2022**

| Program | 2022 (MWh/year) | Percent of Total Electricity Savings |
|---|---|---|
| Savings from code-compliant residential and commercial construction | 857,526 | 1.4% |
| Energy Efficiency (EE), savings from SB 7 program | 510,991 | 0.8% |
| EE in Institutions of Higher Education and Certain Government Entities, savings from SB 5 program | 1,140,211 | 1.9% |
| Electricity savings from renewable power generation | 56,941,742 | 94.6% |
| Savings from residential air conditioner retrofits | 725,539 | 1.2% |
| **Total Integrated Annual Savings** | **60,176,008** | **99.9%** |

Source: ESL TAMU, 2023

**Table 2: Annual $NO_x$ Emissions Reductions (Calendar Year 2021 and 2022)**

| Program | 2021 tons of $NO_x$ | 2022 tons of $NO_x$ |
|---|---|---|
| Texas Building Energy Performance Standards | 225 | 355 |
| Goal for EE, SB 7 | 141 | 188 |
| EE Programs in Institutions of Higher Education and Certain Government Entities, SB 5 | 341 | 493 |
| Renewable Generation - Wind (ERCOT) | 22,385 | 32,816 |
| Residential Air Conditioner Retrofits | 183 | 290 |
| **Total Integrated Annual $NO_x$ Emissions Reductions** | **23,275** | **34,142** |

Source: ESL TAMU, 2023

### 2.3.6. Renewable Energy

*Solar*

According to Solar Energy Industries Association (SEIA), Texas had 22,872 MW of solar capacity installed in the fourth quarter of 2023, which was enough solar to power more than 2,677,486 homes. In the next five years, solar is projected to grow to 40,913 MW. In 2023, solar made up about 5.8% of the state's electricity generation. Texas is poised to become a national leader in solar energy, with more than four gigawatts (GW) of capacity expected to be installed over the next five years (SEIA, 2024). According to the Energy Information Administration (EIA), Texas was the nation's second-largest solar power producer behind California in 2022. Almost $5 billion was invested in Texas solar in 2022. Table 3: *Largest Solar Electric Generating Plants in Texas by Capacity, 2023* shows some of the utility-sized solar plants that were not included in the 2021 Plan (EIA, 2024).

**Table 3: Largest Solar Electric Generating Plants in Texas by Capacity, 2023**

| Facility | County | Capacity (MW) | In-Service Date |
|---|---|---|---|
| Eunice Solar | Andrews | 427 | September 2021 |
| Prospero Solar | Andrews | 300 | June 2020 |
| Noble Solar | Denton | 279 | September 2022 |
| Titan Solar | Culberson | 270 | November 2021 |
| Taygete Solar | Pecos | 255 | June 2021 |
| Greasewood Solar | Pecos | 255 | February 2021 |
| Phoebe Solar | Winkler | 250 | November 2019 |
| Prospero Solar II | Andrews | 250 | September 2021 |
| Galloway Solar | Concho | 250 | October 2021 |
| Misae Solar | Childress | 241 | December 2021 |

Federal and state incentives helped facilitate significant growth in utility-scale solar power in Texas, helping to spur investment in renewable energy. Federal incentives such as the Investment Tax Credit provide a direct credit that covers a portion of investment costs for a solar project that has helped advance the energy source. The 2022 federal Inflation Reduction Act extended the Investment Tax Credit for the next 10 years. According to the Federal Reserve Bank of Dallas, the Investment Tax Credit can help to create decreases in the cost of new solar projects while also increasing solar cost competitiveness in relation to other power generation types (Texas Comptroller, 2023).

*Wind*

According to EIA in 2022, Texas generated 26% of all U.S. wind-sourced electricity, leading the nation for the 17th year in a row. Wind power surpassed the state's nuclear generation for the first time in 2014 and exceeded coal-fired generation for the first time in 2020. Per EIA in the fourth quarter report in 2023, wind capacity in Texas was 41,577 MW (EIA, 2024).

In 2005, the Texas Legislature directed the Public Utility Commission of Texas to establish Competitive Renewable Energy Zones (CREZ) to facilitate the construction of transmission lines from areas where wind energy was generated to other, population dense areas of the state. The project, completed in 2013, built a network that included

approximately 3,500 miles of high-voltage transmission lines capable of carrying 18,500 MW of wind power to population centers in central, north, and east Texas. Today, CREZ lines serve as an example of how private investments in infrastructure can spur further energy development for the benefit of consumers, who are estimated to have saved $31.5 billion on wholesale power prices between 2010 and 2022 due to the inclusion of low-cost renewable energy (Texas Comptroller, 2023).

### 2.3.7. Utility Electric Power Generating Sources

As discussed in Section 7.6.3.8: *Potential Effects of Economically Driven Coal Burning Power Plant Closures* of the 2021 Plan, certain utility electric power generating sites were expected to either shutdown and cease operations or cease operations of a specific fuel type and transition to another fuel while continuing to operate and produce electric power. Information available from the EIA, EPA, TCEQ air permits, and the Public Utility Commission of Texas was used to confirm if a site shut down, if a site continued with its plan to convert to another fuel, or if a site executed a different plan from what was described in the 2021 Plan. Updates on these sources are provided in Table 4: *Update on Texas EGUs with Announced Closure or Conversions.*

**Table 4: Update on Texas EGUs with Announced Closure or Conversions**

| Plant | Closure Year in 2021 Plan | Coal Operations Ending Year in 2021 Plan | Update |
|---|---|---|---|
| Texas Municipal Power Agency (TMPA) Gibbons Creek | Not included in 2021 Plan | Not included in 2021 Plan | Ceased coal-fueled electrical generation operations in October 2018 and imploded power plant equipment on October 15, 2019.[1] TMPA officially retired the plant on October 23, 2019 according to Electric Reliability Council of Texas (ERCOT) and company correspondence.[2] Estimated annual average $NO_x$ and $SO_2$ shutdown reductions are 1,526 tpy and 367 tpy, respectively, based on five-year annual average emissions from 2013 through 2017. |

[1] https://www.kbtx.com/2021/10/15/gibbons-creek-power-plant-imploded-friday-morning/
[2] Letter from Bob Kahn, TMPA to Erin Chancellor, TCEQ, August 23, 2021

| Plant | Closure Year in 2021 Plan | Coal Operations Ending Year in 2021 Plan | Update |
|---|---|---|---|
| Oklaunion Power Station, Wilbarger County | 2020 | | Ceased operations of coal-fueled generation and transitioned to only natural gas to produce electric power due to a utility boiler retrofit authorized by New Source Review Permit 9015 and Prevention of Significant Deterioration Permit TX325M3 in July 2023. Change in ownership for site with plans to construct and operate a new hydrogen production facility with wind and solar power generation. Estimated $SO_2$ reductions are 1,430 tpy based on five-year annual average from 2016 through 2020 and new limit based on natural gas. |
| H.W. Pirkey Power Plant, Harrison County | 2023 | | Ceased operations in 2023 based on information from American Electric Power (AEP).[3] Estimated $SO_2$ reductions are 1,922 tpy based on five-year annual average from 2019 through 2023. |
| Coleto Creek Power Station, Goliad County | 2027 | | Planned retirement in 2027 based on information from EIA.[4] |
| Harrington Station Power Plant, Potter County | | 2025 | Scheduled to transition from coal-fueled generation to natural gas by January 2025 based on information from the site owner/operator, Xcel, and according to an agreed order between TCEQ and Xcel (Project No. 2020-046-OTH-NR).[5] |
| Welsh Power Plant, Titus County | | 2028 | Scheduled to cease coal-fueled generation in 2028 based on information from the site owner/operator, Southwestern Electric Power Co., an AEP company.[6] |

### 2.3.8. $SO_2$ Nonattainment Area SIP Revisions

Section 7.6.3.9: *$SO_2$ Nonattainment Area SIP Revisions* of the 2021 Plan included a discussion of SIP revisions that were being developed to demonstrate attainment and maintenance for the state's six 2010 $SO_2$ NAAQS nonattainment areas. The following is a description of the status of those SIP revisions and associated control plans, which have already resulted in $SO_2$ emissions reductions or will result in $SO_2$ emissions

[3] https://aepcommunitytransition.com/closures/pirkey/
[4] https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_6_06
[5] https://www.xcelenergy.com/staticfiles/xe-responsive/Energy%20Portfolio/Natural%20Gas/Projects/ProjectSchedule-Board-Xcel.pdf
[6] https://www.swepco.com/company/news/view?releaseID=5847

reductions when compliance with associated control plans is complete. While the $SO_2$ emissions reductions resulting from these SIP revisions are not necessary to demonstrate reasonable progress for the second planning period, they could result in marginal visibility improvement at Class I areas in and outside of Texas.

On February 9, 2022, TCEQ adopted the Rusk-Panola Attainment Demonstration SIP Revision for the 2010 $SO_2$ NAAQS and an associated Agreed Order with Luminant Generation Company, LLC to support attainment and maintenance of the 2010 $SO_2$ NAAQS in those portions of Rusk and Panola Counties designated as nonattainment for the 2010 $SO_2$ NAAQS (Project Nos. 2020-057-SIP-NR and 2021-013-OTH-NR). The agreed order contains requirements to ensure that, for the Martin Lake Steam Electric Station, the company will comply with the 2010 $SO_2$ NAAQS as expeditiously as practicable. The requirements include fuel and unit firing rate limitations and $SO_2$ emission limitations on a pound/hour and on a pound/one million British thermal units basis for three EGUs. Using the EPA's Clean Air Markets Division (CAMD) for reported annual $SO_2$ emissions for years 2019 through 2023, the five-year annual average for all three units combined is 11,327 tpy. Pursuant to the agreed order, the three units are limited to approximately 1,363 tpy, resulting in an approximate combined annual reduction of $SO_2$ emissions of 9,960 tons. The Rusk-Panola attainment demonstration and associated agreed order were submitted to EPA for consideration on February 28, 2022, and EPA has not yet acted on them.

