TCEQ

Development of 2018 Future Case Emission Inventory Inputs for Dallas-Fort Worth (DFW) Area Photochemical Modeling

Air Modeling and Data Analysis Section
Air Quality Division

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DFW State Implementation Plan (SIP) Technical Information Meeting
Arlington, Texas
January 31, 2014

Basic Steps in Photochemical Modeling for State Implementation Plan (SIP) Attainment Demonstrations

1. Episode: Select a representative historical ozone episode, with preference given to longer synoptic cycles with transition from low to high and back to low ozone days.

2. Base Case: Develop modeling inputs for this episode that include meteorological fields, biogenic emissions, anthropogenic emissions, boundary conditions, initial conditions, etc.

3. Performance: Evaluate performance of the episode by comparing with historically monitored data.

4. Baseline Case: Run the base case meteorology and biogenic emissions with daily average inputs. For example, the base case has specific electrical utility emission measurements by hour; the baseline has a monthly/seasonal representative average instead.

5. **Future Case: Develop daily average anthropogenic emission inputs for the future year accounting for known Federal, state, and local rules.**

6. Attainment Test: Obtain future design values by applying the future/baseline modeled ozone ratios to monitored design values.

Presentation Overview for Ten-County DFW Area Future Case Emissions Estimation

- 2018 emissions summary by source category for ozone precursors of nitrogen oxides (NO_X) and volatile organic compounds (VOC).
- Background for estimating on-road emissions and trends from 1999-2030.
- Emission rate comparison of modern on-road vehicles to unregulated ones.
- Summary of modern light-duty vehicles by Federal Tier 2 emission standards.
- Background for estimating non-road emissions and trends from 2000-2050.
- Non-road equipment population and emissions distribution with diesel focus.
- Overview of locomotive emission standards and rate trends from 2006-2040.
- Summary of airport emission trends from 2002-2020.
- Development of point source, area source, and drilling rig estimates.
- Natural gas production and price trends from 1993-2013 with future projections.
- Expected future case emission inventory updates expected to occur during 2014.
- VOC reactivity and reaction rates for modeling ozone formation.
- Availability of electronic files for inventory development and ozone modeling.

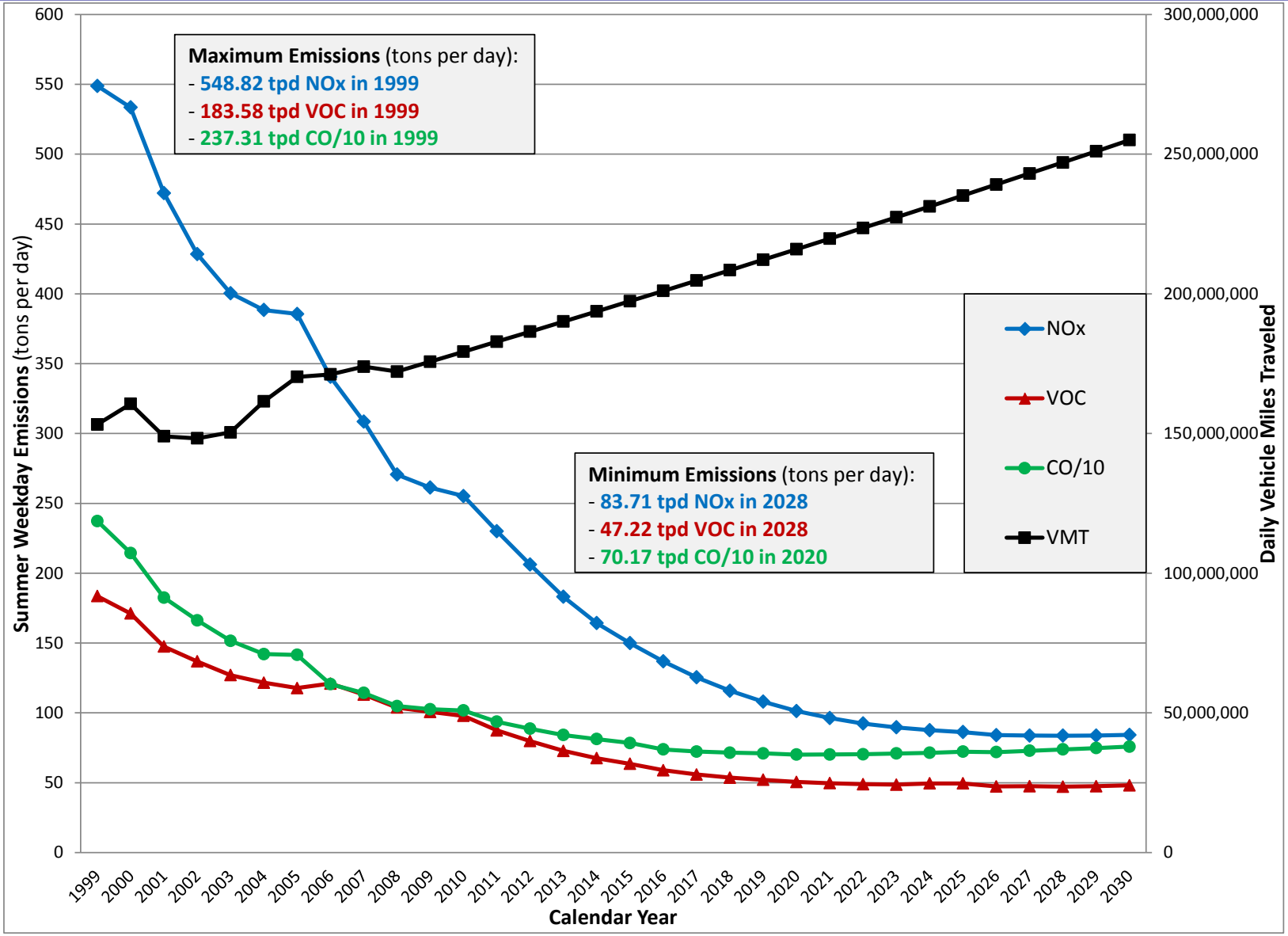
2018 Ten-County DFW Area Anthropogenic Emissions Summary by Source Category

Source Category Description	2018 Summer Weekday Emissions (tons per day)		2018 Summer Weekday Emissions Distribution	
	NO_X	VOC	NO_X	VOC
On-Road	113.21	55.61	39.0%	11.9%
Non-Road	39.87	32.77	13.7%	7.0%
Area	30.76	284.94	10.6%	60.8%
Off-Road – Locomotives	18.90	0.93	6.5%	0.2%
Off-Road – Airports	11.77	3.53	4.1%	0.8%
Oil and Gas - Production	12.21	43.68	4.2%	9.3%
Oil and Gas - Drill Rigs	5.83	0.01	2.0%	0.002%
Point - Electric Utilities	15.02	2.05	5.2%	0.4%
Point - Cement Kilns	17.60	0.80	6.1%	0.2%
Point - Other	24.95	44.24	8.6%	9.4%
Total	290.12	468.56	100.0%	100.0%

Background: Estimating On-Road Emissions

- Emission estimates of on-road vehicles are a combination of:
  - activity, such as vehicle miles traveled (VMT); and
  - emission rates per unit of activity, such as grams per mile.
- Activity estimates typically come from state or local transportation departments, such as:
  - Highway Performance Monitoring System (HPMS) data from the Texas Department of Transportation (TxDOT); or
  - travel demand model output from local metropolitan planning organizations (MPOs) such as the North Central Texas Council of Governments (NCTCOG).
- Emission rates estimates typically come from an EPA on-road model, such as:
  - the MOBILE6 model (http://www.epa.gov/otaq/m6.htm) which was first released in 2002; or
  - the Motor Vehicle Emission Simulator (MOVES) model (http://www.epa.gov/otaq/models/moves/) which replaced MOBILE6 starting in March of 2010.
- The MOVES model estimates emission rates for various pollutants, including VOC, NO_X, and the following NO_X components:
  - nitrogen oxide (NO);
  - nitrogen dioxide (NO_2); and
  - nitrous acid (HONO).
- Emission rates vary for different operating processes:
  - running exhaust from a warm engine versus higher rates for start mode exhaust; and
  - VOC exhaust emission rates based on distance traveled versus evaporative rates from parked vehicles.

MOVES2010a Ten-County DFW Area On-Road Emission Trends from 1999-2030



Source: Texas Transportation Institute On-Road Trends Study for 1999-2030 with MOVES2010a, July 2011, which is available at ftp://amdaftp.tceq.texas.gov/pub/Mobile_EI/Trends/mvs/.

Comparison of Emission Rates from Modern Vehicles to Unregulated Vehicles

Vehicle Type and Emissions Standard Description	Average In-Use Emission Rates (grams per mile)	
	NO_X	VOC
Unregulated 1960 Gasoline Passenger Car (Source: MOBILE6.2 Model Default)	4.2805	16.0060
Modern Tier 2 Gasoline Passenger Car (Source: MOVES2010a Model Default)	0.0971	0.1168
Relative Reduction for Gasoline Passenger Car	98%	99%
Unregulated 1960 Diesel 18-Wheeler (Source: MOBILE6.2 Model Default)	35.8014	4.9869
Modern 18-Wheeler (Source: MOVES2010a Model Default)	4.4450	0.5022
Relative Reduction for Diesel 18-Wheeler	88%	90%

2012 Model Year Summary of Tier 2 Passenger Fleet Vehicles

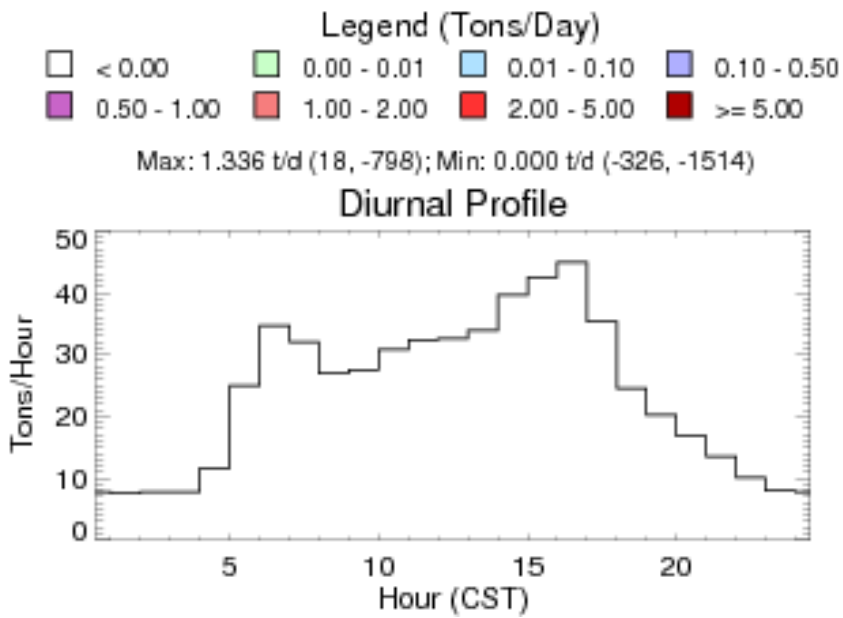
Federal Tier 2 Bin	120,000 Mile Useful Life Standards (grams per mile)[1]			Number of 2012 Model Year Certified Vehicles by Fuel Type[3]						
	NO_X	NMOG[2]	CO	Diesel Fuel	Electricity Only	Gasoline/ Electricity	Gasoline/ Ethanol	Gasoline Only	Natural Gas	All
Bin 1	0.00	0.000	0.0		8					8
Bin 2	0.02	0.010	2.1					11	2	13
Bin 3	0.03	0.055	2.1			1		37		38
Bin 4	0.04	0.070	2.1			1	94	159		254
Bin 5	**0.07**	**0.090**	**4.2**	17		1	56	808		882
Bin 6	0.10	0.090	4.2							
Bin 7	0.15	0.090	4.2							
Bin 8	0.20	0.125	4.2				62	8		70
Total				17	8	3	212	1,023	2	1,265

