APPENDIX 4

INDUSTRIAL, COMMERCIAL, AND INSTITUTIONAL (ICI) FUEL USE STUDY

Bexar County Moderate Area Reasonable Further Progress State Implementation Plan Revision for the 2015 Eight-Hour Ozone National Ambient Air Quality Standard

Project Number 2022-024-SIP-NR

Eastern Research Group, Inc.

Industrial, Commercial, and Institutional (ICI) Fuel Use Study

Final

Prepared for:

Texas Commission on Environmental Quality
Air Quality Division
MC-164, P.O. Box 13087
Austin, TX 78711-3087

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ACRONYMS

BBL	barrel
BTU	British thermal unit
CBP	County Business Patterns
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
COG	Census of Government
DLR	Department of Licensing and Regulation
EIA	Energy Information Administration
EIS	Emission Inventory System
EPA	U.S. Environmental Protection Agency
ERG	Eastern Research Group, Inc.
FIPS	Federal Information Processing System
GHGRP	Greenhouse Gas Reporting Program
HAP	Hazardous air pollutant
Hp-hr	Horsepower-hour
ICI	Industrial and Commercial/Institutional
lb	pound
LPG	Liquified Petroleum Gasoline
MMBTU/hr	Million BTU per hour
MCF	thousands cubic feet
MECS	Manufacturing and Energy Consumption Survey
MMSCF	Million standard cubic feet
MW	Megawatt
NAA	Nonattainment Area
NAAQS	National Ambient Air Quality Standard
NAICS	North American Industry Classification System
NEI	National Emissions Inventory
NESHAP	National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters

NH_3	ammonia
NO_x	Oxides of nitrogen
NSR	New Source Review
OSD	Ozone season daily
PM_{10}-PRI	PM_{10} primary (filterable + condensable)
$PM_{2.5}$-PRI	$PM_{2.5}$ primary (filterable + condensable)
SCC	Source classification code
SEDS	State Energy Data System
SIP	State Implementation Plan
SO_2	Sulfur dioxide
TCEQ	Texas Commission on Environmental Quality
TexAER	Texas Air Emissions Repository
tpd	tons per day
tpy	tons per year
TX	Texas
VOC	volatile organic compound

ES.0 EXECUTIVE SUMMARY

Eastern Research Group, Inc. (ERG) completed the development of a 2014 statewide nonpoint industrial and commercial/institutional (ICI) combustion emissions inventory for sources burning distillate fuel oil and natural gas in Texas. ERG updated several key components of the U.S. Environmental Protection Agency (EPA) ICI Combustion Tool with Texas-specific calculational and allocation factors developed from this study. ERG also converted the EPA ICI Combustion Tool from Access-based to Excel-based distillate fuel oil and natural gas ICI calculators for increased flexibility of the data inputs, transparency of the emissions calculations, and quality assurance of the emissions calculations. Additionally, ERG provided 2014 activity updates to the ICI Combustion Tool to specifically calculate ICI residual fuel oil, kerosene, and liquified petroleum gasoline (LPG) emissions. Finally, ERG prepared electronic files of the annual and ozone season daily (OSD) emissions inventory for upload to the Texas Air Emissions Repository (TexAER) and EPA's Emissions Inventory System (EIS).

1.0 INTRODUCTION

Emission inventories are a core component of air quality analyses. Inventories are used to estimate the quantity of emissions generated by a range of source types (i.e., point sources, area sources, on-road motor vehicles, nonroad mobile sources, and natural sources) and pollutants (i.e., criteria air pollutants, hazardous air pollutants, and greenhouse gases). Inventories are used as inputs to air quality models for simulating air quality concentrations based on base case and/or control scenarios for determining future-year compliance with federal National Ambient Air Quality Standards (NAAQS) within State Implementation Plans (SIPs).

As part of the 2014 National Emissions Inventory (NEI), the U.S. Environmental Protection Agency (EPA) developed a series of emissions calculations tools for numerous nonpoint area sectors, including the Industrial and Commercial/Institutional (ICI) sector. The ICI Combustion Tool uses total state-level ICI energy consumption data released annually as part of the Energy Information Administration's (EIA) State Energy Data System (SEDS). Adjustments are made to account for the fraction of fuel consumed by nonroad mobile sources and for fuel used as feedstock for manufacturing. The tool also allows the user to perform point source emissions reductions using a nonpoint to point source crosswalk.

Eastern Research Group, Inc. (ERG) reviewed the inputs and emissions estimation methodologies of the EPA ICI Tool, and identified the key components available for update. The tool was developed in 2015, prior to the availability of 2014 base year activity data. Additionally, national defaults are applied in lieu of state- or county-specific inputs. However, the EPA's default fuel allocation data may not accurately reflect fuel allocation for Texas ICI combustion sources, especially at the county-level. ERG was tasked with improving EPA's calculation methodology by developing Texas-specific distillate fuel and natural gas usage allocation factors.

Although the purpose of this current project is to develop a 2014 nonpoint emissions inventory for distillate fuel oil and natural gas-fired ICI combustion sources in Texas, ERG also developed emissions estimates for other ICI source categories: residual fuel oil, kerosene, and liquefied petroleum gas (LPG). The remainder of this report describes in detail the steps involved with developing the Texas county-level distillate fuel oil and natural gas-fired emissions inventory. The report includes the following sections:

- Section 2.0 describes the collection of data used to develop calculation and spatial allocation factors;
- Section 3.0 explains the development of the ICI distillate fuel oil factors;
- Section 4.0 explains the development of the ICI natural gas factors;
- Section 5.0 describes the development of the ICI distillate fuel oil and natural gas emissions inventories;
- Section 6.0 describes the development of the other ICI source categories emissions inventories;
- Section 7.0 summarizes the statewide ICI emissions, and highlights county variability that exists between the original ICI Combustion Tool approach and the Updated Approach;
- Appendix A presents the 2014 NEI Version 1 ICI emissions inventory;
- Appendix B presents the point source SCC-to-nonpoint source SCC crosswalk;
- Appendix C presents the updated County Business Patterns and Census of Government employment allocation factors for the Industrial and Commercial/Institutional sectors;
- Appendix D presents the ICI Distillate Oil Combustion Emissions Background Data and Calculator Tool;
- Appendix E presents the ICI Natural Gas Combustion Emissions Background Data and Calculator Tools;
- Appendix F presents the ICI-Other Fuels Combustion Emissions Data; and
- Appendix G presents emission comparisons from the 2014 Nonpoint NEI Version 1, the original ICI Combustion Tool, and the Updated Approach.

2.0 COLLECTED DATA

In support of the development of calculation and spatial allocation factors for development of distillate fuel oil and natural gas-fired emissions inventories, data were collected from a number of sources. As indicated in the project work plan, ERG obtained and analyzed data from the following sources:

- EPA's Boiler Inspector Inventory Database with Projections;
- Texas Department of Licensing and Registration's Boiler Data Search;
- TCEQ's New Source Review permit information system;
- EPA's Greenhouse Gas Reporting Program (GHGRP);
- Energy Information Administration (EIA);
- EPA's Point and Nonpoint Sources National Emissions Inventory (NEI);
- U.S. Census Bureau' County Business Patterns (CBP) and Census of Governments (COG); and
- EPA's Regulatory Boiler Database.

A discussion of the findings and data analysis conducted in review of each of these data sources follows.

2.1 EPA's Boiler Inspector Inventory Database with Projections

EPA's Boiler Inspector Inventory Database with Projections was evaluated for consideration in developing the distillate fuel allocations for industrial and commercial/institutional boilers. The database was determined to be comprehensive in geographic coverage, and in boiler size (industrial and commercial/institutional) coverage and distribution. The database contained over 50,000 individual boilers records for boilers in operation in 235 counties in Texas. After exclusion of certain incomplete boiler records, records for boilers with a heat input capacity greater than 100 (MMBtu/hr), and records showing the combustion of mixed fuel, approximately 49,600 records remained with sufficient information to be used in the distillate fuel allocation analysis described in Section 3. These records contained relevant information for use in the county-level fuel allocation analysis including:

- Boiler Location (County);
- Boiler Size; and
- Fuel Type.