On February 23, 2022, TCEQ adopted a redesignation request and maintenance plan SIP revision for the Freestone-Anderson and Titus 2010 $SO_2$ NAAQS nonattainment areas (Project No. 2021-007-SIP-NR). These areas contained the Big Brown Steam Electric Station and the Monticello Steam Electric Station, respectively, both of which are now shut down. Using reported annual emissions from the EPA's CAMD for years 2016 through 2018 for Big Brown, the three-year annual average for both units combined was 16,127 tpy. Using EPA's CAMD for years 2016 through 2017 for Monticello, the two-year annual average for all three units combined was 9,061 tpy. As a result of both sites being shut down, anticipated $SO_2$ emissions reductions, when using historical annual averages, can be up to approximately 25,000 tpy, if not greater, since the sources operated below their respective authorized limits. Big Brown did not report emissions after 2018, and Monticello did not report emissions after 2017. For all three sites discussed above, actual reductions are expected to be greater because averages were used for this report. The redesignation request and maintenance plans SIP revision was submitted to EPA for consideration on March 3, 2022, and EPA has not yet acted on it.

On October 5, 2022, TCEQ adopted revisions to the SIP to address the 2010 $SO_2$ NAAQS for portions of Howard, Hutchinson, and Navarro Counties (Project Nos. 2021-010-SIP-NR, 2021-011-SIP-NR, and 2021-012-SIP-NR). TCEQ also adopted rule revisions to 30 TAC Chapter 112: *Control of Air Pollution from Sulfur Compounds* to establish $SO_2$ control measures for the three nonattainment areas, with a compliance deadline of January 1, 2025 for affected sources (Project No. 2021-035-112-AI). The rules added to Chapter 112 address new pollutant standards for flares, incinerators, fluid catalytic cracking units, and sulfur recovery and processing units at refineries and chemical plants; flares and production and processing units at carbon black manufacturing sites, including tail-gas cleanup; flares and incinerators at gas processing plants; and a

lightweight aggregate kiln. The SIP revisions and associated rulemaking were submitted to EPA on October 24, 2022, and EPA has not yet acted on them.

## 3. EMISSIONS REDUCTIONS ACHIEVED

The Regional Haze Rule §51.308(g)(2) requires "[a] summary of the emissions reductions achieved throughout the state through the implementation of the measures described in paragraph (g)(1) of this section." The measures discussed in Section 2 of this progress report have or are expected to achieve emissions reductions to help meet the reasonable progress goals adopted in the 2021 Plan.

## 4. VISIBILITY CONDITIONS AND CHANGES

According to the Regional Haze Rule §51.308(g)(3), states with Class I areas must assess the visibility conditions and changes described in items i through iii, as listed below.

i. Current visibility conditions
ii. The difference between current conditions and baseline conditions
iii. The change in visibility impairment over the period since the period addressed in the most recent plan required under §51.308(f)

These conditions are expressed in terms of five-year averages of the annual haze index values, in deciviews (dv), for the 20% most impaired and clearest days. The applicable period to assess for current conditions is the most recent five-year period available six months preceding the required date of the progress report. Based on this criterion, the most recent five-year period for this progress report submittal is 2018 through 2022.

To satisfy items i and ii for Texas, current conditions, baseline conditions, and the difference between the two are shown in:

- Table 5: *Baseline and Current Conditions for Texas Class I Areas, 20% Most Impaired Days (in deciviews)*, and
- Table 6: *Baseline and Current Conditions for Texas Class I Areas, 20% Clearest Days (in deciviews).*

For item iii for Texas, current conditions and the conditions assessed in the 2021 Plan for the second planning period are shown in:

- Table 7: *Most Recent Plan and Current Conditions for Texas Class I Areas, 20% Most Impaired Days (in deciviews),* and
- Table 8: *Most Recent Plan and Current Conditions for Texas Class I Areas, 20% Clearest Days (in deciviews).*

Similarly, to satisfy items i and ii for Class I areas potentially affected by Texas emissions, current conditions, baseline conditions, and the difference between the two are shown in:

- Tables 9: *Baseline and Current Conditions for Class I Areas Potentially Affected by Texas Emissions, 20% Most Impaired Days (in deciviews),* and
- Table 10: *Baseline and Current Conditions for Class I Areas Potentially Affected by Texas Emissions, 20% Clearest Days (in deciviews).*

For item iii for Class I areas potentially affected by Texas emissions, the current conditions, and the conditions for the second planning period regional haze SIPs are shown in:

- Tables 11: *Most Recent Plan and Current Conditions for Class I Areas Potentially Affected by Texas Emissions, 20% Most Impaired Days (in deciviews),* and
- Table 12: *Most Recent Plan and Current Conditions for Class I Areas Potentially Affected by Texas Emissions, 20% Clearest Days (in deciviews).*

The visibility metrics presented in these tables are based on data that were measured and analyzed as part of the Interagency Monitoring of Protected Visual Environments (IMPROVE) program (https://vista.cira.colostate.edu/Improve/). The data were accessed in February and March of 2024 via the Federal Land Manager Environmental Database webpage (http://views.cira.colostate.edu/fed/).

For Texas' Class I areas, Tables 5 and 6 show that current five-year haze indexes are lower than those from the time of baseline, meaning that visibility in Big Bend National Park and Guadalupe Mountains National Park has improved since the time of baseline for both the 20% most impaired and the 20% clearest days.

**Table 5: Baseline and Current Conditions for Texas Class I Areas, 20% Most Impaired Days (in deciviews)**

| Class I Area | State | Baseline 2000 through 2004 | Current 2018 through 2022 | Difference |
|---|---|---|---|---|
| Big Bend National Park | Texas | 15.57 | 13.19 | -2.38 |
| Guadalupe Mountains National Park | Texas | 14.60 | 12.70 | -1.90 |

Notes: Difference = Current minus Baseline; therefore, negative differences indicate an improvement in visibility since the time of baseline.
[a] Baseline for Big Bend National Park is for years 2001 through 2004 since data are unavailable for 2000.

**Table 6: Baseline and Current Conditions for Texas Class I Areas, 20% Clearest Days (in deciviews)**

| Class I Area | State | Baseline 2000 through 2004 | Current 2018 through 2022 | Difference |
|---|---|---|---|---|
| Big Bend National Park | Texas | 5.78[a] | 5.38 | -0.40 |
| Guadalupe Mountains National Park | Texas | 5.92 | 4.81 | -1.11 |

Notes: Difference = Current minus Baseline; therefore, negative differences indicate an improvement in visibility since the time of baseline.
[a] Baseline for Big Bend National Park is for years 2001 through 2004 since data are unavailable for 2000.

Table 7 shows the most recent plan and the current five-year haze indexes at Texas' Class I areas on the 20% most impaired days. Big Bend National Park's current haze index is lower than the index that was current at the time of the 2021 Plan, meaning that there has been improvement in visibility since adoption of the 2021 Plan at Big Bend National Park on the 20% most impaired days. However, Guadalupe Mountains National Park shows a slight increase in visibility impairment between the most recent plan and current conditions for the 20% most impaired days.

Table 8 shows the five-year haze indexes at Texas' Class I areas on the 20% clearest days for the most recent plan and the current conditions. Big Bend National Park and Guadalupe Mountains National Park have slight increases in visibility impairment between the most recent plan and current conditions.

**Table 7: Most Recent Plan and Current Conditions for Texas Class I Areas, 20% Most Impaired Days (in deciviews)**

| Class I Area | State | Most Recent Plan 2014 through 2018 | Current 2018 through 2022 | Difference |
|---|---|---|---|---|
| Big Bend National Park | Texas | 14.06 | 13.19 | -0.87 |
| Guadalupe Mountains National Park | Texas | 12.64 | 12.70 | 0.06[a] |

Notes: Difference = Current minus Most Recent Plan; therefore, negative differences indicate an improvement in visibility since the time of baseline.
[a] Guadalupe Mountains National Park shows a slight increase in visibility impairment.

**Table 8: Most Recent Plan and Current Conditions for Texas Class I Areas, 20% Clearest Days (in deciviews)**

| Class I Area | State | Most Recent Plan 2014 through 2018 | Current 2018 through 2022 | Difference |
|---|---|---|---|---|
| Big Bend National Park | Texas | 5.17 | 5.38 | 0.22[a] |
| Guadalupe Mountains National Park | Texas | 4.73 | 4.81 | 0.08[b] |

Notes: Difference = Current minus Most Recent Plan; therefore, negative differences indicate an improvement in visibility since the time of Most Recent Plan.
[a] Big Bend National Park is showing a slight increase in visibility impairment.
[b] Guadalupe Mountains National Park shows a slight increase in visibility impairment.

Tables 9 and 10 show that current five-year haze indexes for the Class I areas potentially affected by Texas emissions are lower than those from the time of baseline, meaning that visibility has improved since the time of baseline for both the 20% most impaired and the 20% clearest days. (Baseline data are unavailable for Breton Wilderness Area.)

**Table 9: Baseline and Current Conditions for Class I Areas Potentially Affected by Texas Emissions, 20% Most Impaired Days (in deciviews)**

| Class I Area | State | Baseline 2000 through 2004 | Current 2018 through 2022 | Difference |
|---|---|---|---|---|
| Caney Creek Wilderness Area | Arkansas | 23.99[a] | 16.27 | -7.72 |
| Upper Buffalo Wilderness Area | Arkansas | 24.21 | 16.40 | -7.81 |
| Great Sand Dunes Wilderness Area | Colorado | 9.66 | 7.94 | -1.72 |
| Breton Wilderness Area | Louisiana | Unavailable | 17.82[b] | Unavailable |
| Hercules-Glades Wilderness Area | Missouri | 25.17[a] | 17.36 | -7.81 |
| Mingo Wilderness Area | Missouri | 26.28[c] | 18.95[d] | -7.33 |
| Bosque del Apache Wilderness Area | New Mexico | 11.78[e] | 10.04[f] | -1.74 |
| Carlsbad Caverns National Park | New Mexico | 14.60 | 12.70 | -1.90 |
| Salt Creek Wilderness Area | New Mexico | 16.50[g] | 14.51 | -1.99 |
| Wheeler Peak Wilderness Area | New Mexico | 7.34[h] | 5.50 | -1.85 |
| White Mountain Wilderness Area | New Mexico | 11.31[i] | 9.56 | -1.74 |
| Wichita Mountains Wilderness Area | Oklahoma | 22.15[j] | 16.86 | -5.28 |

Notes: Difference = Current minus Baseline; therefore, negative differences indicate an improvement in visibility since the time of baseline.