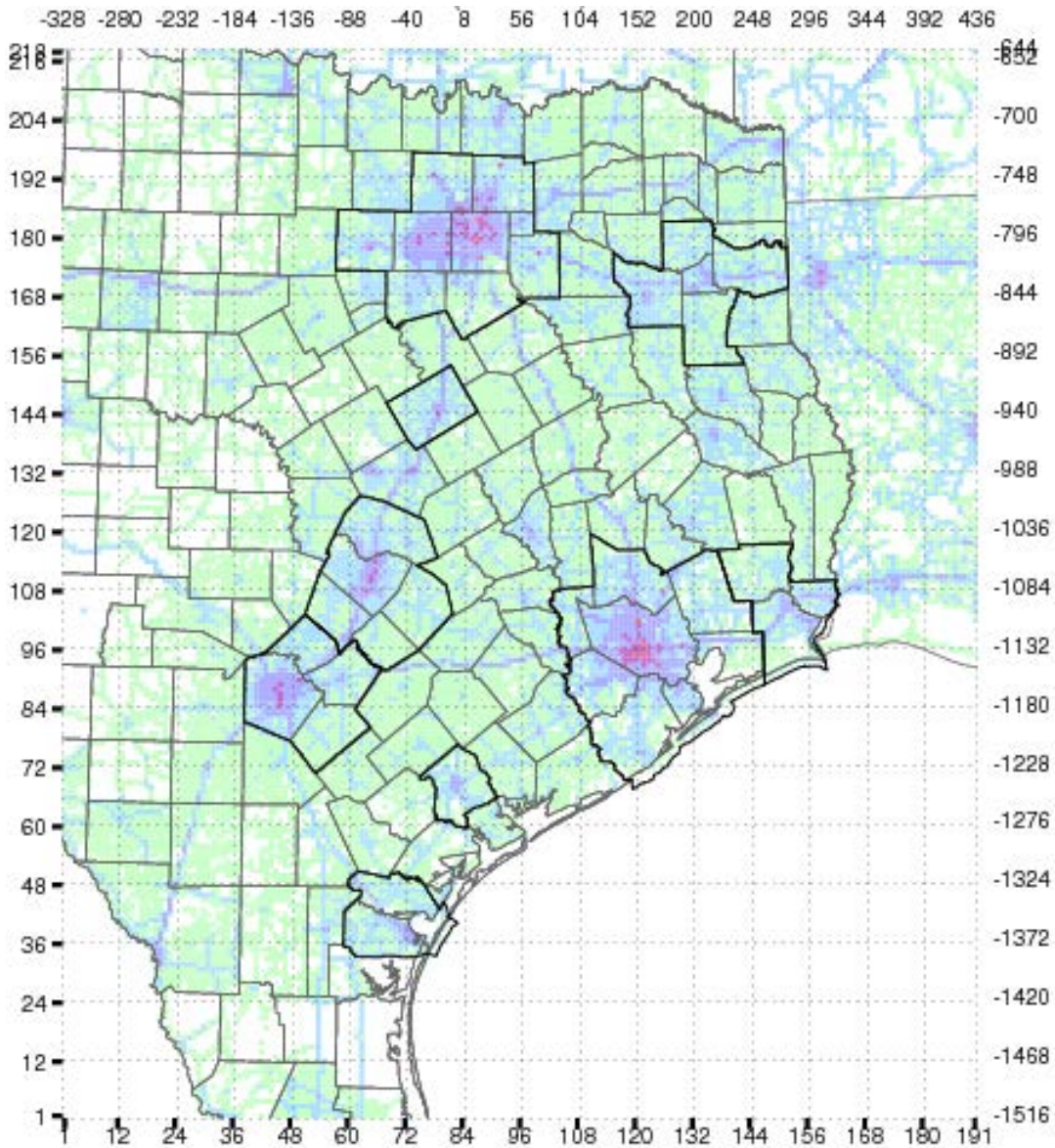
Notes:

1. From Table S04-1 of Tier 2 Motor Vehicle Emissions Standards and Gasoline Sulfur Control Requirements rule, which is available at http://www.epa.gov/tier2/. Manufacturer sales must average out to Bin 5 or better.
2. Non-methane organic gases, which are VOC plus ethane (or total hydrocarbons minus methane).
3. From the U.S. EPA Green Vehicle Guide, which is available at http://www.epa.gov/greenvehicles.

2018 Summer Weekday On-Road NO_X Texas 4 km Domain – June 14 Episode Day

County	On-Road NO_X (tpd)
Collin	12.99
Dallas	40.26
Denton	10.03
Ellis	4.49
Johnson	3.65
Kaufman	4.26
Parker	5.12
Rockwall	2.28
Tarrant	27.44
Wise	2.68
Ten-County Total	113.21





Background: Estimating Non-Road Emissions

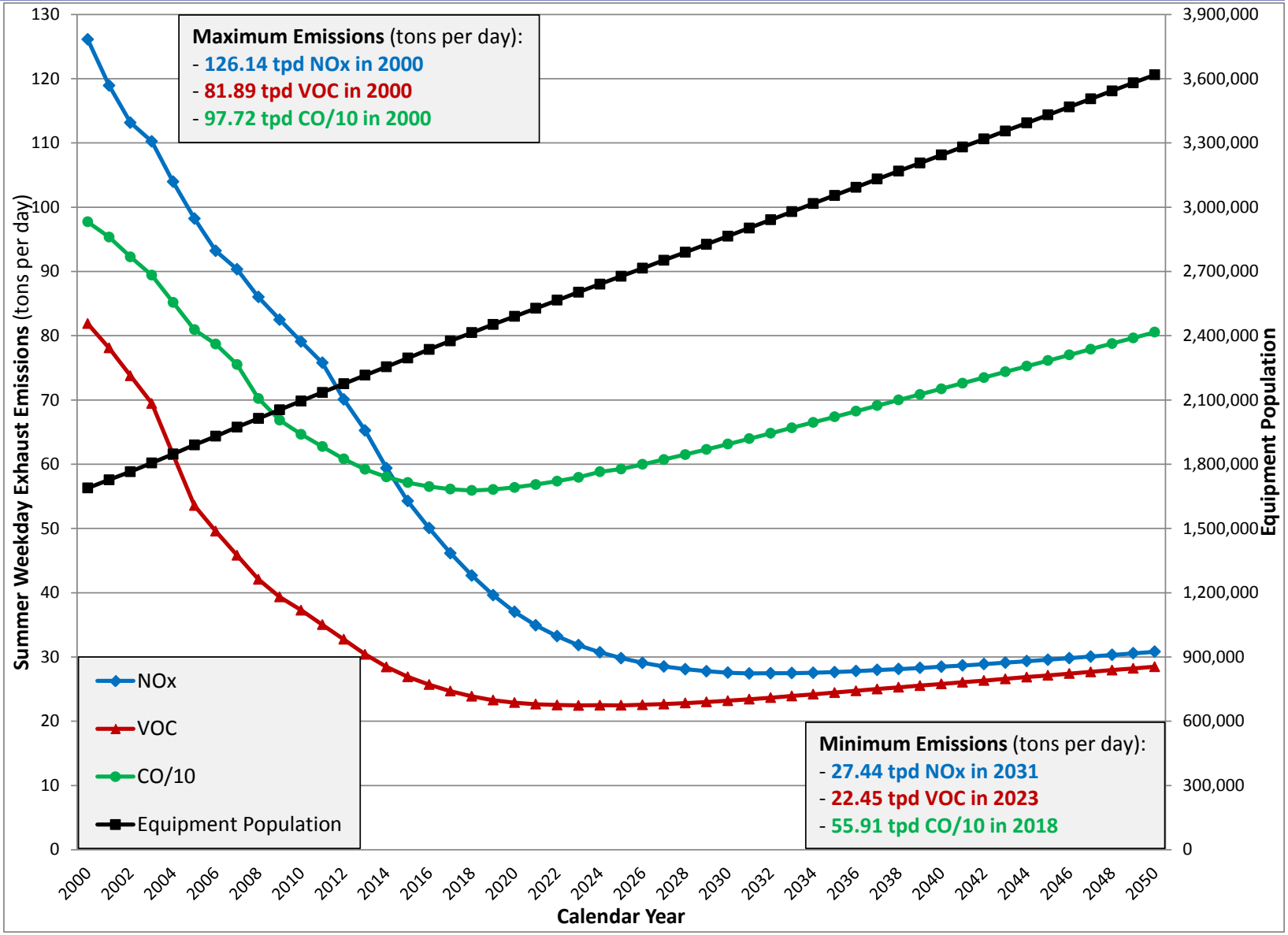
- Non-road equipment includes:
  - agricultural equipment, such as tractors;
  - construction equipment, such as graders and back hoes;
  - industrial equipment, such as fork lifts and sweepers;
  - logging equipment, such as chain saws;
  - recreational marine vessels, such as power boats ;
  - recreational vehicles, such as all-terrain vehicles and off-road motorcycles; and
  - residential and commercial lawn and garden equipment, such as lawn mowers and leaf blowers.

- Non-road emission estimates are a combination of:
  - equipment population by age, horsepower, fuel type, and application;
  - average load factor expressed as the average fraction of available power;
  - activity in hours of use per time period (e.g., day, month, or year); and
  - emission rates that account for new standards and deterioration with age.

- The U.S. EPA NONROAD model (http://www.epa.gov/otaq/nonrdmdl.htm) is used to combine these inputs and estimate total emissions by county for pollutants such as NO_X and VOC.

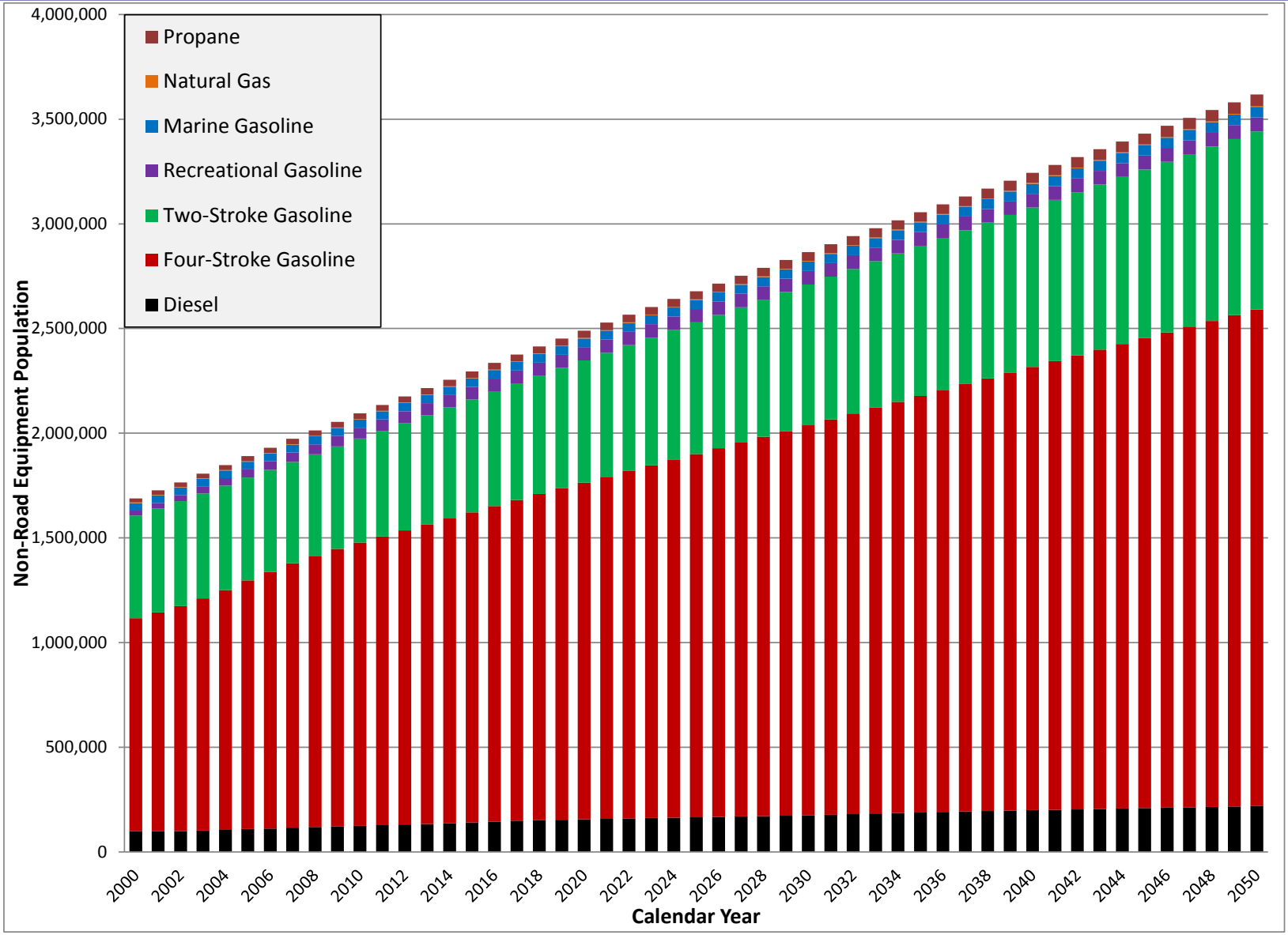
- Customized versions of the NONROAD model used by the TCEQ include:
  - the Texas NONROAD (TexN) model, which is run for all 254 counties in the state and is available at ftp://amdaftp.tceq.texas.gov/pub/Nonroad_EI/TexN/; and
  - the National Mobile Inventory Model (NMIM), which is run for all non-Texas U.S. counties and is available at http://www.epa.gov/otaq/nmim.htm.

