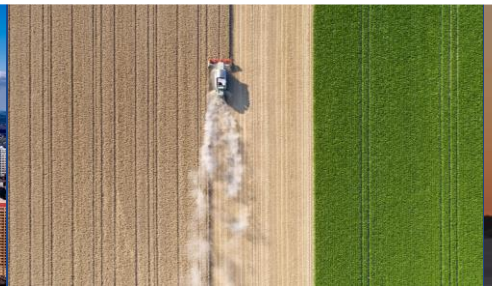
# 2022 Regulatory Emissions Modeling Platform Quarterly Update

National Emissions Collaborative

August 7, 2024



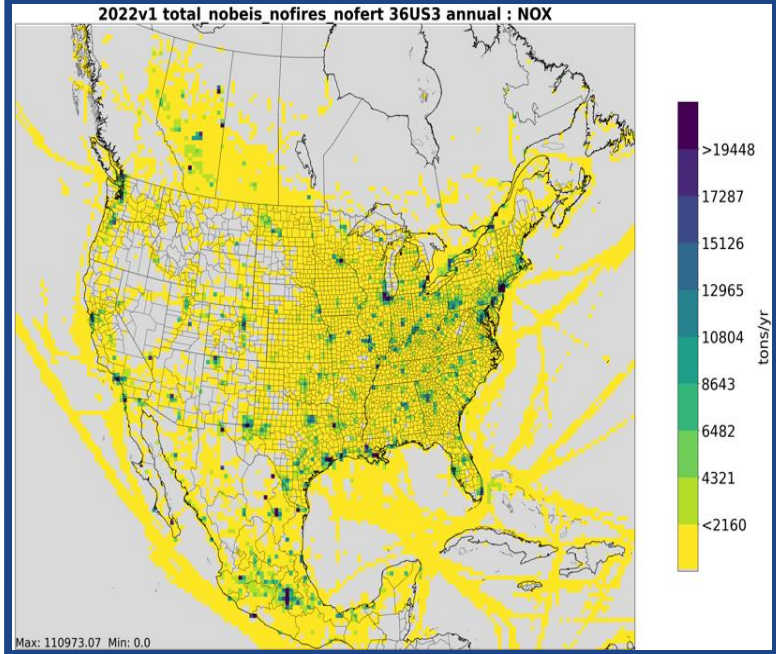



# Agenda

- Summary of activities and accomplishments to date
- Communication support update
- 2022v1 base year platform release
- Analytic year development update
- Schedule reminders
- Next steps

# Summary of Activities and Accomplishments

- EPA reviewed and incorporated comments on 2022 inventories
- 2022 base year emissions are finalized
- Model-ready emissions are available for 36km and 12km grids
- EPA started 36km air quality model runs
- EPA and Collaborative members developed approaches for projecting emissions
- The Collaborative held an emissions projection / control webinar
- Analytic year inventory development has started

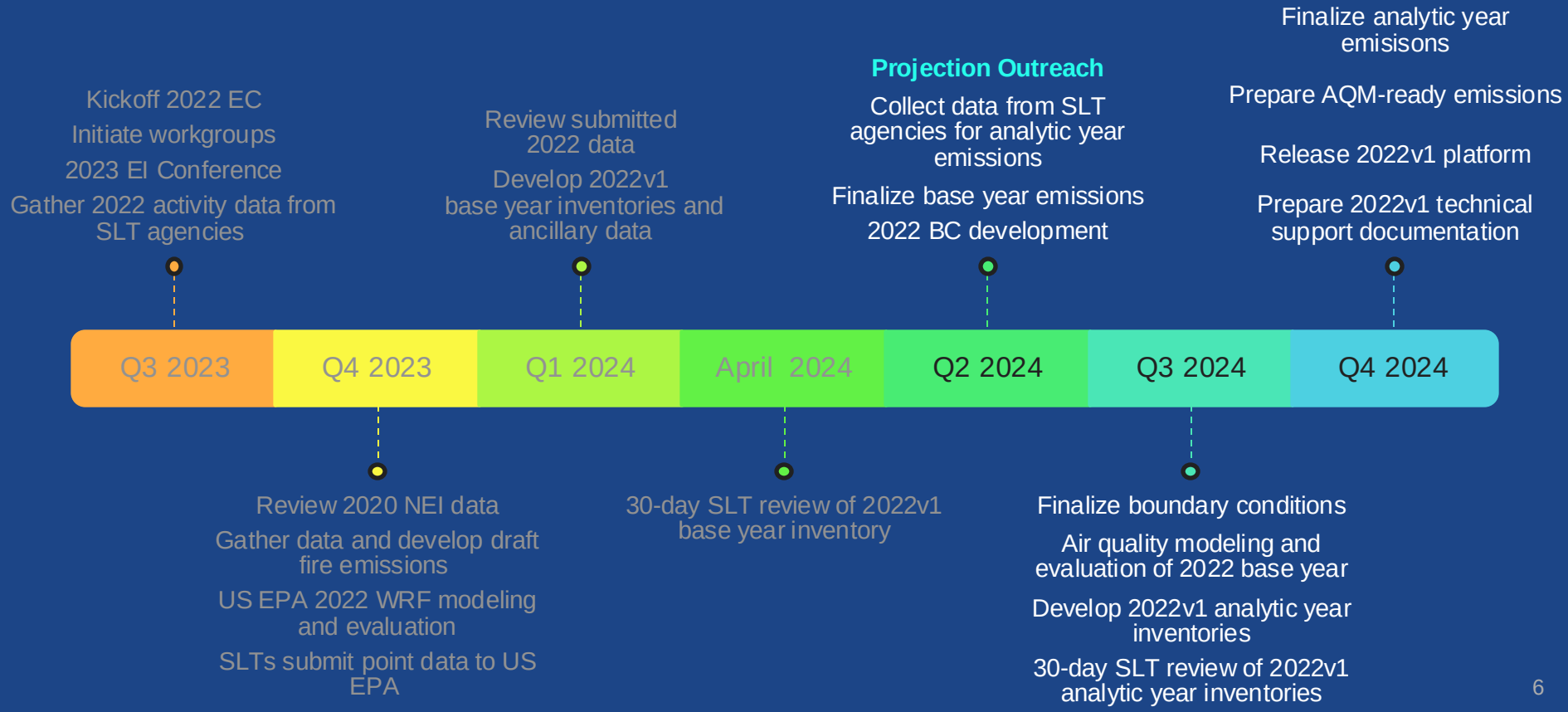


# 2022 EMP Collaborative

- Co-leads
  - Zac Adelman (LADCO), Mary Uhl (WESTAR), and Alison Eyth (EPA OAQPS)
- Communication support
  - Rhonda Payne (WESTAR/WRAP), Tom Richardson (OK DEQ), Tom Moore (Denver/NFR RAQC)
- Coordination Committee
  - 28 members from MJOs, state agencies, and US EPA staff from OAQPS, OTAQ, and CAMD
  - Monthly calls
  - Quarterly outreach webinars
- Workgroups
  - Leverage existing national emissions workgroups
  - Some 2022-specific workgroups have been created, e.g., fires and projection

# Communication Support Update

# Timeline for 2022v1 - Comms Focus



Collect data from SLT agencies for analytic year emissions

Develop 2022v1 analytic year inventories

2022 BC development

Q2 2024

Air quality modeling and evaluation of 2022 base year

30-day SLT review of 2022v1 analytic year inventories

Q3 2024

Finalize analytic year inventories

Release 2022 v1 platform

2022v1 technical support documentation

Q4 2024

## Analytic Data Outreach

- June 18th Projections Call - Build understanding of how growth and controls are applied in an analytic year. Call to agencies to submit future control information for inclusion in analytic years
- Relay information on Projections Task Force recommendations

## Review of Analytic Data Outreach

- Provide communication assistance for data review period (tips for reviewing data, commenting, updating controls, etc.)
- Share info on data sharing opportunities (when data is posted to ftp, AWS, etc.)
- Share info on model performance evaluation

## Release of v1 and Prepping for v2 Outreach

- Organize a 'debrief' session on v1 development, to capture lessons learned and use them to guide and improve the v2 process

# Communications Outreach since last Quarterly Report Out

| | | |
|---|---|---|
| May 1 | 2022 EMP Projections Workgroup – 4 Eastern | Contact: Zac Adelman |
| 9 | National Oil & Gas Emissions Committee (NOGEC) - 2 Eastern | Contact: Jeff Vukovich |
| 15 | Nonpoint Methods Advisory (NOMAD) Committee– 2 Eastern | Contact: Jennifer Snyder |
| 23 | National EGU Workgroup / Projections Task Force – 4th Thursday at 2 Eastern | Contact: Serpil Kayin |
| June 4 | NACAA Emissions & Modeling Committee – 2 Eastern | Contact: Karen Mongoven |
| 5 | 2022 EMP Projections Workgroup – 4 Eastern | Contact: Zac Adelman |
| 6 | Oil & Gas Projections Task Force – 2 Eastern | Contact: Jeff Vukovich |
| 11 | CMV Committee - 1 Eastern | Contact: Jesse Carpentier |
| 13 | NOGEC - 2 Eastern | Contact: Jeff Vukovich |
| 18 | 2022 Regulatory Emissions Modeling Platform Projections Webinar | Contact: Zac Adelman |
| 20 | MJO MOVES Workgroup 3rd Thursday of each month at 3 Eastern | Contact: Jesse Carpentier |

# Communications Outreach since last Quarterly Report Out

| | | |
|---|---|---|
| July 3 | 2022 EMP Projections Workgroup – 4 Eastern | Contact: Zac Adelman |
| 11 | NOGEC - 2 Eastern | Contact: Jeff Vukovich |
| 23 | Oil & Gas Projections Task Force – 2 Eastern | Contact: Jeff Vukovich |
| 25 | AAPCA Emissions Inventory Committee Call – 3 Eastern | Contact: Morgan Dickie |
| August 6 | Oil & Gas Projections Task Force – 2 Eastern | Contact: Jeff Vukovich |

# 2022 EMP Communications Plan

**Goals of Outreach – v1 completion, moving toward v2!**

- Target national and regional groups, continuing to encourage engagement
- Support EMP as communication facilitators and advocates
- Emphasize the need for involvement in EMP data decisions

# Communications Outreach – New Focus for Presentations and Future Work

# Communications Outreach Plans for Aug-Oct

## Default Growth and Controls Projections Approaches:

- Comms team to share sector-specific default approaches adopted for Version 1 of the EMP.

## SLT Review of Analytic Year Emissions:

- Comms team encourage SLT review of the 2022 v1 analytic year emissions projections
- Solicit and track feedback on the process and recommendations for improvements.

## SLT Alternative Growth and Controls Projections Approaches:

- To improve Version 2, how can we help to incorporate SLT preferences into the base year data and analytic year projections?
- What documentation is necessary?
- What additional data do SLTs need to provide to justify the use of an alternative approach?

# 2022v1 Emissions Modeling Platform Base Year Emissions Update

# Activities since the May meeting

- Comments were reviewed and responses prepared (see the Sharepoint site)
- Inventories were updated to incorporate changes from the comments
- A review of ancillary data was performed and comments on these were reviewed
- Updates to ancillary data were made in response to the comments
- SMOKE was run at 36km and 12km
- Initial air quality model runs have started

# Examples of Comments Received on Emission Inventories

127 comments were received from 29 organizations

Q: Road dust is higher than expected

*A: We posted unadjusted emissions instead of met-adjusted or met. and transportable fraction adjusted - the modeling will use both types of adjustments; also there was an issue with 2020 NEI met. aadjustments.*

Q: Some facility emissions were posted multiple times.

*A: There was a cross referencing bug in the tool*

Q: Some facility emissions were not in the Retrieval Tool.

