2022 Emissions Modeling Platform Development Plan

version October 31, 2023

Background and Purpose

An Emissions Modeling Platform (EMP) is developed periodically to serve as a basis for national, regional, and local modeling for regulatory analyses and State Implementation Plan (SIP) development. The U.S. EPA, multi-jurisdictional organizations (MJOs), state, local and tribal air agencies developed a 2016 EMP[1] through a collaborative project. The most recent triennial national emissions inventory (NEI) is for 2020. Members of the regional, state, local, and tribal (RSLT) air quality planning community anticipate that due to the impacts of the pandemic and the air quality patterns in recent years the year 2020 is not an appropriate base year for modeling to support the ozone (O3) and regional haze SIPs due in the 2025-2028 timeframe. Some of the inventory sectors in the 2020 NEI, such as onroad mobile sources, reflect emissions activity patterns that are atypical due to the COVID-19 pandemic. Unmodified, the 2020 NEI would not provide a representative baseline for analytic year air quality projections. In addition, the next triennial NEI (2023) will not be available until spring 2026, and thus a national emissions modeling platform (EMP) derived from the 2023 NEI that includes emissions for projected years could not be developed prior to fall 2026. Having a platform by late 2026 is not soon enough for air quality modeling that needs to be completed before 2028 to meet upcoming regulatory and statutory deadlines.

In consideration of the issues with using the 2020 and 2023 NEIs for upcoming regulatory analyses, a new national EMP will be developed for the year 2022 through a collaboration between RSLT staff and the U.S. EPA. Building off of the experiences and relationships from the 2016 Inventory Collaborative, a new collaborative effort will develop emissions data for use in the next round of O3 and regional haze SIPs, and other purposes. As with the 2016 Collaborative, transparency in the EMP development process will be fundamental to the new effort. Regular communication between the EMP collaborative and the national air quality modeling and planning communities, including RSLT staff, will be critical to a successful 2022 EMP.

The purpose of this document is to outline the principles and process, and to define metrics for successful collaboration by RSLT and the U.S. EPA, to develop a national scale 2022 EMP that will provide a complete and transparent set of nationally consistent emission modeling files. These files will be modular by source sector and there is no requirement for any state, tribe, MJO, or the U.S. EPA to use any or all the files resulting from this process in air quality modeling. Herein referred to as the 2022EC (2022 Emissions Collaborative), this effort will focus on the improvement of key sectors and will not necessarily improve emission inventories for all sectors, although emission inputs for all sectors will be available in some form as part of the platform. The U.S. EPA will assist with providing non-emissions files necessary for regional air quality modeling over the U.S. and parts of Canada and Mexico.

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[1] Adelman Z., A. Eyth, B. Kim, M. Uhl, T. Richardson. 2023. A Collaborative Approach to the Development of a National Air Pollution Emissions Inventory. Draft Manuscript available at https://drive.google.com/drive/folders/11hnCT21stfIWHqVx2yplIM2-umEkIBlf?usp=sharing.

The products of the 2022EC will be data files and supporting documentation that will serve as SIP-ready regulatory inputs that RSLT staff, U.S. EPA staff, researchers, and modeling groups can readily modify, and augment as needed to address air quality analysis and planning needs within their own jurisdictions.

The process to develop the 2022 EMP will proceed in the following phases, with each phase improving on the previous one:

Version 1.0: The 2022EC in coordination with the U.S. EPA will provide a first version of inventories and ancillary data for the 2022 EMP by July 2024. This platform will provide air quality planners and modelers with SIP-ready 2022 base year emissions data with which to initiate photochemical modeling for ozone and haze planning. It will consist of 2020 NEI components as the basis to represent 2022 emissions for several nonpoint inventory sectors and 2022-specific data for electricity generating units (EGUs), most non-EGU point sources, onroad and nonroad mobile sources, commercial marine vessels, airports, biogenic sources and fires. The 2022EC will coordinate work across existing national emissions workgroups, the U.S. EPA, and new workgroups, as needed, to complete version 1.0. States, tribes, and local agencies will have a data review and editing opportunity to verify the data used to represent the emissions within their respective jurisdictions. The U.S. EPA will develop 2022 boundary conditions for photochemical modeling to be distributed in conjunction with the version 1.0 EMP.

Analytic year emissions for the years 2026, 2032, and 2038 through projecting the 2022 emissions will be available by October 2024.

Version 2.0: Following analysis of air quality modeling based on version 1.0, the 2022EC and the U.S. EPA will identify and implement updates to the 2022 and projected inventories and ancillary data. Onroad mobile emissions will be based on MOVES5. Some sectors may be updated with emissions data developed for the triennial 2023 NEI. The additional improvements or modifications to all emissions sectors will be explicitly documented as part of the version 2.0 EMP. A tentative target for this version is summer 2025, although the actual delivery will depend on the release date of MOVES5 and the timing of the reviews and updates to the version 1.0 EMP. The 2022EC will refine the version 2.0 EMP target date in summer 2024 as the timing of the various version 2.0 elements becomes clearer. States, tribes, and local agencies will have a data review and editing opportunity to verify the data used to represent the emissions within their respective jurisdictions.

States, tribes, and local agencies will have opportunities to review and provide feedback on the data used in each version to represent the emissions within their respective jurisdictions. This document details the principles and procedures to manage the 2022EC, as well as short descriptions of the workgroups and potential work items for each group.