Texas NONROAD Model Ten-County DFW Area Non-Road Emission Trends from 2000-2050



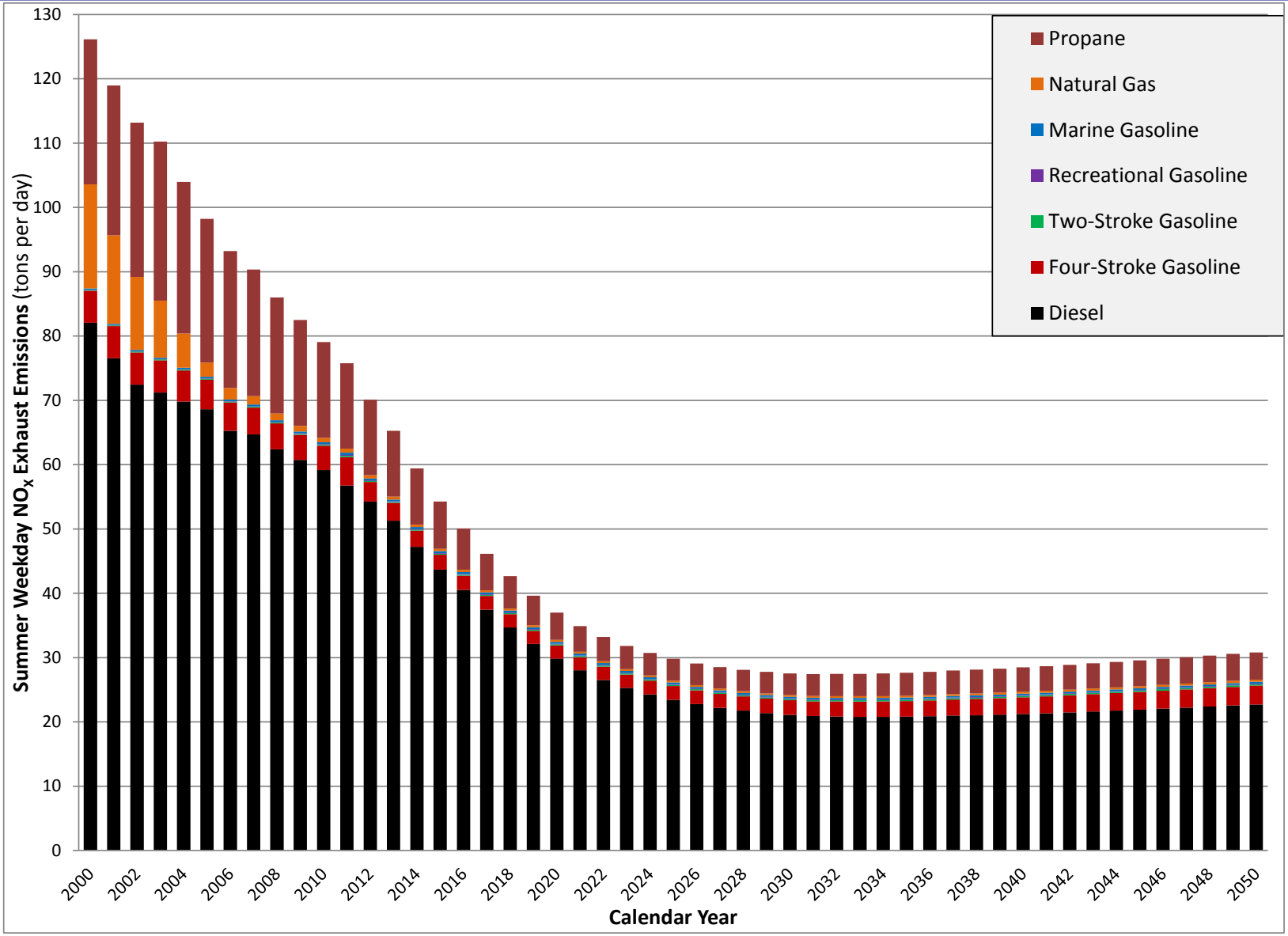
Source: Default runs of the Texas NONROAD (TexN) model for every county from 2000-2050. The TexN model is available at ftp://amdaftp.tceq.texas.gov/pub/Nonroad_EI/TexN/.

Non-Road Equipment Population in DFW by Fuel and Engine Type from 2000-2050



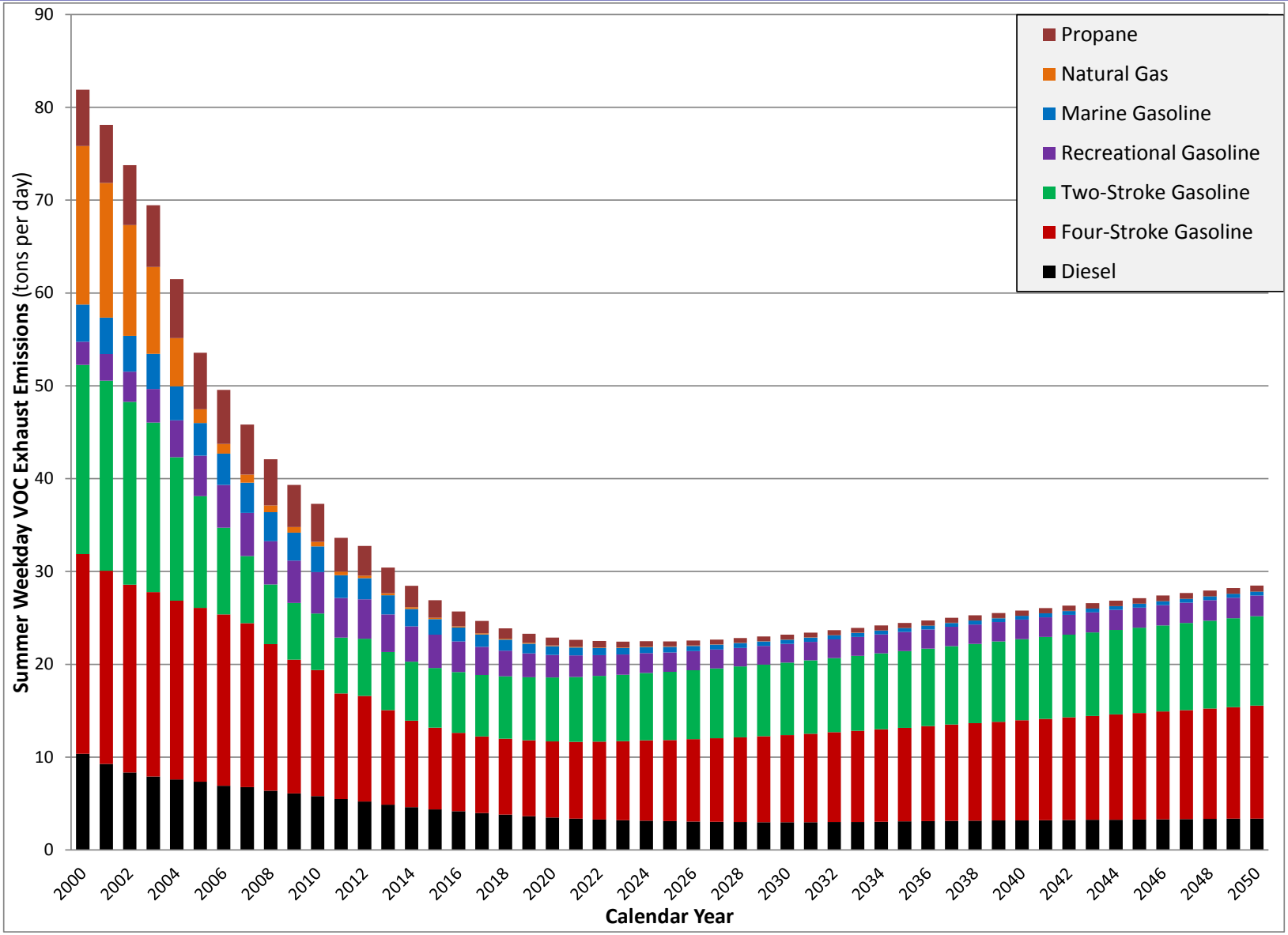
Source: Default runs of the Texas NONROAD (TexN) model for every county from 2000-2050. The TexN model is available at ftp://amdaftp.tceq.texas.gov/pub/Nonroad_EI/TexN/.

Non-Road NO_X Emissions in DFW by Fuel and Engine Type from 2000-2050



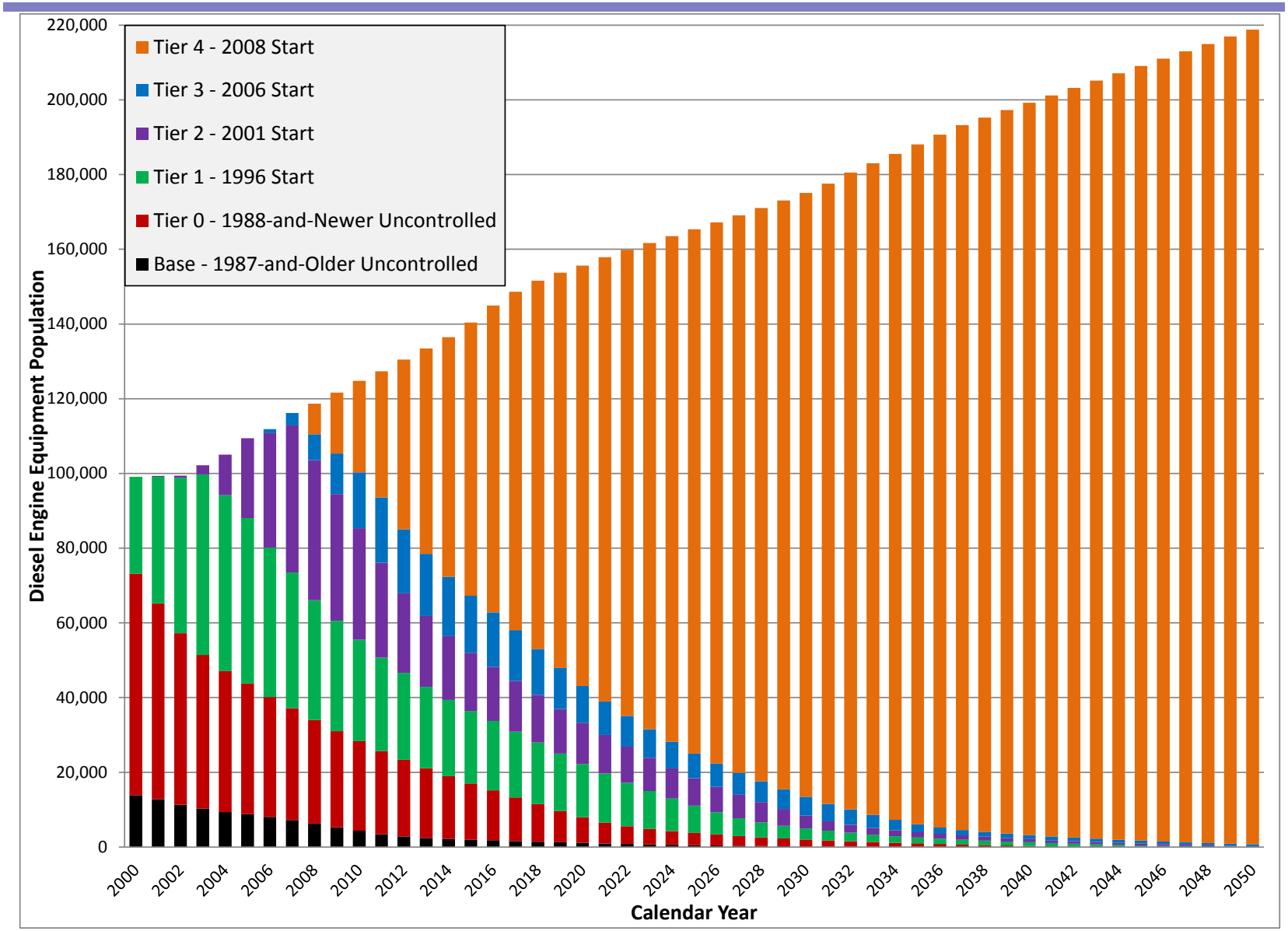
Source: Default runs of the Texas NONROAD (TexN) model for every county from 2000-2050. The TexN model is available at ftp://amdaftp.tceq.texas.gov/pub/Nonroad_EI/TexN/.