*A: There was a bug in the tool that duplicated emissions when the facility had emissions from multiple modeling sectors (e.g., EGU and non-EGU); also facilities with counties ending in 777 are not included*

Q: Some comments related to unit retirements and name changes.

*A: These could be submitted to EIS during the review period*

# Other Types of Comments Received on 2022 Emissions

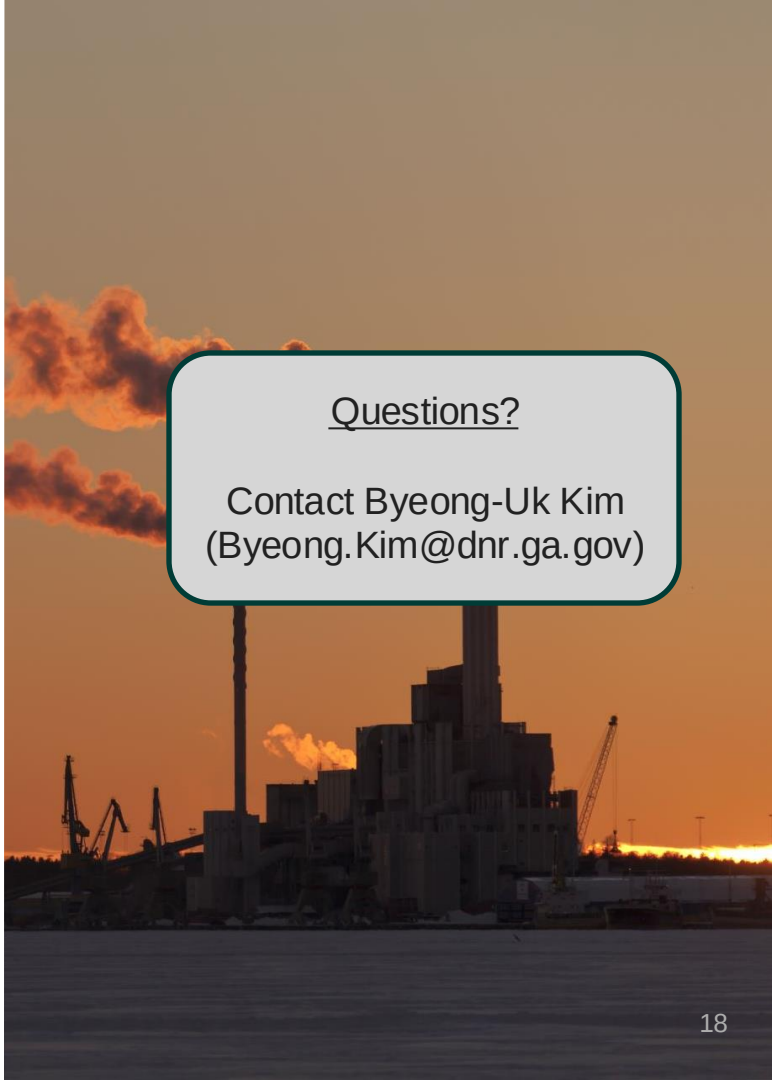
- Q: Where are the fertilizer emissions? A: they will be computed in August using a CMAQ run
- Q: How did livestock emissions change? A: they are now based on the 2022 USDA census coupled with year 2022 meteorological effects
- Q: Why did biogenic NOx and VOC emissions change differently? A: The land use data were corrected after 2020 NEI and the meteorological data are different
- Q: Why did the 2020-2022 projection factor not match up to the change in fuel use? A: projection factors from 2020->2022 were limited to +/- 30% (0.7-1.3)
- Q: Why did the EGU emissions not match the submitted data? A: Hourly Continuous Emissions Monitoring System (CEMS) data are given preference and CEMS totals were incorporated into the review data
- Q: Why are there oil and gas emissions in counties with no production? A: Abandoned well and blowdown/pigging emissions are included in 2022v1 for counties without production

# Other Types of Comments Received on 2022 (ctd.)

- Q: Why are onroad NH3 emissions higher in 2022 than 2020? A: MOVES4 uses improved rates for NH3, plus 2022 VMT is higher
- Q: Why are refueling VOC emissions much higher than 2020? A: MOVES4 uses improved emission factors and VMT are higher in 2022 than in 2020
- Some submitted data were not included in the inventories
- Some nonpoint emissions are included in the point source inventory and should be removed
- Facility parameters changed (e.g., lat-lon, name) or facility/unit shut down or is double-counted with others
- 19 comments were submitted on agricultural, wild and prescribed fires

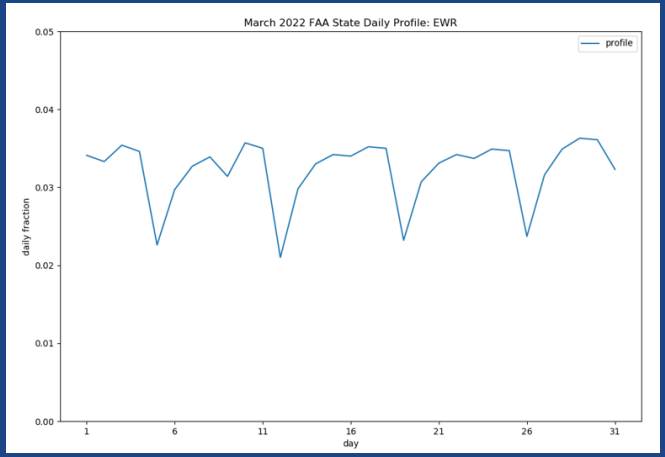
# Ancillary Data Review

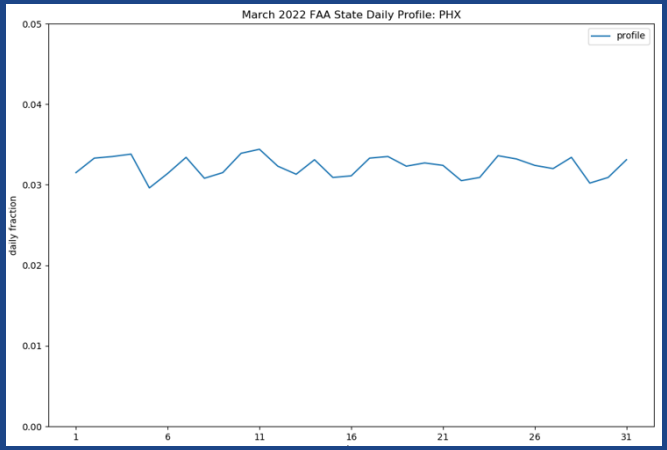
- Mark Jansen (LADCO) provided review materials
  - Powerpoint presentation
- Updates to temporal profiles were made based on the comments:
  - Snowblowers now use flat day of week profile
  - Some evaporative monthly profiles based on monthly VOC from onroad
  - Residential natural gas emissions now use monthly profiles by state
  - Asphalt paving and roofing monthly profiles now based on EIA data for asphalt and road oil
  - Temporal profiles for paved and unpaved road dust are now based on onroad profiles and emissions
  - Ag. tilling profiles based on nonroad ag. emissions
  - Surface coating for metals sources now operate 7AM-5PM



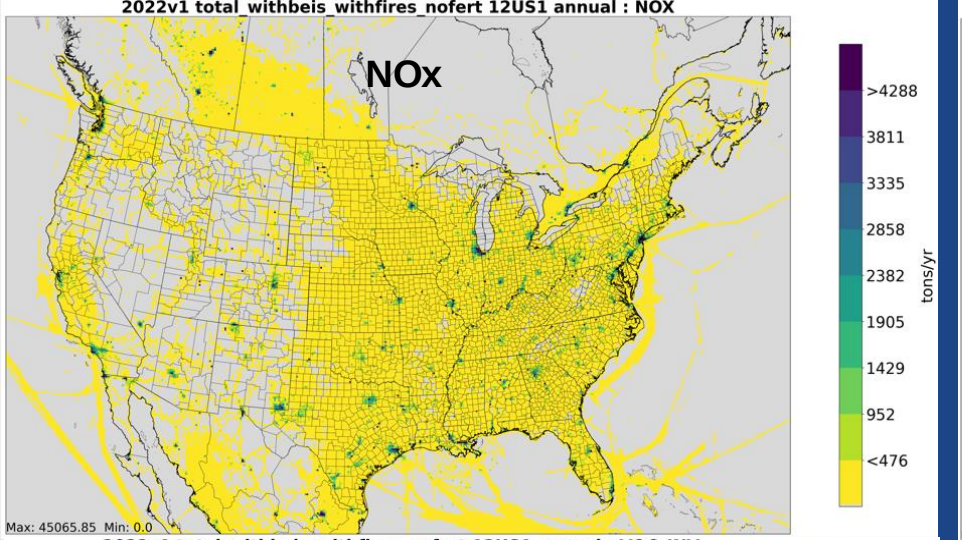
# Other Ancillary Data Updates

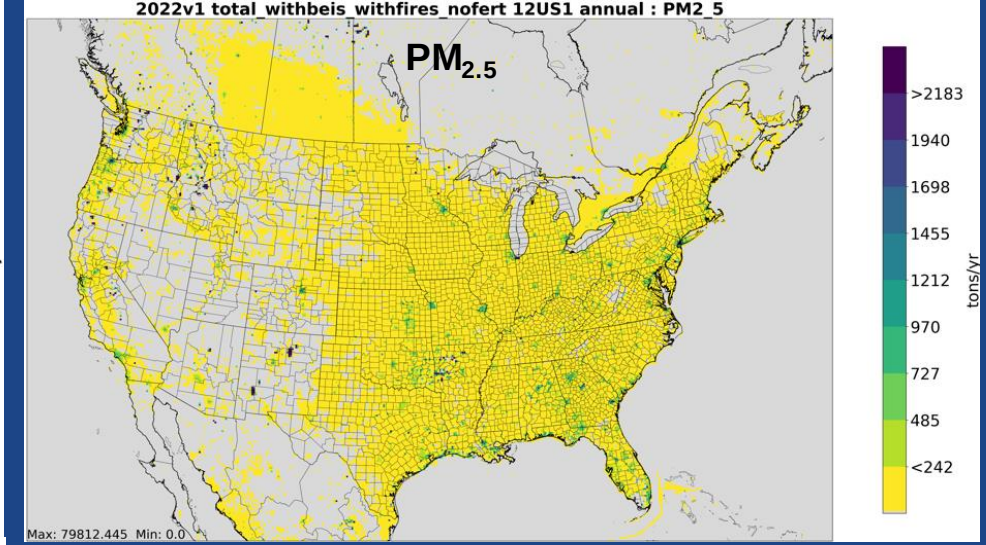
- Emissions at airports use 2022-specific temporal profiles based on Aviation system performance Metrics
- Month-to-day temporal profiles are used for airports instead of month to day-of-week
- Oil and gas sources use 2022-specific monthly profiles and spatial surrogates
- New spatial surrogates were generated for Mexico based on updated data
- Additional spatial surrogate updates will be considered for version 2 (e.g., for residential wood combustion and pleasure craft, agricultural silage, snow cover)

