ENERGY EFFICIENCY/RENEWABLE ENERGY IMPACT IN THE TEXAS EMISSIONS REDUCTION PLAN (TERP)

SUMMARY REPORT: INTEGRATED NOX EMISSIONS SAVINGS FROM EE/RE PROGRAMS STATEWIDE

Annual Report to the
Texas Commission on Environmental Quality
January 2022 – December 2022

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ENERGY SYSTEMS LABORATORY
TEXAS A&M ENGINEERING EXPERIMENT STATION

TEXAS A&M ENGINEERING EXPERIMENT STATION

ENERGY SYSTEMS LABORATORY

September 29, 2023

Ms. Lindley Anderson
Technical Specialist
Air Quality Division
Texas Commission on Environmental Quality
Austin, TX 78711-3087

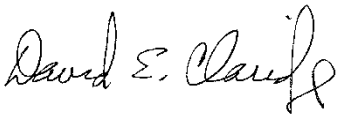
Dear Ms. Anderson:

The Energy Systems Laboratory (ESL) at the Texas A&M Engineering Experiment Station of the Texas A&M University System is pleased to provide this summary report, "Energy Efficiency/Renewable Energy Impact in the Texas Emissions Reduction Plan (TERP): Integrated NOx Emissions Savings from EE/RE Programs Statewide," as required under Texas Health and Safety Code Ann. § 388.003 (e) (Senate Bill 5, 77R as amended 78 R & 78S).

The ESL is required to annually report the energy savings from statewide adoption of the Texas Building Energy Performance Standards in Senate Bill 5 (SB 5), as amended, and the relative impact of proposed local energy code amendments in the Texas non-attainment and near-non-attainment counties as part of the Texas Emissions Reduction Plan (TERP).

Please contact me at (979) 845-9213 should you or any of the TCEQ staff have any questions concerning this report or any of the work presently being done to quantify emissions reductions from energy efficiency and renewable energy measures as a result of the TERP implementation.

Sincerely,



David E. Claridge, Ph.D., P.E., FASHRAE
Director

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Acknowledgments

This work has been completed as a fulfillment of Sections 386.205, 386.252, 388.006, and 388.003 (e) of the Texas Health and Safety Code and Sections 39.9051 (g) (h), and 39.9052 (c) (d) of the Texas Utilities Code, which require the Laboratory to assist TCEQ in quantifying emissions reductions credits from energy efficiency and renewable energy programs.

The authors are also grateful for the timely input provided by the following individuals, and agencies: Lindley Anderson, David Serrins, TCEQ, Dan Mantena, ERCOT, Therese Harris, PUCT, Eddy Trevino and Fred Yebra, SECO. Numerous additional individuals at the Energy Systems Laboratory contributed significantly to this report, including: Jounghwan Ahn, Yu Sun, and Xiaodi Hou.

SUMMARY REPORT:
INTEGRATED NOX EMISSIONS SAVINGS FROM EE/RE STATEWIDE

Energy Efficiency/Renewable Energy Impact
In The Texas Emissions Reduction Plan

Executive Summary

The Energy Systems Laboratory (Laboratory), at the Texas A&M Engineering Experiment Station of the Texas A&M University System, in fulfillment of its responsibilities under Texas Health and Safety Code Ann. § 388.003 (e), submits this annual report, Energy Efficiency/Renewable Energy (EE/RE) Impact in the Texas Emissions Reduction Plan (Summary Report) to the Texas Commission on Environmental Quality.

This summary report shows the NOx emissions reductions from the energy-efficiency programs from multiple Texas State Agencies working under Senate Bill 5 and Senate Bill 7 in a uniform format to allow the TCEQ to consider the combined savings for Texas' State Implementation Plan (SIP) planning purposes. This required that the analysis should include the integrated savings estimation from all projects projected through 2027 for both the annual and Ozone Season Period (OSP)[1] NOx reductions. The year 2018 was used for the baseline year to estimate the emissions. The NOx emissions reductions from all these programs were calculated using estimated emissions factors for 2018 from the US Environmental Protection Agency (US EPA) eGRID database, which had been specially prepared for this purpose.

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

- Annual electricity savings is 60,176,008 MWh/year (34,142 tons-NOx/year) and
- OSP electricity savings are 265,172 MWh/day, which would be 11,049 MW average hourly load reduction during the OSP period (145.12 tons-NOx/day).

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

- Annual electricity savings 373,481,128 MWh/year (211,074 tons-NOx/year) and
- OSP electricity savings 1,404,310 MWh/day, which would be equivalent to 58,513 MW average hourly load reduction during the OSP period (748.83 tons-NOx/day).

A summary of the savings for 2022 and 2027 is presented in the table below using as baseline year 2018.

	2022	2027
Annual Electricity Savings (MWh/year)	60,176,008	373,481,128
Annual Emissions Reductions (tons NOx/year)	34,142	211,074
OSP Electricity Savings (MWh/day)	265,172	1,404,310
OSP Emissions Reductions (tons NOx/day)	145.12	748.83

[1] An Ozone Season Period (OSP) represents the daily average emissions during the period that runs from May 1 to September 30.

Legislative Background

In 2001, the Texas Emissions Reduction Plan (TERP), established by the 77th Texas Legislature with the enactment of Senate Bill 5 (SB 5), identified that Energy Efficiency and Renewable Energy (EE/RE) measures make an important contribution to a comprehensive approach for meeting the minimum federal ambient air quality standards. In 2003 through 2007, the 78th, 79th and 80th Legislatures enhanced the use of EE/RE programs for meeting the TERP. The 78th Legislature enhanced the use of EE/RE programs for meeting TERP goals by requiring the Texas Commission on Environmental Quality (TCEQ) to promote EE/RE as a means to improve air quality standards and to develop a methodology for computing emissions reduction for use in the State Implementation Plan (SIP) from EE/RE programs.

The 79th Legislature expanded the scope of the SIP-eligible credits by adding savings from the State Renewable Portfolio Standards from the generation of electricity from renewable sources; specifically requiring the TCEQ to develop methods to quantify emissions reductions from renewable energy; and required the Laboratory to develop at least 3 alternative methods for achieving a 15 percent greater potential energy savings in residential, commercial and industrial construction.

In the 80th Legislature several new energy efficiency initiatives were introduced, including: requiring the Laboratory to provide written recommendations to the State Energy Conservation Office (SECO) about whether or not the energy efficiency provisions of latest published edition of the International Residential Code (IRC), or the International Energy Conservation Code (IECC), are equivalent to or better than the energy efficiency and air quality achievable under the editions adopted under the 2001 IRC/IECC; requiring the Laboratory to develop a standardized report format to be used by providers of home energy ratings; and encouraging the Laboratory to cooperate with an industry organization or trade association to develop guidelines for home energy ratings, including training.

The 81st Legislature (2009) extended the TERP to 2019 and required the TCEQ to contract with Laboratory to compute emissions reduction from wind and other renewable energy resources for the SIP.

The 82nd Legislature (2011), the Laboratory's responsibilities under TERP increased as new legislatively allocated energy efficiency initiatives were introduced.

The 83rd Legislature (2013), the Laboratory's responsibilities under TERP were kept the same as previous years.

The 84th Legislature (2015) changed to the Sec. 388.003. Adoption of Building Energy Efficiency Performance Standards, with the passage of HB 1736, affected the Laboratory's responsibilities under TERP.