Non-Road VOC Emissions in DFW by Fuel and Engine Type from 2000-2050



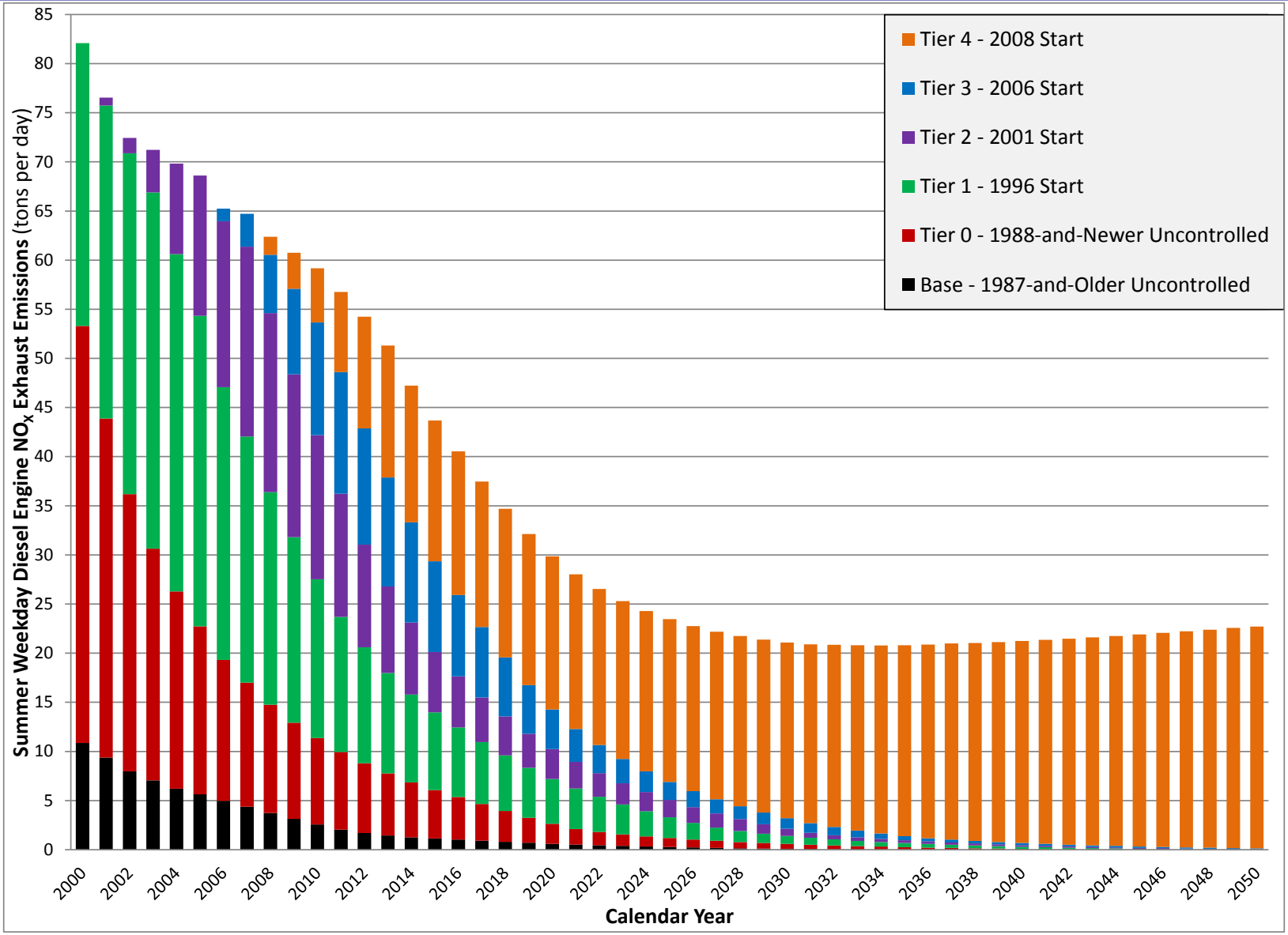
Source: Default runs of the Texas NONROAD (TexN) model for every county from 2000-2050. The TexN model is available at ftp://amdaftp.tceq.texas.gov/pub/Nonroad_EI/TexN/.

Diesel Non-Road Equipment Population in DFW by Emission Standard from 2000-2050



Source: Default runs of the Texas NONROAD (TexN) model for every county from 2000-2050. The TexN model is available at ftp://amdaftp.tceq.texas.gov/pub/Nonroad_EI/TexN/.

Diesel Non-Road NO_X Emissions in DFW by Emission Standard from 2000-2050



Source: Default runs of the Texas NONROAD (TexN) model for every county from 2000-2050. The TexN model is available at ftp://amdaftp.tceq.texas.gov/pub/Nonroad_EI/TexN/.

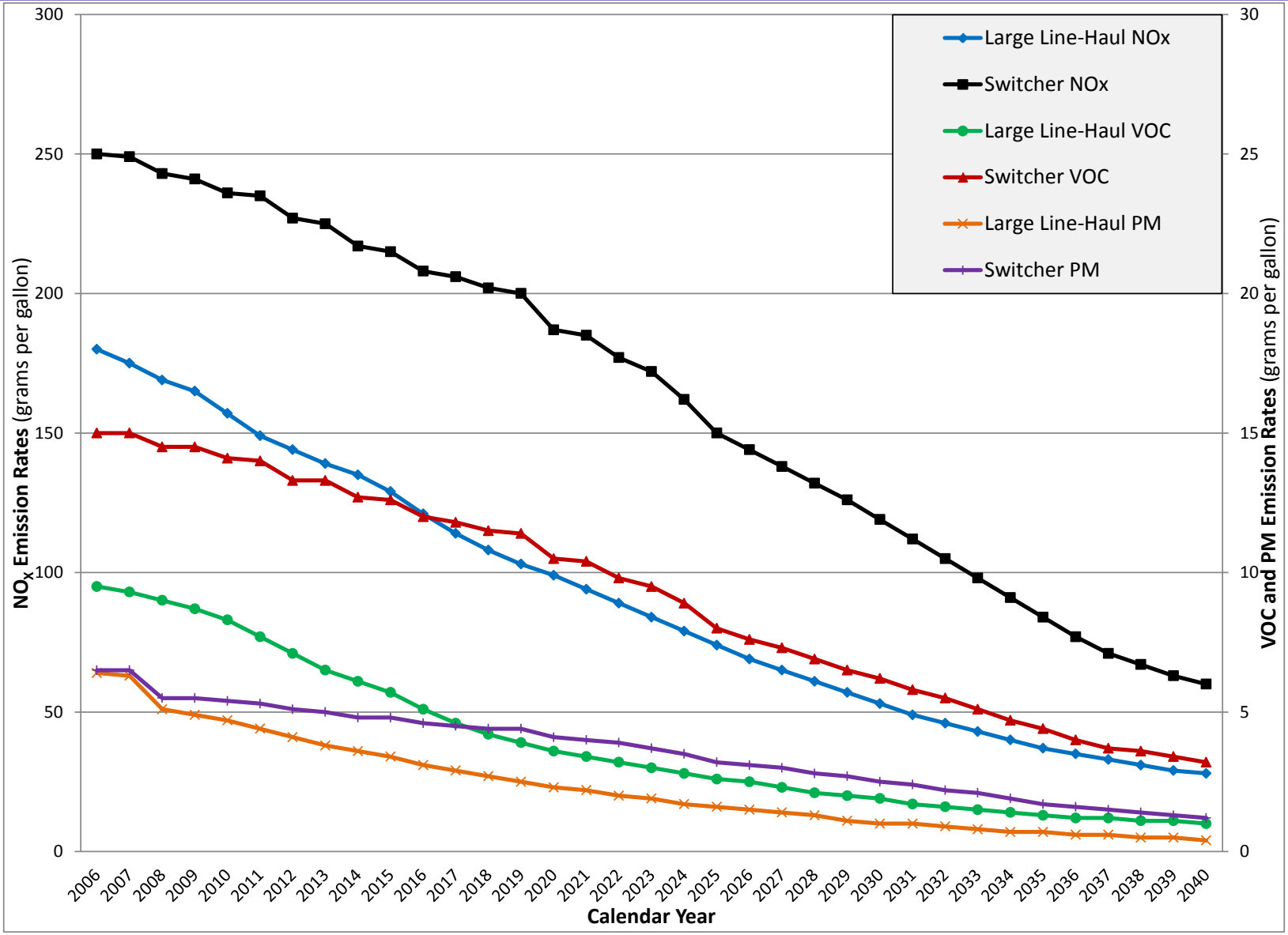
Locomotive Exhaust Emission Standards for Line-Haul and Switcher Engines

Emission Standard	Model Year Range	**Line-Haul Engines** (grams/brake horsepower hour)			
		NO_X	VOC	CO	PM
Tier 0	1973 - 1992	9.5	1.00	5.0	0.22
Tier 1	1993 - 2004	7.4	0.55	2.2	0.22
Tier 2	2005 - 2011	5.5	0.30	1.5	0.10
Tier 3	2012 - 2014	5.5	0.30	1.5	0.10
Tier 4	2015-and-Later	1.3	0.14	1.5	0.03

Emission Standard	Model Year Range	**Switcher Engines** (grams/brake horsepower hour)			
		NO_X	VOC	CO	PM
Tier 0	1973 - 1992	11.8	2.10	8.0	0.26
Tier 1	1993 - 2004	11.0	1.20	2.5	0.26
Tier 2	2005 - 2011	8.1	0.60	2.4	0.13
Tier 3	2012 - 2014	5.0	0.60	2.4	0.10
Tier 4	2015-and-Later	1.3	0.14	2.4	0.03

Source: U.S. EPA *Locomotive – Exhaust Emission Standards*, http://www.epa.gov/otaq/standards/nonroad/locomotives.htm.

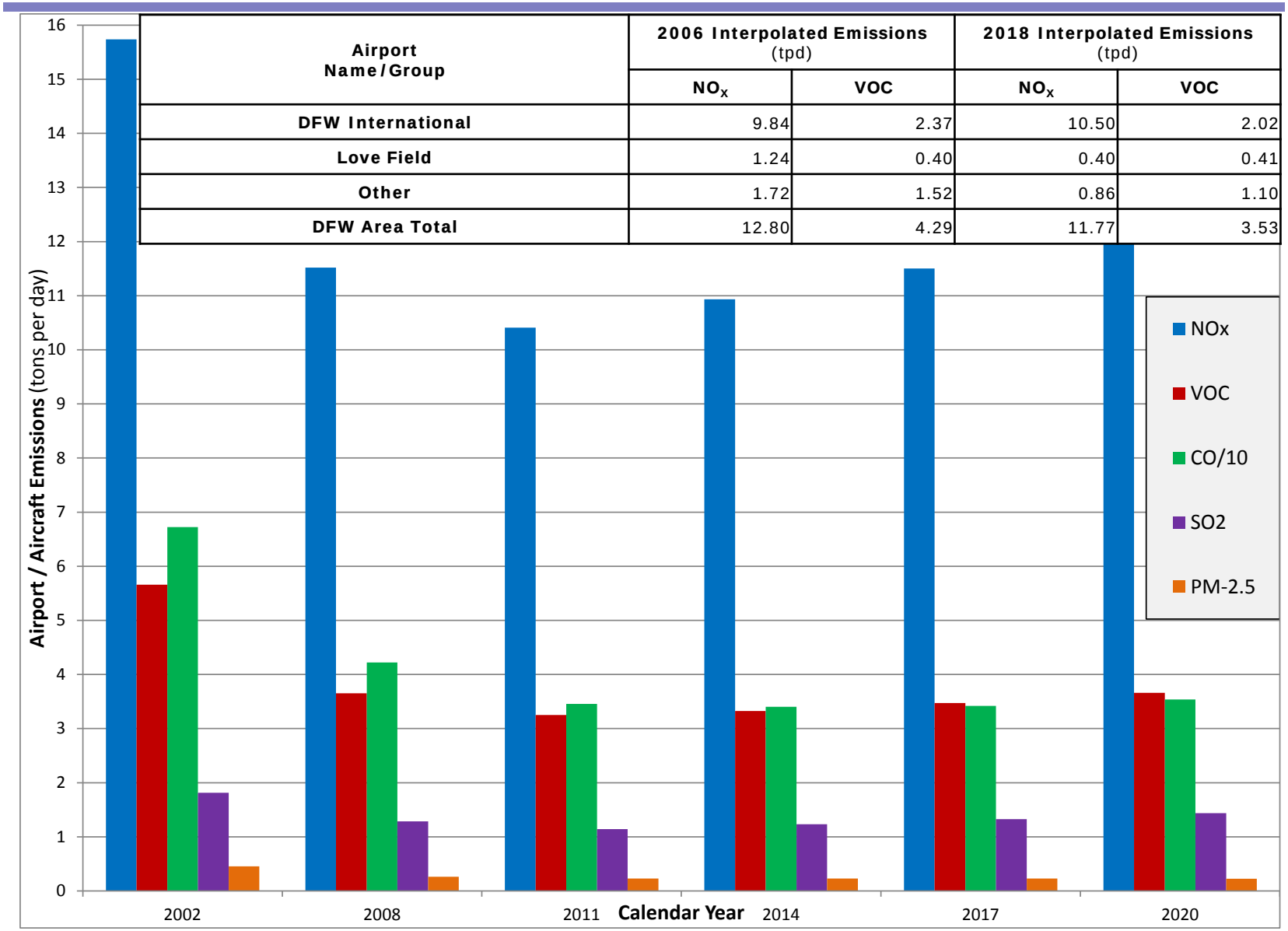
Locomotive Line-Haul and Switcher Engine Fleet Average Emission Rates for 2006-2040



Source: Emission Factors for Locomotives, U.S. EPA Office of Transportation and Air Quality, EPA-420-F-09-025, April 2009, http://www.epa.gov/otaq/regs/nonroad/locomotv/420f09025.pdf.