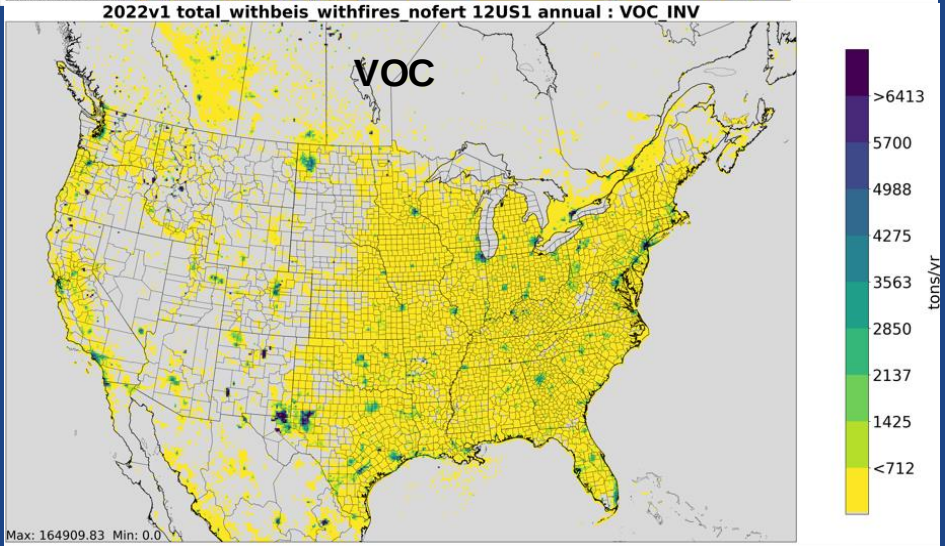


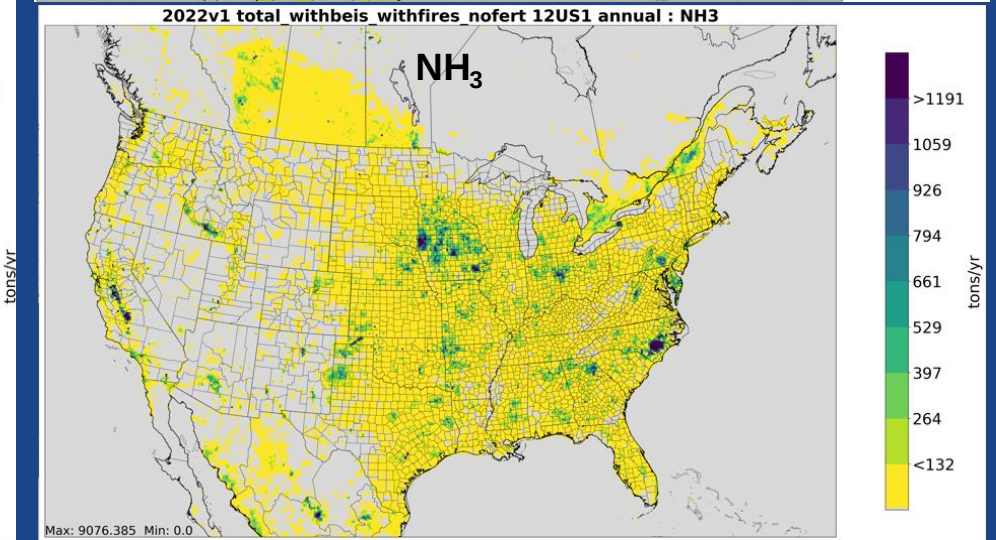



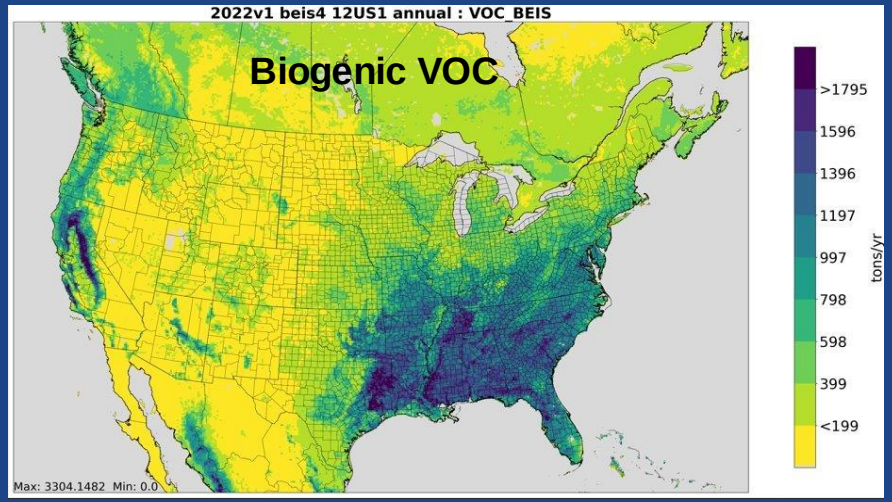
# Selected Plots of Gridded 12km Emissions

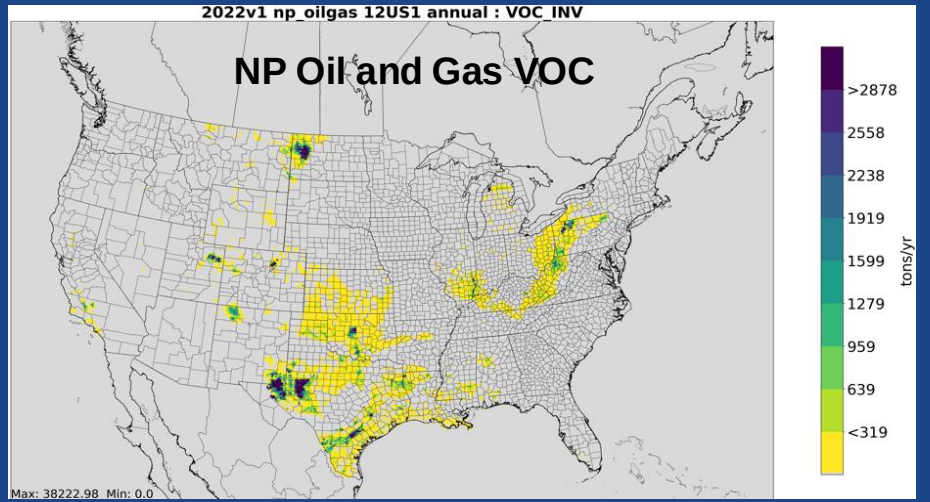

2022v1 total_withbeis_withfires_nofert 12US1 annual : NOX
NOx
>4288
3811
3335
2858
2382
1905
1429
952
<476
tons/yr
Max: 45065.85 Min: 0.0

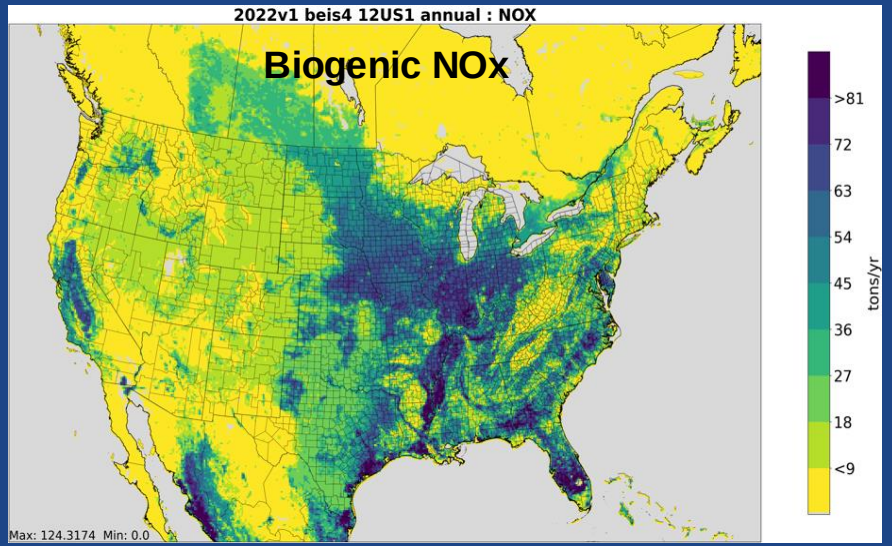

2022v1 total_withbeis_withfires_nofert 12US1 annual : PM2_5
PM2.5
>2183
1940
1698
1455
1212
970
727
485
<242
tons/yr
Max: 79812.445 Min: 0.0

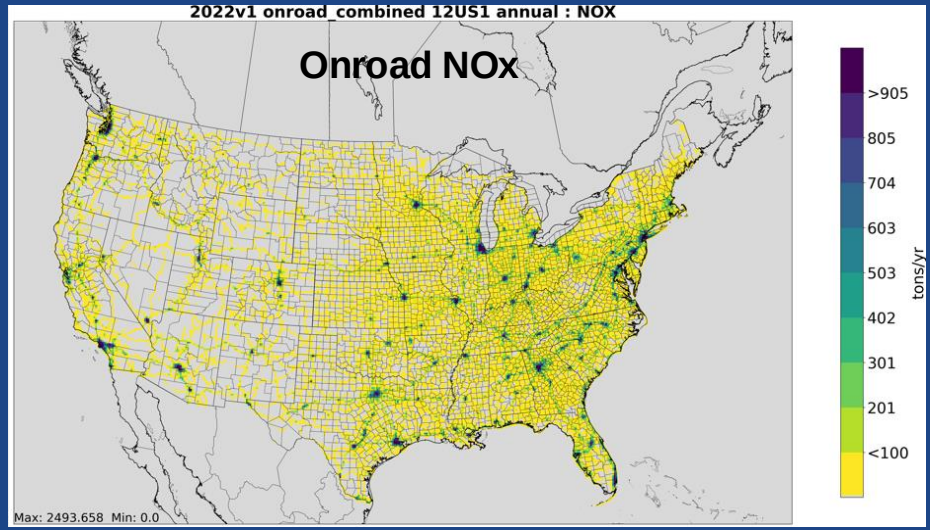

2022v1 total_withbeis_withfires_nofert 12US1 annual : VOC_INV
VOC
>6413
5700
4988
4275
3563
2850
2137
1425
<712
tons/yr
Max: 164909.83 Min: 0.0

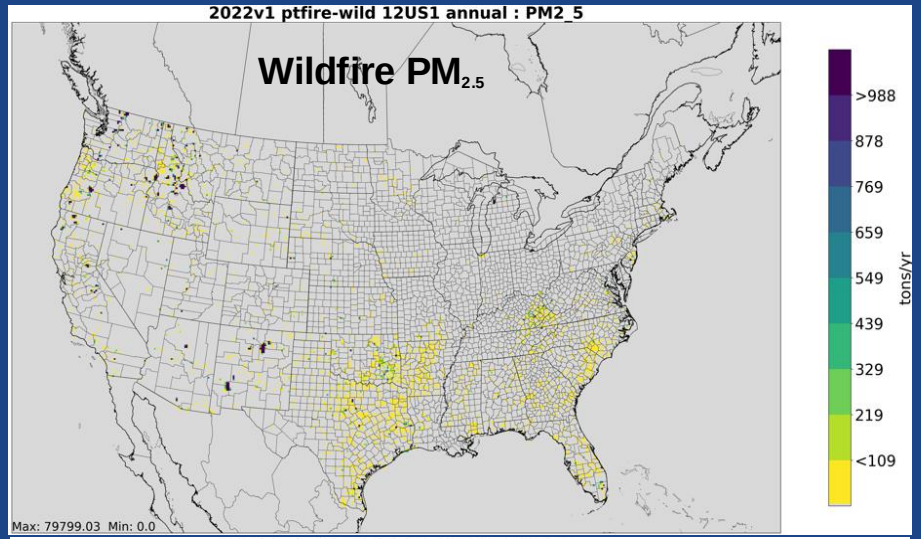

2022v1 total_withbeis_withfires_nofert 12US1 annual : NH3
NH3
>1191
1059
926
794
661
529
397
264
<132
tons/yr
Max: 9076.385 Min: 0.0