[a] Baseline for Caney Creek and Hercules-Glades is for years 2002 through 2004 since data are unavailable for 2000 through 2001.

[b] Current for Breton Wilderness Area uses 2018 and 2022 data. Data for 2019, 2020, and 2021 are unavailable.

[c] Baseline for Mingo Wilderness Area uses 2001 through 2004 data since 2000 data are unavailable .

[d] Current for Mingo Wilderness Area uses 2018, and 2021 through 2023 data. 2019 through 2020 data are unavailable for Mingo Wilderness Area.

[e] Baseline for Bosque del Apache Wilderness Area includes 2002 through 2004 data. 2000 through 2001 data are unavailable for Bosque del Apache Wilderness Area.

[f] Current for Bosque del Apache Wilderness Area includes 2018, and 2020 through 2024 data. 2019 data are unavailable for Bosque del Apache Wilderness Area.

[g] Baseline for Salt Creek Wilderness Area includes 2002 through 2004 data. 2000 and 2001 data are unavailable for Salt Creek Wilderness Area.

[h] Baseline Wheeler Peak Wilderness Area includes 2002 through 2004 data. 2000 through 2001 data are unavailable for Wheeler Peak Wilderness Area.

[i] Baseline White Mountain Wilderness Area includes data for 2001 through 2004. 2000 data are unavailable for White Mountain Wilderness Area.

[j] Baseline for Wichita Mountains Wilderness Area includes data for 2002 through 2004. 2000 through 2001 data are unavailable for Wichita Mountains Wilderness Area.

**Table 10: Baseline and Current Conditions for Class I Areas Potentially Affected by Texas Emissions, 20% Clearest Days (in deciviews)**

| Class I Area | State | Baseline 2000 through 2004 | Current 2018 through 2022 | Difference |
|---|---|---|---|---|
| Caney Creek Wilderness Area | Arkansas | 11.24[a] | 7.48 | -3.76 |
| Upper Buffalo Wilderness Area | Arkansas | 11.71 | 7.98 | -3.73 |
| Great Sand Dunes Wilderness Area | Colorado | 4.50 | 2.50 | -2.00 |
| Breton Wilderness Area | Louisiana | Unavailable | 11.05[b] | Unavailable |
| Hercules-Glades Wilderness Area | Missouri | 12.84[a] | 8.85 | -3.99 |
| Mingo Wilderness Area | Missouri | 14.37[c] | 10.25[d] | -4.12 |
| Bosque del Apache Wilderness Area | New Mexico | 6.17[e] | 4.62[f] | -1.55 |
| Carlsbad Caverns National Park | New Mexico | 5.92 | 4.81 | -1.11 |
| Salt Creek Wilderness Area | New Mexico | 7.84[g] | 6.75 | -1.09 |
| Wheeler Peak Wilderness Area | New Mexico | 0.31[h] | 0.19 | -0.12 |
| White Mountain Wilderness Area | New Mexico | 3.55[i] | 2.70 | -0.85 |
| Wichita Mountains Wilderness | Oklahoma | 9.78[j] | 8.69 | -1.09 |

Note: Difference = Current minus Baseline; therefore, negative differences indicate an improvement in visibility since the time of baseline.

[a] Baseline for Caney Creek and Hercules-Glades is for years 2002 through 2004 since data are unavailable for 2000 through 2001.

[b] Current for Breton Wilderness Area uses 2018 and 2022 data. Data for 2019, 2020, and 2021 are unavailable.

[c] Baseline for Mingo Wilderness Area uses 2001 through 2004 data since 2000 data are unavailable.

[d] Current for Mingo Wilderness Area uses 2018, and 2021 through 2023 data. 2019 through 2020 data are unavailable for Mingo Wilderness Area.

[e] Baseline for Bosque del Apache Wilderness Area includes 2002 through 2004 data. 2000 through 2001 data are unavailable for Bosque del Apache Wilderness Area.

[f] Current for Bosque del Apache Wilderness Area includes 2018, and 2020 through 2024 data. 2019 data are unavailable for Bosque del Apache Wilderness Area.

[g] Baseline for Salt Creek Wilderness Area includes 2002 through 2004 data. 2000 and 2001 data are unavailable for Salt Creek Wilderness Area.

[h] Baseline Wheeler Peak Wilderness Area includes 2002 through 2004 data. 2000 through 2001 data are unavailable for Wheeler Peak Wilderness Area.

[i] Baseline White Mountain Wilderness Area includes data for 2001 through 2004. 2000 data are unavailable for White Mountain Wilderness Area.

[j] Baseline for Wichita Mountains Wilderness Area includes data for 2002 through 2004. 2000 through 2001 data are unavailable for Wichita Mountains Wilderness Area.

Tables 11 and 12 show that current five-year haze indexes at the majority of the Class I areas potentially affected by Texas emissions are lower than those that were current at the time of the second planning period regional haze SIPs, meaning that there have been similar improvements in visibility since the time of the second planning period regional haze SIPs. The exceptions are Carlsbad Caverns National Park, as shown in Table 11, shows a slight increase in visibility impairment between the most recent planning period and current conditions for the 20% most impaired days. As shown in Table 12, there are slight increases in visibility impairment at Bosque del Apache Wilderness Area, Salt Creek Wilderness Area, White Mountain Wilderness Area, and Wichita Mountains Wilderness for the 20% Clearest Days between Current Conditions and the Most Recent conditions.

**Table 11: Most Recent Plan and Current Conditions for Class I Areas Potentially Affected by Texas Emissions, 20% Most Impaired Days (in deciviews)**

| Class I Area | State | Most Recent Plan 2014 through 2018 | Current 2018 through 2022 | Difference |
|---|---|---|---|---|
| Caney Creek Wilderness Area | Arkansas | 18.29 | 16.27 | -2.02 |
| Upper Buffalo Wilderness Area | Arkansas | 17.95 | 16.40 | -1.55 |
| Great Sand Dunes Wilderness Area | Colorado | 8.02 | 7.94 | -0.08 |
| Breton Wilderness Area | Louisiana | 18.98 | 17.82[a] | -1.17 |
| Hercules-Glades Wilderness Area | Missouri | 18.72 | 17.36 | -1.36 |
| Mingo Wilderness Area | Missouri | 20.13 | 18.95[b] | -1.18 |
| Bosque del Apache Wilderness Area | New Mexico | 10.47 | 10.04[c] | -0.43 |
| Carlsbad Caverns National Park | New Mexico | 12.64 | 12.70 | 0.06[d] |
| Salt Creek Wilderness Area | New Mexico | 14.97 | 14.51 | -0.46 |
| Wheeler Peak Wilderness Area | New Mexico | 5.95 | 5.50 | -0.45 |
| White Mountain Wilderness Area | New Mexico | 9.95 | 9.56 | -0.39 |
| Wichita Mountains Wilderness | Oklahoma | 18.12 | 16.86 | -1.26 |

Note: Difference = Current minus Most Recent Plan; therefore, negative differences indicate an improvement in visibility since the time of Most Recent Plan.

[a] Current for Breton Wilderness Area included 2019 and 2022. Data for 2018, and 2020 through 2021 are unavailable for Breton Wilderness Area.

[b] Current for Mingo Wilderness Area includes 2018, 2021, and 2022 data. 2019 through 2020 data are unavailable for Mingo Wilderness Area.

[c] Current for Bosque del Apache Wilderness Area includes 2018, and 2020 through 2022. 2019 data are unavailable for Bosque del Apache Wilderness Area.

[d] Carlsbad Caverns National Park shows a slight increase in visibility impairment.

**Table 12: Most Recent Plan and Current Conditions for Class I Areas Potentially Affected by Texas Emissions, 20% Clearest Days (in deciviews)**

| Class I Area | State | Most Recent Plan 2014 through 2018 | Current 2018 through 2022 | Difference |
|---|---|---|---|---|
| Caney Creek Wilderness Area | Arkansas | 8.02 | 7.48 | -0.54 |
| Upper Buffalo Wilderness Area | Arkansas | 8.20 | 7.98 | -0.22 |
| Great Sand Dunes Wilderness Area | Colorado | 2.74 | 2.50 | -0.24 |
| Breton Wilderness Area | Louisiana | 11.81 | 11.05[a] | -0.75 |
| Hercules-Glades Wilderness Area | Missouri | 9.71 | 8.85 | -0.86 |
| Mingo Wilderness Area | Missouri | 11.08 | 10.25[b] | -0.83 |
| Bosque del Apache Wilderness Area | New Mexico | 4.59 | 4.62[c] | 0.03[d] |
| Carlsbad Caverns National Park | New Mexico | 4.73 | 4.81 | 0.08[d] |
| Salt Creek Wilderness Area | New Mexico | 6.62 | 6.75 | 0.13[d] |
| Wheeler Peak Wilderness Area | New Mexico | 0.31 | 0.19 | -0.12 |
| White Mountain Wilderness Area | New Mexico | 2.54 | 2.70 | 0.16[d] |
| Wichita Mountains Wilderness | Oklahoma | 8.47 | 8.69 | 0.22[d] |

Note: Difference = Current minus Most Recent Plan; therefore, negative differences indicate an improvement in visibility since the time of Most Recent Plan.
[a] Current for Breton Wilderness Area included 2019 and 2022. Data for 2018, and 2020 through 2021 are unavailable for Breton Wilderness Area.
[b] Current for Mingo Wilderness Area includes 2018, 2021, and 2022 data. 2019 through 2020 data are unavailable for Mingo Wilderness Area.
[c] Current for Bosque del Apache Wilderness Area includes 2018, and 2020 through 2022. 2019 data are unavailable.
[d] Bosque del Apache Wilderness Area, Carlsbad Caverns National Park, Salt Creek Wilderness Area, White Mountain Wilderness Area, and Wichita Mountains Wilderness show a slight increase in visibility impairment.

Finally, Table 13: *Reasonable Progress Goals and Current Conditions at Texas' Class I Areas for the 20% Most Impaired Days* shows that current five-year haze indexes are below the 2028 Reasonable Progress Goals at the Texas Class I areas.