Context for the 2022 EMP

Based on conversations with a broad group of state planners in summer 2022 about a new national EMP, the following considerations for O3 and regional haze planning were identified.

Ozone

- 2015 O3 NAAQS serious nonattainment area (NAA) SIPs are due in early 2026.

- For the SIPs that are due in early 2026, attainment demonstration modeling should begin in mid- to late-2024; thus, emissions inputs are needed starting by Summer 2024.

- The projection year for serious NAA SIPs is 2026, which is the last complete O3 season before the August 3, 2027 attainment date

  - If areas do not attain by the August 2027 attainment date, they will be reclassified to severe NAAs with attainment dates in August 2033, and require a modeling projection year of 2032

- The 2015 Ozone NAAQS implementation rule requires that reasonable further progress (RFP) calculations be referenced to 2017, which was the last triennial NEI year that preceded the NAA designations in 2018.

- The base year for attainment demonstration modeling is less prescribed than the RFP requirement, but it should be a recent year and discussed with the "appropriate EPA regional office" (EPA, 2018). At the time of the August 3, 2027 attainment date, 2023 will be the most recent triennial NEI released. However, the 2023 NEI will not be released until spring of 2026 and therefore cannot be used for SIPs that are due in early 2026.

Regional Haze

- The SIPs for the 3rd implementation period of the regional haze rule (RHR) are due in summer 2028.

- Several states and regions have expressed that they plan to start modeling and analysis for the 3rd implementation period as early as summer 2023, but on average the planning schedules ranged from summer 2024 to summer 2025.

- The projection year for the third implementation period of the RHR is 2038.

- Mobile, oil and gas, agricultural, and international sources were noted by state agency staff as focal points for the next regional haze modeling inventories (and 4-factor analyses) because of the relative importance that these sources will have as sources of haze precursors given the declining emissions from stationary sources.

- Given the 15-year time horizon from present, the expected effects of on-the-books controls and effective reductions by 2038 are more uncertain than the nearer-term ozone

nonattainment milestones and thus assumptions about reductions past 2032 should be conservative.

● The actual modeling base year should be after 2020, although both 2021 and 2022 had either high fire activity, high observed particulate matter, or both for one region of the country or another. As with the 2016 EMP, there is no ideal base year for the entire U.S.

● Availability of an EMP for a year that all states and MJOs can use for RH analysis would provide efficiencies in state-to-state consultations, interstate emissions reduction analyses, and reduce costs to states for RH planning. States receive no funding for regional haze SIP development and MJOs receive funds inadequate to conduct regional modeling.

For both O3 and haze planning, there is a stated need by RSLT planning agency staff to coordinate closely with EPA on the methods used for creating emissions projections.

The 2022 Emissions Modeling Platform is intended for use wholly or in part by air quality jurisdictions across the contiguous U.S. and will very likely be used by EPA for NAAQS and rulemaking evaluations, with regulatory decisions from EMP analyses then affecting all states, tribes, and local air agencies to various degrees. The 2022 EMP base year data and future projections from 2022 are important for agencies to evaluate, review, and acknowledge those data as representative for their jurisdictional area.

Collaborative Principles and Goals

Organization

The levels of organization that comprise this effort are: 2022EC co-leads, coordination committee, and workgroups. The 2022EC co-leads are responsible for the following:

- Manage communication and documentation by workgroups and the coordination committee.
- Ensure that up-to-date, technically credible data required to prepare emissions for air quality modeling are available.
- Define processes to be followed during the development of the data.
- Help resolve issues that may arise during data development.
- Ensure that the data are distributed to stakeholders in an accessible way within the agreed-to time constraints of the effort.

The coordination committee will assist with decision-making and implementation of these tasks. The 2022EC co-leads are Zac Adelman, Executive Director of Lake Michigan Air Directors Consortium (LADCO), Mary Uhl, Executive Director of Western States Air Resource Council, and Alison Eyth, Emissions Modeling Team Leader at EPA's Emission Inventory and Analysis Group within the Office of Air Quality Planning and Standards (OAQPS). The coordinating committee will include emissions inventory and modeling subject matter experts from RSLT agencies and the U.S. EPA. Additional regional, federal, state, and tribal and RSLT air agency staff will convene in workgroups around specific areas that are determined important by the coordination committee.

In contrast to the 2016 Collaborative which formed new workgroups to develop and review emissions data, the 2022EC will coordinate with existing national emissions workgroups. The 2022EC coordination committee will work with the existing workgroup leaders to define practical scopes for participation in the 2022EC for each group. The workgroups are responsible for prioritizing issues related to the development of emissions modeling inputs for their specific sectors and providing critical feedback on the emissions data to the 2022EC within the targeted timelines. Unlike the 2016 Collaborative, additional air quality management stakeholders with subject matter expertise in air pollution emissions, including Federal Land Managers, private consultants, and academics could be invited to participate in this collaborative effort. Additional details of the 2022EC are described below.

Process Management Principles

The following process management principles and technical procedures for collaboration apply to all workgroups:

National Emissions Collaborative: 2022 EMP Development Plan

Oversight: The 2022EC co-leads and the coordination committee will implement the organizing principles and collaboration guidelines set forth in this document (see this section), manage communication and documentation by workgroups and the coordination committee, organize and facilitate monthly coordination meetings that include members from all workgroups, and create general charges for the workgroups. The individual workgroup leads will report back to the coordination committee on their progress at least monthly through shared documents. Issues that need resolution for work to proceed may be raised on monthly coordination calls. The 2022EC co-leads are responsible for communicating all information to the workgroup leadership that will support them in meeting the goals of the Collaborative.

