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INTRODUCTION TO THE MARAMA INVENTORY PROJECTION SPREADSHEET TOOL

EPA International Emissions Inventory Conference

July 31, 2019

Susan McCusker

Overview

- What is an inventory projection?
- Why is the NE focused on inventory projection?
- Spreadsheet tool benefits
- Spreadsheet tool “demo”
  - Growth
  - Control
- Wrap up

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Inventory Projection

- Future year expected emissions based on **best available growth surrogates** and **on-the-books/on-the-way** controls

FIPS	SCC	Ann_GF	Comment
10000	2102004001	1.130	"! Projection from 2016 to 2023 Growth Code = AEO2019_SA_IND_DISTILLATE"

fips	scc	pol'	Control Efficiency %	compliance _date	comments
10001	2102004001	SO2	99.5	1/1/2017	"MANEVU Low Sulfur #2 Fuel Oil County Rule"

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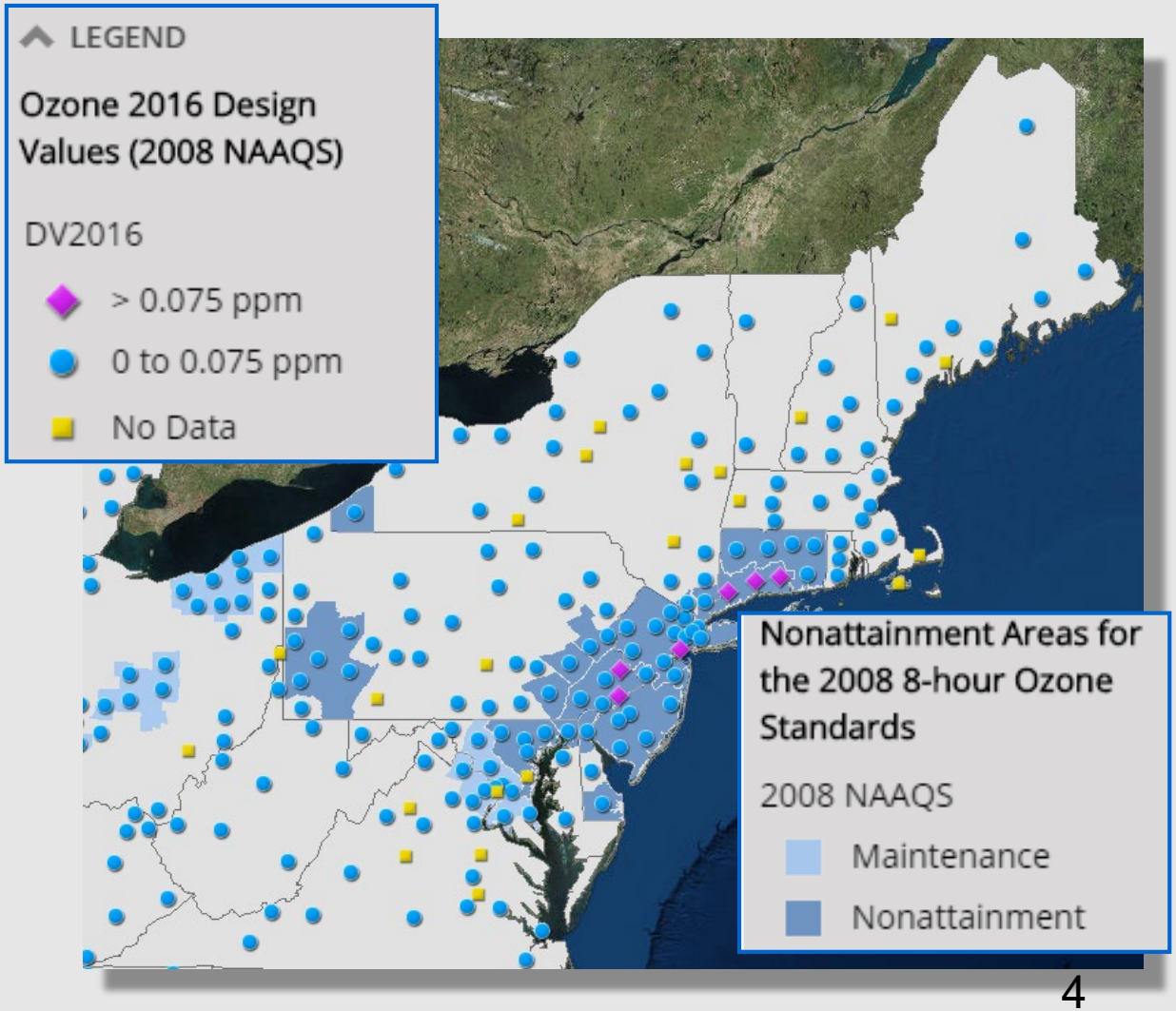
Why NE is focused on developing locally-refined inventories