**Table 13: Reasonable Progress Goals and Current Conditions at Texas' Class I Areas for the 20% Most Impaired Days**

| Class I Area | State | 2028 Reasonable Progress Goal | Current 2018 through 2022 |
|---|---|---|---|
| Big Bend National Park | Texas | 14.4 | 13.2 |
| Guadalupe Mountains National Park | Texas | 12.8 | 12.7 |

Table 14: *Reasonable Progress Goals and Current Conditions at Class I Areas Potentially affected by Texas' Emissions for the 20% Most Impaired Days* shows that current five-year haze indexes are below the 2028 Reasonable Progress Goals at the Class I areas potentially affected by Texas' emissions with the exception of Salt Creek Wilderness Area and Bosque del Apache Wilderness Area. TCEQ's modeling indicates that Salt Creek Wilderness area will be above the glidepath in 2028, and Bosque del Apache will be below the glidepath in 2028.

**Table 14: Reasonable Progress Goals and Current Conditions at Class I Areas Potentially Affected by Texas' Emissions for the 20% Most Impaired Days**

| Class I Area | State | 2028 Reasonable Progress Goal | Current 2018 through 2022 |
|---|---|---|---|
| Caney Creek Wilderness Area | Arkansas | 18.8 | 16.3 |
| Upper Buffalo Wilderness Area | Arkansas | 19.2 | 16.4 |
| Great Sand Dunes Wilderness Area | Colorado | 8.2 | 7.9 |
| Breton Wilderness Area | Louisiana | 19.8 | 17.8[a] |
| Hercules-Glades Wilderness Area | Missouri | 19.6 | 17.4 |
| Mingo Wilderness Area | Missouri | 20.2 | 19.0[b] |
| Bosque del Apache Wilderness Area | New Mexico | 9.9 | 10.0[c] |
| Carlsbad Caverns National Park | New Mexico | 12.8 | 12.7 |
| Salt Creek Wilderness Area | New Mexico | 13.5 | 14.5 |
| Wheeler Peak Wilderness Area | New Mexico | 6.5 | 5.5 |
| White Mountain Wilderness Area | New Mexico | 10.0 | 9.6 |
| Wichita Mountains Wilderness | Oklahoma | 17.4 | 16.9 |

[a] Current for Breton Wilderness Area included 2019 and 2022. Data for 2018, and 2020 through 2021 are unavailable for Breton Wilderness Area.
[b] Current for Mingo Wilderness Area includes 2018, 2021, and 2022 data. 2019 through 2020 data are unavailable for Mingo Wilderness Area.
[c] Current for Bosque del Apache Wilderness Area includes 2018, and 2020 through 2022. 2019 data are unavailable for Bosque del Apache Wilderness Area.

# 5. EMISSIONS INVENTORY

## 5.1. Introduction

The Regional Haze Rule requires an analysis tracking the change in emissions of pollutants contributing to visibility impairment from all sources in the state (40 CFR §51.308(g)(4)). The emissions changes should be identified by source type or activity and cover the time frame since the previous regional haze SIP planning period.

TCEQ complies with 40 CFR Part 51, Subpart A, Air Emissions Reporting Requirements (AERR) to develop and submit periodic emissions inventories (PEI) to EPA every three years. Per the AERR, the 2011, 2014, 2017, and 2020 PEIs were reported to EPA's NEI as a comprehensive and detailed estimate of statewide air emissions from all sources and activities. The type of emissions sources, amount of each pollutant emitted, and the types of processes and control devices employed at each facility or source category are identified in the inventory. The AERR emissions inventory (EI) is derived from estimates developed for four general categories of anthropogenic emissions sources: point, area, non-road mobile, and on-road mobile.

This section discusses general EI development for each of these anthropogenic source categories and for the emissions analysis, subcategorizes point sources into EGUs and non-EGUs.

The Regional Haze Rule requires an analysis to extend at least through the most recent NEI year for which data are available six months prior to the required date of the progress report. Since the 2023 NEI is due January 2025 for point source and mobile source EIs and March 2025 for the area source EI, 2020 is the most recent statewide NEI year available in the six-month timeframe and is included for emissions summaries and the assessment of significant changes in emissions.[7] Emissions summaries for the 2011, 2014, 2017 statewide NEI years from the previous regional haze SIP planning period are also included in this progress report to provide a broader picture of emissions trends.

Emissions summaries for 2011, 2014, 2017, and 2020 are provided in Section 5.6: *Emissions Summaries* for the visibility impairing pollutants listed below.

- Ammonia ($NH_3$)
- Carbon monoxide (CO)
- Nitrogen oxides ($NO_X$)
- Particulate matter less than 10 microns ($PM_{10}$)
- Particulate matter less than 2.5 microns ($PM_{2.5}$)
- Sulfur dioxide ($SO_2$)
- Volatile organic compounds (VOC)

Section 6: *Assessment of Significant Changes in Emissions* provides an assessment of significant changes (15% or greater total change, across all EI categories) in $NO_X$, $SO_2$, and VOC emissions between 2017, the latest NEI year from the previous second planning period, and 2020, the most recent NEI year at the time of this progress

[7] https://www.epa.gov/system/files/documents/2023-05/2023_NEI_Plan_draft_May2023.pdf

report. The 2021 Plan identified $NO_X$ and $SO_2$ emissions as the anthropogenic emissions that primarily affect visibility in Class I areas in Texas and surrounding states.

The other visibility-impairing pollutants experienced a 4% or less total emissions change between 2017 and 2020 (across all EI categories). Tables, charts, and explanations for $NO_X$, $SO_2$, and VOC are provided in Section 6.

## 5.2. Point Sources

Stationary point source emissions data are collected annually from sites that meet the reporting requirements of 30 TAC §101.10. These typically represent large sources of emissions located at a discrete geographic point such as refineries, EGUs, and cement production facilities. The 30 TAC Chapter 101 establishes EI reporting thresholds including those in ozone nonattainment areas that are currently at or less than major source thresholds. Therefore, some minor sources report to the point source EI.

To collect the data, TCEQ provides detailed reporting instructions and tools for completing and submitting an EI. Companies submit EI data using a web-based system called the Annual Emissions Inventory Report System. Companies are required to report emissions data and to provide sample calculations used to determine the emissions. Information characterizing the process equipment, the abatement units, and the emissions points is also required. Further, per FCAA, §182(a)(3)(B), company representatives certify that reported emissions are true, accurate, and fully represent emissions that occurred during the calendar year to the best of the representative's knowledge.

All data submitted in the EI are reviewed for quality assurance purposes and then stored in the State of Texas Air Reporting System database. TCEQ's Point Source Emissions Inventory webpage (https://www.tceq.texas.gov/airquality/point-source-ei/psei.html) contains guidance documents and historical point source emissions data.

## 5.3. Area Sources

Stationary emissions sources that do not meet the reporting requirements for point sources are classified as area sources. Area sources are small-scale stationary industrial, commercial, and residential sources that use materials or perform processes that generate emissions. Examples of typical area sources include oil-and-gas production sources, printing operations, industrial coatings, degreasing solvents, house paints, gasoline service station underground tank filling, vehicle refueling operations, stationary source fossil fuel combustion at residences and businesses, outdoor refuse burning, and structure fires.

Area source emissions are calculated as county-wide totals rather than as individual sources. Area source emissions are typically calculated by multiplying an EPA, or TCEQ, developed emissions factor (emissions per unit of activity) by the appropriate activity or activity surrogate responsible for generating emissions. Population is one of the more commonly used activity surrogates for area source calculations. Other activity data commonly used include the amount of gasoline sold in an area, employment by industry type, and crude oil and natural gas production.

The emissions data for the different area source categories are developed, quality assured, stored in the Texas Air Emissions Repository database, and compiled to develop the statewide area source EI.

## 5.4. Non-Road Mobile Sources

Non-road vehicles (non-road sources) do not normally operate on roads or highways and are often referred to as off-road or off-highway vehicles. Non-road emissions sources include agricultural equipment, commercial and industrial equipment, construction and mining equipment, lawn and garden equipment, aircraft and airport equipment, locomotives, drilling rigs, and commercial marine vessels (CMV).

EIs for non-road sources were developed for the following subcategories: NONROAD model categories, airports, locomotives, CMVs, and drilling rigs used in upstream oil-and-gas exploration activities. The airport subcategory includes estimates for emissions from the aircraft, auxiliary power units (APU), and ground support equipment (GSE) subcategories. The following sections describe the emissions estimation methods used for the non-road mobile source subcategories.

### 5.4.1. Non-Road Model Categories

For the 2011, 2014, 2017, and 2020 non-road model EIs, the latest version of the Texas Nonroad utility (TexN) available at the time of inventory development was used to estimate all non-road mobile source category emissions except for airports, locomotives, CMVs, and drilling rigs used in upstream oil-and-gas exploration activities. TexN utilities incorporate the EPA MOVES model updates and replace EPA defaults used to determine emissions with Texas county-specific data.

Because emissions for airports, CMVs, and locomotives are not included in either the MOVES model or the TexN utility, the emissions for these categories are estimated using other EPA-approved methods and guidance.

The 2011 and 2014 non-road model mobile source EIs were developed in-house by TCEQ staff. A description of the method and procedures used to develop the 2017 non-road model mobile source EI for this regional haze progress report is provided in the Eastern Research Group, Inc. (ERG) report *Development of Texas Statewide 2017 AERR Inventory for Non-road Model Category Mobile Sources.*[8]

For the 2020 NEI, the MOVES3 model was EPA's latest mobile source emissions model available for estimating non-road source category emissions at the time of inventory development. The MOVES4 model was not used to develop EIs for this progress report since TCEQ had already invested significant resources to develop mobile source EIs using MOVES3, and there was insufficient time to switch to MOVES4 for the development of this progress report. As EPA stated in its notice of availability published in the *Federal Register* (FR) on September 12, 2023 "[…] state and local agencies that have already completed significant work on a SIP with a version of

[8] https://wayback.archive-it.org/414/20210527185039/https:/www.tceq.texas.gov/assets/public/implementation/air/am/contracts/reports/ei/5821881185013-20181026-erg-texas_statewide_emissions_inventory_nonroad_model_mobile_sources.pdf

MOVES3 (*e.g.,* attainment modeling has already been completed with MOVES3) may continue to rely on this earlier version of MOVES" (88 FR 62567, 62569). A description of the method and procedures used to develop the 2020 non-road model mobile source EI for this regional haze progress report is provided in the ERG report *Development of Texas Nonroad Model Mobile Source Air Emissions Reporting Requirements, Reasonable Further Progress, and Redesignation and Maintenance Emissions Inventories.*[9]

### 5.4.2. Drilling Rigs Estimation Methodology

Although emissions for drilling rig diesel engines are included in the MOVES and TexN models, alternate emissions estimates were developed for that source category to develop more accurate county-level inventories. The equipment populations for drilling rigs were set to zero in the TexN utility to avoid double counting emissions.