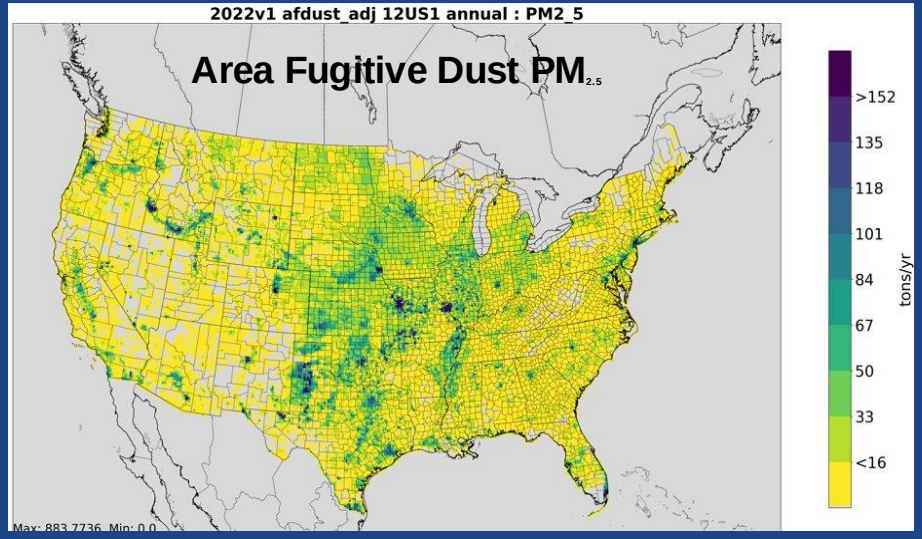

2022v1 beis4 12US1 annual : VOC_BEIS
Biogenic VOC
>1795
1596
1396
1197
997
798
598
399
<199
tons/yr
Max: 3304.1482 Min: 0.0

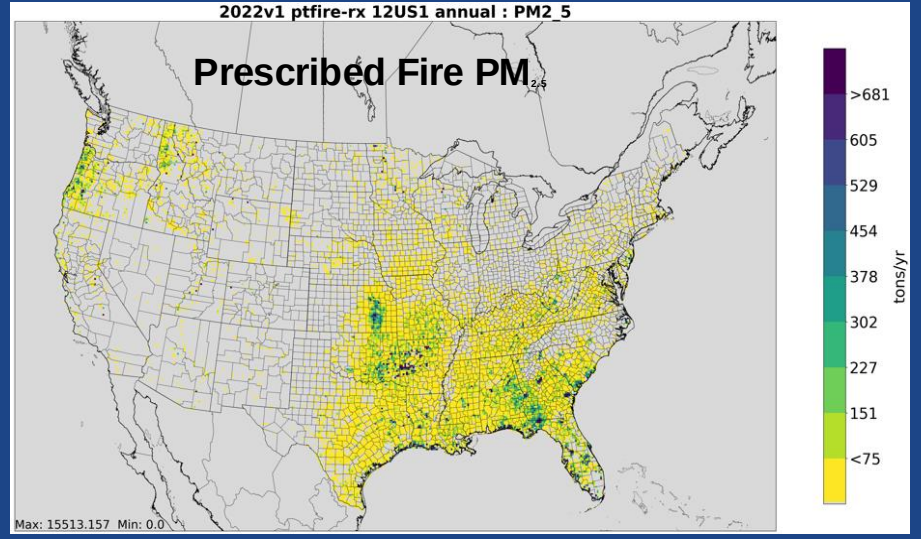

2022v1 np_oilgas 12US1 annual : VOC_INV
NP Oil and Gas VOC
>2878
2558
2238
1919
1599
1279
959
639
<319
tons/yr
Max: 38222.98 Min: 0.0

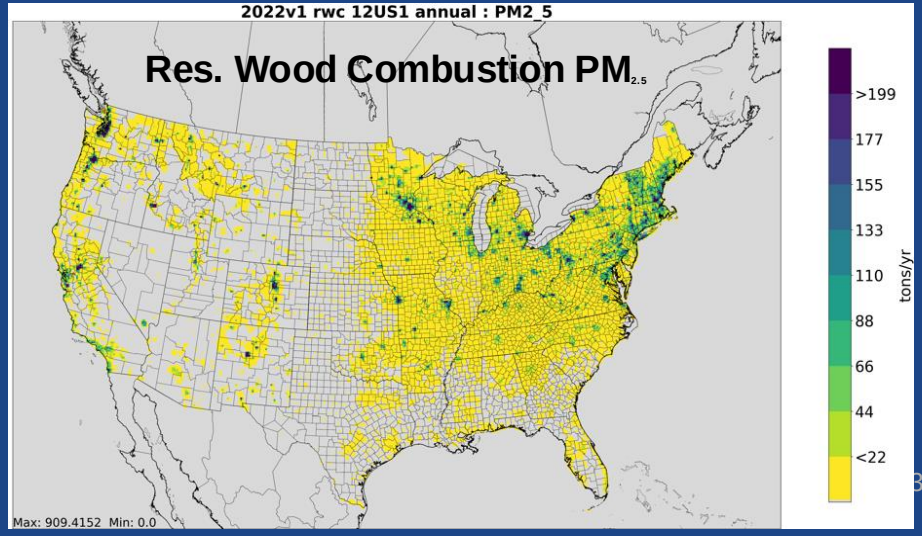

2022v1 beis4 12US1 annual : NOX
Biogenic NOx
>81
72
63
54
45
36
27
18
<9
tons/yr
Max: 124.3174 Min: 0.0


2022v1 onroad_combined 12US1 annual : NOX
Onroad NOx
>905
805
704
603
503
402
301
201
<100
tons/yr
Max: 2493.658 Min: 0.0


2022v1 ptfire-wild 12US1 annual : PM2_5
Wildfire $PM_{2.5}$
>988
878
769
659
549
439
329
219
<109
tons/yr
Max: 79799.03 Min: 0.0


2022v1 afdust_adj 12US1 annual : PM2_5
Area Fugitive Dust $PM_{2.5}$
>152
135
118
101
84
67
50
33
<16
tons/yr
Max: 883.7736 Min: 0.0


2022v1 ptfire-rx 12US1 annual : PM2_5
Prescribed Fire $PM_{2.5}$
>681
605
529
454
378
302
227
151
<75
tons/yr
Max: 15513.157 Min: 0.0

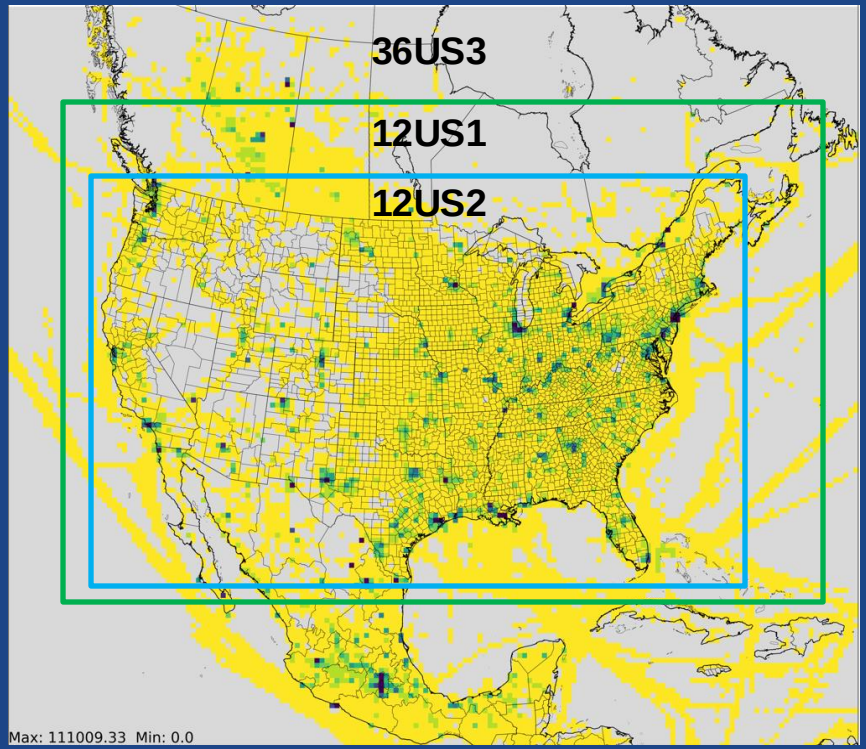

2022v1 rwc 12US1 annual : PM2_5
Res. Wood Combustion $PM_{2.5}$
>199
177
155
133
110
88
66
44
<22
tons/yr
Max: 909.4152 Min: 0.0

# 2022v1 Base Year Data Release

- Inventories, ancillary data, gridded plots, and preliminary scripts have been posted to the 2022v1 web page
  - https://www.epa.gov/air-emissions-modeling/2022v1-emissions-modeling-platform
  - A summary of responses to base year comments is available on Sharepoint and as a summary on FTP site
  - Portable scripts should be available by mid-September
- SMOKE 5.1 has been released and is the version that should be used to process 2022v1 emissions
- Model-ready emissions at 36km and 12km will be uploaded to the AWS Open Data site for the OAQPS 2022 Modeling Platform in September, following initial air quality modeling

# Boundary Condition Development and AQM Status

- 36US3 and 12US1 MCIP data are available on the OAQPS 2022 Modeling Platform AWS Open Data Site
- Global model data and 36US3 initial and boundary condition data are now being uploaded to AWS
- 36US3 CMAQ simulations are being performed and reviewed
- 12US2 boundary conditions will be developed and uploaded in September



# 2022v1 Analytic Year Emissions Update

# Typical Ways to Perform Projections to Analytic Years

- Apply factors that represent changes in activity between years
    - Factors can be derived from Annual Energy Outlook (AEO), other economic data, human population projections, etc.
- Apply factors to reflect controls or technology changes between years
- Apply any closures to facilities or units
- Run a model with updated inputs for the analytic year (e.g., IPM or ERTAC EGU, MOVES for onroad and nonroad)

# Emissions Control Data Outreach

- June 18: Projection Background and Controls Data Request webinar held
- Described emissions projection methods, data, and uses
- Requested data from SLT agencies about emissions control programs or stationary source changes applicable to the years 2022-2038
    - Included a data request template for providing information
- See 2022EIC Projections wiki for the slides and webinar recording

# Control Data Summary

- 18 organizations submitted closure and control data by the July 19 deadline
  - Allegheny, DE, GA, HI, IA, IL, MT, NC, ND, NH, OK, SC, TN, TX, UT, VA, WA, WI
- The majority of information provided was for closures, with some control data
- EPA will collate the data into packets to use with the Control Strategy Tool
- EPA will pull additional closures from the Emissions Inventory System (EIS)

# Analytic Year Development

- 2022 EIC Projections Workgroup
  - Organized into task forces that are reviewing projection methods and data by sector: EGU point, non-EGU point, onroad/nonroad mobile, marine/airport/rail, oil and gas
  - 2022v1 work has been focused on understanding recent US EPA and MJO/state methods and data to project activity
  - Goal of the workgroup is to make recommendations to U.S. EPA about data sources or methodology changes for projecting emissions in each version of the 2022 platform
  - The methods discussed in this section are for 2022v1. In 2022v2 many sectors will have different methods or adjustment factors