The 85th and 86th Legislatures (2017, 2019 respectively) the Laboratory's responsibilities under TERP were kept the same as previous years.

The 87th Legislature (2021) amended Sec. 388.003 (i), (j) and (k) through H.B. 3215.

Calculation of Integrated NOx Emissions Reductions from Multiple State Agencies Participating in the Texas Emissions Reduction Plan (TERP)

In January 2005, the Laboratory was asked by the Texas Commission on Environmental Quality (TCEQ) to develop a method by which the NOx emissions reductions from the energy-efficiency programs from multiple Texas State Agencies working under Senate Bill 5 and Senate Bill 7 could be reported in a uniform format to allow the TCEQ to consider the combined savings for Texas' State Implementation Plan (SIP) planning purposes. This required that the analysis should include the integrated savings estimation from all projects forecasted through 2027 for both the annual and Ozone Season Period (OSP) NOx reductions. In 2022, the NOx emissions reductions from all these programs were calculated using estimated emissions factors for 2018 from the US Environmental Protection Agency (US EPA) eGRID database, which had been specially prepared for this purpose. The different programs included in this 2022 integrated analysis are:

- ESL Single-family, Multi-family, and Commercial new construction,
- PUC Senate Bill 7 Program,
- SECO Senate Bill 5 Program,
- Electricity generated by renewables in Texas (ERCOT)[2],
- SEER 14 upgrades to Single-family and Multi-family residences.

The Laboratory's single-family and multi-family programs include the energy savings attained by the construction of new residences in Texas. To estimate energy savings, the adopted residential building energy code in Texas for the year of 2018 (i.e., the 2015 IECC), that is used as a baseline, as well as the published data on residential construction characteristics provided by the Home Innovation Research Labs (HIRL) are used[3]. Annual electricity savings (MWh) in single- and multi-family programs are also reported to the Laboratory's Annual Reports to the TCEQ (Haberl et al., 2002 - 2018) (Baltazar et al., 2019 - 2022).

The Laboratory's commercial program includes the energy savings attained by constructing new commercial buildings in Texas, including office, apartment, healthcare, education, retail, food service, and lodging buildings, as defined by U.S. Department of Energy (U.S. DOE; USDOE 2011). Energy savings are estimated from code-compliant buildings for target year (ASHRAE Standard 90.1-2013) against code-compliant buildings for baseline year (ASHRAE Standard 90.1-2013) using the Energy Use Intensity (EUI) in the USDOE report and constructed square footage information in Dodge data[4].

The Public Utility Commission of Texas (PUC) Senate Bill 7 program includes the energy efficiency programs implemented by electric utilities under the Public Utility Regulatory Act §39.905. The PUC regulated energy efficiency program was adopted pursuant to 1999 legislation (SB 7) and subsequent legislation in 2001 (SB 5), 2007 (HB 3693), and 2011 (SB 1125). The energy efficiency measures include: high-efficiency HVAC equipment, variable speed drives, increased insulation levels, infiltration reduction, duct sealing, Energy Star Homes, etc. Annual electricity savings claimed by the utilities were reported for the different programs completed in the years 2022 (PUC 2023).

The Texas State Energy Conservation Office (SECO) funds energy-efficiency programs that are directed towards school districts, government agencies, city and county governments, private

[2] ERCOT is the Electric Reliability Council of Texas. ERCOT contains 215 Counties.
[3] 2021 HIRL data is used for the 2022 new code-compliant simulations (HIRL 2021).
[4] The commercial energy savings for 2022 are estimated against the baseline year of 2018, and the annual energy savings for new commercial construction in 2022 are not generated because both years adopted ASHRAE Standard 90.1-2013.

industries and residential energy consumers. For the 2022 reporting year SECO (SECO 2023) submitted annual energy savings values for projects funded by SECO and by Energy Service projects.

The *Electric Reliability Council of Texas (ERCOT) electricity production from currently installed green power generation* in Texas is reported. In this report, the measured electricity productions for 2001 through 2022 were included. For projections to 2027, an annual growth factor was estimated using the last six years of installed power capacity.

Finally, NOx emissions reductions from *the installation of SEER 14 air conditioners in existing residences* are also reported.

Description of the Analysis Method

Annual and Ozone Season Period (OSP) NOx emissions reductions were calculated for 2022 and integrated through 2027 using several factors to discount the potential savings. These factors include an annual degradation factor, a transmission, and distribution factor, a discount factor, and growth factors as shown in Table 1 and are described as follows:

Annual degradation factor: This factor was used to account for an assumed decrease in the performance of the measures installed as the equipment wears down and degrades. With the exception of electricity generated from renewables, an annual degradation factor of 2% was used for ESL Single-family, Multi-family, and Commercial programs and an annual degradation factor of 5% was used for all other programs[5]. The value of the 5% degradation factor was taken from a study by Kats et al. (1996).

Transmission and distribution loss: This factor adjusts the reported savings to account for the loss in energy resulting from the transmission and distribution of the power from the electricity producers to the electricity consumers. For this calculation, the energy savings reported at the consumer level are increased by 7% from 2018 to 2021 and 5.25% after 2021 (EIA 2023) to give credit for the actual power produced that is lost in the transmission and distribution system on its way to the customer. In the case of electricity generated by renewables, the T&D losses were assumed to cancel out since renewable energy is displacing power produced by conventional power plants; therefore, there is no net increase or decrease in T&D losses.

Initial discount factor: This factor was used to discount the reported savings for any inaccuracies in the assumptions and methods employed in the calculation procedures. For the Laboratory's Single, Multi-family and Commercial program, the discount factor was assumed to be 20%. For PUC's Senate Bill 7 program, the discount factor was taken as 10%. For the savings in the SECO program, the discount factor was 30% for the estimations. For the electricity from renewables, the discount factor was taken as 5%. In addition, the discount factor for SEER 14 single-family and multi-family program was 20%.

Growth factor: The growth factors shown in Table 1 were used to account for several different factors. Growth factors for single-family (4.1%), multi-family residential (6.1%), and commercial (5.3%) construction are projections based on the average growth rate for these housing types from recent U.S. Census data for Texas. The growth factor for renewable energy (8.5%) is a linear

[5] A degradation of 5% per year would accumulate as a 5%, 10%, 15%...etc, degradation in performance. Although the assumption of this high level of degradation may not actually occur, it was chosen as a conservative estimate. For renewable energy, a degradation factor of 0% was used. The choice of a 0% degradation factor for renewables is based on the most recent four years of analysis of measured wind data from all Texas wind farms that shows no degradation.

projection based on the installed renewable power generation capacity in 2021 from the Public Utility Commission of Texas. No growth was assumed for PUC programs, SECO, and SEER 14 entries.

Figure 1 shows the overall information flow that was used to calculate the NOx emissions savings from the annual and OSP electricity savings (MWh) from all programs. For the Laboratory's single-family and multi-family code-implementation programs, the annual and OSP were calculated from DOE-2 hourly simulation models[6]. The base case is taken as the average characteristics of single-family and multi-family residences for Texas published the Home Innovation Research Labs (HIRL) based on the performance path of the 2015 IECC. The annual electricity savings from PUC's energy efficiency programs were calculated using PUC approved demand savings calculations and verification methods (PUC 2023). The SECO electricity savings were submitted as annual savings by project[7]. The electricity production from renewables in Texas was from the on-site metered data recorded at 15-minute intervals except for non-utility scale solar photovoltaic (PV) projects. The OSP consumption is the average daily consumption for the period between May 1 and September 30.