Due to significant growth in the oil-and-gas exploration and production industry, a 2015 TCEQ-commissioned survey of oil-and-gas exploration and production companies was used to develop updated drilling rig emissions characterization profiles.[10] The drilling rig emissions characterization profiles from this study were combined with county-level drilling activity data obtained from the Texas Railroad Commission for each NEI year to develop the EI.

### 5.4.3. CMVs and Locomotives Estimation Methodology

The locomotive EI was developed from a TCEQ-commissioned study using EPA-accepted EI development methods. The locomotive EI includes line haul and yard emissions activity data from all Class I and III locomotive activity and emissions by rail segment. A description of the method and procedures used to develop the locomotive EI for this regional haze progress report is provided in the Texas Transportation Institute (TTI) report *2020 Texas Statewide Locomotive and Rail Yard Emissions Inventory and 2011 through 2050 Trend Inventories.*[11]

The CMV EI was developed from a TCEQ-commissioned study using EPA-accepted EI development methods. The CMV EI includes at-port and underway emissions activity data from Category I, II, and III CMVs by county. A description of the method and procedures used to develop the CMV EI for this regional haze progress report is provided in the Ramboll US Consulting, Inc. report *2020 Texas Commercial Marine Vessel Emissions Inventory and 2011 through 2050 Trend Inventories.*[12]

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[9] https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory/5822122417fy2021-20210729-erg-texn2_nonroad_aerr_ei.pdf
[10] https://wayback.archive-it.org/414/20210527185246/https://www.tceq.texas.gov/assets/public/implementation/air/am/contracts/reports/ei/5821552832FY1505-20150731-erg-drilling_rig_2014_inventory.pdf
[11] https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory/5822111027-20211015-tti-texas-locomotive-railyard-2020-aerr-trend-ei.pdf
[12] https://web.archive.org/web/20220122014359/https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory/5822111294fy2021-20210730-ramboll-2020-cmv-ei-trends.pdf

#### 5.4.4. Airports Estimation Methodology

The airport EI was developed from a TCEQ-commissioned study using the Federal Aviation Administration (FAA) Aviation Environmental Design Tool (AEDT). AEDT is the most recent FAA model for estimating airport emissions and has replaced the FAA's Emissions and Dispersion Modeling System. The airport emissions categories used for this regional haze progress report included aircraft (commercial air carriers, air taxis, general aviation, and military), APU, and GSE operations. A description of the method and procedures used to develop the airport EIs for this revision is provided in the TTI report *2020 Texas Statewide Airport Emissions Inventory and 2011 through 2050 Trend Inventories.*[13]

### 5.5. On-Road Mobile Sources

On-road mobile emissions sources consist of automobiles, trucks, motorcycles, and other motor vehicles traveling on public roadways. On-road mobile source ozone precursor emissions are usually categorized as combustion-related emissions or evaporative hydrocarbon emissions. Combustion-related emissions are estimated for vehicle engine exhaust. Evaporative hydrocarbon emissions are estimated for the fuel tank and other evaporative leak sources on the vehicle. To calculate emissions, both the rate of emissions per unit of activity (emission factors) and the number of units of activity must be determined.

Updated on-road EIs and emissions factors for this progress report were developed using EPA's MOVES3 model. The MOVES4 model was not used in this progress report since TCEQ had already invested significant resources to develop an on-road mobile source EI using MOVES3 and there was insufficient time to switch to MOVES4 for the development of this progress report. The MOVES model may be run using national default information or the default information may be modified to simulate specific data, such as the control programs, driving behavior, meteorological conditions, and vehicle characteristics. Because modifications to the national default values influence the emission factors calculated by the MOVES model, parameters that are used in TCEQ EI development reflect local conditions to the extent that local values are available. The localized inputs used for the on-road mobile EI development include vehicle speeds for each roadway link, vehicle populations, vehicle hours idling, temperature, humidity, vehicle age distributions for each vehicle type, percentage of miles traveled for each vehicle type, type of inspection and maintenance program, fuel control programs, and gasoline vapor pressure controls.

To estimate on-road mobile source emissions, emission factors calculated by the MOVES model must be multiplied by the level of vehicle activity. On-road mobile source emissions factors are expressed in units of grams per mile, grams per vehicle (evaporative), and grams per hour (extended idle). Therefore, the activity data required to develop the on-road mobile source EI are vehicle miles traveled (VMT) in units of miles per day, vehicle populations, and source hours idling. The level of vehicle travel activity is developed using travel demand models (TDM) run by the Texas Department of Transportation or by the local metropolitan planning organizations. The TDMs are validated against a large number of ground counts, i.e., traffic passing over counters

[13] https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory/5822111196-20211015-tti-texas-airport-2020-aerr-trend-ei.pdf

placed in various locations throughout a county or area. For SIP inventories, VMT estimates are calibrated against outputs from the federal Highway Performance Monitoring System, a model built from a different set of traffic counters. Vehicle populations by source type are derived from the Texas Department of Motor Vehicles' registration database and as needed, national estimates for vehicle source type population.

In addition to the number of miles traveled on each roadway link, the speed on each roadway type or segment is also needed to complete an on-road EI. Roadway speeds, required inputs for the MOVES model, are calculated by using the activity volumes from the TDM and a post-processor speed model.

### 5.6. Emissions Summaries

The summaries of the latest NEI years for 2011, 2014, 2017, and 2020 statewide emissions for this SIP revision are presented in the following:

- Table 15: *2011 Statewide Pollutant Summary by Source Category*;
- Table 16: *2014 Statewide Pollutant Summary by Source Category*;
- Table 17: *2017 Statewide Pollutant Summary by Source Category*; and
- Table 18: *2020 Statewide Pollutant Summary by Source Category*.

Emissions are provided in annual (routine) tpy by source category for each pollutant. Point source EGUs are represented separately from non-EGU point sources.

**Table 15: 2011 Statewide Summary by Source Category**

| Source Category | $NH_3$ (tpy) | CO (tpy) | $NO_X$ (tpy) | $PM_{10}$ (tpy) | $PM_{2.5}$ (tpy) | $SO_2$ (tpy) | VOC (tpy) |
|---|---|---|---|---|---|---|---|
| EGU Point Sources | 1,334.80 | 172,417.41 | 145,553.49 | 21,238.82 | 13,804.20 | 425,548.43 | 3,864.99 |
| Non-EGU Point Sources | 2,107.59 | 137,200.28 | 177,667.73 | 31,491.61 | 19,995.74 | 87,504.46 | 99,473.76 |
| Area Sources | 439,797.03 | 268,859.29 | 238,655.61 | 1,287,802.37 | 181,060.53 | 21,325.03 | 1,312,524.79 |
| On-Road Mobile Sources | 10,445.77 | 1,791,416.21 | 445,565.28 | 23,303.57 | 13,585.36 | 2,243.40 | 130,978.20 |
| Non-Road Mobile Sources | 801.21 | 882,961.16 | 267,107.26 | 18,555.96 | 17,772.46 | 21,727.96 | 111,034.30 |

**Table 16: 2014 Statewide Summary by Source Category**

| Source Category | $NH_3$ (tpy) | CO (tpy) | $NO_X$ (tpy) | $PM_{10}$ (tpy) | $PM_{2.5}$ (tpy) | $SO_2$ (tpy) | VOC (tpy) |
|---|---|---|---|---|---|---|---|
| EGU Point Sources | 1,399.38 | 170,600.75 | 122,079.27 | 20,020.55 | 14,703.15 | 343,604.78 | 3,446.30 |
| Non-EGU Point Sources | 2,070.01 | 125,681.74 | 162,703.68 | 28,198.47 | 19,065.22 | 78,676.81 | 96,361.03 |
| Area Sources | 432,727.83 | 323,899.53 | 272,274.61 | 1,324,790.02 | 187,626.40 | 25,162.10 | 1,413,148.30 |
| On-Road Mobile Sources | 9,062.64 | 1,491,309.33 | 327,435.36 | 18,710.24 | 9,216.46 | 2,347.43 | 95,422.17 |
| Non-Road Mobile Sources | 661.70 | 805,768.38 | 251,946.00 | 15,067.58 | 14,468.84 | 9,143.95 | 90,035.29 |

**Table 17: 2017 Statewide Summary by Source Category**

| Source Category | $NH_3$ (tpy) | CO (tpy) | $NO_X$ (tpy) | $PM_{10}$ (tpy) | $PM_{2.5}$ (tpy) | $SO_2$ (tpy) | VOC (tpy) |
|---|---|---|---|---|---|---|---|
| EGU Point Sources | 1,089.26 | 172,966.97 | 109,133.84 | 18,276.93 | 13,912.95 | 276,027.96 | 2,824.66 |
| Non-EGU Point Sources | 2,352.34 | 115,009.97 | 140,943.56 | 27,620.41 | 18,813.26 | 77,007.18 | 86,567.58 |
| Area Sources | 433,008.07 | 310,699.36 | 256,535.47 | 1,334,509.63 | 186,175.37 | 14,721.20 | 1,321,739.71 |
| On-Road Mobile Sources | 8,799.43 | 1,338,039.57 | 251,010.58 | 18,441.56 | 7,939.73 | 2,107.50 | 78,211.68 |
| Non-Road Mobile Sources | 253.55 | 692,592.62 | 195,056.44 | 10,608.38 | 10,175.54 | 2,353.29 | 68,363.23 |

**Table 18: 2020 Statewide Summary by Source Category**

| Source Category | $NH_3$ (tpy) | CO (tpy) | $NO_X$ (tpy) | $PM_{10}$ (tpy) | $PM_{2.5}$ (tpy) | $SO_2$ (tpy) | VOC (tpy) |
|---|---|---|---|---|---|---|---|
| EGU Point Sources | 1,102.75 | 101,020.32 | 82,410.18 | 12,211.17 | 10,159.02 | 130,186.10 | 2,698.98 |
| Non-EGU Point Sources | 2,753.65 | 110,732.78 | 134,765.03 | 26,219.59 | 18,640.61 | 61,336.51 | 84,503.03 |
| Area Sources | 433,783.94 | 333,518.39 | 265,658.25 | 1,364,606.39 | 191,134.13 | 28,510.98 | 1,587,414.07 |
| On-Road Mobile Sources | 7,542.89 | 1,042,874.59 | 169,086.89 | 15,010.23 | 5,190.22 | 891.34 | 55,028.73 |
| Non-Road Mobile Sources | 178.22 | 941,232.76[14] | 144,909.41 | 8,011.94 | 7,626.46 | 2,070.02 | 64,450.02 |

[14] TCEQ's TexN model was updated to reflect an increase in gasoline-fueled equipment populations, for the 2020 NEI year, so non-road mobile CO emissions increased by 35.90% between 2017 and 2020.