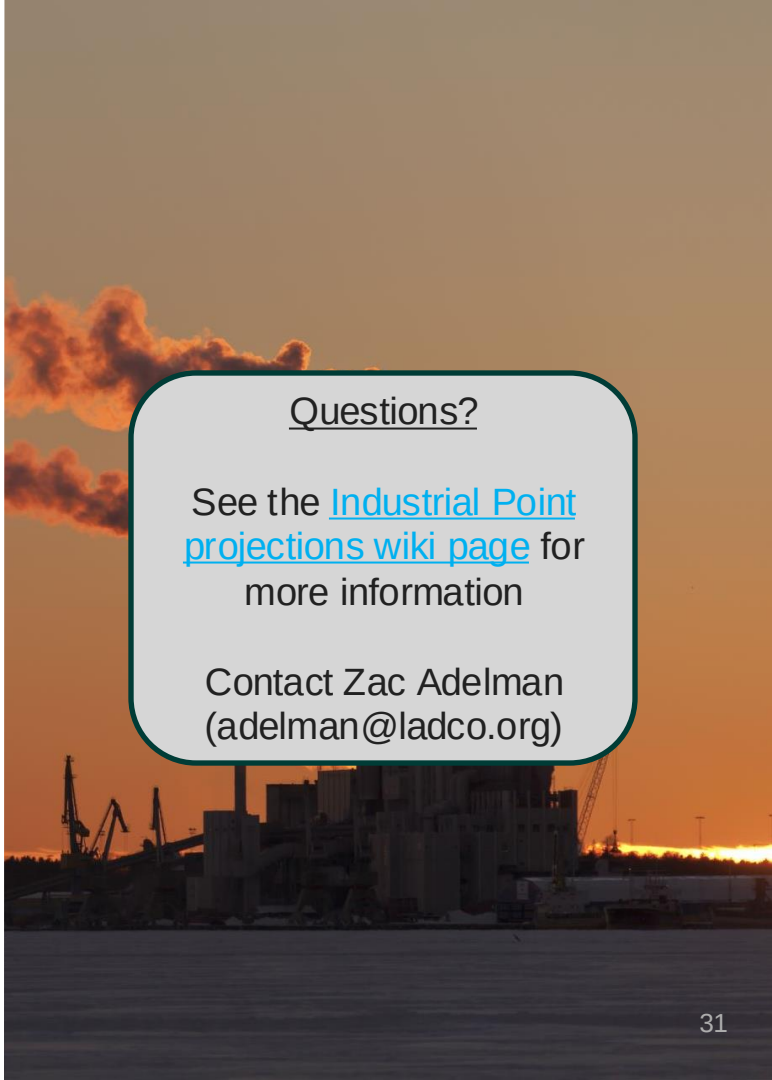
Questions?

See the Projections Workgroup wiki page

Contact Zac Adelman (adelman@ladco.org)

# 2022v1 Industrial Point Projections

- The goal of the task force was to recommend to EPA methods for projecting industrial point source  emissions from 2022 to 2026, 2032, and 2038
    - These methods would be used as the national default approach for these sources
- Reviewed past projection methods and data from EPA, MARAMA, New Jersey, and North Carolina
- The task force sought a method that used industry-specific, regional-scale (rather than national) information to inform the projections
- Reached consensus in the task force to use a method developed by NC DAQ



Questions?

See the Industrial Point projections wiki page for more information

Contact Zac Adelman (adelman@ladco.org)

# 2022v1 Industrial Point Projections

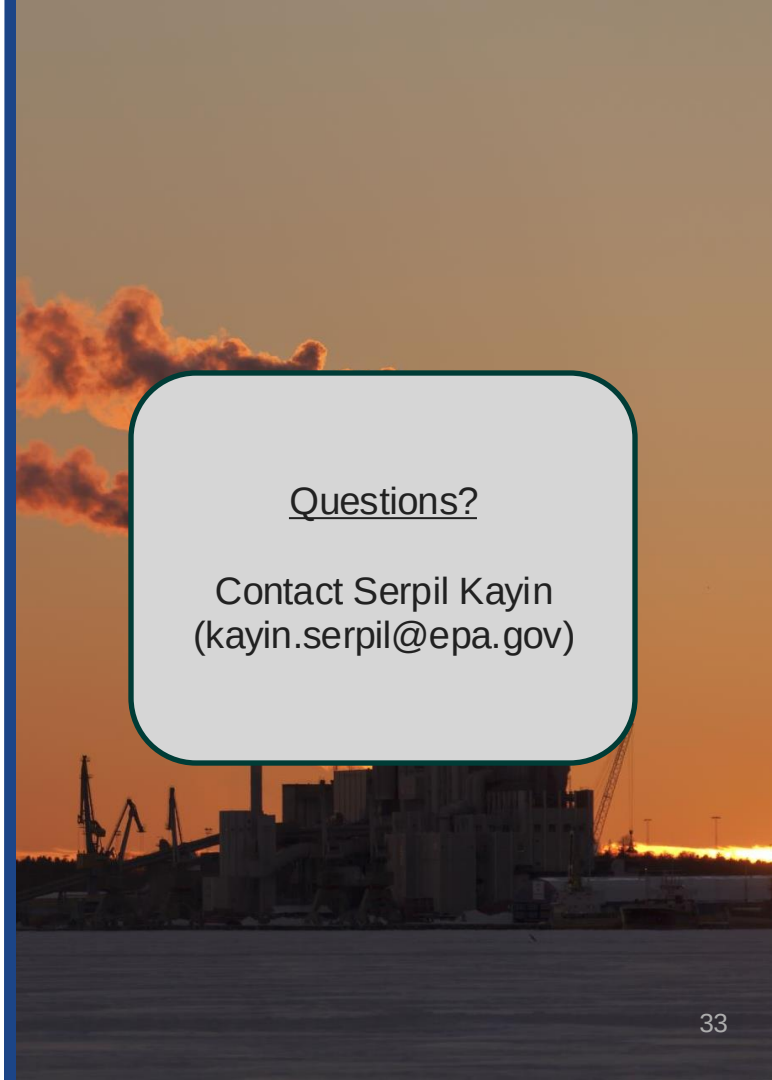
- Fuel Use Categories (combustion and storage)
  - National energy consumption and value of shipments (revenue) from the U.S. Annual Energy Outlook (AEO) combined with regional revenue from AEO
  - Mapping from AEO tables to inventory sources using NAICS and SCC codes, where applicable
- Non-Fuel Use Industrial Categories
  - Regional-scale employment and revenue projections from the U.S. Energy Information Administration (EIA)
- Projection Limits
  - Cap annual change at +/- 2% per year
  - Equates to a max growth (+/-) of 8% (2026), 22% (2032), and 37% (2038)

**Details**

2022v1 Industrial Point Projections Recommendations

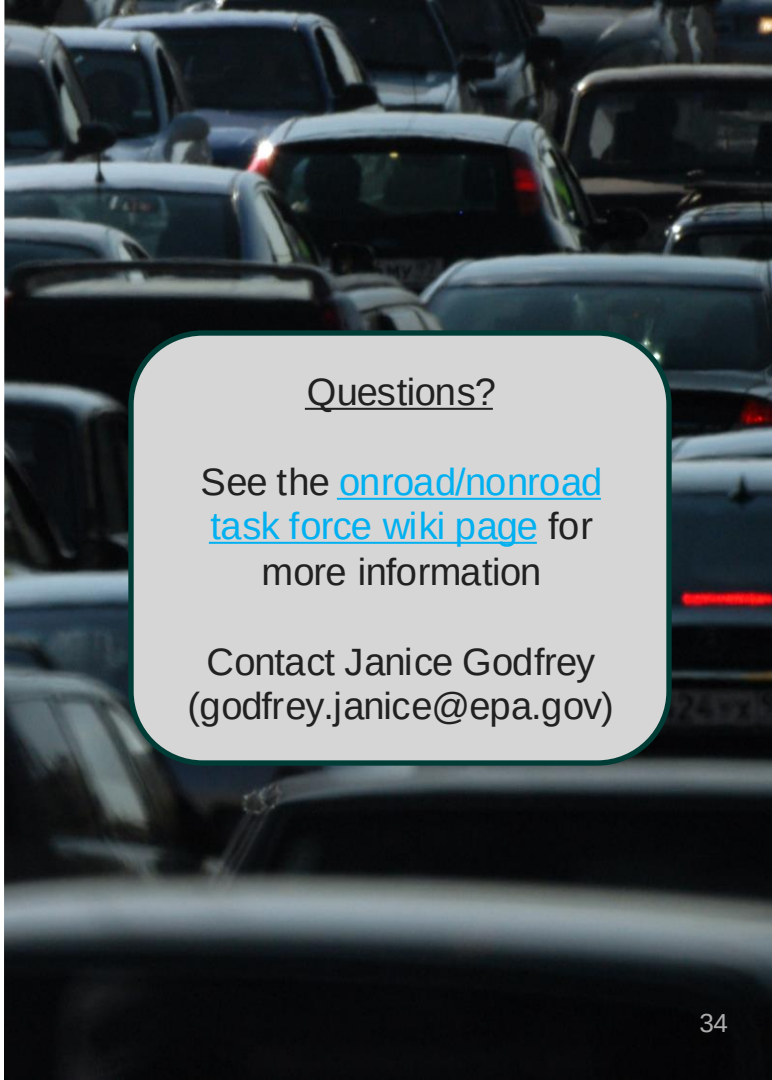
# 2022v1 Electric Generating Unit Projections

- EPA developed a 2026 inventory using an engineering analytics approach
  - Uses 2023 NOx and SO2 emissions
  - Incorporates known changes from the January 2024 Naional Electric Energy Data System (NEEDS)
  - PM, VOC, NH3, CO emission factors are linked to 2022 level and U.S. Energy Information Administration (EIA) forms 860and 923
  - No additional Good Neighbor Plan changes are reflected in 2026 – in 2023 all but two states are in compliance (and those two states are under assurance levels)
- EPA ran the Integrated Planning Model (IPM) 2023 to develop EGU emissions for 2032 and 2038
- The ERTAC EGU group is also preparing analytic year emissions for EGUss



# 2022v1 Onroad Mobile Projection Methods

- EPA ran MOVES4 for 2026, 2032, and 2038 to compute emission factors for each year.
- EPA projected VMT to analytic years using AEO 2023-based factors.
- Some states submitted analytic year VMT: NC, NJ, NY, and WI
- OTAQ developed state and SCC-specific adjustment factors to reflect the impacts of recent EPA rules on analytic year emissions.
- Emissions for 2026 and 2032 have been developed; SMOKE-MOVES is running for 2038
- More information will be available at the August 15 MOVES MJO Workgroup webinar



Questions?

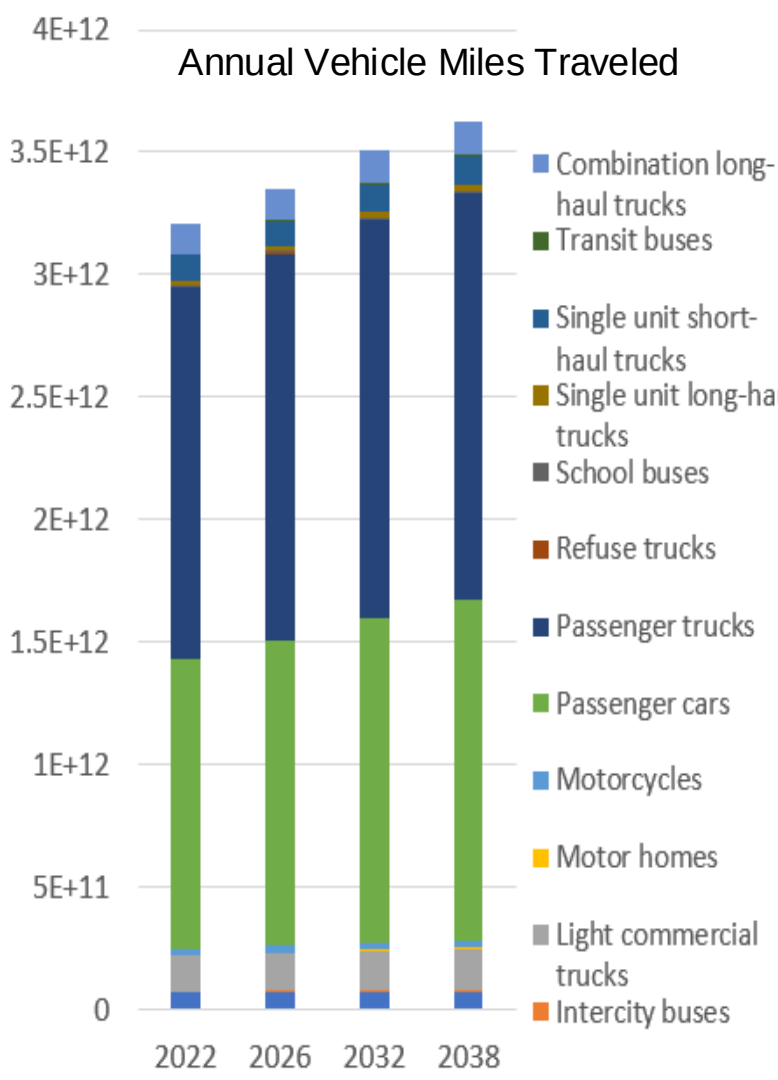
See the onroad/nonroad task force wiki page for more information