2.2 Texas Department of Licensing and Regulation Boiler Data Search

The Texas Department of Licensing and Regulation (DLR) database is available on-line (https://www.tdlr.texas.gov/Boilerdata/) and was queried and downloaded. Similar to the EPA Boiler Inspector Inventory Database with Projections database, the Texas DLR database was evaluated for consideration in developing the distillate fuel allocations for commercial/institutional and industrial boilers. The database was determined to be comprehensive in geographic coverage, and in boiler size (commercial/institutional and industrial) coverage and distribution. The database contained over 52,000 individual boilers records for boilers in operation in 228 counties in Texas. After exclusion of certain incomplete boiler records, records for boilers with a heat input capacity greater than 100 (MMBtu/hr), and records showing the combustion of mixed fuel, nearly 45,000 records remained with sufficient information to be used in the distillate fuel allocation analysis described in Section 3. These records contained relevant information for use in the county-level fuel allocation analysis including:

- Boiler location (county);
- Boiler size; and
- Fuel type.

After evaluating the Texas DLR database, it was determined that the EPA Boiler Inspector Inventory Database with Projections was more comprehensive for purposes of the fuel allocation factor development. Therefore, the Texas DLR database was not used to develop the allocation factors.

2.3 TCEQ's New Source Review Permit Information System

TCEQ provides access to New Source Review (NSR) Air Permits and Title V Operating Permits on the TCEQ website at http://www2.tceq.texas.gov/airperm/index.cfm. ERG coordinated with the TCEQ

project manager to obtain access to the permit database for evaluation for potential use in development of the fuel use allocation factors. The following permit types were of interest in this study:

- Rule 6011 Boilers (with capacity greater than 40MMBtu/hr)
- Rule 106.183 Boilers (with capacity less than or equal to 40MMBtu/hr)
- Rule 6005 Engines
- Rule 106.511 Portable and Emergency Engines and Turbines
- Rule 106.512 Stationary Engines and Turbines

The data available for each permit record included location (county), permit type, and permit/project status. ERG evaluated the permit records and excluded permits with a project status of "VOID", "DENIED", or "WITHDRAWN". Table 2-1 shows the number of each type of permit in the resultant database.

Table 2-1. Permit Counts by Permit Type

Permit Type	Permit Count
Rule 6011 Boilers (with capacity greater than 40MMBtu)	52
Rule 106.183 Boilers (with capacity less than or equal to 40MMBtu)	740
Rule 6005 Engines	115
Rule 106.511 Portable and Emergency Engines and Turbines	510
Rule 106.512 Stationary Engines and Turbines	9,834

While information on size and/or fuel use was not available for these permits, the relative permit counts indicate a much higher number of engines (and turbines) are permitted than boilers. However, absent any quantitative data on unit size or fuel use, the TCEQ permit data was not used to derive the county-level fuel use allocation factors.

2.4 EPA's Greenhouse Gas Reporting Program

Under EPA's Greenhouse Gas Reporting Program (GHGRP), facilities that meet the applicability criteria under the program (including an emissions

threshold) are required to report estimates of greenhouse gas pollutant emissions, including methane (CH_4) and carbon dioxide (CO_2). For certain industrial sectors, information on the quantity of fuel combusted is required to be reported, as well as other factors that can be used to determine emissions. For purposes of this study, it was determined that alternative data sources provided more comprehensive data on fuel use in Texas, most notably the Energy Information Administration (EIA) data discussed in Section 2.5. Likewise, while some information is available under the GHGRP that would allow for an estimate of fuel use allocation factors between commercial/institutional and industrial combustion sources, other sources provided for a more rigorous analysis at the county level. Therefore, information from the GHGRP was not used in this study.

2.5 Energy Information Administration (EIA)

The primary source of distillate oil and natural gas consumption for ICI sources is Energy Information Administration's (EIA) State Energy Data System (SEDS). This data is published annually at the state-level, and 2014 data was made available on June 29, 2016. Texas-specific consumption of fuels was downloaded from the:

- Energy Consumption Estimates for Major Energy Sources in Physical Units, Selected Years, 1960-2014, Texas data table (https://www.eia.gov/state/seds/sep_use/total/csv/use_TX.csv);
- EIA's Natural Gas Consumption by End-Use (https://www.eia.gov/dnav/ng/ng_cons_sum_dcu_stx_a.htm); and
- EIA's Distillate Fuel Oil and Kerosene Sales by End Use (https://www.eia.gov/dnav/pet/pet_cons_821use_dcu_STX_a.htm).

2.6 EPA's Point and Nonpoint Sources National Emissions Inventory (NEI)

EPA's National Emissions Inventory (NEI) contains point and nonpoint emission estimates for stationary, mobile, and biogenic sources of emissions in

each county in the United States. For Texas, the 2014 NEI point source data contains emissions information for over 7,000 boilers and engines operating in nearly 150 counties. In addition to emissions estimates, the NEI data contains process characterization parameters such as unit type, process type, fuel type, and operating parameters such as hours per year.

In addition to the point source emissions inventory, ERG retrieved Version 1 of the 2014 Nonpoint NEI for Texas. These county-level emissions are presented in Appendix A. Table 2-2 presents the nonpoint SCCs for the ICI source categories.

Table 2-2. Nonpoint ICI SCCs

SCC	SCC Short Name
2102001000	Stationary Fuel Comb /Industrial /Anthracite Coal /Total: All Boiler Types
2102002000	Stationary Fuel Comb /Industrial /Bituminous/Subbituminous Coal /Total: All Boiler Types
2102004001	Stationary Fuel Comb /Industrial /Distillate Oil /All Boiler Types
2102004002	Stationary Fuel Comb /Industrial /Distillate Oil /All IC Engine Types
2102005000	Stationary Fuel Comb /Industrial /Residual Oil /Total: All Boiler Types
2102006000	Stationary Fuel Comb /Industrial /Natural Gas /Total: Boilers and IC Engines
2102007000	Stationary Fuel Comb /Industrial /Liquefied Petroleum Gas /Total: All Boiler Types
2102008000	Stationary Fuel Comb /Industrial /Wood /Total: All Boiler Types
2102011000	Stationary Fuel Comb /Industrial /Kerosene /Total: All Boiler Types
2103001000	Stationary Fuel Comb /Commercial/Institutional /Anthracite Coal /Total: All Boiler Types
2103002000	Stationary Fuel Comb /Commercial/Institutional /Bituminous/Subbituminous Coal /Total: All Boiler Types
2103004001	Stationary Fuel Comb /Commercial/Institutional /Distillate Oil /All Boiler Types
2103004002	Stationary Fuel Comb / Commercial/Institutional /Distillate Oil /All IC Engine Types
2103005000	Stationary Fuel Comb /Commercial/Institutional /Residual Oil /Total: All Boiler Types
2103006000	Stationary Fuel Comb /Commercial/Institutional /Natural Gas /Total: Boilers and IC Engines
2103007000	Stationary Fuel Comb /Commercial/Institutional /Liquefied Petroleum Gas /Total: All Combustor Types
2103008000	Stationary Fuel Comb /Commercial/Institutional /Wood /Total: All Boiler Types
2103011000	Stationary Fuel Comb /Commercial/Institutional /Kerosene /Total: All Combustor Types

Table 2-3 summarizes the Texas emissions in Version 1 of the 2014 NEI for the nonpoint ICI SCCs.