Data Preparation: Each group coordinating review by its members, or as a group reviewing draft 2022 base or analytic future year(s) emissions estimates prepared by others, will identify and document the source(s) of the data and any data scaling methods. If the data are not 2022 actual emission data estimates, or are from other years to represent 2022, or any of the projections are not based on data representing 2022 base, additionally verification and documentation will be done to assure that the data are complete and consistent both spatially and temporally and for chemical profiles to be used in 2022 base and future analytic years' air quality modeling. The groups conducting Data Preparation review are responsible for conducting and documenting these quality control steps prior to the Data Review-Evaluation-Acknowledgement step by individual jurisdictions such as states, tribes, and local air agencies. If no group is designated or able to address the Data Preparation review steps for an EMP source category, then the entity creating these base and future years' estimates is responsible for the quality control steps above.

Data Review-Evaluation-Acknowledgment:

Accountability: Each workgroup is responsible for their designated sectors and for contributing reviews, information, or data within the specified project timelines. Beyond this level of responsibility, each workgroup will provide documentation of work products for ongoing review and assessment by RSLT staff across the country, and accept and record all comments received on each work product. The workgroup leadership should communicate any issues that need to be addressed with the 2022EC co-leads.

Decision-Making: Each workgroup functions mostly autonomously while actively participating in the oversight process above. The coordination committee members in each work group are responsible for noting decisions about each sector, while providing accountability as described above. Decisions that could impact the overall project timeline or form of the work products should be brought to the coordination committee.

Recruitment of workgroup members and committee members: RSLT agencies will be made aware of this effort through the their MJO modeling leads, the Federal/State Technical Work Collaborative Group and through existing inventory and modeling workgroups such as NOMAD, MJO MOVES, the EPA/ERTAC EGU workgroup, and the National Oil and Gas Emissions Committee. RSLT staff are invited to join workgroups for which they are interested in participating.

Workgroup leaders and contact information are available below with the descriptions of each workgroup.

Communication techniques: Shared Google documents will be used to track status and issues. E-Mail lists for workgroups will be maintained, possibly through Google groups. An Inventory Collaborative Wiki page will be hosted by the Intermountain West Data Warehouse (IWDW) for use in communication and documentation.

Logistics for data and documentation sharing: LADCO set up an Inventory Collaborative Google Drive to share documentation and inventory data up to 15GB. The U.S. EPA FTP Site will be used to distribute finished emissions inputs for the platform. The CMAS Center will host emissions and non-emissions inputs on a permanent basis for distribution by any user by retrieving files from the U.S. EPA FTP site.

Participation of outside groups: Where the 2016 Collaborative limited participation to RSLT staff, the 2022EC will open participation to the national emissions and air quality community in the U.S. For example, academics, contractors, or other subject matter experts can participate as regular workgroup members.

Technical Collaboration Principles

Documentation Requirements: Each workgroup will be responsible for producing documentation on the methods and results of the inventory development. Suggested content for the specification sheets include: (1) an introduction to the sector (what's included in the sector, including a list of SCCs); (2) inventory development methodology (what data were used, how were they processed, why was this method selected); (3) ancillary data description (are there spatial/temporal/chemical profile/cross reference data that accompany the inventory and how were these developed); (4) emissions projection methods and data; (5) modeling requirements describing any special considerations needed to process these data for use in photochemical models.

Once emissions are available, emissions summaries should include:

- Tabulated data (i.e., annual state total emissions for CO, NOx, VOC, NH3, SO2, PM2.5) for 2022 and analytic years
- Tabulated comparison of the 2022 inventory to the 2016v3, 2017 NEI, and 2020 NEI
- Tabulated comparison of analytic year inventories for the 2022 and 2016 platforms
- Graphical summary of 2022 and analytic year inventories (thematic maps of annual county total emissions for criteria pollutants, 12-km CONUS gridded maps of annual emissions for criteria pollutants).

It will be the task of the workgroup leaders to tailor the specification sheet as needed for their workgroup sector. The specification sheets should contain sufficient detail to provide complete documentation on how the 2022 inventory data were developed or reviewed, how the data were projected to analytic year(s), how the data should be processed for photochemical modeling, and summaries of the data with comparisons to contemporary versions of the NEI.

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The workgroup leaders will maintain documentation that describes the activities of the workgroup (possibly as minutes from group meetings) and what key activities the group participated in to review or build the inventory. Milestones and major changes made to the inventory should be noted in the documentation. The purpose of this documentation will be to provide the coordination committee and other group leads a central location for finding information about what each workgroup is doing through the inventory development cycle.

Expected products: Along with the specification sheets, each workgroup will provide critical feedback to the U.S. EPA about updates or revisions to the inventories or ancillary data.

Assessment and evaluation of inputs/products: The 2022 emissions products will be quantitatively evaluated directly through comparison to previous inventory versions and by proxy through air quality model performance evaluation. Qualitative assessment of the data products will be made initially by the workgroups and through comments received from outside stakeholders on the inventory specification sheets.

Timely air quality modeling with the 2022 inventory products should be completed throughout the course of the development cycle. Comparison of the model results with surface observations and insights from these comparisons into the quality of the emissions should be part of the evaluation process for each version of the 2022 inventory. If deficiencies or errors in the 2022 inventory are revealed through this evaluation process, the workgroups should propose solutions to rectify the deficiency in the subsequent version of the inventory.