Contact Janice Godfrey (godfrey.janice@epa.gov)

# 2022v1 Onroad VMT Projection Factors

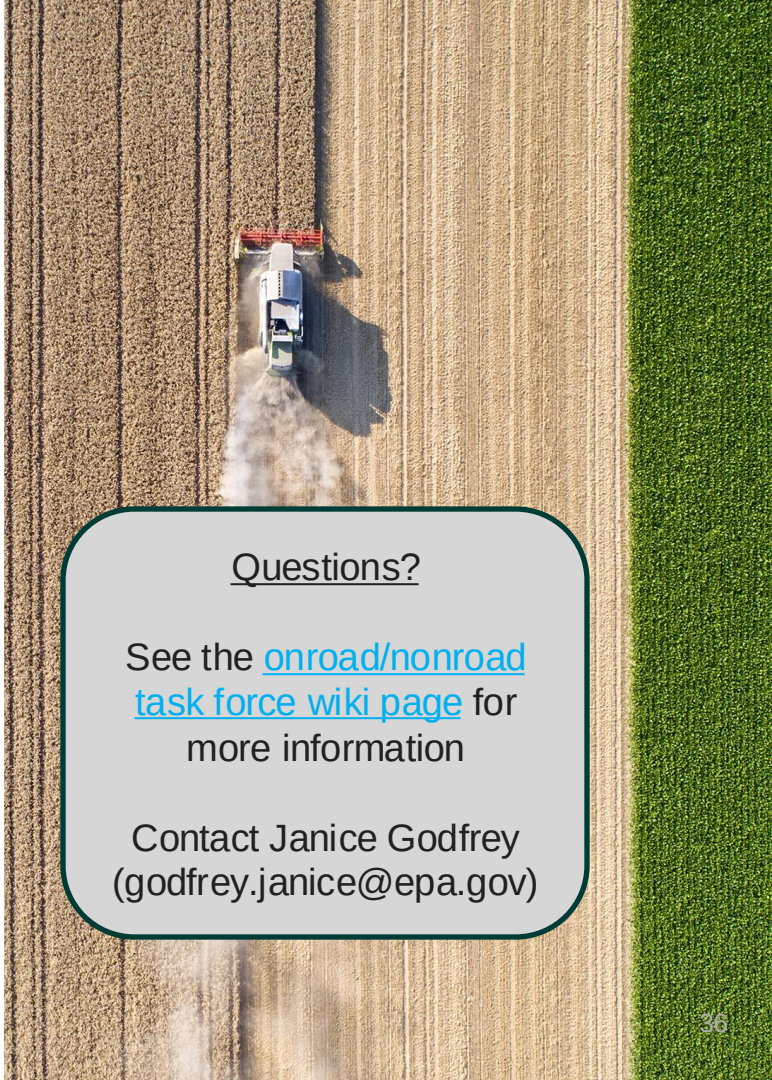
| | 22->26 | 22->32 | 22->38 |
|---|---|---|---|
| **Gas light duty (10s, 20s, 30s)** | 1.036 | 1.054 | 1.059 |
| **Diesel light duty (20s, 30s)** | 1.252 | 1.611 | 1.862 |
| **E-85 light duty (10s, 20s, 30s)** | 0.900 | 0.688 | 0.555 |
| **Electric light duty (10s, 20s, 30s)** | 3.339 | 10.370 | 17.986 |
| **Gas medium duty (40s, 50s)** | 1.108 | 1.303 | 1.500 |
| **Diesel medium duty (40s, 50s)** | 1.008 | 1.050 | 1.091 |
| **CNG medium duty (40s, 50s)** | 1.073 | 1.027 | 1.148 |
| **Electric medium duty (40s, 50s)** | 1.470 | 1.561 | 1.219 |
| **Gas heavy duty (60s)** | 1.103 | 1.508 | 1.788 |
| **Diesel heavy duty (60s)** | 1.018 | 1.050 | 1.067 |
| **CNG heavy duty (60s)** | 1.080 | 1.040 | 1.169 |
| **Electric heavy duty (60s)** | 1.536 | 1.708 | 1.314 |

10s = motorcycles, 20s = passenger cars and trucks,
30s = light commercial trucks; 40s = buses;
50s = single unit trucks; 60s = combination trucks



# Nonroad Mobile Projections

- MOVES4 nonroad runs for 2026, 2032, and 2038 are complete.
- No adjustments are anticipated.
- More information will be available at the August 15 MOVES MJO workgroup webinar



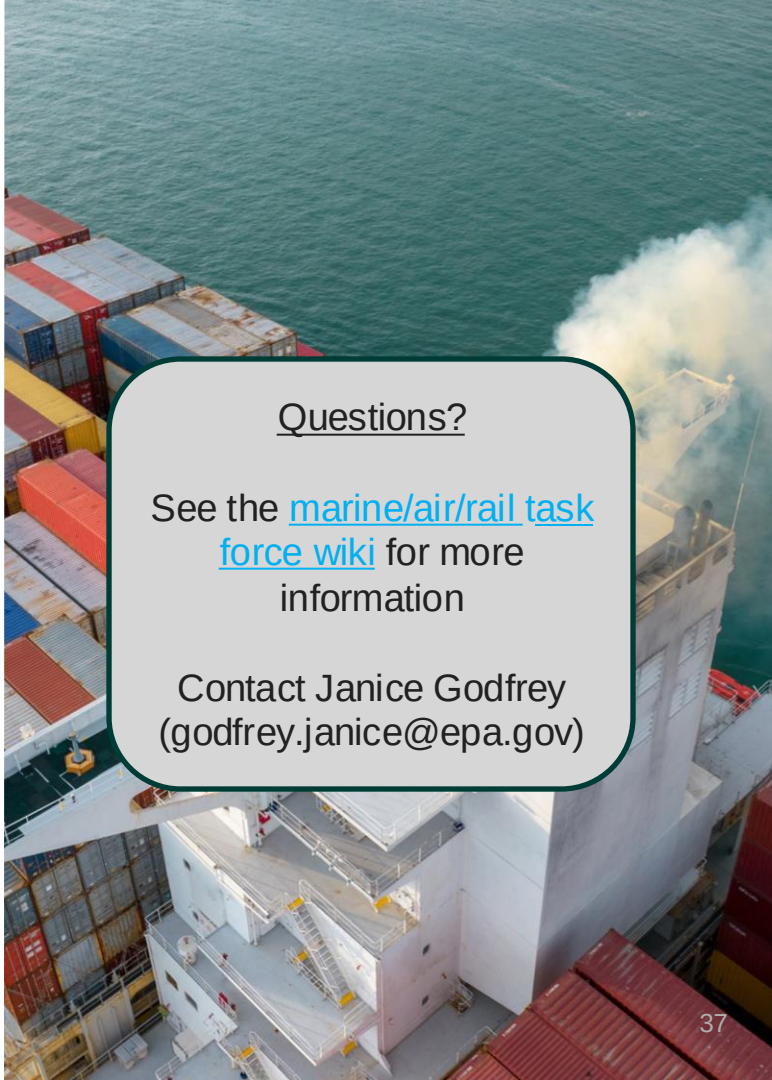
Questions?

See the onroad/nonroad task force wiki page for more information

Contact Janice Godfrey (godfrey.janice@epa.gov)

# 2022v1 Commercial Marine Vessel Projection Methods

- OTAQ developed projection factors by ship type and region based on the Freight Analysis Framework (FAF) v5
  - Regions: inland, atlantic, pacific, gulf, alaska, hawaii
  - Ship types: barge, offshore, bulk, fishing, container, ferry, general, government, roll on/roll off, misc., tanker, tour, tug, reefer, cruise, passenger
- Produced by the Bureau of Transportation Statistics (BTS) and supported by the Federal Highway Administration (FHWA)
- Data sources include:
  - Commodity Flow Survey (CFS)
  - Business Market Insights (BMI) database
  - Agricultural data
  - Extraction, utility, construction, service, and other sectors
- NOx scaling factors due to fleet turnover will also be applied to C3 vessels

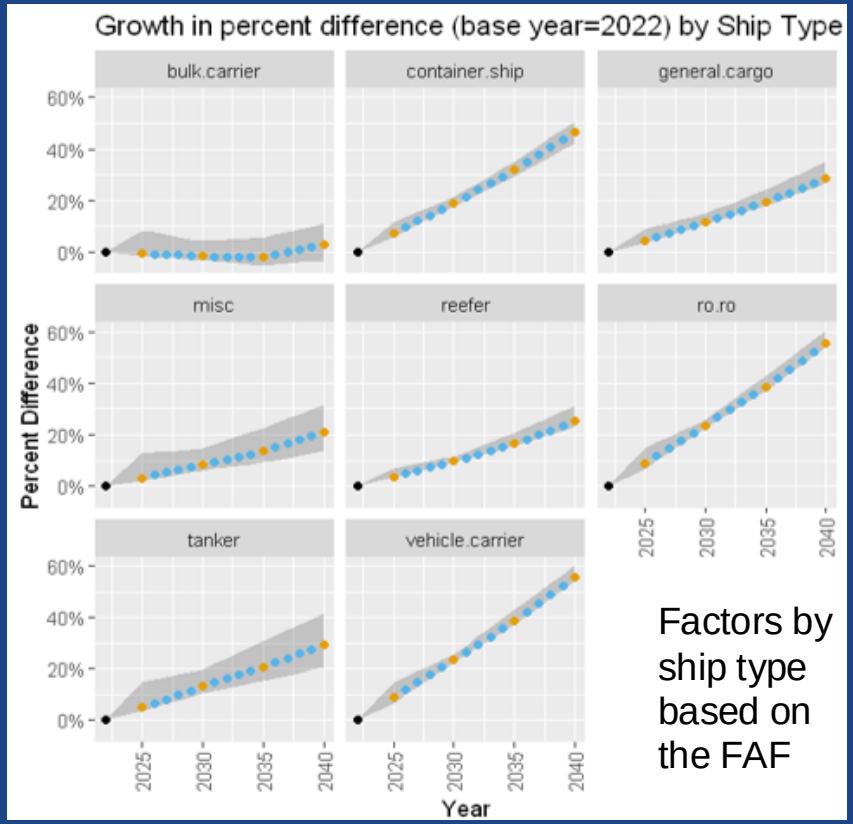


Questions?