Table 2-3. 2014 NEI Version 1 for Nonpoint ICI Emissions

SCC	CO (tpy)	NH_3 (tpy)	NO_X (tpy)	PM_{10}-PRI (tpy)	$PM_{2.5}$-PRI (tpy)	SO_2 (tpy)	VOC (tpy)	HAPs (tpy)
2102001000	0	0	0	0	0	0	0	0
2102002000	0	0	0	0	0	0	0	0
2102004001	0	0	0	0	0	0	0	0
2102004002	0	0	0	0	0	0	0	0
2102005000	103.57	18.20	1,186.55	493.28	330.02	8,032.23	4.79	2.90
2102006000	7,715.70	293.93	9,185.35	49.60	39.50	55.11	505.20	7.54
2102007000	1,012.60	38.79	1,813.85	6.30	5.01	7.66	57.91	0
2102008000	0	0	0	0	0	0	0	0
2102011000	1.44	0.42	6.98	0.71	0.45	21.745	0.05	0.01
2103001000	0	0	0	0	0	0	0	0
2103002000	0	0	0	0	0	0	0	0
2103004001	0	0	0	0	0	0	0	0
2103004002	0	0	0	0	0	0	0	0
2103005000	2.15	0.25	23.65	7.07	3.03	151.93	0.49	0.06
2103006000	5,748.74	0.23	7,143.56	14.48	11.61	37.35	363.01	5.39
2103007000	3.32	0.24	5.76	0.01	0.01	0.02	0.21	<0.01
2103008000	0	0	0	0	0	0	0	0
2103011000	0.50	0.24	1.99	0.24	0.21	4.39	0.03	<0.01
Statewide	**14,588**	**352**	**19,368**	**572**	**390**	**8,310**	**932**	**16**

As presented in Table 2-3, the ICI Distillate Oil combustion emissions (SCCs 2102004001, 2102004002, 2103004001, and 2103004002) were reported as zeroes for Version 1. Also note that TCEQ intentionally zeroed the ICI coal (SCCs 2102001000, 2102002000, 2103001000, and 2103002000) and wood emission estimates (SCCs 2102008000 and 2103008000), as these sources are completely covered in the point source NEI.

2.7 U.S. Census Bureau

The U.S. Census Bureau publishes County Business Patterns (CBP) data on annual county-level statistics which include the number of establishments and estimated number of employees by North American Industrial Classification System (NAICS) code. Industrial manufacturing facilities are coded between NAICS

31 through 33. Commercial/Institutional facilities are coded between NAICS 42 and 92. Additionally, the Census Bureau also publishes Census of Government (COG) data, which are for municipal governments; these data are included for the Commercial/Institutional county allocation scheme. The ICI Tool contains 2011 CBP and 2012 COG allocations. ERG updated county-level allocations using 2014 CBP and 2015 COG data.

Allocations for the county-level industrial sector were calculated by summing the total employment for NAICS 31 through 33 at the county-level, and then dividing by total statewide employment for NAICS 31 through 33. Similarly, allocations for the commercial/institutional sector was calculated by summing the total employment from NAICS 42 through 92 and from the COG at the county-level, and then dividing by the total statewide employment for NAICS 42 through 92 and from the COG. Appendix C presents the updated Industrial and Commercial county-level proportions for Texas.

2.8 EPA Regulatory Database for Boilers and Engines

The final data source reviewed for this study was information from the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Industrial, Commercial, and Institutional Boilers and Process Heaters rulemaking, finalized January 31, 2013 (https://www.gpo.gov/fdsys/pkg/FR-2013-01-31/pdf/2012-31646.pdf). As part of its rulemaking for regulating emissions of HAPs from boilers and engines, EPA collected nationwide survey data from a 2008 questionnare on industrial and commercial/institutional boilers and engines. These survey results are posted on EPA's docket website (https://www.regulations.gov/document?D=EPA-HQ-OAR-2002-0058-3830). Of the more than 2,000 boiler units evaluated, 114 were in Texas. Conversely, information on engines was limited, but there were some data points in Texas that were evaluated.

3.0 DEVELOPMENT OF DISTILLATE FUEL OIL ALLOCATION FACTORS

As described in Section 1, the EPA's ICI Combustion Tool contains estimated distillate fuel-use data, default county-level allocation factors, assumptions on use, and emission factors that are used to generate county-level emission estimates. States were encouraged to update inputs to account for 2014 activity data, as well as data specific to their state. The EPA's ICI Combustion Tool allows the user to edit state-level factors (e.g., distillate fuel consumption), but not county-level factors (e.g., county-level fuel allocation factors).

County-level distillate fuel allocation factors have been developed as described below to provide greater resolution for the inventory than currently accommodated by EPA's ICI Combustion Tool.

Distillate-related SCC codes covered by the ICI Combustion Tool include:

- 2102004001 Industrial /Distillate Oil /Boilers
- 2102004002 Industrial /Distillate Oil /IC Engines
- 2103004001 Commercial/Institutional/Distillate Oil /Boilers
- 2103004002 Commercial/Institutional/Distillate Oil /IC Engines

The EPA's ICI Combustion Tool emissions estimation methodology for industrial distillate fuel combustion is as follows:

1) Obtain state-level industrial distillate fuel consumption by product (e.g., #2 fuel oil) from the EIA. The tool currently utilizes 2013 activity data.[1]

2) Adjust total distillate fuel consumption to account for distillate fuel used in industrial processes as feedstock. This distillate fuel is

[1] U.S. Energy Information Administration (EIA) distillate fuel consumption data for Texas is available for download at: https://www.eia.gov/dnav/pet/pet_cons_821use_dcu_STX_a.htm

considered non-fuel. The tool currently utilizes 2010 data from the Manufacturing Energy Consumption Survey (MECS).[2]

3) Allocate distillate fuel consumption between boilers and engines. The ICI Combustion Tool user's guide notes that "Due to a lack of data, the default value for the boiler/engine split is 50/50."

4) Allocate adjusted state-level consumption to the county-level using the U.S. Census Bureau's CBP database.[3] The tool currently utilizes 2011 activity data from the Industrial NAICS (31-33) codes.

5) Adjust point source activity and/or point source emissions.

6) Recalculate county-level activity data to account for counties that had point source adjustments.

The EPA's ICI Combustion Tool emissions estimation methodology for commercial/institutional distillate fuel combustion is similar, but there are some slight differences:

1) Obtain state-level commercial distillate fuel consumption from the US EIA. The tool currently utilizes 2013 activity data.[2]

2) Allocate state-level consumption to the county-level using a combination of data from the U.S. CBP database[2] and the COG database.[4] The tool currently utilizes 2011 activity data for the Commercial/Institutional NAICS (42-81, 99) codes and 2012 Census of Governments data (NAICS 92).

3) Adjust point source activity and/or point source emissions.

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[2] U.S. Energy Information Administration (EIA) MECS data for the U.S. by regions is available for download at: https://www.eia.gov/consumption/manufacturing/data/2010/

[3] U.S. Census Bureau data for the U.S. is available for download at: https://www.census.gov/data/datasets/2014/econ/cbp/2014-cbp.html

[4] U.S. Census of Governments data for the U.S. is available for download at: https://www.census.gov/govs/apes/

4) Recalculate county-level activity data to account for counties that had point source adjustments.

The Industrial and Commercial allocation factors for each county presented in the EPA's ICI Combustion Tool are reflective of 2011 data. The listing of County Federal Information Processing System (FIPS) codes in the tool does not include King (48269) or Loving (48301) counties. This indicated that no employment data was available for those two counties from the 2011 Census Bureau data.

3.1 Boiler/Engine Allocation

The EPA's ICI Combustion Tool uses a default 50/50 split to allocate fuel combustion between boilers and engines. To improve this default split for Texas, ERG analyzed data in the Texas 2014 NEI point source inventory. Several characteristics of the NEI point source data made it conducive to this analysis, including:

- Unit-specific location (county);
- Unit-specific source type (boiler or engine);
- Unit-specific design capacity (MMBtu/hr or horsepower);
- Unit-specific PM_{10} emissions; and
- Unit-specific operating schedule (hr/yr).