DFW Area Airport / Aircraft Emission Trends Using Emissions Dispersion and Modeling System (EDMS)

Airport Name / Group	2006 Interpolated Emissions (tpd)		2018 Interpolated Emissions (tpd)	
	NO_x	VOC	NO_x	VOC
DFW International	9.84	2.37	10.50	2.02
Love Field	1.24	0.40	0.40	0.41
Other	1.72	1.52	0.86	1.10
DFW Area Total	12.80	4.29	11.77	3.53



Source: *North Central Texas Council of Governments Aircraft Emissions Inventory*, August 2011, which is available at ftp://amdaftp.tceq.texas.gov/pub/Offroad_EI/Airports/DFW/.

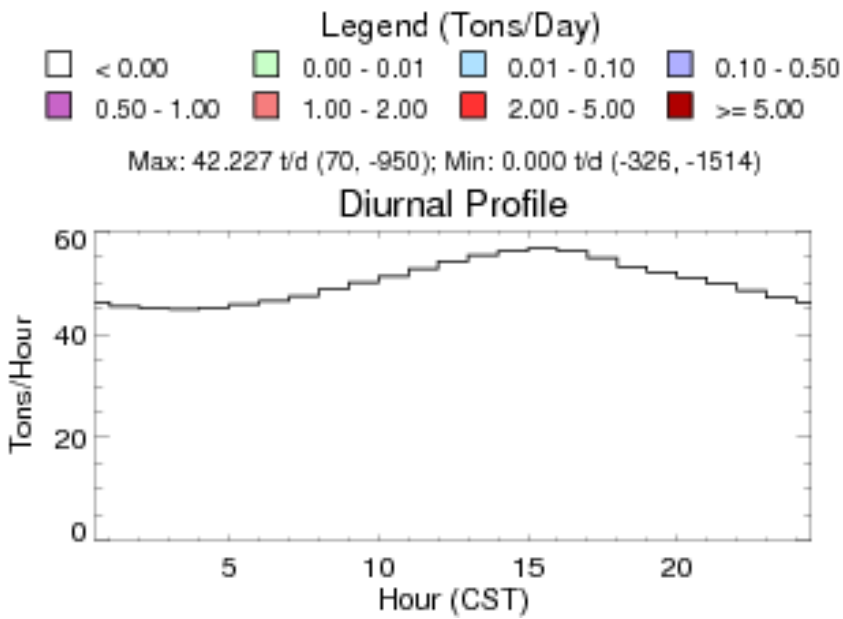
Development of Point Source Emission Estimates

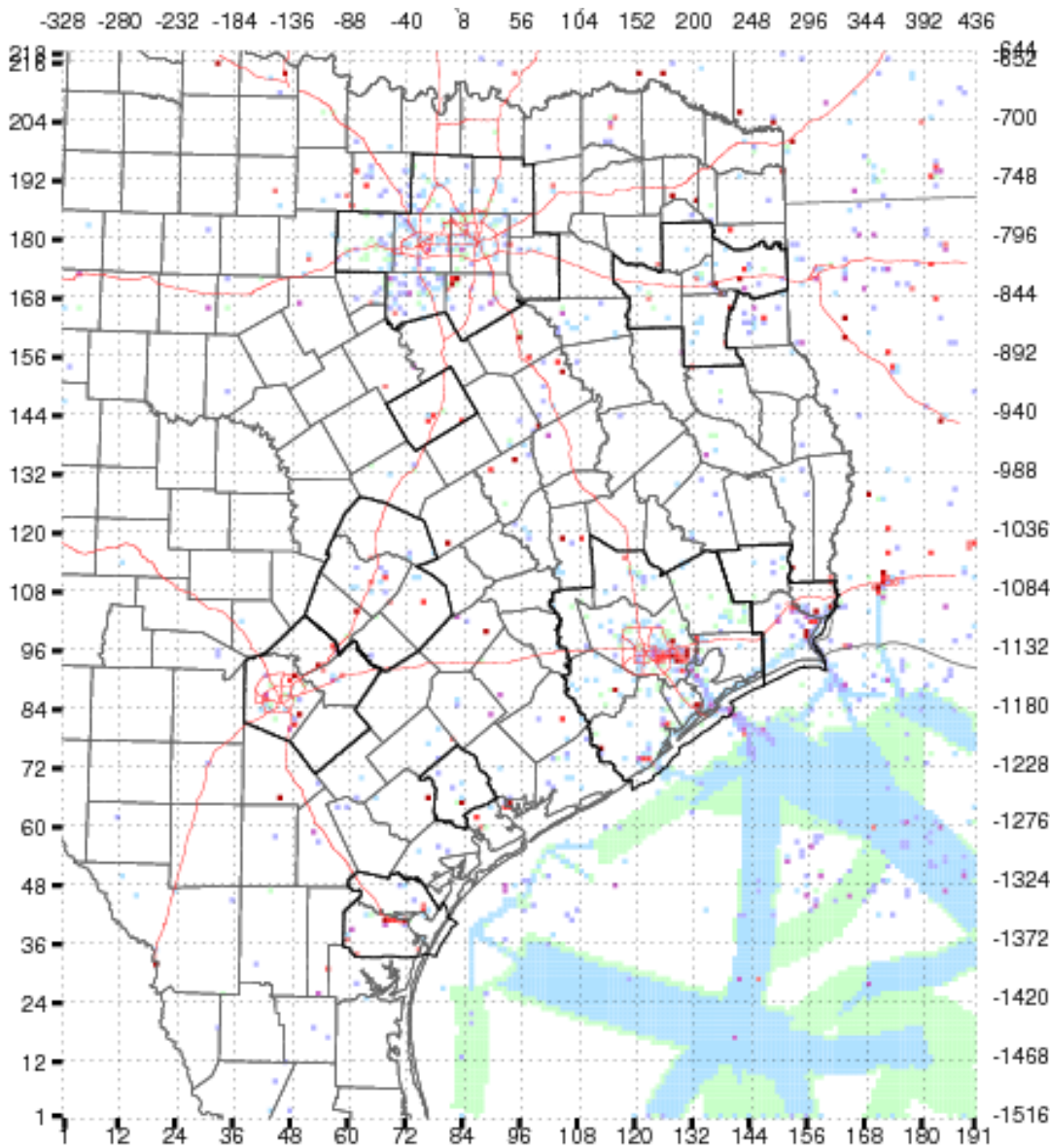
- Electric Generating Units (EGUs):
  - 2006 emission estimates based on hourly continuous emission monitoring (CEM) data archived in the acid rain database (ARD) which is maintained by EPA.
  - 2018 emission estimates based on Clean Air Interstate Rule (CAIR) caps:
    - Phase I caps apply from 2009-2014 with Texas set at 181,014 NO_X tons per year; and
    - Phase II caps apply for 2015-and-later with Texas set at 150,845 NO_X tons per year.
  - House Bill 2481 from the 2005 Texas Legislature established that:
    - 90.5% of the annual cap will be for existing EGUs; and
    - 9.5% of the annual cap will be set aside for new EGUs.
  - Example CAIR allowances for EGU and year are available on the TCEQ CAIR Program web page at http://www.tceq.texas.gov/airquality/banking/Air_Banking_CAIR.html.
  - Seasonal and hourly temporal profiles are applied per EGU to account for increased operation during ozone season months and in the afternoon.

- Non-EGUs (NEGUs):
  - 2006 emission estimates are based on extracts from the State of Texas Air Reporting System (STARS) which contains required submissions from large point sources.
  - 2018 projections for most NEGUs are based on the latest available full-year extract from STARS (e.g., 2011) with expected economic growth out to 2018.
  - Cement kilns in the DFW area are modeled at the TCEQ Chapter 117 NO_X cap rules applicable for these sources.

2018 Summer Weekday Elevated Point Source NO_X Texas 4 km Domain – June 14 Episode Day

County	Point Source NO_X (tpd)
Collin	0.61
Dallas	2.76
Denton	1.47
Ellis	23.32
Johnson	6.44
Kaufman	6.63
Parker	1.26
Rockwall	0.01
Tarrant	3.99
Wise	11.09
Ten-County Total	57.57



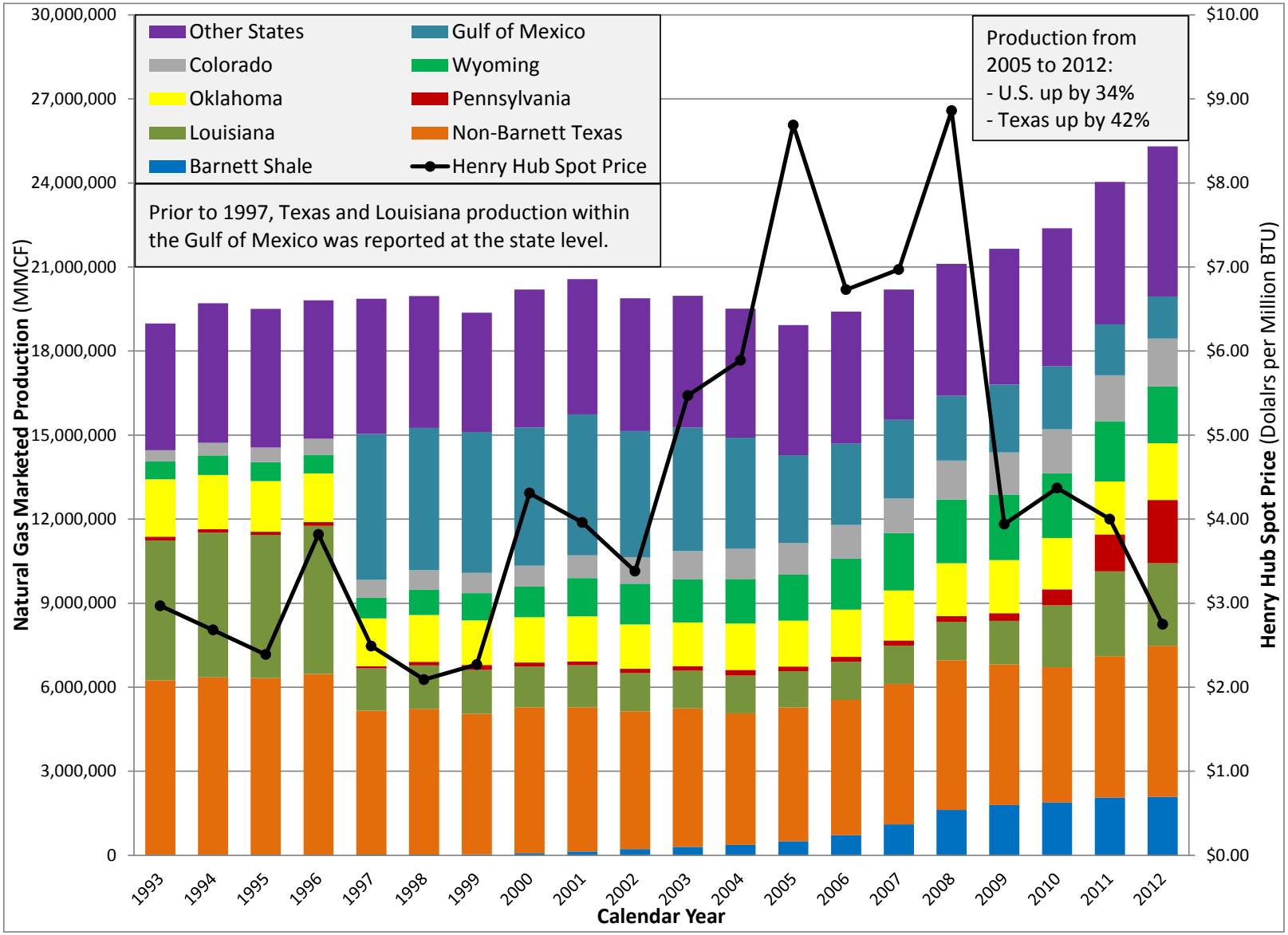


Development of Area Source and Drilling Rig Estimates

- Area source emissions:
  - Area sources include a wide range of miscellaneous categories with the largest NO_X typically coming from both industrial and residential fuel combustion.
  - Area source emission estimates for periodic years (e.g., 2011) are done for every Texas county and archived within the Texas Air Emissions Repository (TexAER) system, which is available at http://www5.tceq.state.tx.us/texaer/index.cfm.
  - Estimates for each source category are grown from the baseline year such as 2011 to 2018 based on expected population and/or economic growth factors.
  - The next periodic area source inventory will be for 2014, but the work will not be completed until after the DFW SIP adoption in the Summer of 2015.