Representative Review and Comment: Each workgroup will provide documentation of work products for ongoing review and assessment by RSLT staff across the country, and accept and record all comments received on each work product. Further, a more complete process for sharing information about the 2022 EMP with others outside the collaborative and receiving input from outside stakeholders will be defined by the coordination committee.

Timeline and Milestones

To support the upcoming planning targets for both the O3 and regional haze programs, a national EMP with data representing 2022 for base year modeling, as well as the 2022 data being the basis of analytic years' emissions projections, needs to be available by summer to fall 2024. To meet this goal, planning for collaborative work on a new national modeling platform commenced in early 2023. The process to complete the EMP development and documentation is expected to take 12-18 months. Starting in early 2023 allowed for sufficient time to organize the collaborative and conduct focused technical work on areas of the EMP that the community determines are most important for the O3 and haze planning processes.

Timeline

Completion milestones for the 2022 EMP development plan are shown (e.g., involvement-data development-documentation-review is to be done for each task by these dates). This is an accelerated schedule compared to the triennial NEI cycle, the 2016 EMP, and other previous national or regional platforms.

- **2022 version 1.0 data (2022v1) – Fall 2024**
    - § December 2023: Deadline for input data for 2022v1 (e.g., VMT, point sources)
    - § January-March 2024: Complete base year 2022 emissions and ancillary data development
    - § **April 2024: Base year data review**
    - § **June 2024: Finalize and release base year data**
    - § Spring-Summer 2024: Develop Initial analytic year (2026, 2032, and 2038) emissions data
    - § Summer 2024: Draft base year documentation
    - § **August 2024: Review data for analytic years**
    - § **September-October 2024: Finalize data for analytic years**
    - § **Fall 2024: Release completed 2022v1 base and analytic year data**
    - § Fall 2024: Develop draft analytic year documentation
    - § December 2024: Finalize v1 documentation

- **2022 version 2.0 data (2022v2) – Fall 2025**
    - § January 2025: Deadline for data inputs to 2022v2 (for sectors to be updated from v1)
    - § Winter-early Spring 2025: Complete base year version 2.0 data
    - § **April or May 2025: 2022 base year v2 data review**
    - § **Summer 2025: Release 2022v2 base year data**
    - § Spring-Summer 2025: Develop 2022v2 analytic year data for 2026, 2032, and 2038
    - § Summer 2025: Draft base year documentation
    - § **Late Summer 2025: Review v2 data for analytic years**
    - § **Fall 2025: Finalize 2022v2 data for analytic years**
    - § Fall 2025: Develop draft v2 analytic year documentation
    - § December 2025: Finalize v2 documentation

Milestones

Date and Venue	Purpose	Milestone	Lead and desired participants
2023			
July 2023	Outreach	Inform RSLT EI staff and modelers of 2022 platform development effort	MJO EI leads
early-August	Recruitment	Recruit national workgroups to join the 2022EC	Tom Richardson
August 2 Teams meeting	Outreach	**Quarterly Large Group Check In Meeting** Review plan & milestones for 2022 EMP development	Mary, Zac and Alison
September Teams meeting	Coordination	Present to Coordination Committee on details of proposed 2022 base year v1 data input sources by sector; designate coordination committee members to facilitate 2022EMP work in each workgroup	Alison and Zac
September EIC	Outreach	Inform EIC attendees of 2022 platform development plan through presentation(s), panel, and interactive discussion	Zac and Alison
October Teams meeting	Coordination	Check on progress for each sector workgroups at their standing meetings.	All
November 1, 2023 Teams meeting	Outreach	**Large Group Check In Meeting** 1) Status report for RSLT EI staff and modelers of progress to complete v1 of base year 2022 data 2) Present the EPA NEI review tool and how to use it for the 2022 EMP review	Mary, Zac and Alison
November Teams meeting	Coordination	Check on progress for each sector workgroups at their standing meetings.	All
early December	Coordination	Inform Coordination Committee of methods (*EPA hosted application*) for evaluation and modification/approval of	Zac and Alison

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Date and Venue	Purpose	Milestone	Lead and desired participants
		proposed base year 2022 data (*due date for input*)	
December	Input	Deadline for input to EPA on data to include in the 2022v1 EMP	
2024			
late January 2024	Coordination	Present and review data with the Coordination Committee from final v1 2022 year platform data by sector	Alison
February	Coordination	Present to the Coordination Committee the proposed default v1 analytic year platform data input sources by sector	Alison
February 7, 2024	Outreach	**Large Group Check In Meeting** 1) Review of data received for 2022v1	Mary, Zac and Alison
April	Outreach	**Data Review for 2022v1**	
May	Coordination	Inform the Coordination Committee of methods (*EPA hosted application*) for evaluation and modification/approval of proposed v1 analytic year data projected from 2022 v1 (*due date for input*)	
May 1, 2024	Outreach	**Large Group Check In Meeting** 1) Status report of progress to complete v1 base year 2022 data 2) Review plan & milestones for default v1 analytic year platform data input sources by sector	Mary, Zac and Alison
June	Delivery	2022v1 base emissions inventories and ancillary data	
August 7, 2024	Outreach	**Large Group Check In Meeting** 1) Review 2022v1 emissions data	Mary, Zac and Alison
August 31, 2024	Delivery	Draft documentation on 2022v1 emissions data	
October	Delivery	2022v1.0 analytic year emissions and ancillary data	