Several processing steps were employed to standardize the list of units considered in the analysis. These steps included:

- For units where capacity was reported in megawatts, a conversion factor of (3.41 MMBtu/MW) was used to determine capacity in units of (MMBtu/hr);
- For units where capacity was reported in horsepower, a conversion factor of (7,000 Btu/HP-hr) was used to determine capacity in units of (MMBtu/hr);
- Boilers and engines with a heat input capacity greater than 100 (MMBtu/hr) were excluded from further analysis as they exceed the size rating for industrial boilers; and

- Engines identified as “Emergency” or “Fire Pump” with reported annual hours of operation greater than 7,000 were excluded from further analysis as these engines typically only run for up to 500 hours per year.

Using this information, the total heat input in terms of (MMBtu/yr) was calculated for each boiler with a complete record of unit size, capacity, and operating schedule. For engines, total annual heat input in terms of (MMBtu/yr) was back-calculated based on PM_{10}-PRI emissions using an emission factor of 0.31 (lb/MMBtu) for engines up to 600 HP, and 0.1 (lb/MMBtu) for engines over 600 HP. Once unit-specific total heat input was determined for all boilers and engines, state-wide total heat input for engines and boilers was calculated.

Table 3-1 presents the findings of this analysis for Texas.

Table 3-1. Boiler/Engine Allocation Factors

Unit Type	Heat Input (MMBtu/yr)	Unit- Fuel Type Allocation (%)
Engine	585,568	61.6
Boiler	364,887	38.4

Appendix D1 contains the results of the NEI analysis conducted to determine the boiler/engine split presented in Table 3-1.

ERG also reviewed the TCEQ’s NSR permit information management system data to help inform this analysis. Unfortunately, quantitative data was not available for unit size, which precluded use of the permit data to conduct a rigorous quantitative analysis as allowed by the NEI data. However, it is worth noting that there were over 15,000 permits issued for engines as compared to just over 1,000 permits issued for boilers.

3.2 Industrial and Commercial/Institutional Allocation

The EPA’s ICI Combustion Tool utilizes 2011/2012 census data to allocate fuel use between industrial and commercial/institutional sources. ERG improved

upon this methodology by obtaining and analyzing point source data found in the 2014 NEI, EPA's Boiler Inspector Inventory Database, and 2014/2015 census data. The information available in each of these sources are discussed below.

3.2.1 *2014 NEI*

As described above for the boiler/engine split analysis, the 2014 NEI point source data was processed to develop (MMBtu/yr) fuel consumption data for each unit with sufficient data to allow for the calculation (unit size, operating schedule, and/or PM_{10} emissions). This data was then allocated between industrial and commercial/institutional using a size cutoff of 10 (MMBtu/hr) for commercial/institutional, and 100 (MMBtu/hr) for industrial. County-level data was then compiled for each unit type (boiler/engine) and size (commercial/institutional and industrial). Table 3-2 presents state-wide summary findings of this analysis.

Table 3-2. 2014 NEI Fuel Combustion Summary

Fuel Type	Unit Type	Size	(MMBtu/yr)
Distillate	Boilers	<10 MMBtu/hr	115,227
Distillate	Boilers	10 to 100 MMBtu/hr	249,660
Distillate	Engines	<10 MMBtu/hr	488,340
Distillate	Engines	10 to 100 MMBtu/hr	97,228

3.2.2 *EPA's Boiler Inspector Inventory Database with Projections*

EPA's Boiler Inspector Inventory Database with Projections contains nearly 50,000 records of individual natural gas and distillate-fired boilers in operation in Texas. The database includes:

- Boiler location (county);
- Boiler size (MMBtu/hr); and
- Boiler fuel type.

To compile county-level allocation factors for each unit, fuel, and size category, the boiler data was allocated between industrial and commercial/institutional using a size cutoff of 10 (MMBtu/hr) for commercial/institutional, and 100 (MMBtu/hr) for industrial. Total heat input capacity for each size range was then summed to determine total county-level boiler heat input capacity for commercial/institutional and industrial boilers in (MMBtu/hr). Table 3-3 presents the state-wide summary of findings of this analysis.

Table 3-3. EPA Boiler Inspector Database Summary

Fuel Type	Size	(MMBtu/hr)
Distillate	<10 MMBtu/hr	294
Distillate	10 to 100 MMBtu/hr	1,398

Appendix D2 contains the county-level results of the EPA Boiler Inspector Database analysis conducted to determine the commercial/institutional and industrial boiler fuel allocation.

3.2.3 *2014 Census Information*

As mentioned above, the Industrial combustion and Commercial/ Institutional combustion differentiation is currently accomplished in the ICI Combustion Tool using U.S. Census Bureau 2011 CBP, and 2012 COG data. The listing of County FIPS codes in the ICI Combustion Tool does not include King (48269) or Loving (48301) counties. This likely indicates that no employment data was available for those two counties for 2011 (CBP) and 2012 (COG).

ERG updated this analysis utilizing 2014 U.S. Census Bureau County Business Patterns and 2015 Census of Governments data. For this update, each Texas county had at least a commercial allocation factor. Appendix C contains the

Industrial and Commercial allocation factors for each county based on the Census Bureau and Census of Governments Information.

3.3 Final Distillate Fuel Factor Allocation Determination

After evaluating each available source of quantitative data, ERG developed the final distillate fuel allocation factors for commercial/institutional and industrial boilers and engines using the following hierarchy:

- 2014 NEI Engine Data;
- EPA Boiler Inspector Database; and
- 2014 Census Information.

This approach allowed for use of the best available data, considering the breadth of coverage of each data reference. In particular, the EPA Boiler Inspector Database had greater county-level coverage than the county-level coverage contained in the NEI. Where no data were available in the 2014 NEI or the EPA Boiler Inspector Database, the 2014 Census Information was used to populate the data for that county.

Appendix D3 contains the final allocation factors developed using the methodology described in this memo, and Appendix D4 contains the raw activity data used in this analysis.

The final ICI-Distillate ICI Calculator Tool is in Appendix D5. TCEQ provided point source emission reductions, which are reflected in the final nonpoint emissions estimates.

4.0 DEVELOPMENT OF NATURAL GAS ALLOCATION FACTORS

For the 2011 NEI, TCEQ employed a NAICS employee-weighted approach to allocate statewide natural gas consumption to the county-level. TCEQ originally tasked ERG with following the same procedure with 2014 data, and those results are in Appendix E1. Results of the NAICS employee-weighted approach yielded a statewide natural gas fuel allocation split of 39.8% to area sources and 60.2% to point sources.

TCEQ also requested that ERG identify alternative approaches for allocating statewide natural gas consumption to the county-level, including the procedure used in the ICI Combustion Tool. Natural gas fuel-related SCC codes covered by the ICI Combustion Tool include:

- 2102006000 Industrial /Natural Gas /Boilers and Engines
- 2103006000 Commercial/Institutional /Natural Gas /Boilers and Engines

The EPA ICI Combustion Tool uses county-level allocation factors from 2011 CBP and 2012 COG data to allocate statewide natural gas consumption to the county-level. The ICI Combustion Tool then subtracts point source county activity data (if available), and calculates the emissions. Point source emissions can also be subtracted from the county-level emissions, if those are available and don't overlap with the point source activity data for the same counties and SCCs.

ERG evaluated the approach used in the ICI Combustion Tool, and recommended switching the order from:

- Statewide allocation to county using employment proportions
- Point source activity subtraction
- Calculate emissions

to:

- Subtract point sources activity data from Statewide total
- Allocate remaining nonpoint activity using employment proportions
- Calculate emissions

The ICI Combustion Tool approach is problematic in that if the actual reported point source activity at the county-level is greater than the allocated activity for the same county, then the ICI Combustion Tool will zero out the activity, and emissions for that county will be zero. The ICI Combustion Tool then rebalances remaining counties with excess activity. By using this approach, certain counties could be zeroed out, when in reality that's not likely.

An example of this zeroing out occurred for Harris County, TX when point source activity data was subtracted, as presented in Table 4-1.