- Drilling rigs:
  - Current 2018 drilling rig estimates are based on a report done by Eastern Research Group (ERG) entitled *Development of Texas Statewide Drilling Rigs Emission Inventories for the Years 1990, 1993, 1996, and 1990 through 2040*.
  - This report is available on the TCEQ Air Quality Research and Contract Reports web page, http://www.tceq.state.tx.us/airquality/airmod/project/pj_report_ei.html.
  - TCEQ may obtain a subscription to comprehensive Baker Hughes rig count data to perform periodic updates of drilling rig emission estimates.

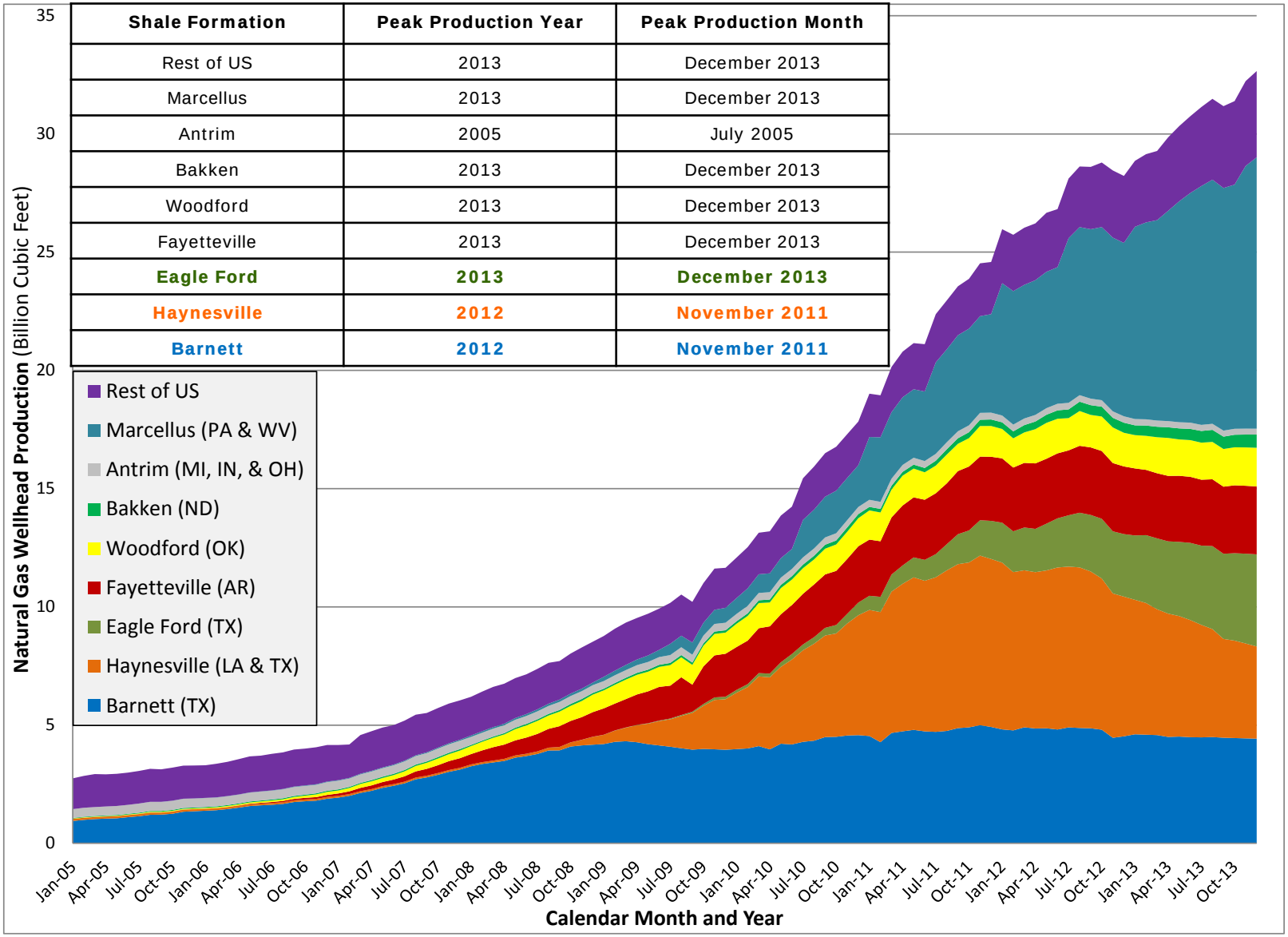
Nationwide U.S. Gas Production Summary from 1993-2012



Source:
- U.S. Energy Information Administration Natural Gas Web Page: http://www.eia.gov/naturalgas/

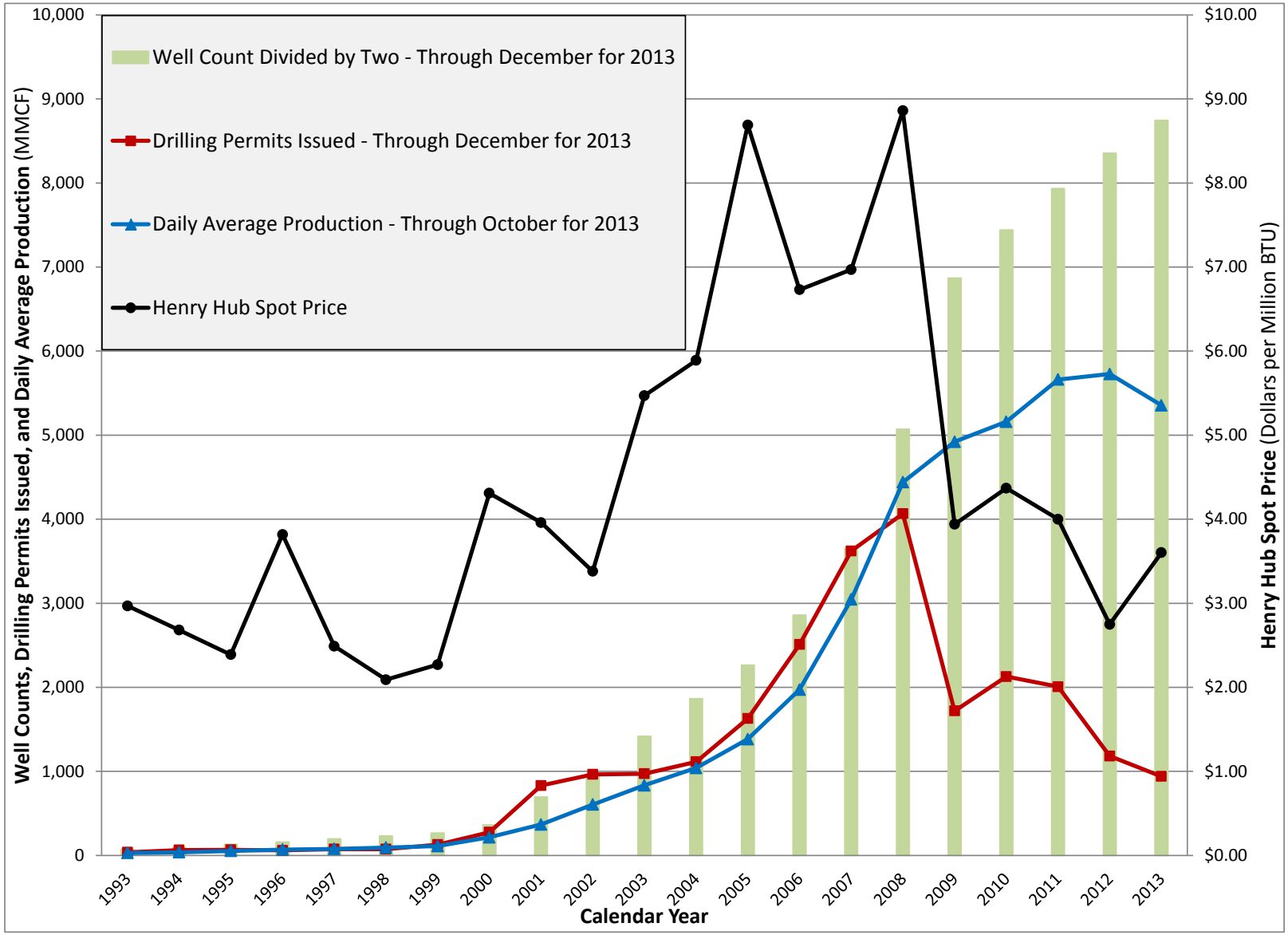
Nationwide U.S. Natural Gas Production by Shale Formation from 2005-2013

Shale Formation	Peak Production Year	Peak Production Month
Rest of US	2013	December 2013
Marcellus	2013	December 2013
Antrim	2005	July 2005
Bakken	2013	December 2013
Woodford	2013	December 2013
Fayetteville	2013	December 2013
Eagle Ford	**2013**	**December 2013**
Haynesville	**2012**	**November 2011**
Barnett	**2012**	**November 2011**



Source:
- U.S. Energy Information Administration Natural Gas Web Page: http://www.eia.gov/naturalgas/