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Date and Venue	Purpose	Milestone	Lead and desired participants
November 6, 2024	Outreach	**Large Group Check In Meeting** 1) Review 2022v1.0 emissions data 2) Update milestones for delivery date for 2022v2.0 inventory	Mary, Zac and Alison
December	Delivery	Final 2022v1 documentation Deadline for input to EPA on data to include in the 2022v2 EMP	
2025			
February 5	Outreach	**Large Group Check In Meeting** 1) Review of data received for 2022v2 inventory 2) Review 2022v1 base air quality modeling performance	Mary, Zac and Alison
May 7	Outreach	**Large Group Check In Meeting** 1) Review 2022v1 base and analytic year modeling results 2) Check in on progress of the 2022v2 inventory	Mary, Zac and Alison
Summer	Delivery	2022v2.0 base emissions and ancillary data	
August 6	Outreach	**Large Group Check In Meeting** 1) Compare 2022v1.0 and 2022v2.0 emissions data	Mary, Zac and Alison
October	Delivery	2022v2.0 analytic year emissions and ancillary data Final 2022v1.0 documentation	
November 5	Outreach	**Large Group Check In Meeting** 1) Compare 2022v1.0 and 2022v2.0 emissions data	Mary, Zac and Alison

Approach

Base Year Selection

The 2022EC will use the 2020 NEI as the basis for an extrapolation to a 2022 base year. Using the 2020 NEI as the basis for a collaborative EMP is appealing because it will leverage the required triennial NEI submittals by SLT agencies, and allow any new work to focus on improving or modifying the data rather than on generating entirely new "off-cycle" base year information.

Emissions for some of the 2020 NEI sectors can be used "as is" to represent emissions in 2022; other sectors will need to use 2022-specific activity information. The activity and emissions factors used to estimate 2020 emissions for many sectors are not precisely based on 2020 data but rather represent the best-known information for these types of sources at the time of the triennial NEI process. The coordination committee and workgroups that are participating in the 2022 EMP will review the sectors and determine the best base year data to use.

An important consideration for the design of this approach will be to represent in the base year inventories any emissions control rules that become active in the years between 2020 and 2022 but are not reflected in the S/L/T submitted point source emissions. These on-the-books (OTB) control programs will need to be included in the extrapolated base year to which they apply. RSLT staff will be asked to provide information on control programs that went into effect between 2020 and 2022 by early 2024, the U.S. EPA will work to integrate these control programs into the first version of the 2022 EMP for the programs that are specified in enough detail to quantify the impacts to the inventory.

Analytic Year Projections

The target analytic years for O3 planning are 2026 and 2032, and 2038 for regional haze planning.

The 2022EC will focus on how to represent analytic year emissions. Emissions projections include both activity growth (or contraction) and the impact of control programs. Given the uncertainty in activity projections, there should be a close analysis and discussion within the regulatory emissions and air quality modeling community about holding activity data for some of the sectors constant, while only including the impacts of emissions control programs in analytic year inventories. Which inventory sectors to consider for holding activity constant shall be deliberated and decided as part of the 2022EC process.

As a starting point, the 2022EC will consider holding constant the activity for those sectors that are based on population, land use, or market forces. Under this construct, the following inventory sectors would use 2022 activity and emissions factors, and only include OTB controls in analytic year projections:

- Nonpoint combustion, waste, solvents, industrial, and energy use
- Industrial (non-electricity) point
- Agricultural fertilizer
- Upstream and midstream oil and gas
- Residential wood combustion

The 2022EC will develop an approach for how to evolve the on-the-books (OTB) controls that are included in the inventory to stay current with new local, state, and federal rulemaking. How to implement variable penetration rates for electrification of engines and mobile sources shall also be considered for analytic year inventories.

The inventory sectors that will include activity projections along with emissions control programs include:

- Onroad mobile (MOVES)
- Electricity generating units
- Airports

The analytic year treatment for sources in these sectors need to be discussed in the projections workgroup:

- Commercial marine, including C1/C2 and C3
- Nonroad mobile
- Rail
- Agricultural livestock
- Fugitive dust

Natural and fire sources will be held constant at 2022 levels for analytic year modeling, including:

- Biogenic
- Fires: prescribed, agricultural, and wild
- Windblown dust [if this sector is included in the platform]

The table below summarizes the approach for each inventory sector that the 2022EC will use to develop base and analytic year inventories.

Sector	COVID Impacts	Data source(s)	2022 data source timing	Activity projections to analytic years
EGUs	Yes	Annual NEI point and CEMS	Annual point: summer 2024	Yes

Sector	COVID Impacts	Data source(s)	2022 data source timing	Activity projections to analytic years
			CEMS: spring 2023	
Non-EGU point	Yes	Annual NEI point	Spring 2024	No
Airports	Yes	Triennial 2020 NEI point; terminal activity data	Spring 2024	Yes
Ag. Fires	No	Satellite data, land use	Fall 2023	No
Wild & prescribed fires	No	Satellite and State-provided data	Fall 2023	No
Meteorological inputs	No	2022 U.S. EPA WRF	Summer 2023	No
Biogenics	No	Met. data, land use	Fall 2023	No
Commercial Marine Vessels	Yes	2022 AIS data	Winter 2024	TBD
Fertilizer	No	2022 CMAQ simulation	TBD. If there is not time for a year-specific CMAQ run, could instead adjust a previous year's data	No
Livestock	None reflected	2020 NEI data, USDA	Fall 2023	TBD
Fugitive dust	No	2020 NEI data + onroad activity data	Fall 2023 unless we adjust paved road dust based on year 2022 VMT	TBD
Nonpoint oil and gas	Yes	2022 well activity data	Spring 2024	No
Solvents	No	Annual Survey of Manufacturers (end of each year); County Business Patterns (Apr each	Summer 2024	No