Table 4-1. ICI Tool V1.4 Allocation Approach, Harris County, TX

Statewide Industrial NG Consumption, Total (MMSCF)	% Feedstock	Statewide Industrial NG Consumption, Fuel (MMSCF)	Harris County, TX Industrial Allocation Factor (from CBP)	Harris County, TX Calculated Activity Data (MMSCF)	Harris County, TX NEI Point Sources Activity Data (MMSCF)	Harris County, TX Nonpoint Sources Activity Data (MMSCF)
1,770,465	13.58%	1,530,059	0.21030996	321,787	403,531	-81,744

In this scenario, the Tool will convert the difference of -81,744 MMSCF to zero for Harris County, and 81,744 MMSCF will be added to the remaining statewide totals, and redistributed to the remaining counties that are nonzero for activity. The point sources activity data for Harris County is based on 196 facilities in EPA's NEI point sources inventory. The 2014 County Business Patterns estimates 4,099 establishments reporting NAICS 31 through 33 in Harris County, TX. Thus, it's highly unlikely that, after removing the 196 facilities using natural gas from the total number of establishments, there would be zero natural gas consumption activity reported for the remaining 3,903 establishments.

The alternative approach used for this study is to first subtract out total statewide point sources activity from the total statewide usage, and then allocate

the remaining nonpoint activity by the allocation factors calculated from 2014 CBP 2015 COG employment data.

ERG evaluated each natural gas-fired boiler and engine from the 2014 point sources NEI, Version 1. Of the 7,672 reported units burning natural gas, 3,760 were operating at industrial facilities. Of the 3,760 industrial boiler and engine units, 78% (2,917 units) contained design capacity information and hours of operation to calculate unit-level activity. If hours of operation and/or design capacity was not provided, then surrogate data from EPA's Regulatory Boiler Database was used instead. These surrogates were 5,764 hours and 44.30012 MMBTU/hr for design capacity. The total point sources activity for the natural gas-fired industrial boilers and engines was calculated to be 1,268,772 MMSCF.

The alternative approach is presented in Table 4-2. The industrial natural gas nonpoint activity is calculated by removing natural gas used as feedstock at industrial facilities from the reported EIA statewide industrial consumption and plant fuel. The percent feedstock data is from the Manufacturing and Energy Consumption Survey (MECS).

Table 4-2. Updated Industrial ICI – Natural Gas Allocation Approach, Harris County, TX

Statewide Industrial NG Consumption, Total (MMSCF)	% Feedstock	Statewide Industrial NG Consumption, Fuel (MMSCF)	Statewide Point Sources Activity Data (MMSCF)	Remaining Nonpoint Activity Data (MMSCF)	Harris County, Industrial Allocation Factor	Harris County Calculated Activity Data (MMSCF)
1,770,465	13.58%	1,530,059	1,268,772	261,287	0.21030996	54,951.26

Using this approach, nonpoint county-level activity is now allocated to Harris County, TX. Similarly, of the 7,672 reported units burning natural gas, 325 were operating at commercial/institutional facilities. Of the 325 commercial/ institutional boiler and engine units, 83% (269 units) contained design capacity information and hours of operation to calculate unit-level activity. If hours of

operation and/or design capacity was not provided, then surrogate data from the boiler/engine combustion regulatory database was employed. These surrogates were 6,570 hours and 0.51632 MMBTU/hr for design capacity. The total point source activity for the natural gas-fired commercial/ institutional boilers and engines was calculated to be 41,761 MMSCF.

Table 4-3 presents the results of the alternative approach for Harris County, TX Commercial/Institutional sources using natural gas. The only difference in approach is that there are no adjustments for natural gas used as feedstock.

Table 4-3. Updated Commercial/Institutional ICI – Natural Gas Allocation Approach, Harris County, TX

Statewide Commercial NG Consumption, Total (MMSCF)	Statewide Point Sources Activity Data (MMSCF)	Remaining Nonpoint Activity Data (MMSCF)	Harris County, Commercial/ Institutional Allocation Factor	Harris County Calculated Activity Data (MMSCF)
184,908	41,761	143,147	0.20622455	29,520.51

County-level point source activity data by point source SCC was obtained from EPA's 2014 point source NEI. Each point source SCC was then cross walked to a nonpoint SCC, as presented in Appendix B.

As a result of this updated approach, an additional 48 counties now have industrial natural gas emissions that were originally zeroed out using the original ICI Combustion Tool methodology of point source subtraction. Similarly, an additional 9 counties now have commercial/institutional natural gas emissions that were originally zeroed out. These additional counties are presented in Table 4-4.

Table 4-4. Texas Counties with ICI Natural Gas Emissions that were Zeroed Out in the ICI Combustion Tool

State and County FIPS	County Name	Industrial NG Emissions	Commercial/ Institutional NG Emissions
48001	Anderson	✓	
48019	Bandera	✓	
48025	Bee	✓	
48039	Brazoria	✓	
48057	Calhoun	✓	
48065	Carson	✓	
48071	Chambers	✓	
48077	Clay	✓	
48079	Cochran	✓	
48081	Coke	✓	
48103	Crane	✓	
48109	Culberson	✓	✓
48117	Deaf Smith		✓
48131	Duval	✓	
48161	Freestone	✓	
48165	Gaines	✓	
48167	Galveston	✓	
48175	Goliad	✓	
48179	Gray	✓	
48189	Hale		✓
48195	Hansford	✓	
48197	Hardeman	✓	
48199	Hardin	✓	
48201	Harris	✓	
48203	Harrison	✓	
48211	Hemphill	✓	
48229	Hudspeth	✓	✓
48233	Hutchinson	✓	✓
48237	Jack	✓	
48241	Jasper		✓
48245	Jefferson	✓	
48255	Karnes	✓	
48257	Kaufman		✓
48267	Kimble		✓
48297	Live Oak	✓	
48321	Matagorda	✓	
48331	Milam	✓	
48341	Moore	✓	
48355	Nueces	✓	
48357	Ochiltree	✓	
48361	Orange	✓	
48365	Panola	✓	

Table 4-4. Texas Counties with ICI Natural Gas Emissions that were Zeroed Out in the ICI Combustion Tool

State and County FIPS	County Name	Industrial NG Emissions	Commercial/ Institutional NG Emissions
48371	Pecos	✓	
48375	Potter		✓
48389	Reeves	✓	
48391	Refugio	✓	
48395	Robertson	✓	
48435	Sutton	✓	
48445	Terry	✓	
48469	Victoria	✓	
48475	Ward	✓	
48483	Wheeler	✓	
48495	Winkler	✓	
48499	Wood	✓	
48395	Robertson	✓	
48435	Sutton	✓	
Total Number of Counties		48	9

5.0 DEVELOPMENT OF AREA NONPOINT EMISSIONS INVENTORY

The final ICI Distillate Fuel Oil and Natural Gas Calculators are presented in Appendices D5, E2, and E3.

Table 5-1 presents the statewide distillate fuel oil emissions.

Table 5-1. ICI-Distillate Fuel Oil Emissions Comparisons (Default vs. Updated)

Version	CO (tpy)	NH_3 (tpy)	NO_X (tpy)	PM_{10}-PRI (tpy)	$PM_{2.5}$-PRI (tpy)	SO_2 (tpy)	VOC (tpy)	HAPs (tpy)
V1.4 ICI Tool	2,399.89	23.82	11,112.26	810.41	752.97	282.55	758.71	10.27
Updated Approach	1,437.07	23.81	7,110.22	521.53	478.20	251.33	414.38	7.72
% Change (Updated Approach vs. V1.4 Tool)	-40	0%	-15	-16	-16	-27	-16	-16

Table 5-2 presents the ICI Distillate Fuel Oil emissions comparison from the 2014 Nonpoint NEI, the ICI Combustion Tool, and the Updated Approach.