Integration of the savings from the different programs into a uniform format allowed for creditable NOx emissions to be evaluated using different criteria as shown in Table 1. These include evaluation across programs, evaluation across individual counties by program, evaluation by SIP area, and evaluation for all ERCOT counties except Houston/Galveston.

Calculation Procedure

The electricity savings in this report were estimated based on the baseline year of 2018. In addition, the emissions reduction estimation throughout this report was updated to include the 2018 eGrid database, which is applied to the four different Competitive Load (CL) zones: Houston, North, West, and South as well as other counties in Texas. For all the programs, except renewable projects, the corresponding OSP emissions reductions were calculated using an annual daily average. The OSP emissions reductions from the electricity generated by renewables except non-utility scale solar PV and biomass projects were estimated by actual measured data.

ESL Single-family and Multi-family. The calculation of the annual electricity savings has been reported since 2002, which included the savings from code-compliant new housing in all 42 non-attainment and affected counties as reported in the Laboratory's annual report submitted by the Laboratory to the Texas Commission of Environmental Quality (TCEQ). From 2018 to 2022, based on year 2018, the annual electricity savings were calculated for new residential construction in all the counties in ERCOT region as well as other counties in Texas, which includes the 42 non-attainment and affected counties. These savings were then tabulated by county and program. Using the calculated values through 2022, savings were then projected to 2027 by incorporating the different adjustment factors mentioned above. In these calculations, it was assumed that the same amount of electricity savings from the code-compliant construction would be achieved for each year after 2022 through 2027[8]. The projected energy savings through 2027, according to county, were then divided into the CL zones in ERCOT as well as other counties in Texas in the 2018 eGRID. To determine which CL zone was to be used, or in counties

[6] These values are based on a performance analysis as defined by Chapter 4 of the 2006, 2009 and 2015 IECC, plus the corresponding NAHB and HIRL data.
[7] The reporting requirements to the SECO did not require energy savings by project type, although for selected sites, energy savings by project type was available.
[8] This includes the appropriate discount and degradation factors for each year.

with multiple Competitive Load (CL) zone. ERCOT region has employed the CL zones, and it is currently divided into four zones: Houston (H), North (N), South (S), and West (W) (ECORT 2023).

For this 2022 annual NOx emissions calculations, the US EPA's 2018 eGRID was used. An example of the eGRID spreadsheet[9] is given in the Table 2. The total electricity savings for each CL zone as well as other counties in Texas were used to calculate the NOx emissions reductions for each of the different counties using the emissions factors contained in eGRID. Similar calculations were performed for each year for which the analysis was required.

ESL-Commercial Buildings. From 2018 to 2022, based on the year 2018, the annual electricity savings were calculated for new commercial construction by county[10]. Using the calculated savings through 2022, savings were then projected to 2027 by incorporating the different adjustment factors mentioned above[11]. In the projected annual electricity savings, it was assumed that the same 2022 amount of electricity savings would be achieved for each year through 2026. Finally, the projected energy saving numbers through 2027, by county, were allocated into the appropriate CL zones.

PUC-Senate Bill 7. For the PUC Senate Bill 7 program savings, the annual electricity savings for 2022 were obtained from the Public Utility Commission of Texas (PUC 2023). Using these savings were projected through 2027 by incorporating the different adjustment factors mentioned above. Similar savings were assumed for each year after 2022 until 2027. The 2018 annual eGRID was used to calculate the NOx emissions savings for the PUC-Senate Bill 7 program. The total electricity savings for each CL zone were used to calculate the NOx emissions reductions for each county using the emissions factors contained in the US EPA's eGRID spreadsheet, which then were used to estimate the integrated NOx emissions reductions for each county.

SECO Savings. The annual electricity consumption reported by political subdivisions for 2022 was obtained from the State Energy Conservation Office (SECO 2023). Using the reported consumption, the annual and OSP electricity savings resulted from energy conservation projects were then calculated. To achieve this, the annual energy use intensity (EUI) for each county was estimated and the county's energy savings for each year against the baseline year of 2018 were then calculated[12]. In addition, the savings through 2027 were projected using the different adjustment factors mentioned above. In a similar fashion to the previous programs, it was assumed that the same amount of electricity savings will be achieved for each year through 2027. The 2018 annual eGRID was also used to calculate the NOx emissions savings for the SECO program.

Electricity Generated by Renewables. The measured and estimated electricity production from renewables in Texas for 2018 through 2022 was obtained from the reports *Statewide Air Emissions Calculations from Wind and Other Renewables (2018-2022)* (Baltazar et al., 2019 - 2023). Using the reported numbers for 2022, savings through 2027 were projected incorporating

[9] To use this spreadsheet electricity savings for each eGRID zone is entered in the bottom row of the spreadsheet (MWh). The spreadsheet then allocates the MWh of electricity savings according to the counties (blue columns) where the CL zone owned and operated a power plant. Totals for all CL zones are then listed on the far right columns (white columns). Similar spreadsheets for the 2018 eGRID exist for SOx and CO_2.

[10] These savings include new construction in office, education, retail, food, lodging and warehouse construction as defined by Dodge building type (Dodge 2011), using energy savings from the US DOE's report (USDOE 2014), and data from CBECS (1995 - 2012) and Dodge (2021).

[11] This also includes the appropriate discount and degradation factors for each year.

[12] In this report, EUI values were used to calculate the electricity savings. This calculation method was also applied to savings estimation for the previous years from 2018 to 2021.

the different adjustment factors mentioned above. The 2016 eGRID was used for the 2019, and the 2018 eGRID was used for the period of 2020 through 2027 to calculate the NOx emissions reductions for the electricity generated by renewables in Texas. The total electricity savings for each CL zone were used to calculate the NOx emissions reductions for each of the different counties.

SEER 14 Single-Family and Multi-Family. In January of 2006, Federal regulations mandated that the minimum efficiency for residential air conditioners be increased to SEER 13 from the previous SEER 10. In this analysis, it was assumed that an equal number of existing houses had their air conditioners replaced, as reported for 2006, by the air conditioner manufacturers[13]. In this report, the annual and OSP electricity savings were calculated for all the counties in ERCOT region, which include the 42 non-attainment and affected counties, were calculated. Based on the energy use and electricity generated for 2018, the savings after 2019 until 2027 were projected by incorporating the appropriate adjustment factors[14]. Similarly, Federal regulations mandated that the minimum efficiency for residential air conditioners be increased to SEER 14. The savings estimation considers the replacement of air-conditioning units by units with an efficiency of SEER 14 in existing residences that were built seventeen years ago[15]. The total SEER 14 electricity savings for each CL zone were used to calculate the NOx emissions reductions for each of the different counties using the emissions factors contained in the 2018 eGRID. Integrated NOx emissions reductions for each county by non-attainment and affected counties were also calculated.

Results

The total integrated annual and OSP electricity savings for all the different programs in the integrated format were calculated for 2019 through 2027 as shown in Table 3, using the adjustment factors shown in Table 1. Annual and OSP NOx emissions reductions from the electricity savings for all the programs in the integrated format are shown in Table 4.