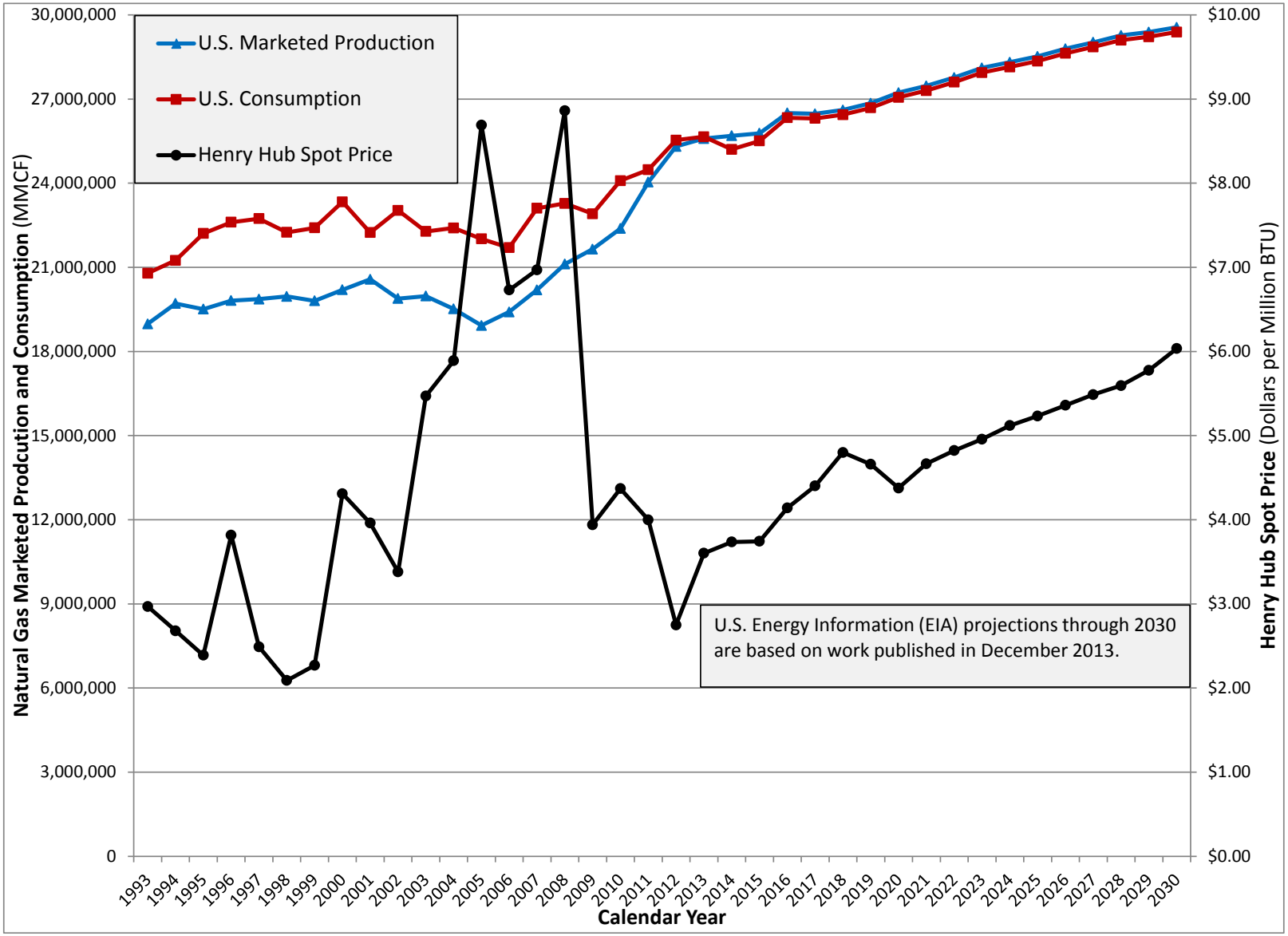
Barnett Shale Natural Gas Production Summary from 1993-2013



Sources:

- Texas Railroad Commission Barnett Shale Web Page: http://www.rrc.state.tx.us/barnettshale/
- U.S. Energy Information Administration Natural Gas Web Page: http://www.eia.gov/naturalgas/

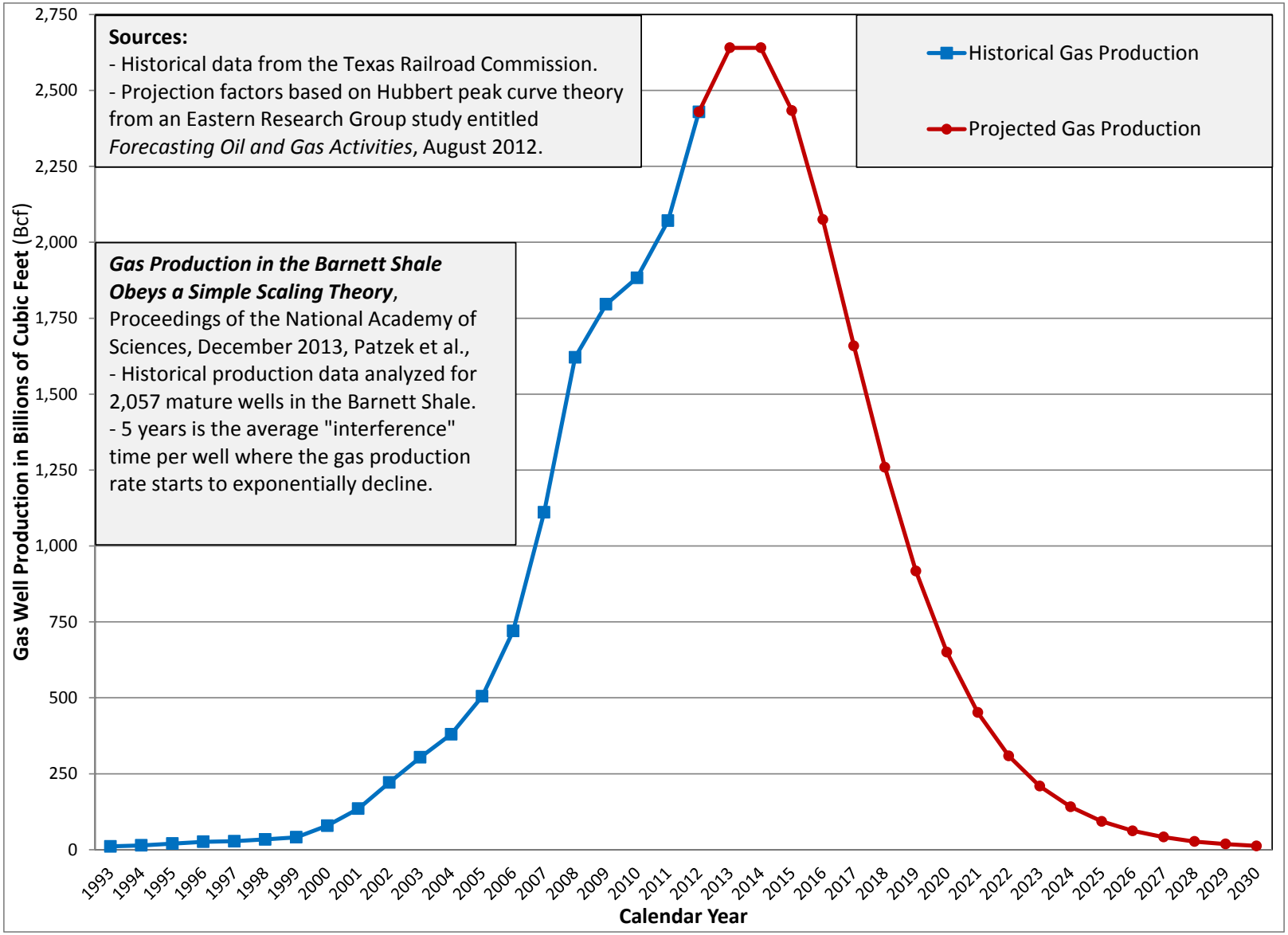
U.S. Natural Gas Production and Price Since 1993 and Projections Through 2030



Source:

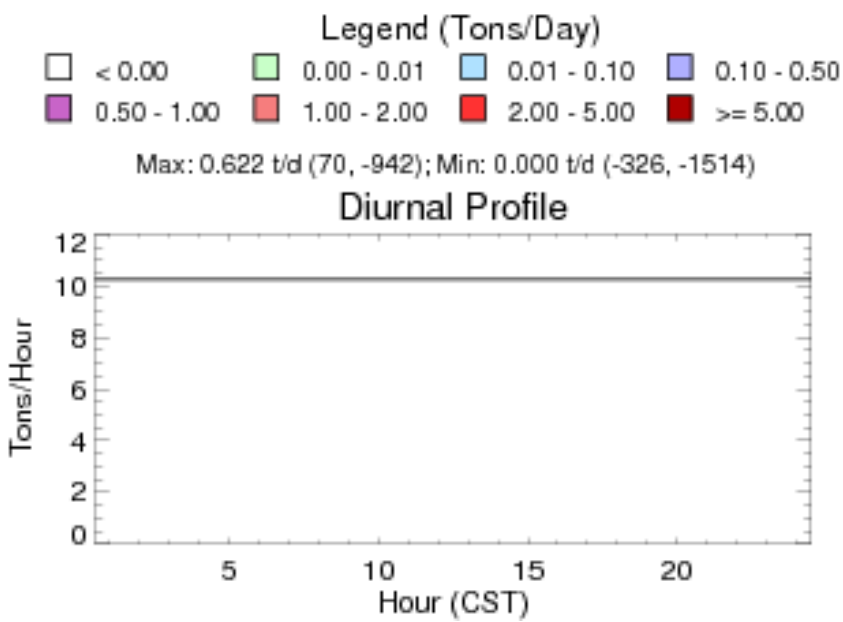
- U.S. Energy Information Administration Natural Gas Web Page: http://www.eia.gov/naturalgas/

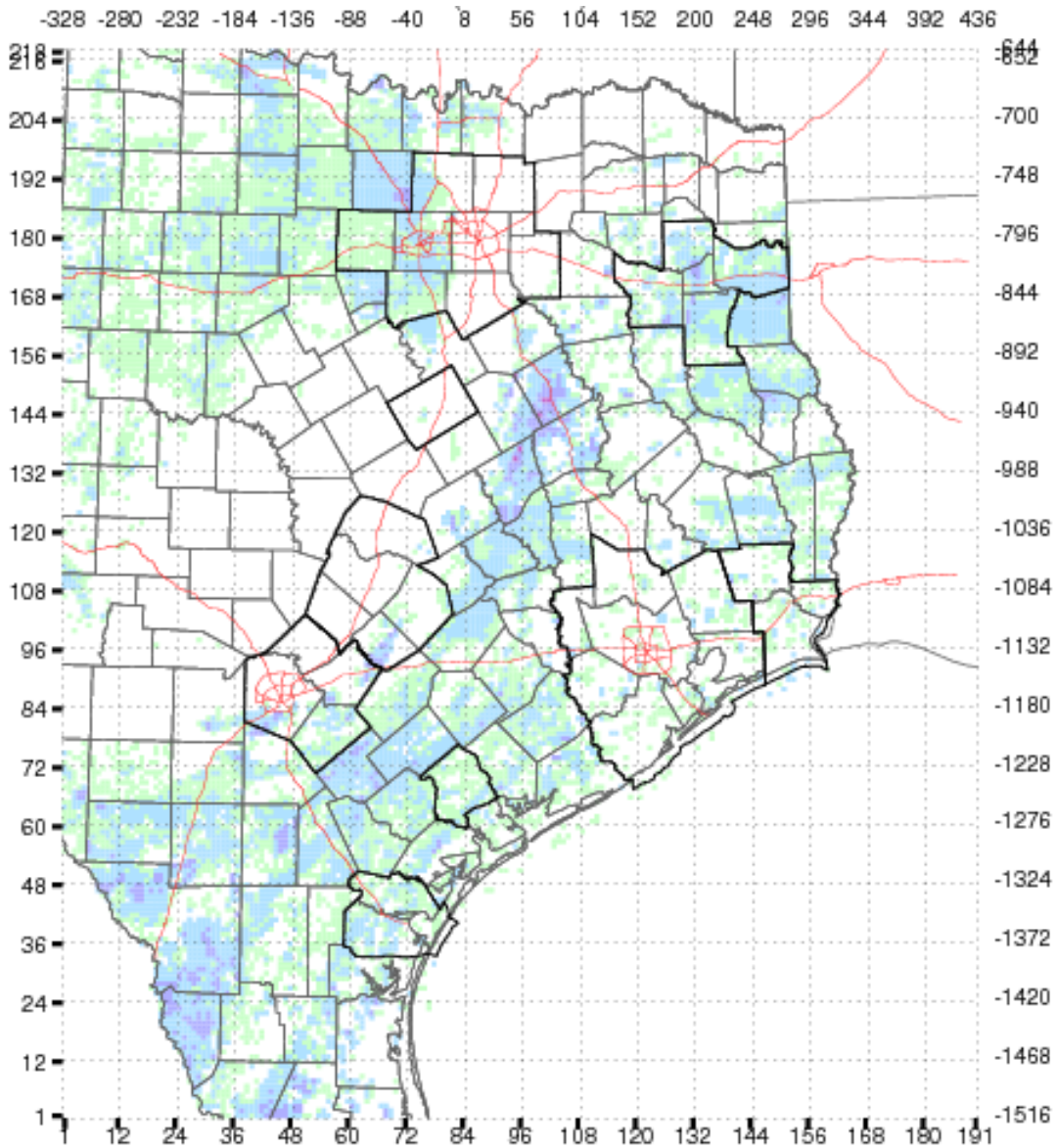
Barnett Shale Gas Production: Historical Levels and Future Projections



2018 Summer Weekday Oil and Gas Production NO_X Texas 4 km Domain – June 14 Episode Day

Shale Region	Oil and Gas Production NO_X (tpd)
Barnett Shale	21.64
Haynesville Shale – Texas Portion	17.36
Eagle Ford Shale	91.28





Expected DFW Area Emission Inventory Updates by Source Category

- On-road:
  - Will update 2018 (and maybe 2006) inventories after MOVES2014 is released by EPA, which is scheduled to occur sometime this year; currently relying on emission estimates from MOVES2010a and MOVES2010b.
  - MOVES2014 will include the benefits of the Tier 3 vehicle standards and 10 parts-per-million sulfur content in gasoline which are proposed to begin in 2017.