Table 5-2. ICI Distillate Fuel Oil Emissions

Sector	Unit Type	Pollutant	2014 Nonpoint NEI, Version 1 Emissions (tpy)	ICI Tool Emissions (tpy)	Updated Approach Emissions (tpy)	% Change (Updated Approach vs. ICI Tool Approach)
Industrial	Boilers	CO	0	4.30	75.67	1,660
Industrial	Boilers	NH_3	0	9.41	13.75	46
Industrial	Boilers	NO_X	0	163.35	313.92	92
Industrial	Boilers	PM_{10}-PRI	0	14.79	35.53	140
Industrial	Boilers	$PM_{2.5}$-PRI	0	6.31	23.68	275
Industrial	Boilers	SO_2	0	97.12	161.16	66
Industrial	Boilers	VOC	0	0	2.91	NA
Industrial	Boilers	HAPs	0	0.15	1.04	593
Industrial	IC Engines	CO	0	2,009.53	1,361.40	-32
Industrial	IC Engines	NH_3	0	14.41	10.06	-30
Industrial	IC Engines	NO_X	0	9,921.63	6,796.30	-32
Industrial	IC Engines	PM_{10}-PRI	0	712.08	486.00	-32
Industrial	IC Engines	$PM_{2.5}$-PRI	0	664.99	454.52	-32
Industrial	IC Engines	SO_2	0	77.40	90.16	16

Table 5-2. ICI Distillate Fuel Oil Emissions

Sector	Unit Type	Pollutant	2014 Nonpoint NEI, Version 1 Emissions (tpy)	ICI Tool Emissions (tpy)	Updated Approach Emissions (tpy)	% Change (Updated Approach vs. ICI Tool Approach)
Industrial	IC Engines	VOC	0	561.55	411.47	-27
Industrial	IC Engines	HAPs	0	7.10	6.68	-6
Commercial/Institutional	Boilers	CO	0	0	0	0
Commercial/Institutional	Boilers	NH_3	0	0	0	0
Commercial/Institutional	Boilers	NO_X	0	0	0	0
Commercial/Institutional	Boilers	PM_{10}-PRI	0	0	0	0
Commercial/Institutional	Boilers	$PM_{2.5}$-PRI	0	0	0	0
Commercial/Institutional	Boilers	SO_2	0	0	0	0
Commercial/Institutional	Boilers	VOC	0	0	0	0
Commercial/Institutional	Boilers	HAPs	0	0	0	0
Commercial/Institutional	IC Engines	CO	0	0	0	0
Commercial/Institutional	IC Engines	NH_3	0	0	0	0
Commercial/Institutional	IC Engines	NO_X	0	0	0	0
Commercial/Institutional	IC Engines	PM_{10}-PRI	0	0	0	0
Commercial/Institutional	IC Engines	$PM_{2.5}$-PRI	0	0	0	0
Commercial/Institutional	IC Engines	SO_2	0	0	0	0
Commercial/Institutional	IC Engines	VOC	0	0	0	0
Commercial/Institutional	IC Engines	HAPs	0	0	0	0

Table 5-3 presents the ICI Natural Gas Combustion emissions comparison from the 2014 Nonpoint NEI ICI, the ICI Combustion Tool, and the Updated Approach.

Table 5-3. ICI Natural Gas Combustion Emissions

Sector	Unit Type	Pollutant	2014 Nonpoint NEI, Version 1 Emissions (tpy)	ICI Tool Emissions (tpy)	Updated Approach Emissions (tpy)	% Change (Updated Approach vs. ICI Tool Approach)
Industrial	Boilers and IC Engines	CO	7,716	10,973.08	10,974.06	<1
Industrial		NH_3	294	418.02	418.06	<1
Industrial		NO_X	9,185	13,063.19	13,064.35	<1
Industrial		PM_{10}-PRI	50	70.54	70.55	<1
Industrial		$PM_{2.5}$-PRI	39	56.17	56.18	<1
Industrial		SO_2	55	78.38	78.39	<1
Industrial		VOC	505	718.48	718.54	<1

Table 5-3. ICI Natural Gas Combustion Emissions

Sector	Unit Type	Pollutant	2014 Nonpoint NEI, Version 1 Emissions (tpy)	ICI Tool Emissions (tpy)	Updated Approach Emissions (tpy)	% Change (Updated Approach vs. ICI Tool Approach)
Industrial		HAPs	8	10.72	10.72	<1
Commercial/Institutional	Boilers and IC Engines	CO	5,749	6,012.19	6,012.19	0
Commercial/Institutional		NH_3	<1	35.07	35.07	0
Commercial/Institutional		NO_X	7,144	7,157.37	7,157.37	0
Commercial/Institutional		PM_{10}-PRI	14	37.22	37.22	0
Commercial/Institutional		$PM_{2.5}$-PRI	12	30.78	30.78	0
Commercial/Institutional		SO_2	37	42.94	42.94	0
Commercial/Institutional		VOC	363	393.66	393.66	0
Commercial/Institutional		HAPs	5	5.87	5.87	0

In addition to annual emissions, ERG developed ozone season daily (OSD) emissions. For the industrial SCCs (2102xxxxxx), ERG divided annual emissions by 260 (5 days per week * 52 weeks). For the commercial/institutional SCCs (2103xxxxxx), ERG divided annual emissions by 312 (6 days per week * 52 weeks per year).

6.0 EMISSIONS INVENTORY DEVELOPMENT – OTHER ICI SOURCES

As part of this Work Order, ERG was asked to update activity inputs for the other ICI SCCs normally generated from the ICI Tool. Table 6-1 presents the other ICI source categories updated for 2014 inputs. TCEQ directed ERG to not generate ICI coal combustion emissions from the Tool. Additionally, for the ICI Wood Combustion emissions, TCEQ directed ERG to zero out activity, but to still generate emission records for the final data files.

Table 6-1. Other ICI Categories Estimated Using EPA's ICI Combustion Tool

SCC	SCC Short Name
2102011000	Industrial Kerosene Fuel Combustion
2103011000	Commercial/Institutional Kerosene Fuel Combustion
2102007000	Industrial LPG Combustion
2103007000	Commercial/Institutional LPG Combustion
2102005000	Industrial Residual Fuel Oil Combustion
2103005000	Commercial/Institutional Residual Fuel Oil Combustion
2102008000	Industrial Wood Combustion
2103008000	Commercial/Institutional Wood Combustion

The ICI Combustion Tool for the above SCCs mirror the distillate fuel oil and natural gas approaches by calculating state-level emissions, and then allocates to the county-level based on the county-level proportion of industrial or commercial/institutional employment, as determined by the CBP and COG employment data. If point source emissions are included, then the Tool subtracts the point emissions from the estimated county emissions using a point-to-nonpoint SCC crosswalk. If the point source emissions are greater than the county emissions, then the county-level estimates are zeroed out, and the excess emissions are then reattributed to the other counties.

For these source categories, ERG made 2014 updates to the ICI Combustion Tool, as presented in Table 6-2.

Table 6-2. Calculation Updates to the ICI Combustion Tool for Other ICI Categories

Tool Input Group	Tool Input Parameter	Units	Tool Default Value (V1.4)	Updated Value (2014)
Edit State-Level Energy Data (part 1)	LPG - Industrial	Thousand Barrels	543,173	453,270
Edit State-Level Energy Data (part 1)	LPG - Commercial	Thousand Barrels	1,986	1,975
Edit State-Level Energy Data (part 1)	Kerosene - Industrial	Thousand Barrels	26	27
Edit State-Level Energy Data (part 1)	Kerosene - Commercial	Thousand Barrels	5	13
Edit State-Level Energy Data (part 1)	Residual Fuel Oil - Industrial	Thousand Barrels	1,626	1,860
Edit State-Level Energy Data (part 1)	Residual Fuel Oil - Commercial	Thousand Barrels	29	9
Nonfuel Use of Energy Assumptions	LPG Nonfuel (Feedstock)	%	99.08	99.00
Nonfuel Use of Energy Assumptions	LPG Fuel (Combustion)	%	0.92	1.00
Nonfuel Use of Energy Assumptions	Residual Fuel Oil Nonfuel (Feedstock)	%	68.42	70.25
Nonfuel Use of Energy Assumptions	Residual Fuel Oil (Combustion)	%	31.58	29.75
County Allocations	Industrial	Fraction	2011 CBP	2014 CBP
County Allocations	Commercial	Fraction	2011 CBP/2012 COG	2014 CBP/2015 COG

Table 6-3 presents the input parameters were not updated for the Other ICI emissions tool.