In 2022, the total integrated annual savings from all programs are 60,176,008 MWh/year. The integrated annual electricity savings from all the different programs are:

- Savings from code-compliant residential and commercial construction are 857,526 MWh/year (1.4% of the total electricity savings),
- Savings from the PUC's Senate Bill 7 program are 510,991 MWh/year (0.8%),
- Savings from SECO's Senate Bill 5 program are 1,140,211 MWh/year (1.9%),
- Electricity savings from renewable power generation are 56,941,742 MWh/year (94.6%), and
- Savings from residential air conditioner retrofits[16] are 725,539 MWh/year (1.2%).

In 2022, the total integrated OSP savings from all programs are 265,172 MWh/day, which would be 11,049 MW average hourly load reduction during the OSP period. The integrated OSP electricity savings from all the different programs are:

[13] In 2011, the U.S.DOE revised the energy conservation standards for residential HVAC systems. Beginning in January 2015, split-system central air conditioners installed in Texas must be at least SEER 14. NOx emissions reductions from SEER 14 replacement air conditioners will be included in future TERP reports as statewide sales data can be evaluated.
[14] Additional details about this calculation are contained in the Laboratory's 2008 Annual Report to the TCEQ, available at the ESL web site "http://esl.tamu.edu/".
[15] The "lifespan" of a central air conditioner is about 15 to 20 years (USDOE 2021).
[16] This assumes air conditioners in existing homes are replaced with the more efficient 14 units, versus an average of SEER 11, which is slightly more efficient than the previous minimum standard of SEER 10.

- Savings from code-compliant residential and commercial construction are 2,349 MWh/day (0.9%),
- Savings from the PUC's Senate Bill 7 programs are 1,400 MWh/day (0.5%),
- Savings from SECO's Senate Bill 5 program are 3,122 MWh/day (1.2%),
- Electricity savings from renewable power generation are 256,313 MWh/day (96.7%), and
- Savings from residential air conditioner retrofits are 1,988 MWh/day (0.8%).

By 2027, the total integrated annual savings from all programs will be 373,481,128 MWh/year. The integrated annual electricity savings from all the different programs are:

- Savings from code-compliant residential and commercial construction will be 2,654,964 MWh/year (0.7% of the total electricity savings),
- Savings from the PUC's Senate Bill 7 program will be 1,087,084 MWh/year (0.3%),
- Savings from SECO's Senate Bill 5 program will be 2,480,463 MWh/year (0.7%),
- Electricity savings from renewable power generation will be 366,157,712 MWh/year (98.0%), and
- Savings from residential air conditioner retrofits will be 1,100,906 MWh/year (0.3%).

By 2027, the total integrated OSP savings from all programs will be 1,404,310 MWh/day, which would be 58,513 MW average hourly load reduction during the OSP. The integrated OSP electricity savings from all the different programs are:

- Savings from code-compliant residential and commercial construction will be 7,274 MWh/day (0.5%),
- Savings from the PUC's Senate Bill 7 programs will be 2,978 MWh/day (0.2%),
- Savings from SECO's Senate Bill 5 program will be 6,795 MWh/day (0.5%),
- Electricity savings from renewable power generation will be 1,384,247 MWh/day (98.6%), and
- Savings from residential air conditioner retrofits will be 3,016 MWh/day (0.2%).

In 2022 (Table 4), the total integrated annual NOx emissions reductions from all programs are 34,142 tons-NOx/year. The integrated annual NOx emissions reductions from all the different programs are:

- NOx emissions reductions from code-compliant residential and commercial construction are 355 tons-NOx/year (1.0% of the total NOx savings),
- NOx emissions reductions from the PUC's Senate Bill 7 programs are 188 tons-NOx/year (0.6%),
- NOx emissions reductions from SECO's Senate Bill 5 program are 493 tons-NOx/year (1.4%),
- NOx emissions reductions from renewable power generation are 32,816 tons-NOx/year (96.1%), and
- NOx emissions reductions from residential air conditioner retrofits are 290 tons-NOx/year (0.9%).

In 2022, the total integrated OSP NOx emissions reductions from all programs are 145.12 tons-NOx/day. The integrated OSP NOx emissions reductions from all the different programs are:

- NOx emissions reductions from code-compliant residential and commercial construction are 0.91 tons-NOx/day (0.6%),
- NOx emissions reductions from the PUC's Senate Bill 7 programs are 0.49 tons-NOx/day (0.3%),

- NOx emissions reductions from SECO's Senate Bill 5 program are 1.27 tons-NOx/day (0.9%),
- NOx emissions reductions from renewable power generation are 141.71 tons-NOx/day (97.7%), and
- NOx emissions reductions from residential air conditioner retrofits are 0.75 tons-NOx/day (0.5%).

By 2027, the total integrated annual NOx emissions reductions from all programs will be 211,074 tons-NOx/year. The integrated annual NOx emissions reductions from all the different programs are:

- NOx emissions reductions from code-compliant residential and commercial construction will be 1,080 tons-NOx/year (0.5% of the total NOx savings),
- NOx emissions reductions from the PUC's Senate Bill 7 programs will be 390 tons-NOx/year (0.2%),
- NOx emissions reductions from SECO's Senate Bill 5 program will be 1,146 tons-NOx/year (0.5%),
- NOx emissions reductions from renewable power generation will be 208,019 tons-NOx/year (98.6%), and
- NOx emissions reductions from residential air conditioner retrofits will be 438 tons-NOx/year (0.2%).

By 2027, the total integrated OSP NOx emissions reductions from all programs will be 748.83 tons-NOx/day. The integrated OSP NOx emissions reductions from all the different programs are:

- NOx emissions reductions from code-compliant residential and commercial construction will be 2.77 tons-NOx/day (0.4%),
- NOx emissions reductions from the PUC's Senate Bill 7 programs will be 1.01 tons-NOx/day (0.1%),
- NOx emissions reductions from SECO's Senate Bill 5 program will be 2.99 tons-NOx/day (0.4%),
- NOx emissions reductions from renewable power generation will be 740.94 tons-NOx/day (98.9%), and
- NOx emissions reductions from residential air conditioner retrofits will be 1.13 tons-NOx/day (0.2%).

Summary

This Summary report presents the NOx emissions reductions from the energy-efficiency programs from multiple Texas State Agencies working under Senate Bill 5 and Senate Bill 7 in a uniform format to allow the TCEQ to consider the combined savings for Texas' State Implementation Plan (SIP) planning purposes. This required that the analysis should include the integrated savings estimation from all projects projected through 2026 for both the annual and OSP NOx reductions. The NOx emissions reductions from all these programs were calculated using estimated emissions factors for 2018 from the US Environmental Protection Agency (US EPA) eGRID database, which had been specially prepared for this purpose.

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

- Annual electricity savings is 60,176,008 MWh/year (34,142 tons-NOx/year) and
- OSP electricity savings are 265,172 MWh/day, which would be 11,049 MW average hourly load reduction during the OSP period (145.12 tons-NOx/day).

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

- Annual electricity savings 373,481,128 MWh/year (211,074 tons-NOx/year) and
- OSP electricity savings 1,404,310 MWh/day, which would be equivalent to 58,513 MW average hourly load reduction during the OSP period (748.83 tons-NOx/day).

The Laboratory has and will continue to provide leading-edge technical assistance to counties and communities working toward obtaining full SIP credit for the energy efficiency and renewable energy projects that are lowering NOx emissions and improving the air quality for all Texans. The Laboratory will continue to provide superior technology to the State of Texas through efforts with the TCEQ and US EPA. The efforts taken by the Laboratory have produced significant success in bringing EE/RE closer to US EPA acceptance in the SIP for Texas.