- Multiple ozone nonattainment areas
- Highly populated, but not uniform
- Numerous state-specific rules & strategies



https://www.epa.gov/green-book

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Benefits of the Spreadsheet Tool

- Don't know FYs of interest (e.g., 2008 ozone NAAQS bump-ups, need 2020 fast – months vs years)
- One set of factors leads to the next – easy to update spreadsheet data for incremental improvements once structure set up
- Deep & specific documentation in the spreadsheet
- Expert info from sources that know the data really well
- Easy review/feedback

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Growth Factor Workbook: Four Spreadsheets

Tab 1	Tab 2	Tab 3	Tab 4
General Methodology	Growth Raw Data	Growth Factor XWALK	EMF Projection Packet

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Tab 1 – General Methodology

Version 2019_07_31	
4/28/2019	**revised NC VMT with data provided in 4/26/19 email**
2/8/2019	**added AEO2019 raw data**
1/29/2019	**updated pop and employment**
1/29/2019	**changed Growth_Code for DC for several SCCs**
1	**Starting point is 2016beta** 2016ff_proj_from_2014NEIv2_NONPOINT_final_20180119_08oct2018_v0
2	**Tab: Growth Raw Data** Column A is a code that succinctly describes the growth data and its source Column B is a fuller description of the growth data and its source Column C provides the units for the raw growth data Columns D - AK provide the raw growth data for years 2014 to 2050 from the native file
3	**Tab: NEI to Growth Factor XWALK** This tab maps NEI County/SCCs to surrogate growth parameters This tab also calculates the growth factor for a given future year/base year combination

General Methodology | Growth Raw Data | 2016b to Growth Factor XWALK | EMF Growth Packet | state review | Sheet 1 | Sheet 2 | Sheet 3 | Sheet 4 | Sheet 5 | Sh

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Tab 2 – Growth Raw Data

- Future year data/Base year data = growth factor
- Use growth factors we have as surrogates for growth factors we need

Growth_Code	Growth Code Name	Units	2016		2050
AEO2018_SA_IND_DISTILLATE	AEO2015, South Atlantic, Industrial, Distillate Fuel Oil	Quadrillion Btu	0.132	...	0.183
AEO2019_SA_IND_DISTILLATE	AEO2019, South Atlantic, Industrial, Distillate Fuel Oil	Quadrillion Btu	0.137	...	0.184
EMP_10_NAICS=236	DE Employment, NAICS=236 Construction of Buildings	Employees	4,880	...	5,240
POP_10001	Population, Kent County, DE	Persons	179,065	...	215,279
VMT_10001	VMT, Kent County, DE	million annual VMT	1,735	...	2,352

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Tab 3 – Growth Factor XWalk

fips	scc	scc_description	GROWTH_CODE
10000	2102004001	Stationary Source Fuel Combustion; Industrial; Distillate Oil; All Boiler Types	AEO2018_SA_IND_DISTILLATE

User Selects Base Year and Future Year

Base Year	2016
Future Year	2023

QA/State input

Base Year Raw Data	Future Year Raw Data	Growth Factor Future/ Base	Annual Growth Rate (%/yr)	Cumulative Growth Rate % 2016 to 2023	Low-End Cap	High-End Cap	"Capped" Growth Factor
0.1316	0.1483	1.1266	1.72%	12.66%	0.75	1.25	1.127

=VLOOKUP($D277,'Growth Raw Data')

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Growth Factor XWALK - recap

- GF for every source in the inventory
  - Each source matched to raw growth data
- One-cell change = GFs for new future year
- Easy to update raw data (e.g., AEO2018 => 19)
- Flags GFs “out of range”
- Annual & cumulative growth for QA
- User chooses low- and high-end caps
- Documentation of feedback

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Tab 2 – Update Raw Data

Growth_Code	Growth Code Name	Units	2016		2050
AEO2018_SA_IND_DISTILLATE	AEO2015, South Atlantic, Industrial, Distillate Fuel Oil	Quadrillion Btu	0.132	...	0.183
AEO2019_SA_IND_DISTILLATE	AEO2019, South Atlantic, Industrial, Distillate Fuel Oil	Quadrillion Btu	0.137	...	0.184
EMP_10_NAICS=236	DE Employment, NAICS=236 Construction of Buildings	Employees	4,880	...	5,240
POP_10001	Population, Kent County, DE	Persons	179,065	...	215,279
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Tab 3 – Change GROWTH_CODE

fips	scc	scc_description	GROWTH_CODE
10000	2102004001	Stationary Source Fuel Combustion; Industrial; Distillate Oil; All Boiler Types	AEO2018_SA_IND_DISTILLATE
10000	2102004001	Stationary Source Fuel Combustion; Industrial; Distillate Oil; All Boiler Types	AEO2019_SA_IND_DISTILLATE