Table 6-3. Tool Input Parameters Not Updated to the ICI Combustion Tool for Other ICI Categories

Tool Input Group	Tool Input Parameter	Units	Tool Default Value (V1.4)
LPG Stationary Source Assumptions	Industrial used for Stationary	%	91.28
LPG Stationary Source Assumptions	Industrial used for Mobile	%	8.72
LPG Stationary Source Assumptions	Commercial/Institutional used for Stationary	%	82.28

Table 6-3. Tool Input Parameters Not Updated to the ICI Combustion Tool for Other ICI Categories

Tool Input Group	Tool Input Parameter	Units	Tool Default Value (V1.4)
LPG Stationary Source Assumptions	Commercial/Institutional used for Mobile	%	17.72
Nonfuel Use of Energy Assumptions	Kerosene Nonfuel (Feedstock)	%	0
Nonfuel Use of Energy Assumptions	Kerosene Fuel (Combustion)	%	100
Sulfur and Ash Content of Fuels	Industrial – Residual Oil, Sulfur Content	%	1.31
Sulfur and Ash Content of Fuels	Commercial/Institutional – Residual Oil, Sulfur Content	%	1.31
Sulfur and Ash Content of Fuels	Industrial - Anthracite Coal, Ash Content	%	13.38
Sulfur and Ash Content of Fuels	Commercial/Institutional - Anthracite Coal, Ash Content	%	13.38

ERG ran the ICI Combustion Tool with the above inputs with no point source emissions adjustments. Rather, point source emission adjustments were applied after the Tool calculations, such that excess emissions from point source emissions subtraction would not redistribute to other counties.

Table 6-4 presents the ICI-Other Emissions comparison from the Tool using Defaults versus Updated Assumptions.

Table 6-4. ICI-Other Emissions Comparisons (Default vs. Updated)

Version	CO (tpy)	NH_3 (tpy)	NO_X (tpy)	PM_{10}-PRI (tpy)	$PM_{2.5}$-PRI (tpy)	SO_2 (tpy)	VOC (tpy)	HAPs (tpy)
2014 Nonpoint NEI, V1	1,124	58	3,039	508	339	8,218	63	3.0
V1.4 ICI Tool	906	38	2,007	144	97	2,455	33	0.3
Updated Approach	975	38	2,293	168	113	2,460	58	0.7
% Diff (Updated Approach vs. V1.4 Tool)	8%	0%	14%	17%	17%	<1%	<1%	66%

Table 6-5 presents the ICI Residual Fuel Oil Combustion emissions comparison from the Tool using Defaults versus Updated Assumptions.

Table 6-5. ICI Residual Fuel Oil Combustion Emissions

Sector	Pollutant	2014 Nonpoint NEI, Version 1 Emissions (tpy)	ICI Tool Emissions (tpy)	Updated Approach Emissions (tpy)	% Difference (Updated Approach vs. ICI Tool Approach)
Industrial	CO	103.57	0	44.63	NA
Industrial	NH_3	18.20	9.30	9.30	0
Industrial	NO_X	1,186.55	320.65	579.29	81
Industrial	PM_{10}-PRI	493.28	136.83	158.17	16
Industrial	$PM_{2.5}$-PRI	330.02	92.17	106.15	15
Industrial	SO_2	8,032.23	2,379.57	2,379.92	<1
Industrial	VOC	4.78	0	2.45	NA
Industrial	HAPs	2.90	0.02	0.39	18,500
Commercial/Institutional	CO	2.15	0.60	0.94	59
Commercial/Institutional	NH_3	0.25	0.15	0.15	0
Commercial/Institutional	NO_X	23.66	10.21	10.39	2
Commercial/Institutional	PM_{10}-PRI	7.07	1.96	2.08	6
Commercial/Institutional	$PM_{2.5}$-PRI	3.03	0.83	0.95	14
Commercial/Institutional	SO_2	151.93	38.86	38.86	<1
Commercial/Institutional	VOC	0.48	0.21	0.21	0
Commercial/Institutional	HAPs	0.01	0.01	0.01	<1

Table 6-6 presents the ICI LPG Combustion emissions comparison from the Tool using Defaults versus Updated Assumptions.

Table 6-6. ICI LPG Combustion Emissions

Sector	Pollutant	2014 Nonpoint NEI, Version 1 Emissions (tpy)	ICI Tool Emissions (tpy)	Updated Approach Emissions (tpy)	% Difference (Updated Approach vs. ICI Tool Approach)
Industrial	CO	1,013	640.43	659.01	3
Industrial	NH_3	38.79	26.07	26.07	0
Industrial	NO_X	1,813.85	1,188.14	1,207.09	2

Table 6-6. ICI LPG Combustion Emissions

Sector	Pollutant	2014 Nonpoint NEI, Version 1 Emissions (tpy)	ICI Tool Emissions (tpy)	Updated Approach Emissions (tpy)	% Difference (Updated Approach vs. ICI Tool Approach)
Industrial	PM_{10}-PRI	6.30	2.70	4.10	52
Industrial	$PM_{2.5}$-PRI	5.01	1.83	3.26	78
Industrial	SO_2	7.66	4.69	5.12	9
Industrial	VOC	57.91	15.00	34.31	128
Industrial	HAPs	NA	NA	NA	NA
Commercial/Institutional	CO	3.32	263.93	267.89	2
Commercial/Institutional	NH_3	0.24	1.71	1.71	0
Commercial/Institutional	NO_X	5.77	482.60	482.60	0
Commercial/Institutional	PM_{10}-PRI	0.01	1.65	1.66	<1
Commercial/Institutional	$PM_{2.5}$-PRI	0.01	1.31	1.32	<1
Commercial/Institutional	SO_2	0.02	1.96	2.01	3
Commercial/Institutional	VOC	0.21	17.72	17.72	<1
Commercial/Institutional	HAPs	<0.01	0.24	0.24	<1

Table 6-7 presents the ICI Kerosene Combustion emissions comparison from the Tool using Defaults versus Updated Assumptions.

Table 6-7. ICI Kerosene Combustion Emissions

Sector	Pollutant	2014 Nonpoint NEI, Version 1 Emissions (tpy)	ICI Tool Emissions (tpy)	Updated Approach Emissions (tpy)	% Difference (Updated Approach vs. ICI Tool Approach)
Industrial	CO	1.43	0	1.50	NA
Industrial	NH_3	0.42	0.44	0.44	0
Industrial	NO_X	6.98	0	8.00	NA
Industrial	PM_{10}-PRI	0.71	0	0.88	NA
Industrial	$PM_{2.5}$-PRI	0.45	0	0.53	NA
Industrial	SO_2	21.75	18.11	22.37	24
Industrial	VOC	0.06	0	0.06	NA
Industrial	HAPs	0.01	<0.01	0.01	-44
Commercial/Institutional	CO	0.50	1.31	1.31	0
Commercial/Institutional	NH_3	0.24	0.22	0.22	0
Commercial/Institutional	NO_X	1.99	5.27	5.27	0

Table 6-7. ICI Kerosene Combustion Emissions

Sector	Pollutant	2014 Nonpoint NEI, Version 1 Emissions (tpy)	ICI Tool Emissions (tpy)	Updated Approach Emissions (tpy)	% Difference (Updated Approach vs. ICI Tool Approach)
Commercial/Institutional	PM_{10}-PRI	0.24	0.64	0.64	0
Commercial/Institutional	$PM_{2.5}$-PRI	0.21	0.57	0.57	0
Commercial/Institutional	SO_2	4.39	11.63	11.63	0
Commercial/Institutional	VOC	0.03	0.09	0.09	0
Commercial/Institutional	HAPs	<0.01	0.01	0.01	0

In addition to annual emissions, ERG developed OSD emissions for these SCCs. For the industrial SCCs (2102xxxxxx), ERG divided annual emissions by 260 (5 days per week * 52 weeks). For the commercial/institutional SCCs (2103xxxxxx), ERG divided annual emissions by 312 (6 days per week * 52 weeks per year).