If any questions arise, please contact us by phone at 979-845-9213.

Table 1: Final Adjustment Factors used for the Calculation of the Annual and OSP NOx Savings for the Different Programs

	ESL-Single Family	ESL-Multifamily	ESL-Commercial	PUC (SB7)	SECO	Renewables-ERCOT	SEER 14 Single Family	SEER 14 Multi Family
Annual Degradation Factor	**2.0%**	**2.0%**	**2.0%**	**5.0%**	**5.0%**	**0.0%**	**5.0%**	**5.0%**
T&D Loss**	**5.25%**	**5.25%**	**5.25%**	**5.25%**	**5.25%**	**0.0%**	**5.25%**	**5.25%**
Initial Discount Factor	**20.0%**	**20.0%**	**20.0%**	**10.0%**	**30.0%**	**5.0%**	**20.0%**	**20.0%**
Growth Factor	**4.1%**	**6.1%**	**5.3%**	**0.0%**	**0.0%**	**8.5%***	**N.A.***	**N.A.***
Weather Normalized	**Yes**	**Yes**	**Yes**	**No**	**No**	**No**	**Yes**	**Yes**

Notes: ** T&D Loss set as 7% from 2018 to 2021, and it sets as 5.25% after 2021.
* SEER 14 growth is based on the past permits of the recent seventeen years. Renewable projects have different growth factor for each type.