## 5.7. 2023 EGU EI Data

On July 30, 2024, EPA issued *Overview of Elements for the Regional Haze Second Planning Period State Implementation Plan Progress Reports Due in 2025*, a guidance document for developing progress reports for the second planning period. EPA's guidance indicates that progress reports must contain EGU emissions data through 2023. Table 19: *2023 Statewide Summary for EGU Point Sources* provides these preliminary data as of July 31, 2024. Due to the timing of the release of EPA's guidance, TCEQ has not analyzed the 2023 EGU EI in relation to this draft progress report.

**Table 19: 2023 Statewide Summary for EGU Point Sources**

| Source Category | $NH_3$ (tpy) | CO (tpy) | $NO_x$ (tpy) | $PM_{10}$ (tpy) | $PM_{2.5}$ (tpy) | $SO_2$ (tpy) | VOC (tpy) |
|---|---|---|---|---|---|---|---|
| EGU Point Sources | 1,775.61 | 108,823.54 | 85,840.28 | 12,524.85 | 10,301.78 | 104,510.62 | 2,979.02 |

## 6. ASSESSMENT OF SIGNIFICANT CHANGES IN EMISSIONS

The Regional Haze Rule requires an assessment of any significant changes in anthropogenic emissions within or outside the state since the period addressed in the most recent plan (in this case, the 2021 Plan), including whether those changes were anticipated in the most recent plan and whether they have limited or impeded in reducing pollutant emissions and improving visibility (40 CFR §51.308(g)(5)).

As presented in Section 5.6: *Emissions Summaries*, emissions for visibility impairing pollutants have declined for almost every pollutant in Texas between 2017 and 2020 except for $PM_{10}$ and VOC. $PM_{10}$ emissions experienced a nominal increase of 1.18% between 2017 and 2020. VOC emissions increased by 15.18% between 2017 and 2020. The data for VOC are presented in Table 22: *Anthropogenic VOC Emissions by Source Type (tpy)* and Figure 3: *Anthropogenic VOC Emissions Trends (tpy).*

Based on the 2021 Plan, $NO_X$ and $SO_2$ emissions are the anthropogenic emissions that primarily affect visibility in Class I areas in Texas and surrounding states. $NO_X$ and $SO_2$ emissions declined significantly for most anthropogenic sources between 2011 and 2020. These data are presented in Table 20: *Anthropogenic $NO_X$ Emissions by Source Type (tpy)* and Table 21: *Anthropogenic $SO_2$ Emissions by Source Type (tpy).* Chart representations of anthropogenic $NO_X$ and $SO_2$ emissions trends for 2011, 2014, 2017, and 2020 are presented in Figure 1: *Anthropogenic $NO_X$ Emissions Trends (tpy)* and Figure 2: *Anthropogenic $SO_2$ Emissions Trends (tpy).*

Tables 20, 21, and 22 focus on the $NO_X$, $SO_2$ and VOC data presented in Section 5.6 by comparing significant emissions changes between 2017, which was the most recent NEI at the time of the 2021 Plan, and 2020, which is the most recently available complete NEI. These tables present the total emissions for Texas with the total tonnage difference and total percent difference between 2017 and 2020 emissions.

An examination of the emissions trends shows that, although there is some year-to-year variability, there are no anthropogenic emissions increases in Texas that are unexpected or large enough that the changes would be expected to limit or impede visibility improvement.

### 6.1. Point Sources Significant Emissions Changes

The point source category showed significant decreases in $NO_X$, $SO_2$, and VOC emissions between 2017 and 2020. The decreases in $NO_X$ emissions occurred due to decreased electric generation from coal-fired EGUs and decreases in emissions at oil-and-gas production and processing sites. The decreases were due to various reasons, including decreased activity, equipment turnover, and the use of equipment-specific emission factors. The vast majority of the decreases in $SO_2$ emissions occurred at EGUs and were due to decreased electric generation from coal-fired EGUs. Most of the VOC decreases occurred in the petroleum refining and natural gas liquids sectors and were due to added controls, improved estimates, reduced activity, and plant shutdowns, among other reasons.

### 6.2. Area Sources Significant Emissions Changes

The area source category showed increases in $NO_X$, $SO_2$, and VOC emissions between 2017 and 2020. The increase in VOC emissions between 2017 and 2020 is due to a 35%

increase in Texas crude oil production, 82% increase in Texas condensate production, and 31% increase in Texas natural gas production resulting in increased storage tank and loading loss emissions. These production increases were accompanied by an associated 70% increase in the amount of wellhead gas that was vented and flared, resulting in increased VOC emissions. Area source $SO_2$ emissions increased between 2017 and 2020 due to a 70% increase in flaring at oil-and-gas wells and a 71% growth in industrial residual oil fuel combustion. Area source $NO_X$ emissions remained stable with only a 3.56% increase between 2017 and 2020.

## 6.3. Non-road Mobile Sources Significant Emissions Changes

The non-road mobile source category showed decreases in $NO_X$, $SO_2$, and VOC emissions between 2017 and 2020. This is due in part to fleet turnover, with older Tier 1 and Tier 2 engines being replaced by more Tier 3 and Tier 4 engines with advanced emissions control technology coupled with changes in gasoline and diesel sulfur content (ultra-low sulfur diesel fuel (15 parts per million (ppm)).

Even though total CO emissions decreased across all categories between 2017 and 2020, non-road CO emissions showed an increase of 35.9% between 2017 and 2020 because of updates made to the TCEQ's TexN model. The changes involved updates made to the equipment populations for all 25 diesel construction equipment (DCE) subsectors between 2017 and 2020, resulting in a relative decrease in DCE counts, along with updates made to gasoline-fueled equipment populations that resulted in large increases in those specific equipment counts. As a result, the overall statewide total equipment population increased by roughly 11% between 2017 and 2020.[15,16] The CO increase is due mainly to this large increase in gasoline-fueled equipment populations. The decrease in CO for the other EI categories resulted in a 3.8% total net decrease in CO emissions between 2017 and 2020.

## 6.4. On-Road Mobile Sources Significant Emissions Changes

The on-road mobile source category showed decreases in $NO_X$, $SO_2$, and VOC emissions between 2017 and 2020. The decreases in $NO_X$ and VOC emissions between 2017 and 2020 are due to the Federal Motor Vehicle Control Program, the vehicle inspection and maintenance program, the federal reformulated gasoline program, the Texas Low Emissions Diesel Program, ultra-low sulfur gasoline regulations, and ultra-low sulfur diesel regulations. On-road mobile $SO_2$ emissions increased between 2011 and 2014 due to increased vehicle activity but decreased in 2017 when the Tier 3 Light-Duty vehicle emissions rule lowered the sulfur content in gasoline from 30 ppm to 10 ppm. $SO_2$ emissions decreased further between 2017 and 2020 since Tier 3 reached full implementation in 2020.

[15] https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory/5822342148fy2023-20230630-erg-emissions-reductions-phase-3-small-spark-ignition-electric-lawn-garden-equipment.pdf
[16] https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory/5822122417fy2021-20210729-erg-texn2_nonroad_aerr_ei.pdf

**Table 20: Anthropogenic $NO_x$ Emissions by Source Type (tpy)**

| Source Category | 2011 | 2014 | 2017 | 2020 | Difference Between 2017 and 2020 | Percent Difference Between 2017 and 2020 |
|---|---|---|---|---|---|---|
| EGU Point Sources | 145,553.49 | 122,079.27 | 109,133.84 | 82,410.18 | -26,723.66 | -24.49% |
| Non-EGU Point Sources | 177,667.73 | 162,703.68 | 140,943.56 | 134,765.03 | -6,178.53 | -4.38% |
| Area Sources | 238,655.61 | 272,274.61 | 256,535.47 | 265,658.25 | 9,122.78 | 3.56% |
| Non-Road Mobile Sources | 267,107.26 | 251,946.00 | 195,056.44 | 144,909.41 | -50,147.03 | -25.71% |
| On-Road Mobile Sources | 445,565.28 | 327,435.36 | 251,010.58 | 169,086.89 | -81,923.69 | -32.64% |
| **Total** | **1,274,549.37** | **1,136,438.92** | **952,679.89** | **796,829.76** | **-155,850.13** | **-16.36%** |