Sector	COVID Impacts	Data source(s)	2022 data source timing	Activity projections to analytic years
		year)		
Residential Wood combustion	No	2020 NEI data	Summer 2023	No
Other nonpoint	??	2020 NEI data	Summer 2023	No
Locomotives	Yes	2020 NEI data + 2022 fuel usage	Spring 2024	No
Nonroad	None reflected	2022 MOVES4 run, 2022 U.S. EPA WRF data	Summer 2024	TBD
Onroad	Yes	2022 MOVES4 run, 2022 activity data	Collect activity data through early 2024; Run SMOKE-MOVES by spring 2024	Yes
Canada	Yes	2023 as-is or possibly adjusted back to 2022	Fall 2023	Yes
Mexico	Yes	TBD	There are ongoing efforts to improve portions of the Mexico inventory - details TBD.	TBD

2022EC Focus Areas

The following areas, with goals for each, will take first priority for analysis, refinement, and development in the 2022EC.

- Fires
    - Incorporate 2022 fire event information from surface and remote sensed data sources
- Onroad Mobile
    - Include 2022 vehicle miles traveled and population estimates
    - 2022 fleet mixes
    - Updates for warehousing and freight movement

- ○ Updates for defeat device and underperforming emissions control systems
- Biogenic
  - ○ Include urban canopy landuse and emissions factors
- Non-EGU Point
  - ○ Review emissions control programs by state and update non-EGU inventory
- Oil & Gas
  - ○ Use state-provided permitting and activity information to estimate 2022 emissions
  - ○ Ask states whether they prefer updated activity and the tool or an alternative (state-provided) approach.
- Residential Wood heating
  - ○ Incorporate latest information on appliance population, fuel wood, and measured appliance efficiency
- Nonpoint
  - ○ Review emissions for the largest SCCs by pollutant
  - ○ Focus on updating the methods for estimating stationary source fuel combustion SCCs to parse the emissions for heating, cooling, water heating, and cooking for NOx, VOC, and PM emissions
  - ○ Review fertilizer and livestock ammonia activity for 2022
- Projections
  - ○ Propose and implement methods to simplify projections that hold activity constant at 2022 levels for sectors where that approach is appropriate

2022EC Workgroups

The 2022EC will use a combination of existing emissions inventory workgroups and new workgroups to develop and analyze a 2022 emissions modeling platform. New workgroups will be formed based on priority areas determined by the coordinating committee. The following inventory sectors will be developed in coordination with existing workgroups:

Fires

Staffing Recommendations: Tom Moore will be the RSLT co-lead and Jeff Vukovich will be the EPA co-lead.

Available data: A draft version of year 2022 wild and prescribed fires prepared by running SMARTFIRE2 and BlueSky Pipeline using activity data sets including the Hazard Mapping System, Incident Status Summary (ICS-209) reports, and National Interagency Fire Center (NIFC) shapefiles (formerly GeoMAC) are available. State and local data will also be incorporated where available. The data set characterizes residual smoldering separately from smoldering that happens concurrently with flaming. For 2022 non-US fires, the Fire INventory from NCAR (FINN) data for 2022 for Canada and Mexico has been processed into a format that can be used as input to SMOKE and heat flux has been estimated. Additionally, EPA has been working on extending SMARTFIRE2 and Bluesky Pipeline to Canada to produce an emissions inventory. Comparisons with these different Canadian datasets for the year 2022 is possible.

For 2022 agricultural fires, a day-specific FF10 point dataset is available and was developed using the same method as the point agricultural fire data in the 2020 NEI.

Tasks: Draft fire inventories would be developed by fall 2023. Kickoff workgroup meeting will likely occur shortly after the draft fire inventories are released. Workgroup members should expect meetings every 2-3 months or as needed. The Fires workgroup should review each of the fire datasets for correctness and completeness. Potential issues with / improvements for the fire datasets will be documented. If it is determined that considering additional inputs (e.g. activity) to compute the fires or adjustments to the fire estimates would be helpful, it will be determined whether resources are available to develop an updated version of the 2022 fire inventories in FY24.

The workgroup should also consider whether it is advantageous to split wild and prescribed fires during processing, which dataset to use for Canada and Mexico fires, and the state of plume rise calculations with residual smoldering as compared to flaming / smoldering. Once treatment of the fires for year 2022 has been confirmed, the workgroup should consider options regarding how fires could be represented for different types of analytic year analyses and document the pros and cons of each approach. Resources permitting, the workgroup may then decide to prepare alternative versions of fire inventories that could be deemed appropriate for different types of analyses.

Mobile (Onroad and Nonroad)

Staffing Recommendations: Request 2022EC participation by the MJO MOVES workgroup; 2022 EC coordination committee member(s) will participate in the MJO MOVES workgroup to facilitate work on the 2022 EMP.

Available data: 2020 and 2021 mobile (on and off-road) emissions will be available in 2023. These are not recommended for use for 2022, but can be reviewed to consider how to update impetus for 2022.