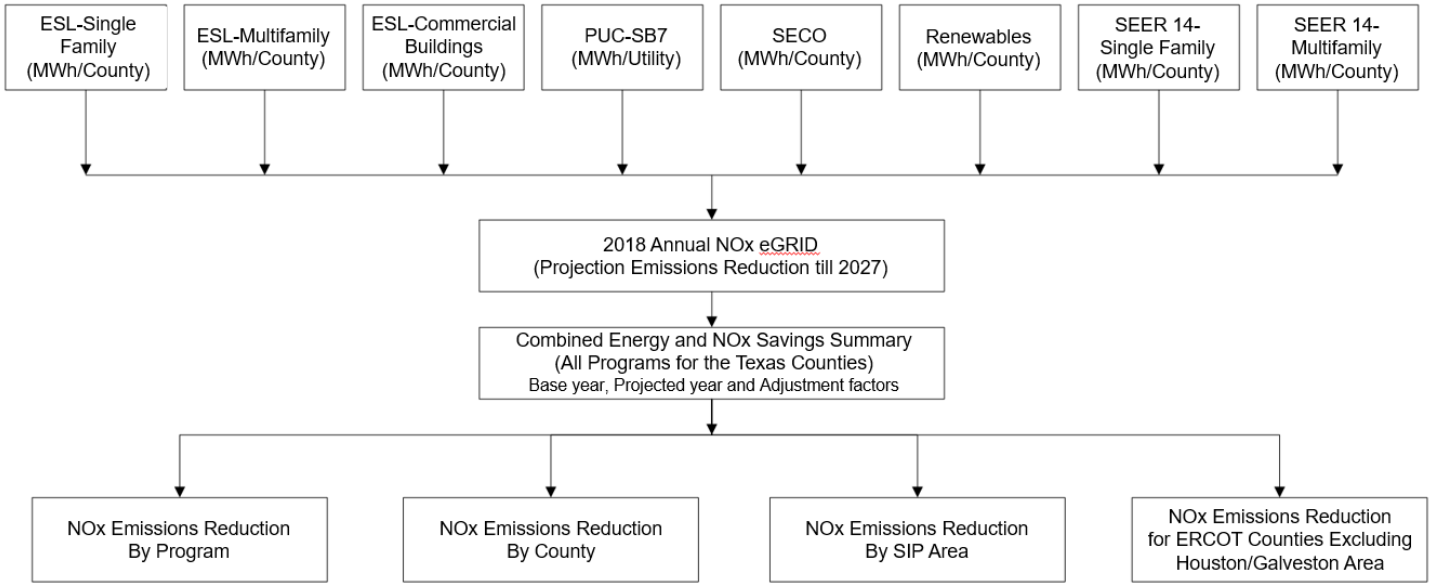

Figure 1: Process Flow Diagram of the NOx Emissions Reduction Calculations

Table 2: Example of NOx Emissions Reduction Calculations using 2018 eGRID

Area	County	ERCOT-H	NOx Reductions (lbs)	ERCOT-N	NOx Reductions (lbs)	ERCOT-W	NOx Reductions (lbs/year)	ERCOT-S	NOx Reductions (lbs)	SPP	NOx Reductions (lbs)	SERC	NOx Reductions (lbs)	WECC	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Houston-Galveston Area	Brazoria	0.1445243	3645.85	0.0000183	0.42	0.0000009	0.00	0.0013540	28.60	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	3674.87	1.84
	Chambers	0.0232302	586.02	0.0000029	0.07	0.0000001	0.00	0.0002176	4.60	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	590.68	0.30
	Fort Bend	0.0925360	2334.37	0.0000117	0.27	0.0000006	0.00	0.0008669	18.31	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	2352.95	1.18
	Galveston	0.0189140	477.14	0.0000024	0.06	0.0000001	0.00	0.0001772	3.74	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	480.93	0.24
	Harris	0.1374166	3466.55	0.0000174	0.40	0.0000008	0.00	0.0012874	27.19	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	3494.14	1.75
	Liberty	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.00	0.00
	Montgomery	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0587430	105.69	0.0000000	0.00	105.69	0.05
	Waller	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.00	0.00
Beaumont/ Port Arthur Area	Hardin	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0027101	4.88	0.0000000	0.00	4.88	0.00
	Jefferson	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.9687861	1742.99	0.0000000	0.00	1742.99	0.87
	Orange	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.8865417	1595.02	0.0000000	0.00	1595.02	0.80
Dallas/ Fort Worth Area	Collin	0.0000743	1.87	0.0004556	10.48	0.0000220	0.04	0.0000046	0.10	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	12.49	0.01
	Dallas	0.0019090	48.16	0.0117105	269.33	0.0005656	0.99	0.0001195	2.52	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	321.00	0.16
	Denton	0.0066429	167.58	0.0407509	937.23	0.0019683	3.43	0.0004158	8.78	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	1117.03	0.56
	Henderson	0.0001509	3.81	0.0009255	21.29	0.0000447	0.08	0.0000094	0.20	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	25.37	0.01
	Hood	0.0008451	21.32	0.0051842	119.23	0.0002504	0.44	0.0000529	1.12	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	142.10	0.07
	Hunt	0.0000043	0.11	0.0000263	0.61	0.0000013	0.00	0.0000003	0.01	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.72	0.00
	Tarrant	0.0004188	10.57	0.0025693	59.09	0.0001241	0.22	0.0000262	0.55	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	70.43	0.04
	Ellis	0.0013349	33.68	0.0081890	188.34	0.0003955	0.69	0.0000835	1.76	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	224.47	0.11
	Johnson	0.0002010	5.07	0.0012332	28.36	0.0000596	0.10	0.0000126	0.27	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	33.80	0.02
	Kaufman	0.0034596	87.27	0.0212228	488.11	0.0010251	1.79	0.0002165	4.57	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	581.74	0.29
	Parker	0.0005940	14.98	0.0036438	83.80	0.0001760	0.31	0.0000372	0.79	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	99.88	0.05
	Rockwall	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.00	0.00
	Wise	0.0031300	78.96	0.0192012	441.61	0.0009275	1.62	0.0001959	4.14	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	526.33	0.26
El Paso Area	El Paso	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	1.2223686	1006.31	1006.31	0.50
San Antonio Area	Bexar	0.0253670	639.92	0.0017108	39.35	0.0000826	0.14	0.2025905	4278.87	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	4958.29	2.48
	Comal	0.0005285	13.33	0.0000356	0.82	0.0000017	0.00	0.0042210	89.15	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	103.31	0.05
	Guadalupe	0.0030546	77.06	0.0002060	4.74	0.0000100	0.02	0.0243949	515.24	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	597.05	0.30
	Wilson	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.00	0.00
Austin Area	Bastrop	0.0024800	62.56	0.0001673	3.85	0.0000081	0.01	0.0198060	418.32	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	484.74	0.24
	Caldwell	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.00	0.00
	Hays	0.0004731	11.93	0.0000319	0.73	0.0000015	0.00	0.0037782	79.80	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	92.47	0.05
	Travis	0.0046184	116.51	0.0003115	7.16	0.0000150	0.03	0.0368846	779.03	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	902.73	0.45
	Williamson	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.00	0.00
North East Texas Area	Gregg	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0053705	6.10	0.0000000	0.00	0.0000000	0.00	6.10	0.00
	Harrison	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.2702671	306.85	0.0000000	0.00	0.0000000	0.00	306.85	0.15
	Rusk	0.0322708	814.08	0.1979648	4553.01	0.0095620	16.68	0.0020197	42.66	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	5426.43	2.71
	Smith	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.00	0.00
	Upshur	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.00	0.00
Corpus Christi Area	Nueces	0.0042426	107.03	0.0002861	6.58	0.0000138	0.02	0.0338828	715.63	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	829.26	0.41
	San Patricio	0.0063692	160.67	0.0004296	9.88	0.0000207	0.04	0.0508668	1074.35	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	1244.94	0.62
Victoria Area	Victoria	0.0016730	42.20	0.0001128	2.60	0.0000054	0.01	0.0133614	282.20	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	327.01	0.16
Other ERCOT Counties	Anderson	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.00	0.00
	Angelina	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.00	0.00
	Atascosa	0.0077084	194.46	0.0005199	11.96	0.0000251	0.04	0.0615620	1300.24	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	1506.70	0.75
	Bell	0.0004444	11.21	0.0027262	62.70	0.0001317	0.23	0.0000278	0.59	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	74.73	0.04
	Bosque	0.0007214	18.20	0.0044257	101.79	0.0002138	0.37	0.0000452	0.95	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	121.31	0.06
	Brazos	0.0005654	14.26	0.0034687	79.78	0.0001675	0.29	0.0000354	0.75	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	95.08	0.05
	Calhoun	0.0111852	282.16	0.0007544	17.35	0.0000364	0.06	0.0893292	1886.70	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	2186.28	1.09
	Cameron	0.0000231	0.58	0.0000016	0.04	0.0000001	0.00	0.0001843	3.89	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	4.51	0.00
	Cherokee	0.0001844	4.65	0.0011310	26.01	0.0000546	0.10	0.0000115	0.24	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	31.00	0.02
	Coke	0.0000223	0.56	0.0001365	3.14	0.0231815	40.43	0.0000014	0.03	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	44.16	0.02
	Colorado	0.0016158	40.76	0.0001090	2.51	0.0000053	0.01	0.0129041	272.54	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	315.82	0.16
	Ector	0.0001338	3.37	0.0008206	18.87	0.1393442	243.04	0.0000084	0.18	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	265.46	0.13
	Fayette	0.0204274	515.31	0.0013777	31.69	0.0000665	0.12	0.1631405	3445.66	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	3992.77	2.00
	Freestone	0.0042261	106.61	0.0259247	596.25	0.0012522	2.18	0.0002645	5.59	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	710.63	0.36
	Frio	0.0097614	246.25	0.0006583	15.14	0.0000318	0.06	0.0779581	1646.54	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	1907.98	0.95
	Goliad	0.0077047	194.36	0.0005196	11.95	0.0000251	0.04	0.0615328	1299.62	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	1505.98	0.75
	Grayson	0.0002857	7.21	0.0017525	40.31	0.0000846	0.15	0.0000179	0.38	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	48.04	0.02
	Grimes	0.0029942	75.53	0.0183678	422.44	0.0008872	1.55	0.0001874	3.96	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	503.48	0.25
	Hidalgo	0.0140830	355.27	0.0009498	21.84	0.0000459	0.08	0.1124720	2375.50	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	2752.69	1.38
	Hill	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.00	0.00
	Howard	0.0000467	1.18	0.0002865	6.59	0.0486558	84.86	0.0000029	0.06	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	92.69	0.05
	Lamar	0.0031379	79.16	0.0192492	442.72	0.0009298	1.62	0.0001964	4.15	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	527.64	0.26
	Limestone	0.0231674	584.43	0.1421203	3268.64	0.0068646	11.97	0.0014500	30.62	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	3895.67	1.95
	Llano	0.0001855	4.68	0.0000125	0.29	0.0000006	0.00	0.0014818	31.30	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	36.27	0.02
	McLennan	0.0043688	110.21	0.0268006	616.39	0.0012945	2.26	0.0002734	5.78	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	734.63	0.37
	Milam	0.0002486	6.27	0.0000168	0.39	0.0000008	0.00	0.0019850	41.93	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	48.58	0.02
	Mitchell	0.0000072	0.18	0.0000443	1.02	0.0075244	13.12	0.0000005	0.01	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	14.33	0.01
	Nacogdoches	0.0002714	6.85	0.0016647	38.29	0.0000804	0.14	0.0000170	0.36	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	45.63	0.02
	Nolan	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.00	0.00
	Palo Pinto	0.0010391	26.21	0.0063745	146.61	0.0003079	0.54	0.0000650	1.37	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	174.73	0.09
	Pecos	0.0000029	0.07	0.0000180	0.41	0.0030637	5.34	0.0000002	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	5.84	0.00
	Reagan	0.0000002	0.01	0.0000015	0.03	0.0002476	0.43	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.47	0.00
	Red River	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.00	0.00
	Robertson	0.0184177	464.61	0.1129830	2598.51	0.0054573	9.52	0.0011527	24.35	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	3096.98	1.55
	Scurry	0.0001246	3.14	0.0007646	17.58	0.1298311	226.45	0.0000078	0.16	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	247.34	0.12
	Titus	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.00	0.00
	Upton	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.00	0.00
	Ward	0.0000206	0.52	0.0001265	2.91	0.0214790	37.46	0.0000013	0.03	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	40.92	0.02
	Webb	0.0000253	0.64	0.0000017	0.04	0.0000001	0.00	0.0002020	4.27	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	4.94	0.00
	Wharton	0.0006585	16.61	0.0000444	1.02	0.0000021	0.00	0.0052594	111.08	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	128.72	0.06
	Wichita	0.0000051	0.13	0.0000315	0.72	0.0053432	9.32	0.0000003	0.01	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	10.18	0.01
	Wilbarger	0.0008609	21.72	0.0052810	121.46	0.8967472	1564.07	0.0000539	1.14	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	1708.38	0.85
	Wood	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.00	0.00
	Young	0.0000257	0.65	0.0001578	3.63	0.0267892	46.72	0.0000016	0.03	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	51.04	0.03
Other SPP Counties	Cass	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0127595	14.49	0.0000000	0.00	0.0000000	0.00	14.49	0.01
	Gaines	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.00	0.00
	Gray	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.00	0.00
	Hale	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0616792	70.03	0.0000000	0.00	0.0000000	0.00	70.03	0.04
	Hemphill	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0246062	27.94	0.0000000	0.00	0.0000000	0.00	27.94	0.01
	Hutchinson	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0134856	15.31	0.0000000	0.00	0.0000000	0.00	15.31	0.01
	Lamb	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.2117054	240.36	0.0000000	0.00	0.0000000	0.00	240.36	0.12
	Lubbock	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0695988	79.02	0.0000000	0.00	0.0000000	0.00	79.02	0.04
	Marion	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0272898	30.98	0.0000000	0.00	0.0000000	0.00	30.98	0.02
	Moore	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.00	0.00
	Morris	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0002270	0.26	0.0000000	0.00	0.0000000	0.00	0.26	0.00
	Potter	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.2710995	307.79	0.0000000	0.00	0.0000000	0.00	307.79	0.15
	Titus	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.00	0.00
	Yoakum	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0438855	49.83	0.0000000	0.00	0.0000000	0.00	49.83	0.02
Other SERC Counties	Jasper	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.00	0.00
	Newton	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0870000	156.53	0.0000000	0.00	156.53	0.08
	San Jacinto	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0072219	12.99	0.0000000	0.00	12.99	0.01
	Tyler	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.0000000	0.00	0.00	0.00
	Total	**0.4927768**	**12431.07**	**0.6891868**	**15850.68**	**0.9589944**	**1672.64**	**0.7276081**	**15367.67**	**1.3340545**	**1514.61**	**0.4990937**	**897.94**	**1.2223686**	**1006.31**	**805950.57**	**402.98**
Energy Savings (MWh)			25,227		22,999		1,744		21,121		1,135		1,799		823		