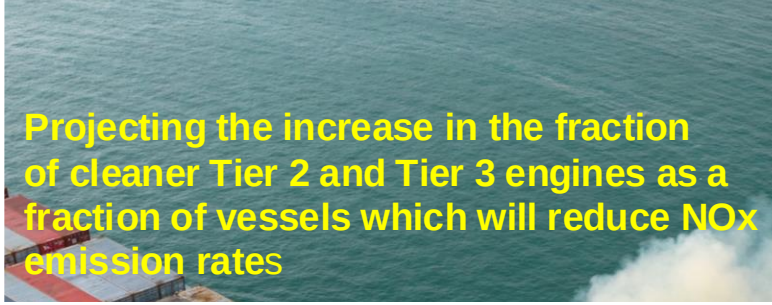
See the marine/air/rail task force wiki for more information

Contact Janice Godfrey (godfrey.janice@epa.gov)

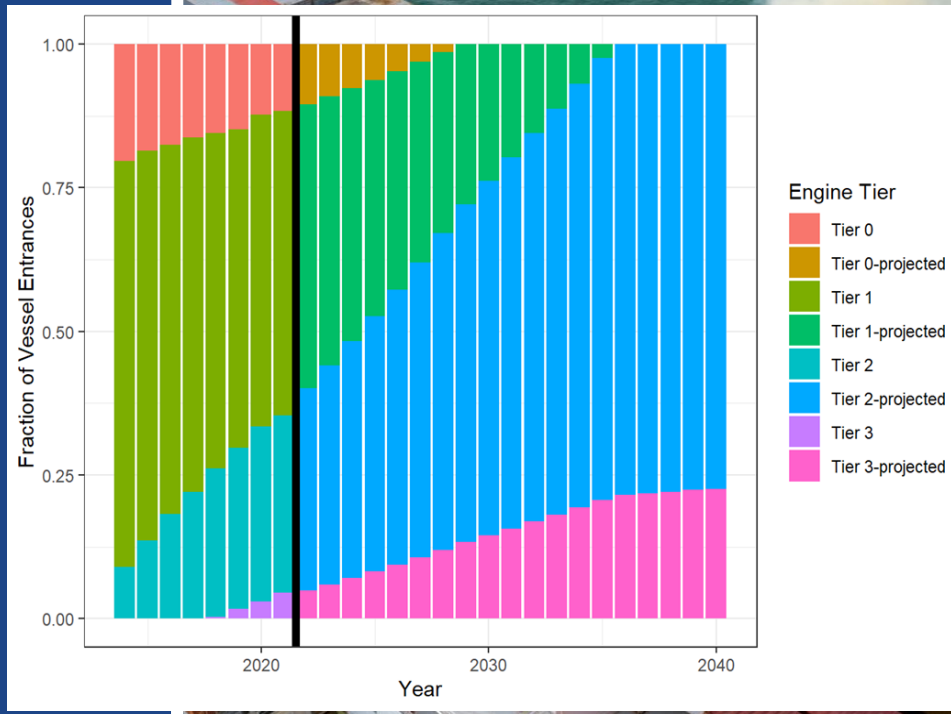
# 2022v1 Commercial Marine Vessel Projection Methods




Factors by ship type based on the FAF

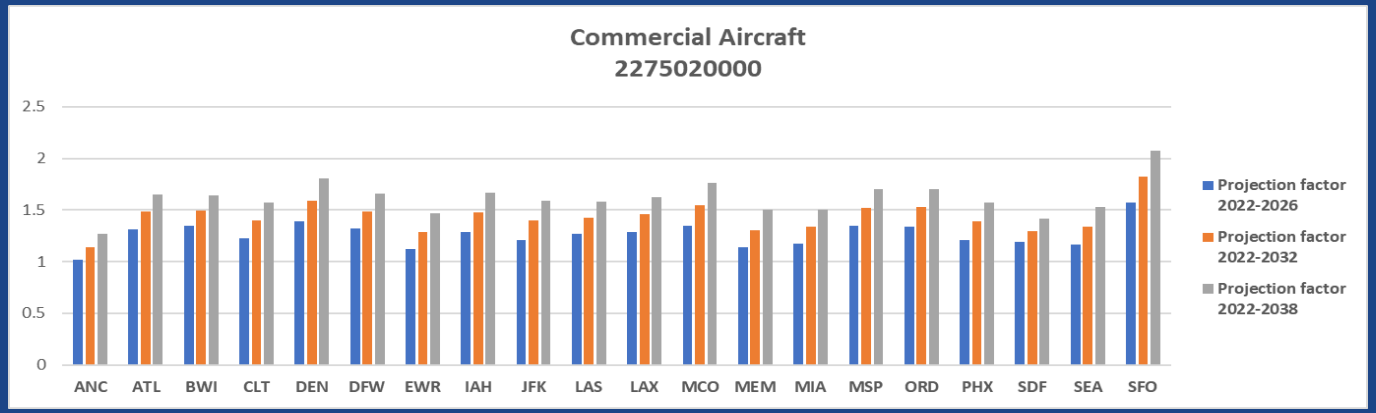


**Projecting the increase in the fraction of cleaner Tier 2 and Tier 3 engines as a fraction of vessels which will reduce NOx emission rates**



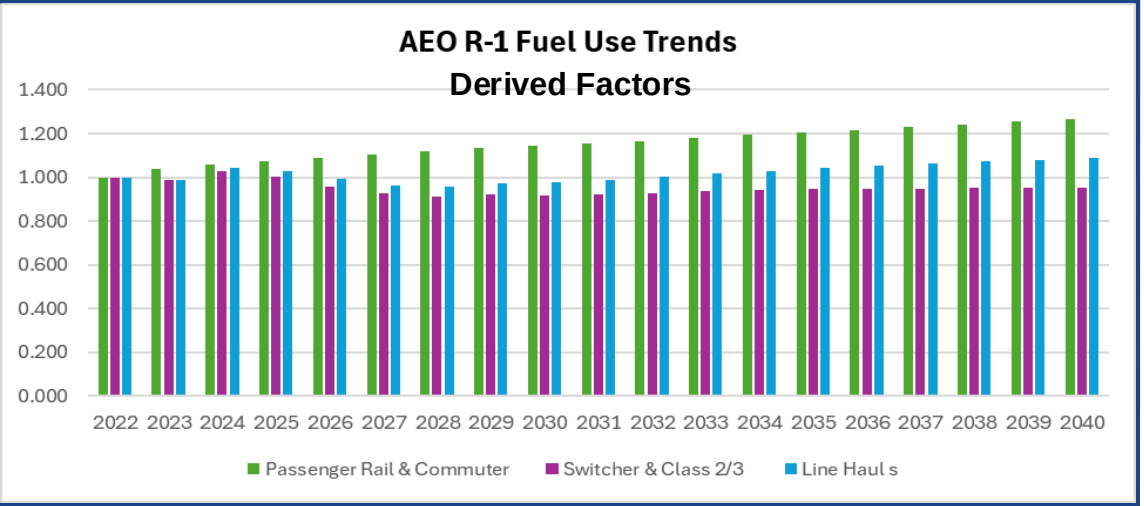

# 2022v1 Aircraft Projection Factors

- EPA used data from the most recent Terminal Area Forecast (TAF) released in January 2024 to compute projection factors from 2022 to each analytic year
  - Airport-specific factors computed for airports with specific data in the TAF and for each SCC
  - State average factors computed for each SCC to use for the other airports
  - A few states showed "spikes" on the order of 50% for state average factors. Where this happened, EPA manually adjusted the spike down to something more realistic
- Georgia provided analytic year emissions for Hartsfield-Jackson (ATL)



# 2022v1 Rail Projection Methods

- LADCO computed projection factors for line haul, switcher and class 2/3 locomotives, and passenger rail and commuter locomotives based on AEO fuel use data.




Questions?

See the marine/air/rail task force wiki page for more information

Contact Mark Janssen (janssen@ladco.org)

# 2022v1 Nonpoint Projections

**Population* (EPA is reviewing population data source)**

- Commercial Cooking; Solvents (Various – Dry Cleaning, Graphic Arts, Miscellaneous Non-Industrial: Consumer and Commercial, Industrial Surface Coatings); Waste Disposal; Miscellaneous Non-Industrial NEC (Cremation, Health Services)

**No Growth**

- Residential Wood Combustion; Dust (Unpaved Roads); Solvents (Cutback Asphalt); Miscellaneous Non-Industrial NEC (Portable Gas Cans, Other Combustion); Waste Disposal; Biogenics - Vegetation and Soil; Livestock Waste (Domestic and Other Animals)

**EIA's Annual Energy Outlook (AEO)**

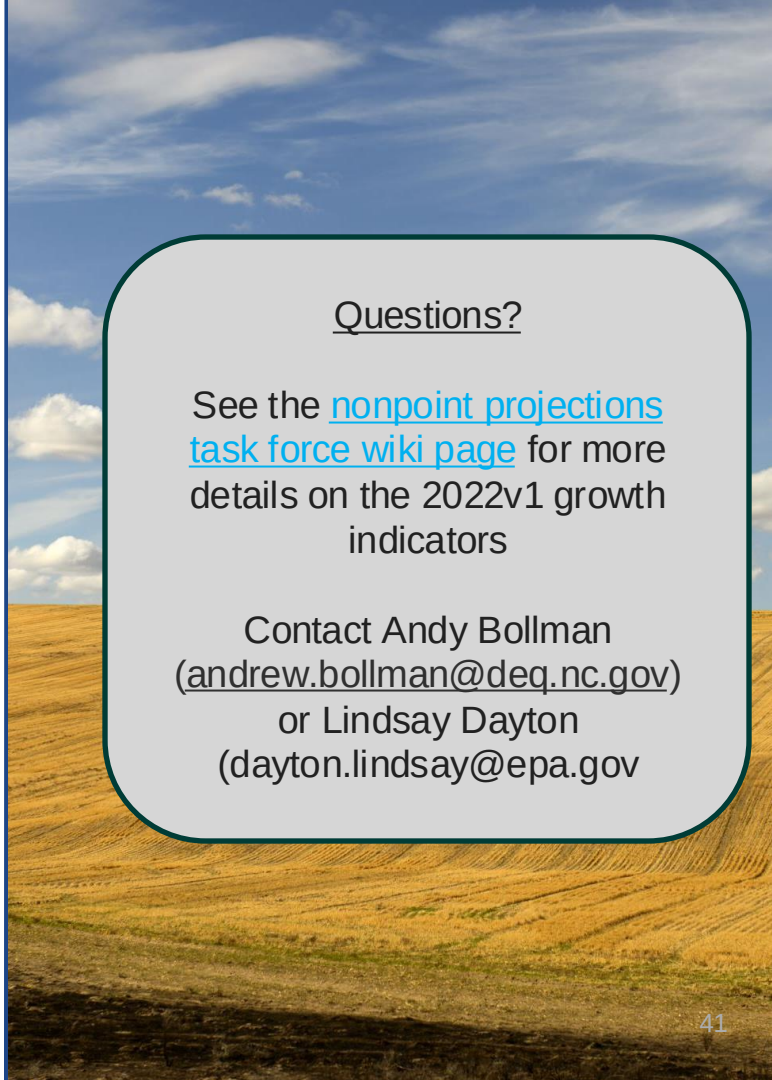
- Gasoline and Other Industrial Processes; Residential Heating; ICI – Commercial Institutional; ICI – Industrial Boilers ICEs; Dust (Agricultural Crops, Construction, Mining and Quarrying); Fertilizer Application; Agricultural Silage; Solvents (Various – Surface Coating, Degreasing, Miscellaneous Industrial and Non-Industrial: Commercial)

**EPA's GHG Tool**

- Livestock Waste (Beef, Poultry, Swine); Dust (Agricultural Livestock)

**Vehicle Miles Traveled (VMT)**

- Dust (Paved Roads and Road Construction); Solvents (Traffic Markings, Emulsified Asphalt, Asphalt Paving)



Questions?

See the nonpoint projections task force wiki page for more details on the 2022v1 growth indicators

Contact Andy Bollman (andrew.bollman@deq.nc.gov) or Lindsay Dayton (dayton.lindsay@epa.gov

# 2022v1 Oil and Gas Projections

- Production-related sources
  - EIA State historical data for year 2023
  - AEO2023 production forecasts by Supply Region
  - Examined basin by basin trends
- Exploration-related sources
  - Average activity for selected years and use average activity in the Oil and Gas Tool to generate "average" exploration emissions
- States have option to submit alternative projection and controls information

Questions?