Tasks: The workgroup should review the available 2022 onroad and offroad mobile emissions and activity data compatible with the 2020NEI along with the documentation on how the emission factors and activity data were developed. Note that the 2020 CDBs used 2020-specific data for many inputs. As part of the review, the workgroup should consider the following items: 1) the distribution of hoteling hours as compared to known truck stops; 2) improving the development of heavy-duty VMT and VPOP data and best practices that could be communicated to states on this topic; 3) use VIN decoding for 2022 to update vehicle age, and fleet mix with 2022 information; 4) reflect underperforming emissions controls systems on diesel vehicles; 5) update extended idle and workday idle times and locations.

For nonroad mobile sources the workgroup should update engine population and activity with 2022 information.

Commercial Marine Vessels

Staffing Recommendations: Request 2022EC participation by the CMV workgroup; 2022 EC coordination committee member(s) will participate in the CMV workgroup to facilitate work on the 2022 EMP.

Available data: A 2022 CMV inventory will be developed based on AIS data under contract to EPA by early 2024. Prior to that, the 2021 CMV inventory will be available by fall 2023 and will have new SCCs that include ship type.

Tasks: The workgroup should review the 2021 CMV inventory and identify any potential problem areas or methodological adjustments. The workgroup should then review the 2022 CMV inventory.

Biogenic

Staffing Recommendations: Jeff Vukovich will be EPA co-lead; need an RSLT co-lead.

Available data: EPA can provide BEIS4 outputs for 2022 for evaluation. The BEIS4 outputs will be generated using Biogenic Emissions Landuse Database version 6 (BELD6). The BELD6 includes the following datasets:
- High resolution tree species and biomass data from Wilson et al. 2013a (https://www.fs.usda.gov/rds/archive/Catalog/RDS-2013-0013), and Wilson et al. 2013b (https://www.fs.usda.gov/rds/archive/Catalog/RDS-2013-0004) for which species names were changed from non-specific common names to scientific names
- Tree species biogenic volatile organic carbon (BVOC) emission factors for tree species were taken from the NCAR Enclosure database (Wiedinmyer, 2001)
  - https://www.sciencedirect.com/science/article/pii/S1352231001004290
- Agricultural land use from US Department of Agriculture (USDA) crop data layer
- Global Moderate Resolution Imaging Spectroradiometer (MODIS) 20 category data with enhanced lakes and Fraction of Photosynthetically Active Radiation (FPAR) for vegetation coverage from National Center for Atmospheric Research (NCAR)
- Canadian BELD4 Landuse

Tasks: The Biogenics workgroup should review the input data used to generate the BEIS4 estimates. Possible improvements to input data will be documented. The workgroup will explore updates to landcover/landuse data and emissions factors. Improve representation of urban canopy and associated emissions.

Point Non-EGU

Staffing Recommendations: Request 2022EC participation by the ERTAC EGU and IPM workgroups; 2022 EC coordination committee member(s) will participate in the ERTAC workgroup to facilitate work on the 2022 EMP

Available data: By summer 2023, the 2021NEI will have estimates of non-EGU point emissions, stack parameters, and locations for 2021. States are required by the Air Emissions Reporting Rule (AERR) to submit 2022 emissions for "Type A" sources by January, 2024 and those will be compiled into a 2022 point source inventory by spring, 2024. Some states only submit "Type A" sources for the non-periodic emission inventory years.

Tasks: The non-EGU point workgroup should consider whether to encourage states to pay additional attention to their submissions of 2022 point sources. This might include reporting of more than just the "A" sources. Review/update emissions control technologies on largest (>50 TPY?) sources

Oil & Gas

Staffing Recommendations: Request 2022EC participation by the National Oil and Gas Emissions Committee. Will likely include some separate Oil and Gas Workgroup meetings on Future Year Projections and Controls (organized by Jeff Vukovich and ideally a non-EPA co-chair); ; 2022 EC coordination committee member(s) will participate in the NOGEC workgroup to facilitate work on the 2022 EMP

Available data: Point: By summer 2023, the 2021 NEI will have 2021 estimates of all Type A and some Type B point sources of oil and gas emissions, stack parameters, and locations. States will submit 2022 "A" source emissions by January, 2023 and those will be compiled into a 2022 point source inventory by spring 2024. Nonpoint: By the end of 2023, EPA will have year 2022 estimates of non-point oil and gas emissions using a version of the Oil and Gas Tool used for the 2020 NEI development.

Tasks:

Point: Determine the suitability of 2021 point inventory data for use in 2022. Near-term projection to 2022: Consider whether growth/control factors should be applied to 2020NEI point to estimate 2022 emissions. For point sources, consider whether to encourage states to pay additional attention to their NEI submissions of 2022 point oil and gas sources. Consider appropriate near-term and longer-term projection approaches for non-EGU point source emissions. Point source projections include Transmission and some Production-related sources.

Nonpoint: EPA plans to have a contractor develop 2022 nonpoint oil and gas emissions in time for the 2022v1 platform. Determine the suitability of using these emissions or if adjustments

need to be made. Provide updated activity or other basin factors to improve the emissions inventory. SLTs that want to use an alternative inventory for year 2022 (e.g., 2020NEI or 2020NEI projected to year 2022 or other option) must inform EPA what alternative inventory is desired with supporting documentation. Consider appropriate near-term and long-term projection approaches for production and exploration-related sources. SLTs that want to use an alternative inventory for a future/analytic year must inform EPA what alternative inventory is desired with supporting documentation.

Residential Woodheating

Staffing Recommendations: Request 2022EC participation by the National Woodheating Task Force; 2022 EC coordination committee member(s) will participate in the NWHTF workgroup to facilitate work on the 2022 EMP.