Table 3: Integrated Annual and OSP Electricity Savings for the Different Programs (Base Year 2018)

PROGRAM	ANNUAL (MWh)									
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
ESL-Single Family	0	0	74,850	158,185	228,167	299,749	373,020	448,076	525,014	603,936
ESL-Multifamily	0	0	175,080	380,168	629,359	889,230	1,160,524	1,444,026	1,740,567	2,051,028
ESL-Commercial	0	0	0	0	0	0	0	0	0	0
PUC (SB7)	0	83,347	195,887	376,958	510,991	638,321	759,286	874,202	983,372	1,087,084
SECO	0	359,121	567,339	828,391	1,140,211	1,436,440	1,717,857	1,985,203	2,239,183	2,480,463
Renewables-ERCOT	0	4,091,723	22,537,959	37,278,263	56,941,742	74,737,111	103,482,550	150,992,668	230,770,375	366,157,712
SEER14-Single Family	0	60,071	181,188	356,259	587,566	796,865	855,307	848,191	836,377	823,784
SEER14-Multi Family	0	33,152	74,374	105,771	137,973	183,666	238,352	280,988	276,696	277,122
Total Annual (MWh)	**0**	**4,627,414**	**23,806,679**	**39,483,996**	**60,176,008**	**78,981,382**	**108,586,896**	**156,873,354**	**237,371,584**	**373,481,128**

PROGRAM	OZONE SEASON PERIOD - OSP (MWh/day)									
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
ESL-Single Family	0	0	205	433	625	821	1,022	1,228	1,438	1,655
ESL-Multifamily	0	0	480	1,042	1,724	2,436	3,180	3,956	4,769	5,619
ESL-Commercial	0	0	0	0	0	0	0	0	0	0
PUC (SB7)	0	228	537	1,033	1,400	1,749	2,080	2,395	2,694	2,978
SECO	0	984	1,553	2,268	3,122	3,934	4,705	5,438	6,134	6,795
Renewables-ERCOT	0	114,596	150,844	181,516	256,313	324,194	431,455	605,958	895,831	1,384,247
SEER14-Single Family	0	165	496	976	1,610	2,183	2,343	2,324	2,291	2,257
SEER14-Multi Family	0	91	204	290	378	503	653	770	758	759
Total OSP (MWh)	**0**	**116,063**	**154,318**	**187,558**	**265,172**	**335,821**	**445,438**	**622,068**	**913,915**	**1,404,310**

Note: 2023-2027 are projections**.**

Table 4: Integrated Annual and OSP NOx Emissions Reduction Values for the Different Programs (Base Year 2018)

PROGRAM	ANNUAL (in tons NOx)									
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
ESL-Single Family	0	0	31	66	95	125	155	186	217	249
ESL-Multifamily	0	0	73	159	260	365	475	590	706	831
ESL-Commercial	0	0	0	0	0	0	0	0	0	0
PUC (SB7)	0	25	74	141	188	233	275	315	353	390
SECO	0	121	230	341	493	637	774	905	1,028	1,146
Renewables-ERCOT	0	1,800	13,849	22,385	32,816	42,929	59,240	86,170	131,361	208,019
SEER14-Single Family	0	20	74	143	236	320	343	341	336	331
SEER14-Multi Family	0	10	27	40	54	71	91	106	105	107
Total Annual (Tons NOx)	**0**	**1,975**	**14,358**	**23,275**	**34,142**	**44,680**	**61,353**	**88,614**	**134,107**	**211,074**

PROGRAM	OZONE SEASON PERIOD - OSP (in tons NOx/day)									
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
ESL-Single Family	0.00	0.00	0.08	0.16	0.23	0.31	0.38	0.46	0.54	0.62
ESL-Multifamily	0.00	0.00	0.19	0.41	0.67	0.94	1.23	1.53	1.83	2.15
ESL-Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PUC (SB7)	0.00	0.07	0.19	0.37	0.49	0.60	0.71	0.82	0.92	1.01
SECO	0.00	0.35	0.59	0.87	1.27	1.64	1.99	2.33	2.65	2.99
Renewables-ERCOT	0.00	60.45	88.21	104.65	141.71	178.12	235.38	328.23	482.09	740.94
SEER14-Single Family	0.00	0.06	0.19	0.37	0.61	0.83	0.89	0.88	0.86	0.85
SEER14-Multi Family	0.00	0.03	0.07	0.10	0.14	0.19	0.24	0.28	0.27	0.28
Total OSP (Tons NOx)	**0.00**	**60.96**	**89.52**	**106.93**	**145.12**	**182.62**	**240.82**	**334.52**	**489.16**	**748.83**