See the oil and gas task force wiki page for more information

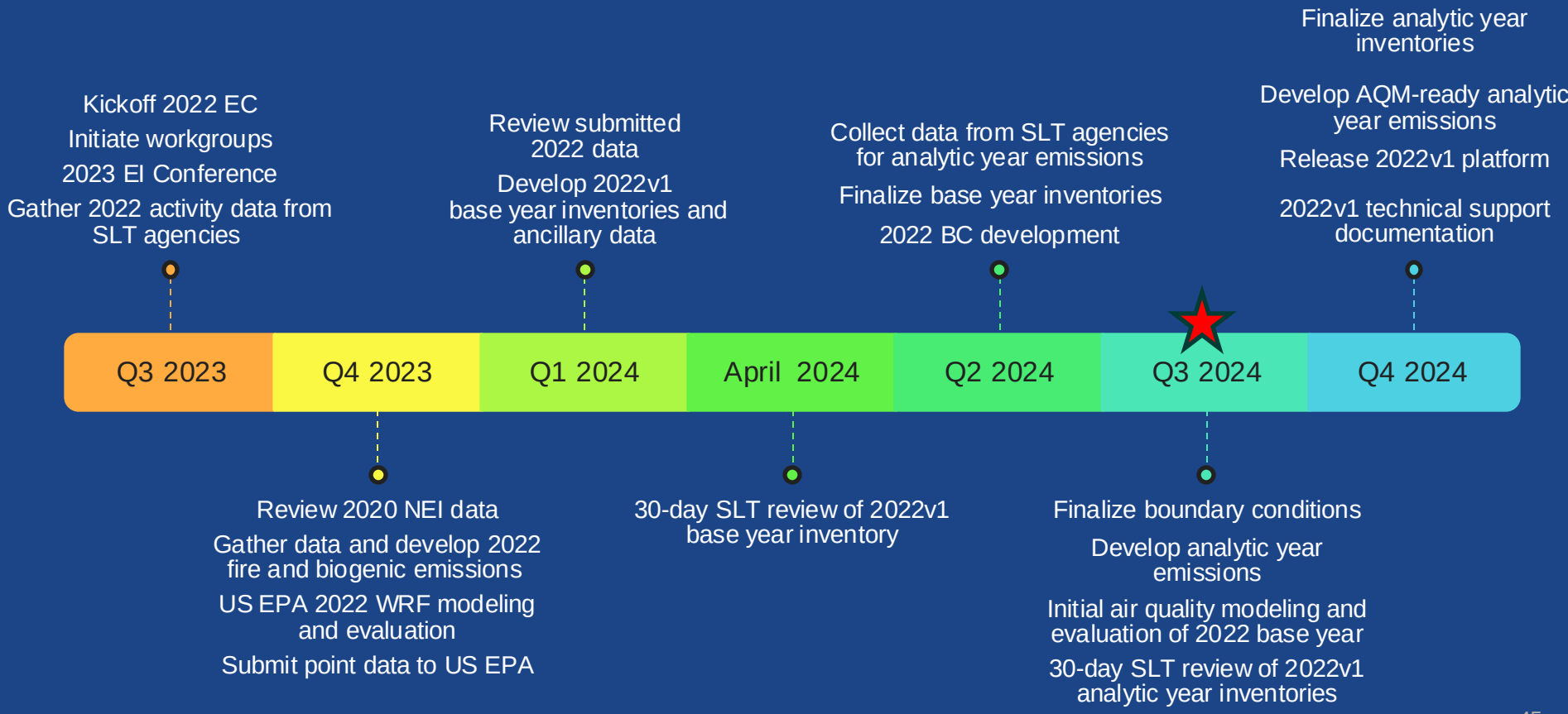
Contact Jeff Vukovich (vukovich.jeffrey@epa.gov)

# 2022v1 Analytic Year Emissions Timeline

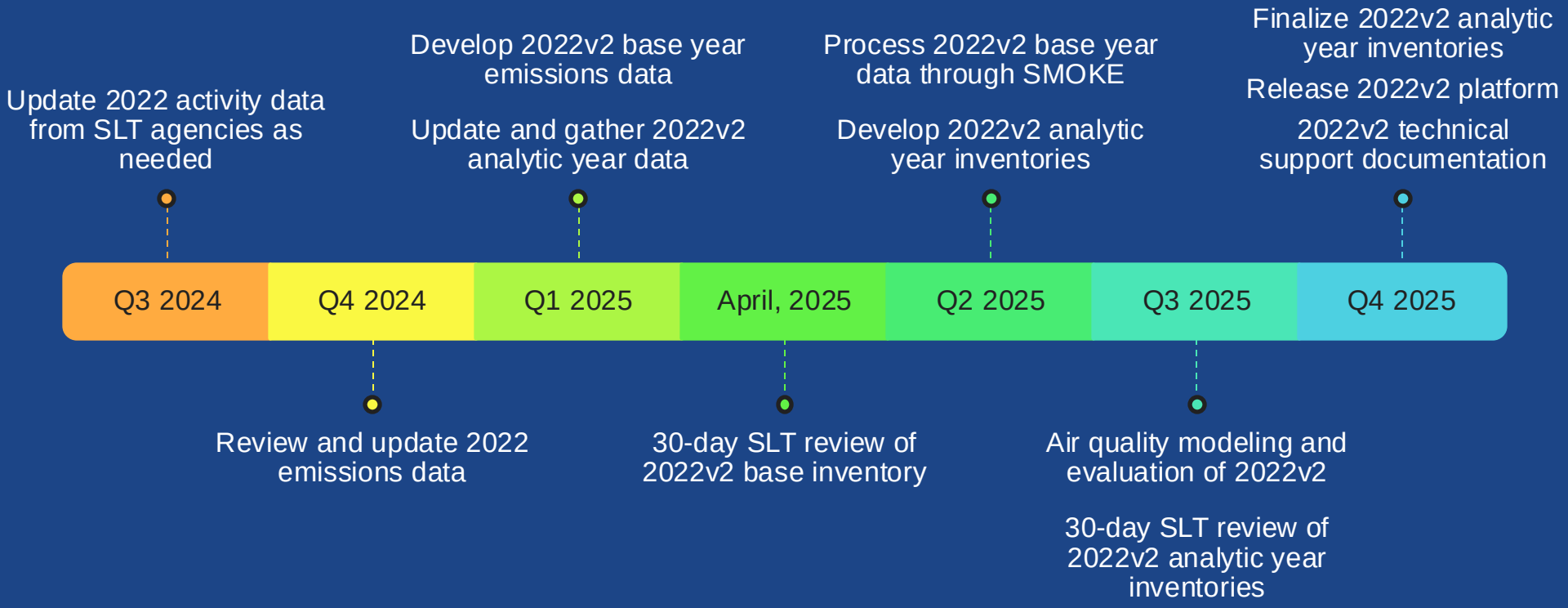
- EPA's goal is to release analytic year data via the 2022v1 web page by mid-September
- The 2022v1 analytic year inventory review process will use the online Emissions Data Review Tool and an updated version of the 2022v1 Sharepoint site to accept comments on analytic year emissions
- We plan to finalize 2022v1 analytic year emission inventories by December 2024
- Air quality model-ready emissions will be developed sequentially for 2026, 2032, and 2038 and posted as they become available
- EPA plans to finalize documentation of the emissions by December 2024

# Collaborative Timeline Review and Next Steps

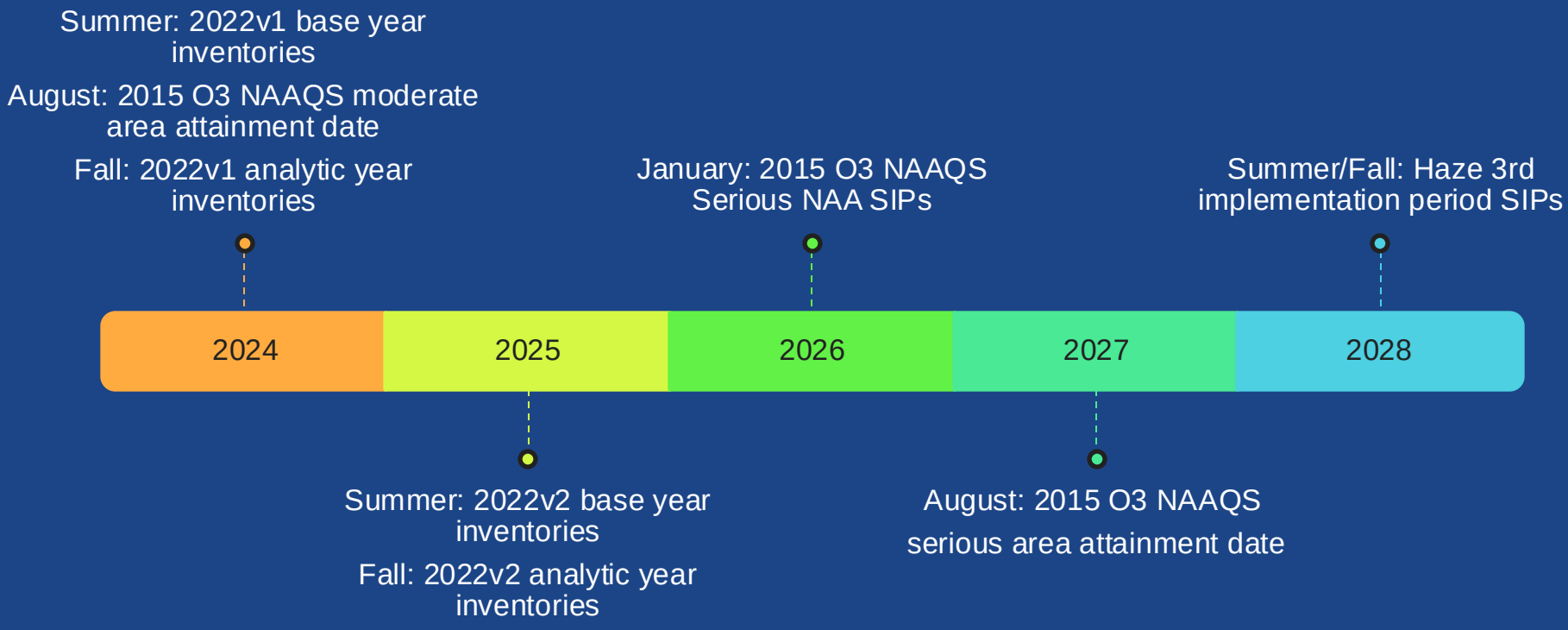
# Timeline for 2022v1 Platform Development



# Timeline for 2022v2 Platform Development



# 2022 Platforms and Planning Timelines



# Stay Informed

- 2022EMP Wiki at Intermountain West Data Warehouse (IWDW)
- 2022v1 web page now available on EPA site: https://www.epa.gov/air-emissions-modeling/2022v1-emissions-modeling-platform
- Quarterly outreach calls
  - **1st Wednesday in August, November, February @ 2 p.m. Eastern**
- Attend workgroup meetings
  - MJO MOVES, EGU, NOMAD, NOGEC, projections, fires, ...
- Participate in data reviews

2022 EMP Wiki

# Next Steps

- S/L/T agencies can:
  - Participate in workgroup meetings
  - Work with other inventory contacts in your region to review the data
    - Explore the 2022v1 data using the online Emissions Review Tool
    - Explore projections data available in Fall 2024
  - Participate in the analytic year data review
- Workgroups will proceed with reviewing data
- Next quarterly call: November 6, 2024 @ 2 PM Eastern
- Email Mary Uhl if you are not already on the email list and want to be added