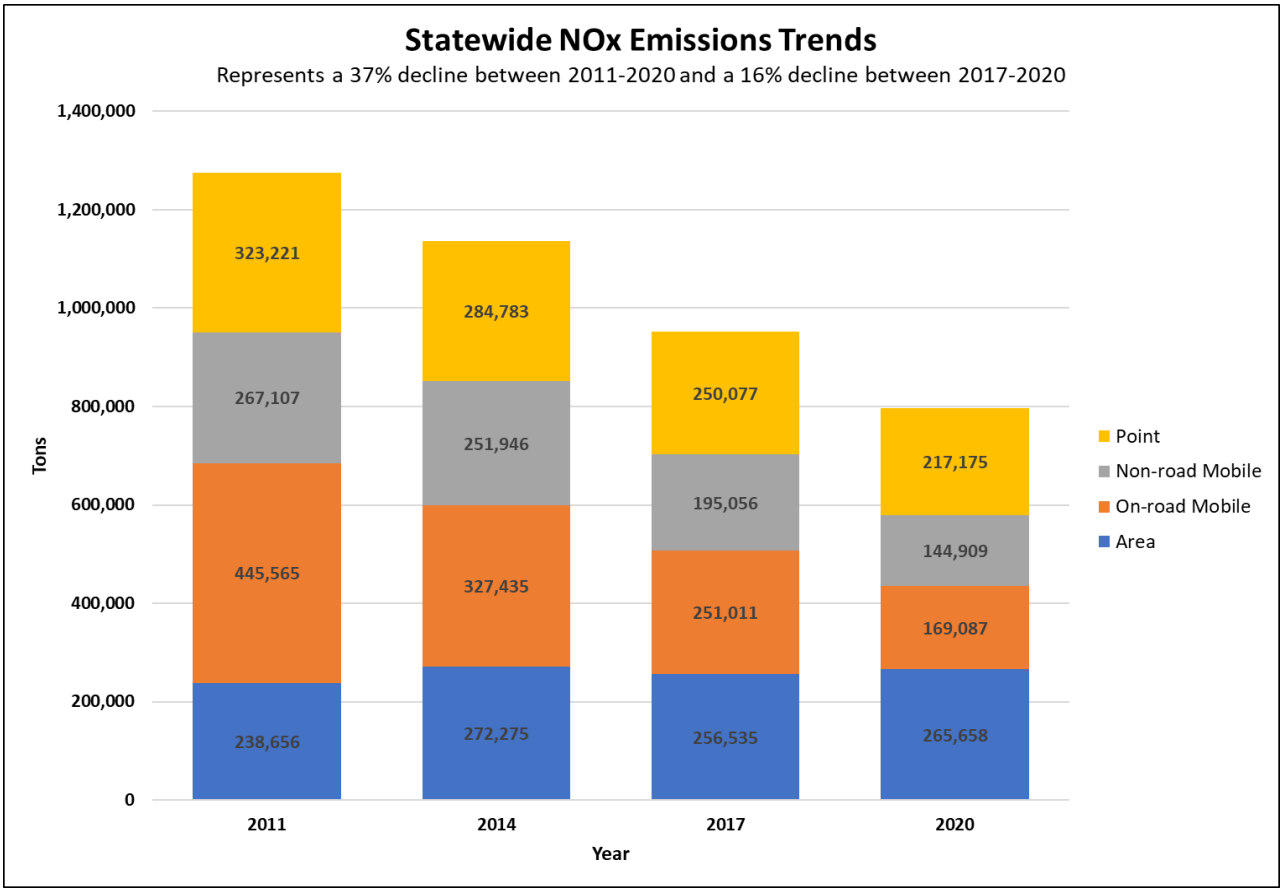


**Figure 1: Anthropogenic $NO_x$ Emissions Trends (tpy)**

**Table 21: Anthropogenic $SO_2$ Emissions by Source Type (tpy)**

| Source Category | 2011 | 2014 | 2017 | 2020 | Difference Between 2017 and 2020 | Percent Difference Between 2017 and 2020 |
|---|---|---|---|---|---|---|
| EGU Point Sources | 425,548.43 | 343,604.78 | 276,027.96 | 130,186.10 | -145,841.86 | -52.84% |
| Non-EGU Point Sources | 87,504.46 | 78,676.81 | 77,007.18 | 61,336.51 | -15,670.67 | -20.35% |
| Area Sources | 21,325.03 | 25,162.10 | 14,721.20 | 28,510.98 | 13,789.78 | 93.67% |
| Non-Road Mobile Sources | 21,727.96 | 9,143.95 | 2,353.29 | 2,070.02 | -283.27 | -12.04% |
| On-Road Mobile Sources | 2,243.40 | 2,347.43 | 2,107.50 | 891.34 | -1,216.16 | -57.71% |
| **Total** | **558,349.28** | **458,935.07** | **372,217.13** | **222,994.95** | **-149,222.18** | **-40.09%** |

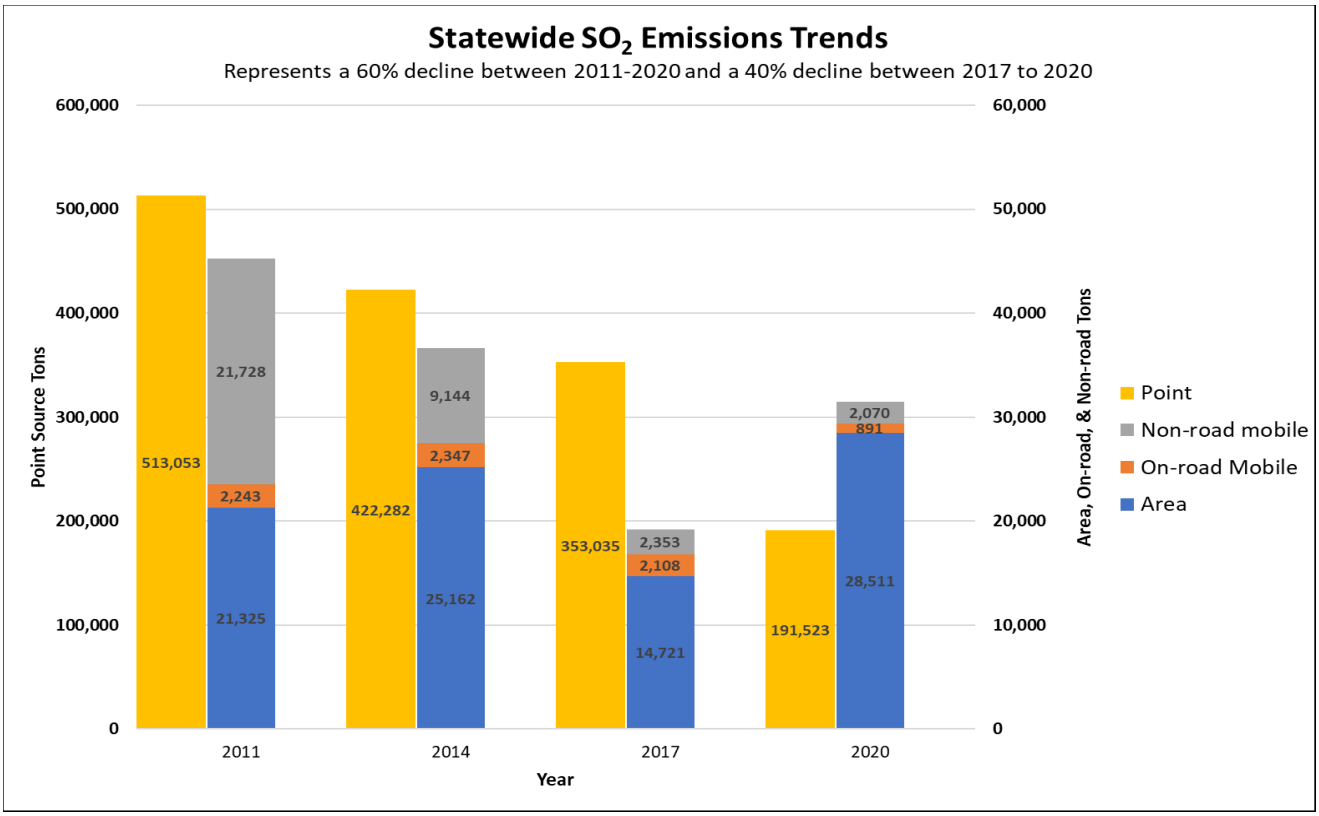


**Figure 2: Anthropogenic $SO_2$ Emissions Trends (tpy)**

**Table 22: Anthropogenic VOC Emissions by Source Type (tpy)**

| Source Category | 2011 | 2014 | 2017 | 2020 | Difference Between 2017 and 2020 | Percent Difference Between 2017 and 2020 |
|---|---|---|---|---|---|---|
| EGU Point Sources | 3,864.99 | 3,446.30 | 2,824.66 | 2,698.98 | -125.68 | -4.45% |
| Non-EGU Point Sources | 99,473.76 | 96,361.03 | 86,567.58 | 84,503.03 | -2,064.55 | -2.38% |
| Area Sources | 1,312,524.79 | 1,413,148.30 | 1,321,739.71 | 1,587,414.07 | 265,674.36 | 20.10% |
| Non-Road Mobile Sources | 111,034.30 | 90,035.29 | 68,363.23 | 64,450.02 | -3,913.21 | -5.72% |
| On-Road Mobile Sources | 130,978.20 | 95,422.17 | 78,211.68 | 55,028.73 | -23,182.95 | -29.64% |
| **Total** | **1,657,876.04** | **1,698,413.09** | **1,557,706.86** | **1,794,094.83** | **236,387.97** | **15.18%** |