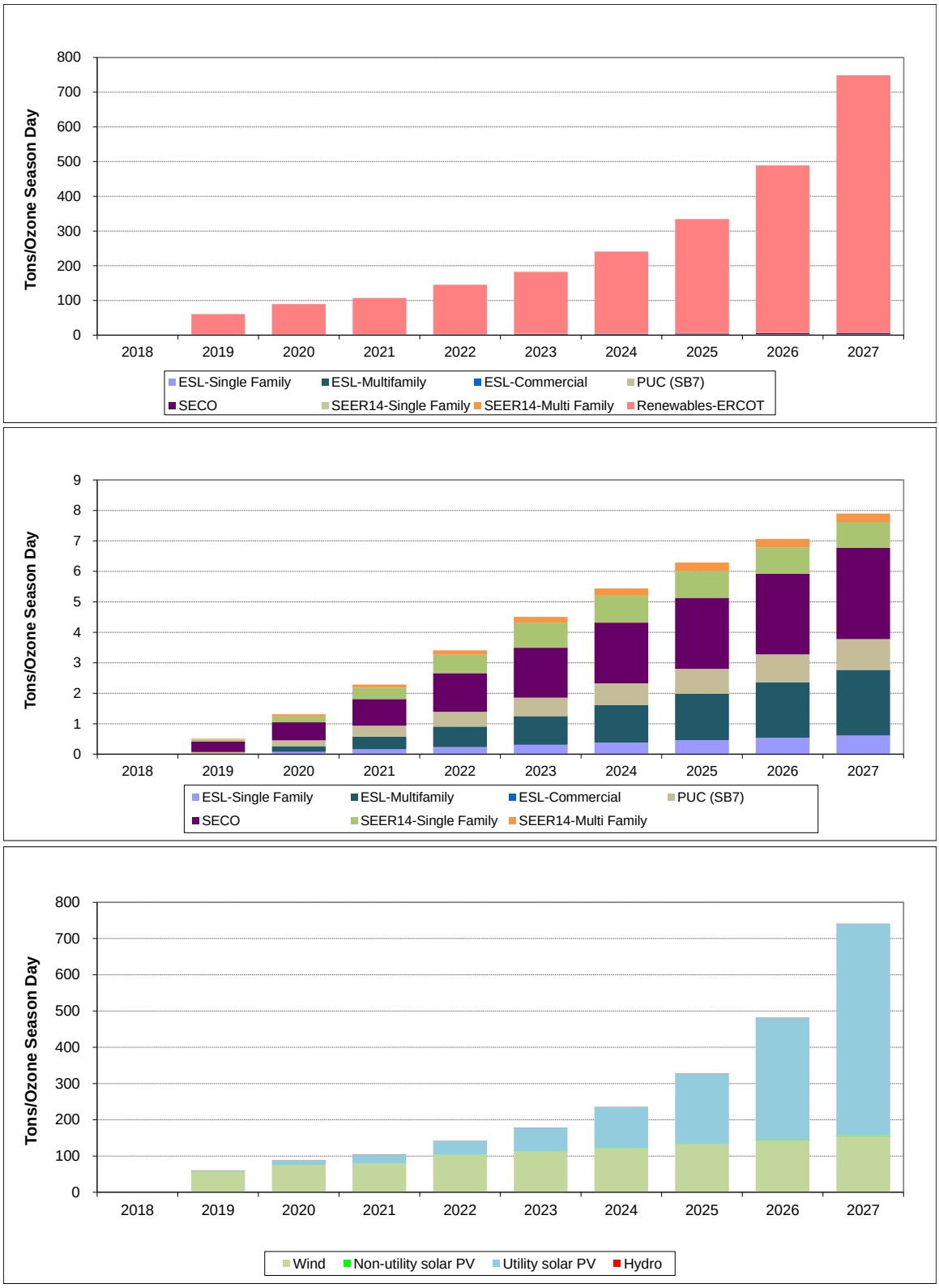

Figure 2: Integrated OSP NOx Emissions Reduction Projections through 2027. (Upper Plot) All Programs, (Middle Plot) All Programs Except Renewables, (Lower Plot) Renewables.

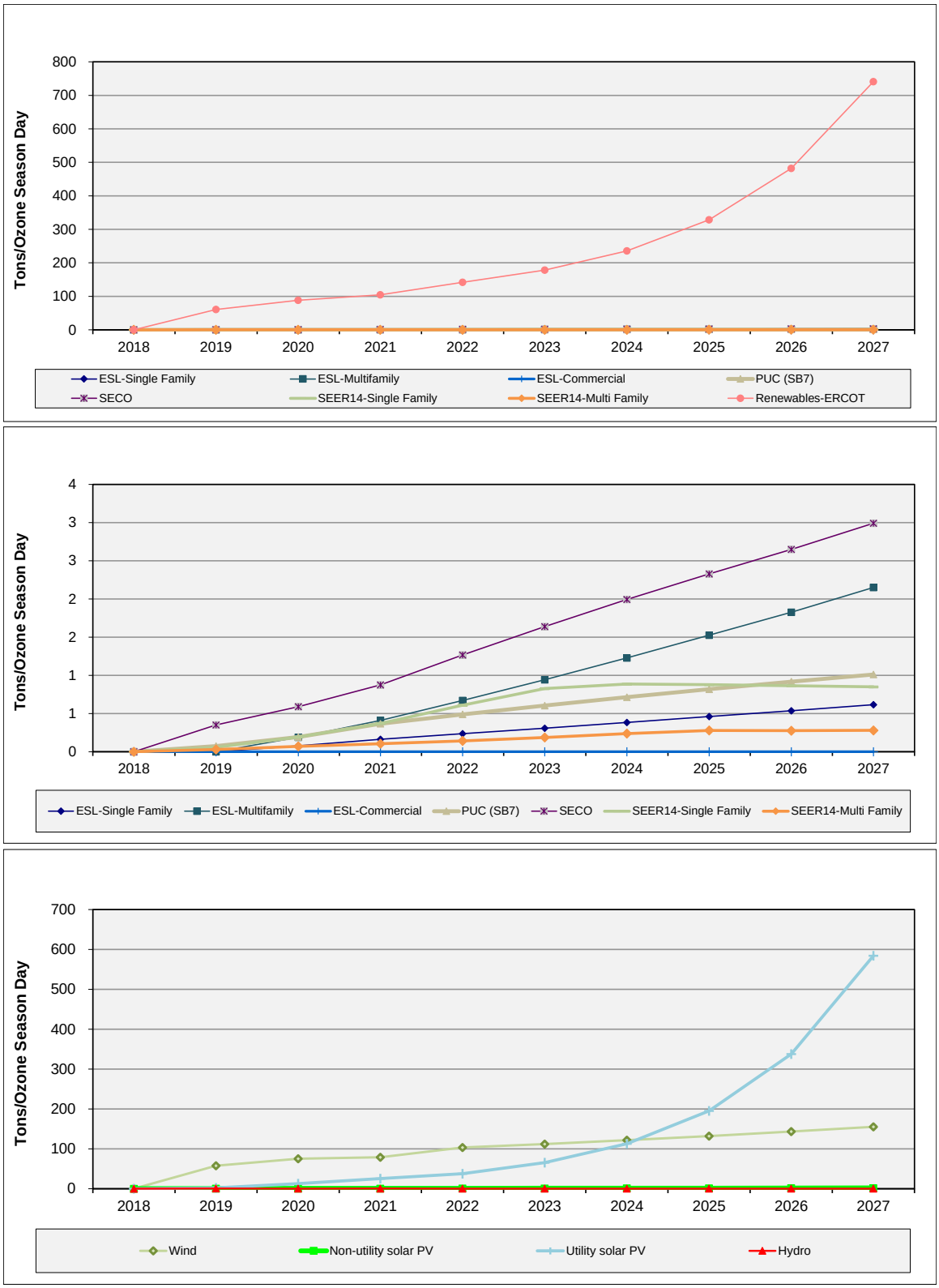

Figure 3: Integrated OSP Individual Programs NOx Emissions Reduction Projections through 2027. (Upper Plot) All Programs, (Middle Plot) All Programs Except Renewables, (Lower Plot) Renewables.

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