Base Year	2016
Future Year	2023

Base Year Raw Data	Future Year Raw Data	Growth Factor Future/ Base	Annual Growth Rate (%/yr)	Cumulative Growth Rate % 2016 to 2023	Low-End Cap	High-End Cap	"Capped" Growth Factor
0.1316	0.1483	1.1266	1.72%	12.66%	0.75	1.25	1.127
0.1369	0.1547	1.1300	1.76%	13.00%	0.75	1.25	1.130

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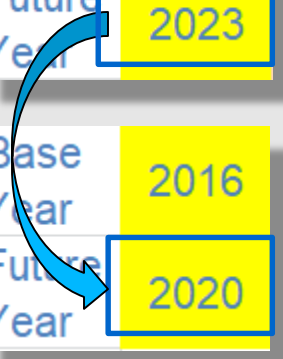
Tab 3 – Change Future Year

fips	scc	scc_description	GROWTH_CODE
10000	2102004001	Stationary Source Fuel Combustion; Industrial; Distillate Oil; All Boiler Types	AEO2019_SA_IND_DISTILLATE

		Base Year Raw Data	Future Year Raw Data	Growth Factor Future/ Base	Annual Growth Rate (%/yr)	Cumulative Growth Rate % 2016 to 2023	Low-End Cap	High-End Cap	"Capped" Growth Factor
Base Year	2016								
Future Year	2023	0.1369	0.1547	1.1300	1.76%	13.00%	0.75	1.25	1.130
Base Year	2016								
Future Year	2020	0.1369	0.1526	1.1144	2.74%	11.44%	0.75	1.25	1.114



Tab 4 – Emissions Modeling Framework (EMF) Growth Packet

- EMF = software system to manage emissions modeling files; analyze and project inventories
  - EPA and MARAMA use it. Others?

FIPS	SCC	Ann_GF	Comment
10000	2102004001	1.130	"! Projection from 2016 to 2023 Growth Code = AEO2019_SA_IND_DISTILLATE"
10000	2102004002	1.130	"! Projection from 2016 to 2023 Growth Code = AEO2019_SA_IND_DISTILLATE"
			"! Projection from 2016 to 2023 Growth

eral Methodology | Growth Raw Data | 2016b to Growth Factor XWALK | **EMF Growth Packet** | state review | Sheet 1 | Sheet 2 | She

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Inventory Projection: CONTROLS

- Gradual change over time
  - Equipment turnover to cleaner technology (e.g. NSPS)
- Sudden change on a given date – “Moment-in - time”
  - Physical device (e.g., scrubber on a boiler)
  - Fuel change (e.g., switch to low-sulfur fuel)
- Not all CONTROLS are controls

“Moment-in-time” Regional Control Ex.

Low-sulfur fuel oil SO_2 reduction calculations from Judy Rand, NJ DEP

			"Phase II"	"Phase II"	2016 Sulfur	From 2016 to 2023 Boilers and Process Heaters
State	County	Fuel Classification	Compliance Date	Sulfur Content (%)	Sulfur Content (%)	(%) SO2 Reduction
DE	Kent	Distillate (#2) and Kerosene	01/01/17	0.0015	0.30	99.5

fips	scc	pol'	Control Efficiency %	compliance_date	comments
10001	2102004001	SO2	99.5	1/1/2017	"MANEVU Low Sulfur #2 Fuel Oil County Rule"

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Thanks!

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Association of ten state/local air quality agencies strengthening the capabilities of its member agencies and helping them work together to reduce air pollution impacts

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Bonus Slides

Growth Raw Data Sources

Level	Data
County	Population projections from state planning agencies
	Vehicle miles travelled (VMT) projections from state transportation agencies
State	Employment projections from state labor departments
Regional	Energy consumption by sector and fuel type from the Energy Information Agency's (EIA) Annual Energy Outlook (AEO)
National	Projections for livestock, residential wood combustion, commercial marine vessels and locomotives from EPA
State-specific	Data provided by state air planning agencies
Airport-specific	Projections from the Federal Aviation Administration

Selecting growth raw data type

- Point: fuel burning, NAICS (employment), combination
- Nonpoint: fuel burning, SCC, POP, VMT
  - National, state, county level
- Not getting into in-depth – may provide webinar in the future. Contact Susan if interested.
- List of SCC groupings
  - https://ofmpub.epa.gov/sccwebservices/sccsearch/docs/SCC-IntroToSCCs.pdf

Thanks!

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