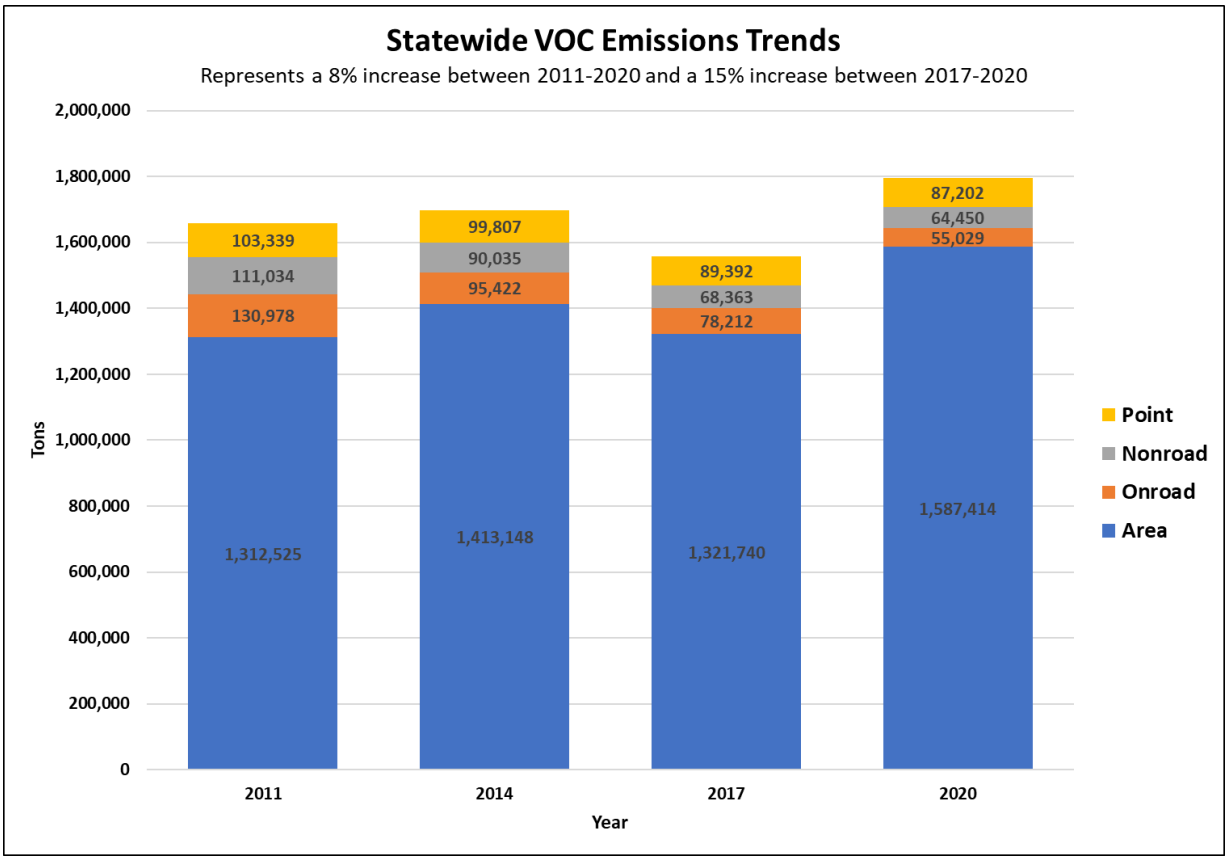


**Figure 3: Anthropogenic VOC Emissions Trends (tpy)**

## 7. ASSESSMENT OF CURRENT IMPLEMENTATION PLAN ELEMENTS AND STRATEGIES

Overall, there is a downward trend in emissions of $NO_X$, $SO_2$, and VOC when comparing the 2017 and 2020 NEIs. Though VOC emissions increased by 236,388 tpy, the combined $NO_X$ and $SO_2$ emissions decreased by 305,072 tpy, resulting in an overall downward trend of 68,684 tpy for those three pollutants. These net emissions reductions will provide for continued visibility improvement in Class I areas in Texas and for Class I areas outside the state that may be impacted by Texas sources.

- In Figure 1, $NO_X$ area source emissions increased slightly from 2017 to 2020, but overall $NO_X$ emissions decreased by 155,850 tpy, or by 16%.
- In Figure 2, $SO_2$ area source emissions increased from 2017 to 2020, but overall $SO_2$ emissions decreased by 149,222 tpy, or by 40%.
- In Figure 3, VOC area source emissions increased from 2017 to 2020, and overall VOC emissions increased by 236,388 tpy, or 15%.

The Regional Haze Rule §51.308(g)(6) requires an assessment of whether current plan elements and strategies are sufficient to enable the state, or states with Class I areas affected by emissions from the state, to meet all established reasonable progress goals for the period covered by the most recent plan. Texas affirms that the elements and strategies in its 2021 Plan continue to be sufficient to meet all established reasonable progress goals. Texas makes this affirmation based on the following assessment of the information and data presented in this progress report.

- There has been no change in the implementation of the measures deemed necessary in Texas' 2021 Plan for making reasonable progress at Big Bend and Guadalupe Mountains National Parks or in other Class I areas that may be affected by Texas' emissions (Section 2: *Status of Implemented Measures).* In addition, there have been verifiable emissions reductions from these measures since adoption of the 2021 Plan (Sections 2 and 3: *Emissions Reductions Achieved* and Section 5: *Emissions Inventory).*
- Current haze indexes for the majority of Texas' Class I areas and other Class I areas are lower than those reported in the 2021 Plan. The exceptions are slight increases in impairment at:
    - Guadalupe Mountains National Park and Carlsbad Caverns National Park on the most impaired days between the period assessed for the 2021 Plan (2014 through 2018) and current conditions (2018 through 2022); and
    - Big Bend National Park, Guadalupe Mountains National Park, Bosque del Apache Wilderness Area, Carlsbad Caverns National Park, Salt Creek Wilderness Area, White Mountain Wilderness Area, and Wichita Mountains Wilderness on the clearest days between the period assessed for the 2021 Plan (2014 through 2018) and current conditions (2018 through 2022).
- Visibility impairment is significantly lower than baseline for the 20% most impaired and 20% clearest days between baseline and current conditions (Section 4: *Visibility Conditions and Changes).* These trends indicate that most Class I areas that emissions sources in Texas may impact are on track to meet the reasonable progress goals established in the 2021 Plan, with the exception of Salt Creek Wilderness Area.

- Except for a nominal increase in $PM_{10}$ and an increase in VOC, emissions of visibility impairing pollutants have overall continued to trend downward for Texas, including for $NO_X$ and $SO_2$, the pollutants that primarily affect visibility in Class I areas in Texas and surrounding states (Section 6: *Assessment of Significant Changes in Emissions*). Further, with the exceptions noted above, currently available emissions data for visibility impairing emissions show lower emissions than those at the time of the 2021 Plan.

## 8. DETERMINATION OF ADEQUACY OF THE EXISTING PLAN

The Regional Haze Rule §51.308(h) requires the state to take one of the actions listed below.

- The state may declare that no further revision of the existing plan is needed at this time. This is commonly referred to as a "negative declaration."
- If the plan is or may be inadequate to ensure reasonable progress due to emissions from another state, or states, which participated in a regional planning process, the state must notify EPA and the applicable state(s). The state must collaborate with the state(s) through the regional planning process to develop additional strategies for addressing the plan's deficiencies.
- If the plan is or may be inadequate to ensure reasonable progress due to emissions from another country, the state must notify EPA and provide any available relevant information.
- If the plan is or may be inadequate to ensure reasonable progress due to emissions from within the state, then that state must revise its plan within one year to address the deficiencies.

Based on information contained in this progress report, the commission declares that no further revision of the 2021 Plan is needed. The status of implemented measures, as described in Section 2 and Section 3, are such that Texas' Class I areas and Class I areas in other states that may be affected by Texas' emissions will continue to make reasonable progress towards the ultimate Regional Haze Rule goal of natural visibility conditions.

This is evidenced by the overall improvements in visibility described in Section 4. When comparing baseline and current conditions in Texas, the 20% most impaired days at Big Bend and Guadalupe Mountains are both trending down at -2.38 dv and -1.90 dv, respectively; for the 20% clearest days, Big Bend and Guadalupe Mountains are both trending down at -0.40 dv and -1.11 dv, respectively (see Tables 5 and 6).

More evidence of improvements in emissions reductions was described in Sections 5 and 6, with the overall trend of $NO_X$, $SO_2$, and VOC emissions down by a total of 68,684 tpy between 2017 and 2020. Additionally, the 2021 Plan identified $NO_X$ and $SO_2$ emissions as the anthropogenic emissions that primarily affect visibility in Class I areas in Texas and neighboring states, and collectively those emissions decreased by 305,072 tpy between 2017 and 2020, as shown in Tables 20 and 21. Texas considers these net emissions reductions and the large reductions in the emissions with the greatest impact on visibility will provide for continued visibility improvement in Class I areas in Texas and for Class I areas outside the state that may be impacted by Texas sources.

## 9. FEDERAL LAND MANAGER (FLM) COORDINATION AND PUBLIC COMMENT

According to the Regional Haze Rule §51.308(i), opportunity for FLM consultation on a progress report must be provided no less than 60 days prior to a public hearing or public comment opportunity on the progress report. The consultation must include the opportunity for the FLMs to discuss their:

- assessment of visibility impairment in the Class I area, and
- recommendations on the development and implementation of strategies to address visibility impairment.

The FLM consultation period for this progress report opened on May 28, 2024, and concluded on July 29, 2024. During the consultation period, two comments were received from the National Park Service (NPS). The first comment noted that area source emissions may be underestimated and are of particular importance for Carlsbad Caverns and Guadalupe Mountains National Parks. NPS also suggested that TCEQ consider lower reporting thresholds for future rules to refine emissions inventories. No changes were made to the draft progress report in response to these comments.

Although this progress report is not being submitted as a formal SIP revision, Texas will publish a notice to invite public review and comments. Public notice will be in Appendix A: *Public Notification*.

## 10. SUMMARY AND CONCLUSIONS

As described above in Section 8: *Determination of Adequacy of the Existing Plan*, Texas declares that no further revision of the existing plan is needed. As described in this progress report, the air pollution control programs included in the 2021 Plan remain fully implemented, and the updates provided for additional programs and measures show that measures that were not included in the 2021 Plan continue to be implemented and result in emissions reduction benefits. Further, more than the estimated reductions in $SO_2$ emissions are expected due to shutdown or fuel conversion, e.g. from coal to natural gas at EGUs in Texas. Additionally, there is an overall downward trend in emissions of $NO_X$, $SO_2$, and VOC when comparing the 2017 and 2020 NEI, and current haze indexes for the majority of the Texas' Class I areas and other Class I areas that may be impacted by Texas emissions are lower than those reported in the 2021 Plan.

Based on the commission's assessment of progress toward achieving Texas' reasonable progress goals for the second planning period, Texas affirms that this progress report satisfies the requirements of Regional Haze Rule §51.308(g), (h), and (i).

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*Appendices Available Upon Request*

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