Available data: By the summer of 2023, the 2020NEI will have 2020 estimates of residential wood heating emissions by county and SCC.

Tasks: Review county activity emissions factors by SCC; review the temporal allocation adjustments that are based on modeled meteorology; confirm that that the emissions factors reflect the best available information on appliance efficiencies and use cases

Nonpoint

Staffing Recommendations: Request 2022EC participation by the NOMAD workgroup ; 2022 EC coordination committee member(s) will participate in the NOMAD workgroup to facilitate work on the 2022 EMP

Available data: By spring 2023, the 2020NEI will have 2020 estimates of nonpoint emissions.

Tasks: Review 2020 inventory and make updates/recommendations for sources to refine for the 2022 inventory. Consider splitting the stationary fuel use natural gas sector into different appliance types for residential and commercial sources. Explore updates/refinements to the fertilizer and livestock ammonia inventories.

Projections

Staffing Recommendations: Zac Adelman will be RSLT co-lead; Alison will be U.S. EPA co-lead, with delegation for some sectors.

Tasks:

- Develop a defensible and acceptable approach that holds activity constant at the base year levels for sectors where appropriate
- Reflect impacts of OTB and OTW federal and state regulations

- Develop an approach to collect state control program information to communicate to US EPA
    - Create a table of control programs (OTB and OTW); indicate if control programs are voluntary
- Reflect increase in electrification penetration for mobile sources

Additional Considerations

Boundary conditions for 2022 air quality modeling will be needed to support planning modeling efforts that are based on the 2022 EMP. Hemispheric or global modeling of 2022 should be performed and evaluated by the U.S. EPA to support this need. Boundary conditions that assimilate chemical observations into the global model solution should be a goal for the 2022 modeling platform.

Analytic year regional air quality modeling boundary conditions that use emissions projections to estimate analytic year global air quality should be considered to support the modeling platforms that forecast air quality beyond 2030. The visibility/regional haze 2038 modeling should consider boundary conditions from a global chemistry model that uses emissions projected to a year in the 2030s. Noting that international emissions projections are highly uncertain and variable, and completely uncontrollable from a SIP or U.S. perspective.

Communications

A central feature of collaborative EMP development is open communication between the U.S. EPA and RSLT air program staff. A noted success of the 2016 Collaborative was the high degree of internal communication between subject matter experts during the development and review of the EMPs, and in the external communication between the Collaborative participants and the external air quality modeling community. The 2022EC will follow a similar communication approach as the 2016 Collaborative.

Recruitment

The 2022EC coordination committee will reach out to RSLT staff, academic partners, federal researchers, and other air quality stakeholders to recruit subject matter experts to participate in the development and review of the 2022-based EMPs. The committee will also contact the leadership of existing emissions workgroups to solicit their participation in the 2022EC. The workgroup leadership will be asked to join the coordinating committee monthly calls to discuss progress on work related to the 2022EC.

Internal Communication

The 2022EC coordination committee will meet monthly via Teams. The monthly calls will be used to track progress on the EMP timeline and milestones, to hear from the U.S. EPA on the status of their work on developing the 2022 EMP components, to discuss any issues in the workgroups, and to plan for outreach with external air quality stakeholders. Notes and action items from these calls will be taken by the committee co-leads and posted to the 2022EC wiki.

Outreach

The 2022EC will use quarterly outreach webinars using Teams to communicate plans, progress, and deliverables to the external air quality stakeholder community. The coordination committee members will be responsible for communicating the schedules and agendas of the outreach calls to RSLT staff and other external stakeholders. The call schedules will be posted on the 2022EC wiki.

Data Exchange

- Google drive for smaller files
- LADCO website for graphics
- US EPA inventory tool for data review
- US EPA ftp site for larger data files and final EMPs
- CMAS open data on AWS for EMPs

Data Reviews

The 2022EC workgroups will be provided advance access to draft emissions data for each of the EMPs (v1.0 and v2.0). The purpose of these data reviews will be to collect input and feedback on the emissions that will be collected into the 2022EC EMPs. EPA is investigating options to provide some interactive tools for querying modeling platform emissions, similar to what is being provided for 2020 NEI. Summary spreadsheets will also be developed at various levels of detail.

2022 Emissions Collaborative Coordination Committee

Name	Organization
Alison Eyth (Co-lead)	U.S. EPA
Zac Adelman (Co-lead)	LADCO
Mary Uhl (Co-lead)	WESTAR
Alexandra Karambelas	NESCAUM
Byeong Uk-Kim	GA DNR
Kevin Civerolo	NY DEC
Debbie Wilson	MARAMA
Eric Zalewsky	NY DEC
Caroline Farkas	US EPA
Greg DeAngelo	Metro 4/SESARM
Janice Godfrey	US EPA
Mark Janssen	LADCO
Serpil Kayin	US EPA
Tammy Manning	NC DENR
Michael Vince	CENSARA
Chris Misenis	US EPA
Norm Posseil	US EPA
Joey Huang	US EPA
Ranae Held	DE DNREC
Rhonda Payne	WESTAR
Sarah Roberts	US EPA
Shantha Daniel	TCEQ
Heather Simon	US EPA

Name	Organization
Susan McCusker	MARAMA
Tom Richardson	OK DEQ
Tom Moore	RAQC
Jeff Vukovich	US EPA
Winston Hao	NY DEC
Wendy Vit	US EPA