- Natural gas production and drilling:
  - Will continue to monitor production, price, and drilling permit updates from the Texas Railroad Commission and the U.S. Energy Information Administration.
  - If the number of new Barnett Shale drilling permits issued increases significantly due to an unexpected surge in natural gas prices, we will alter the projected production levels for 2018.
  - 2013 monthly production figures by individual well are expected from the Texas Railroad Commission by March/April of 2014, and we will revise the 2018 production projections from this data set.

- Point sources:
  - Revise 2018 emission projections for electric generating utilities (EGUs) based on 2013 acid rain database (ARD) instead of the 2012 baseline currently being used.
  - Revise 2018 emission projections for non-EGUs (NEGUs) based on 2012 State of Texas Air Reporting System (STARS) instead of the 2011 baseline currently being used.

- Airports:
  - DFW International Airport has indicated that they would like to provide revised 2018 projected emissions, and we will incorporate them when available.

Maximum Incremental Reactivity and Reaction Rates Associated with VOC for Ozone Formation

- For a specific VOC type, maximum incremental reactivity (MIR) is the highest amount of ozone that can be formed per unit of VOC if a sufficient quantity of NO_X is present and the full reaction is allowed to go to completion (e.g., not halted by loss of sunlight or absence of NO_X).
- The hydroxyl radical (OH) is critical to ozone formation, and K_{OH} is the rate at which the reaction occurs.
- Research done by Dr. William Carter at the University of California at Riverside is the definitive source for specific MIR and K_{OH} values (saprc07.xls spreadsheet at http://www.cert.ucr.edu/~carter/SAPRC/).

Compound Name	**MIR** (Table B-1)		**K_{OH} Reaction Rate** (Table B-4)	
	(grams O_3/grams VOC)	Ratio to Methane	(cm^3 $molec^{-1}$ s^{-1})	Indexed to Isoprene
1,3-Butadiene	**12.61**	**877**	**6.58883E-11**	**1.5**
Propene (Propylene)	**11.66**	**811**	**2.60229E-11**	**3.8**
Isoprene	**10.61**	**738**	**9.96253E-11**	**1.0**
1-Butene	**9.73**	**676**	**3.10666E-11**	**3.2**
Ethene (Ethylene)	**9.00**	**626**	**8.14911E-12**	**12.2**
Alpha-Pinene	**4.51**	**313**	**5.17559E-11**	**1.9**
Beta-Pinene	**3.52**	**245**	**7.35163E-11**	**1.4**
Isopentane	1.45	101	3.600000E-12	27.7
n-Pentane	1.31	91	3.843740E-12	25.9
Isobutane	1.23	86	2.135690E-12	46.6
n-Butane	1.15	80	2.383520E-12	41.8
Benzene	0.72	50	1.224500E-12	81.4
Propane	0.49	34	1.114910E-12	89.4
Ethane	0.28	20	2.539380E-13	392.3
Methane	0.0144	1	6.616770E-15	15,056.5

Excerpts from *Development, Evaluation and Testing of Version 6 of the Carbon Bond Chemical Mechanism (CB6)*, ENVIRON, Yarwood et al.

- "Chemical mechanisms used in models such as CAMx are called condensed mechanisms because they **represent tens of thousands of chemical reactions** that occur in the atmosphere by **hundreds of representative reactions** that can be accommodated in an efficient computer model."
- "Carbon Bond (CB) is one approach to **condensing atmospheric chemistry for organic compounds** which focuses on the **dominant role of chemical structure** (e.g., the presence of an alkene bond) in determining the rates and products of atmospheric chemical reactions."
- "The CB6 mechanism was evaluated by simulating **chamber experiments in which mixtures of VOC and NO_X were irradiated to form ozone**...A **total of 339 experiments** from several chambers at the University of California at Riverside and the Tennessee Valley Authority were used to evaluate CB6."
- Report available at http://www.tceq.texas.gov/airquality/airmod/project/pj_report_pm.html.

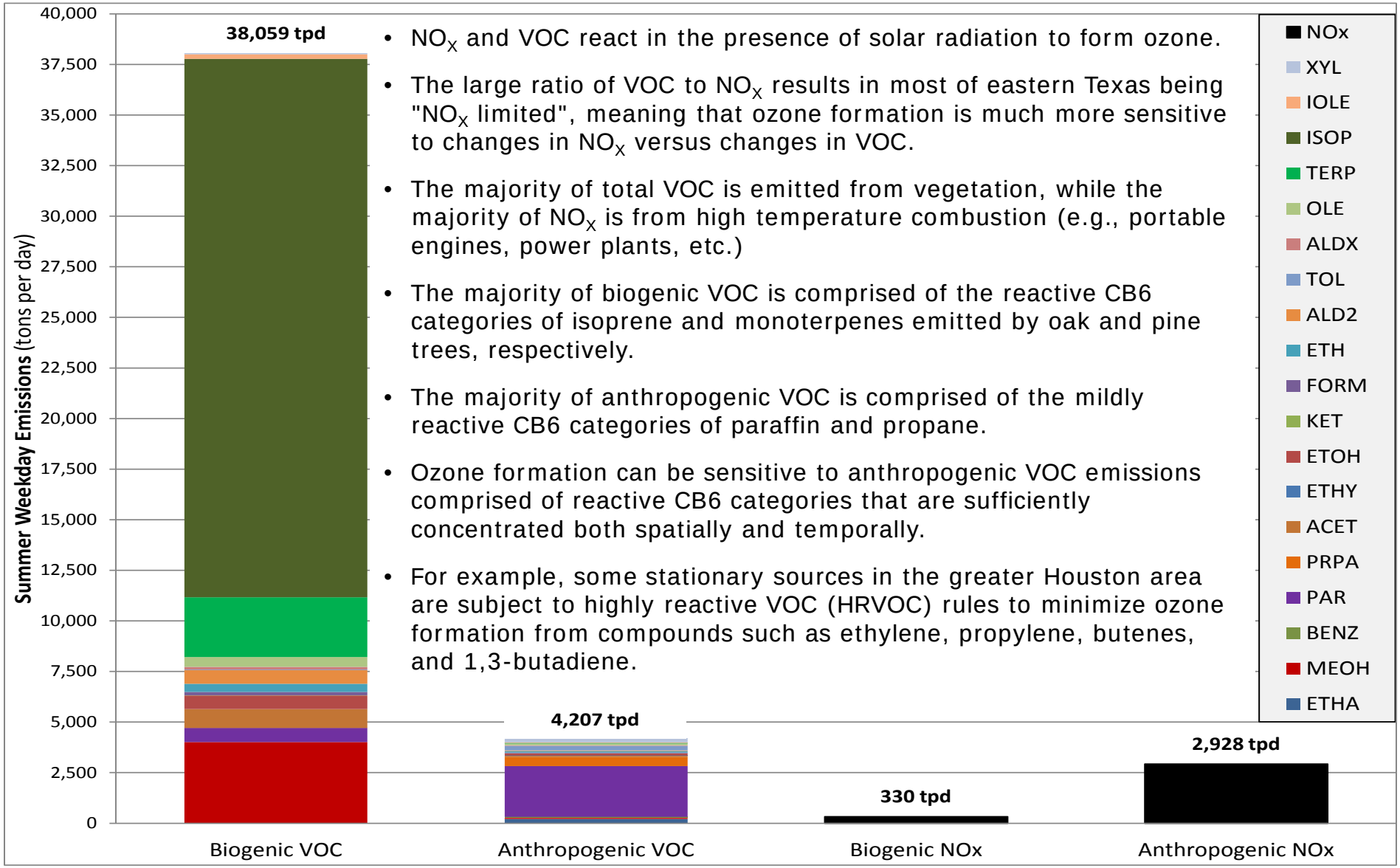
Carbon Bond Mechanism Version	Number of "Lumped" Species	Number of Representative Reactions
CB4 (CBIV)	37	96
CB05	51	156
CB6	77	218

Use of Speciation Profiles to Allocate VOC Emissions into Appropriate CB6 Categories

- The EPA SPECIATE database (http://www.epa.gov/ttn/chief/software/speciate/index.html) contains 5,592 chemical composition profiles for particulate matter, VOC, and other gases.
- Profiles are matched to each specific emission source type (e.g., gasoline engine, diesel engine, etc.) during preparation of photochemical modeling input files.
- The SPeCiate EMiSsions (SPCEMS) module of the Emissions Processor System version 3 (EPS3) matches the correct profile to the specific emission source type, and then allocates the VOC emissions into the correct CB6 species group.
- Sample profile codes used by TCEQ and descriptions from the EPA SPECIATE Database:

Fuel and Engine Type Combination	4-Digit Code	EPA SPECIATE Database Description
Natural Gas Combustion	1001	Internal Combustion Engine - Natural Gas
Non-Road Gasoline Engines	4738	Lawn Mowers - Four-Stroke Gasoline
Gasoline Liquid	5492	Liquid Gasoline Compostion - Reformulated Gasoline
	5493	Liquid Gasoline Compostion - E10 Ethanol Gasoline
On-Road Gasoline Running Exhaust	8756	Gasoline Exhaust - Tier 2 Light-Duty Vehicles Using 0% Ethanol
	8757	Gasoline Exhaust - Tier 2 Light-Duty Vehicles Using 10% Ethanol
On-Road Gasoline Start Exhaust	8759	Gasoline Exhaust - Cold Start - Tier 2 Light-Duty Vehicles Using 0% Ethanol
	8760	Gasoline Exhaust - Cold Start - Tier 2 Light-Duty Vehicles Using 10% Ethanol
Gasoline Vapor	8762	Gasoline Headspace Vapor Using 0% Ethanol
	8763	Gasoline Headspace Vapor Using 10% Ethanol
Diesel Engine Exhaust	8774	Diesel Exhaust Emissions from Pre-2007 Model Year Heavy-Duty Diesel Trucks
	8775	Diesel Exhaust Emissions from 2007 Model Year Heavy-Duty Diesel Engines with Controls

2018 Summer Weekday NO_X and VOC Emission Totals Texas 4 km Domain – June 14 Episode Day



- NO_X and VOC react in the presence of solar radiation to form ozone.
- The large ratio of VOC to NO_X results in most of eastern Texas being "NO_X limited", meaning that ozone formation is much more sensitive to changes in NO_X versus changes in VOC.
- The majority of total VOC is emitted from vegetation, while the majority of NO_X is from high temperature combustion (e.g., portable engines, power plants, etc.)
- The majority of biogenic VOC is comprised of the reactive CB6 categories of isoprene and monoterpenes emitted by oak and pine trees, respectively.
- The majority of anthropogenic VOC is comprised of the mildly reactive CB6 categories of paraffin and propane.
- Ozone formation can be sensitive to anthropogenic VOC emissions comprised of reactive CB6 categories that are sufficiently concentrated both spatially and temporally.
- For example, some stationary sources in the greater Houston area are subject to highly reactive VOC (HRVOC) rules to minimize ozone formation from compounds such as ethylene, propylene, butenes, and 1,3-butadiene.

Electronic File Availability for Ozone Modeling and Emissions Inventory Development

Description	Web Page Address / FTP Directory
TCEQ Ozone Modeling Files Web Page	http://www.tceq.texas.gov/airquality/airmod/rider8/rider8Modeling
TCEQ Ozone Modeling Files FTP Directory	ftp://amdaftp.tceq.texas.gov/pub/TX/
TCEQ On-Road Emission Inventory FTP Directory	ftp://amdaftp.tceq.texas.gov/pub/Mobile_EI/
EPA On-Road Motor Vehicle Emission Simulator (MOVES) Model Web Page	http://www.epa.gov/otaq/models/moves/
TCEQ Non-Road Emission Inventory FTP Directory	ftp://amdaftp.tceq.texas.gov/pub/Nonroad_EI/TEX/
Texas NONROAD (TexN) Model FTP Directory	ftp://amdaftp.tceq.texas.gov/pub/Nonroad_EI/TexN/
TCEQ Airport Emission Inventory FTP Directory	ftp://amdaftp.tceq.texas.gov/pub/Offroad_EI/Airports/
Texas Air Emissions Repository (TexAER) for Periodic Inventories (2005, 2008, 2011, etc.)	http://www5.tceq.state.tx.us/texaer/index.cfm
TCEQ Point Source Emissions Inventory Web Page	http://www.tceq.texas.gov/airquality/point-source-ei/psei.html
TCEQ Air Quality Research and Contract Projects Web Page	http://www.tceq.texas.gov/airquality/airmod/project/pj.html

Questions?

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air modeling data analysis