7.0 SUMMARY

ICI emission estimates for selected fuels in Texas were developed for the 2014 calendar year. Several factors and emission calculation procedures were updated to improve Texas emissions. Table 7-1 presents a comparison of the 2014 Nonpoint NEI V1 emissions, the original ICI Tool emissions, and the Updated Approach emissions.

Table 7-1. Statewide Emissions Comparisons

SCC	Pollutant	2014 Nonpoint NEI, Version 1 Emissions (tpy)	ICI Tool Emissions (tpy)	Updated Approach Emissions (tpy)	% Change (Updated Approach vs. ICI Tool Approach)
Industrial	CO	8,833.31	13,627.34	13,116.27	-3.8
Industrial	NH_3	351.34	477.633	477.67	0.01
Industrial	NO_X	12,192.73	24,656.95	21,968.96	-10.9
Industrial	PM_{10}-PRI	549.89	936.94	755.23	-19.4
Industrial	$PM_{2.5}$-PRI	374.98	821.47	644.28	-21.6
Industrial	SO_2	8,116.75	2,656.27	2,737.12	3.0
Industrial	VOC	567.95	1,295.03	1,169.74	-9.7
Industrial	HAPs	10.45	17.98	18.84	4.8
Commercial/Institutional	CO	5,754.71	6,278.02	6,282.33	0.1
Commercial/Institutional	NH_3	0.96	37.15	37.15	<0.1
Commercial/Institutional	NO_X	7,174.96	7,655.44	7,655.63	<0.1
Commercial/Institutional	PM_{10}-PRI	21.80	41.47	41,59	0.3
Commercial/Institutional	$PM_{2.5}$-PRI	14.86	33.49	33.62	0.4
Commercial/Institutional	SO_2	193.69	95.40	95.45	0.1
Commercial/Institutional	VOC	363.74	411.68	411.68	<0.1
Commercial/Institutional	HAPs	5.45	6.13	6.13	<0.1

While the statewide emissions vary between the ICI Tool Approach and the Updated Approach, the differences are more pronounced in the county-level comparison, as presented in Appendix G. Table 7-2 presents significant emissions differences for Harris County, TX.

Table 7-2. Harris County, TX Emissions Comparisons

State County	Pollutant	2014 Nonpoint NEI, Version 1 Emissions (tpy)	ICI Tool Emissions (tpy)	Updated Approach Emissions (tpy)	% Difference (Updated Approach vs. ICI Tool Approach)
48201 – Harris County	CO	2,766.09	1,504.64	3,780.53	151.3
48201 – Harris County	NH_3	75.51	18.03	103.67	474.8
48201 – Harris County	NO_X	3,899.84	3,658.27	4,916.03	34.4
48201 – Harris County	PM_{10}-PRI	112,97	186.78	67.68	-63.8
48201 – Harris County	$PM_{2.5}$-PRI	75.15	166.85	52.43	-68.6
48201 – Harris County	SO_2	1,778.68	554.86	538.93	-2.9
48201 – Harris County	VOC	182.24	194.44	254.05	30.6
48201 – Harris County	HAPs	3.05	2.63	3.81	45.1

This variation in county-level emissions can have significant impacts in air quality modeling, especially for areas that are in nonattainment for ozone. In the above example, NO_x and VOC emissions increase by 30% in Harris County, TX, which is part of the Houston Nonattainment Area.

Table 7-3 presents statewide ICI emissions for Ozone Nonattainment Areas (NAAs) and Special Inventory counties, which requires lower reporting thresholds of VOC and NO_x for 41 counties, compared to the other counties in Texas.

Table 7-3. ICI Emissions Comparison by Reporting Threshold Counties

Reporting Type	Pollutant	ICI Tool Emissions (tpy)	Updated Approach Emissions (tpy)	% Difference (Updated Approach vs. ICI Tool Approach)
Ozone NAAs/Special Inventory	CO	14,633.66	14,880.19	1.7
Ozone NAAs/Special Inventory	NH_3	367.04	398.16	8.5
Ozone NAAs/Special Inventory	NO_X	24,058.49	21,602.02	-10.2
Ozone NAAs/Special Inventory	PM_{10}-PRI	743.30	495.23	-33.4
Ozone NAAs/Special Inventory	$PM_{2.5}$-PRI	649.90	410.86	-36.8
Ozone NAAs/Special Inventory	SO_2	2,124.49	2,169.02	2.1

Table 7-3. ICI Emissions Comparison by Reporting Threshold Counties

Reporting Type	Pollutant	ICI Tool Emissions (tpy)	Updated Approach Emissions (tpy)	% Difference (Updated Approach vs. ICI Tool Approach)
Ozone NAAs/Special Inventory	VOC	1,258.54	1,115.62	-11.4
Ozone NAAs/Special Inventory	HAPs	17.78	18.13	2.0
All Other Counties	CO	5,271.70	4,518.41	-14.3
All Other Counties	NH_3	147.74	116.66	-21.0
All Other Counties	NO_X	8,253.90	8,022.56	-2.8
All Other Counties	PM_{10}-PRI	235.11	301.59	28.3
All Other Counties	$PM_{2.5}$-PRI	205.05	267.04	30.2
All Other Counties	SO_2	627.17	663.56	5.8
All Other Counties	VOC	448.163	465.80	3.9
All Other Counties	HAPs	6.34	6.84	8.0

Appendix A – 2014 Texas Nonpoint NEI Version 1 ICI Emissions Inventory (see "APPENDIX_A_2014_TX_NONPOINT_NEI_V1.xlsx")

Appendix B – ICI Nonpoint SCC to Point SCC Crosswalk (see "APPENDIX_B_ICI_NONPOINT_POINT_SCC_CROSSWALK.xlsx")

Appendix C – 2014 ICI County Allocations from County Business Patterns (see "APPENDIX_C_2014_ICI_COUNTY_ALLOCATIONS.xlsx")

Appendix D – ICI Distillate Oil Combustion Emissions Background Data and Calculator Tool

Appendix D1 – Boiler/Engine Split Analysis
(see "APPENDIX_D1_BOILER_ENGINE_SPLIT_ANALYSIS.xlsx")

Appendix D2 – Boiler Allocations
(see "APPENDIX_D2_BOILER_ALLOCATIONS.xlsx")

Appendix D3 – Final Fuel Allocations
(see "APPENDIX_D3_FINAL_FUEL_ALLOCATIONS.xlsx")

Appendix D4 – Raw Activity Data
(see "APPENDIX_D4_RAW_ACTIVITY_DATA.zip")

Appendix D5 – TCEQ ICI Distillate Oil Calculator Tool
(see "APPENDIX_D5_TCEQ_ICI_DISTILLATE_OIL_CALCULATOR_FINAL.xls")

Appendix E – ICI Natural Gas Combustion Emissions Background Data and Calculator Tools

Appendix E1 – 2014 Area/Point Split Analysis
(see "APPENDIX_E1_2014_AREA_POINT_SPLIT_ANALYSIS.xlsx")

Appendix E2 – TCEQ ICI Industrial Natural Gas Calculator Tool (see "APPENDIX_E2_TCEQ_ICI_INDUSTRIAL_CALCULATOR_NG_FINAL.xlsx")

Appendix E3 – TCEQ ICI Commercial/Institutional Natural Gas Calculator Tool (see "APPENDIX_E3_TCEQ_ICI_COMMERCIAL_CALCULATOR_NG_FINAL.xlsx")

Appendix F – ICI-Other Combustion Emissions Data
(see "APPENDIX_F_ICI_OTHER_EMISSIONS.xlsx")

Appendix G – County-Level Emissions Comparison
(see "APPENDIX_G_COUNTY_LEVEL_COMPARISON.xlsx")