Base Year Selection Workgroup
Final Report

April 5, 2017

Executive Summary

The Base Year Selection Workgroup was formed as a subgroup of the Federal-State Technical Work Collaboration Group in order to evaluate potential modeling base years for future O_3, $PM_{2.5}$, and regional haze SIP development. The group included representatives from MJOs, state regulators, and regional and national EPA offices. The calls focused on technical and regulatory considerations of choosing the next SIP modeling platform base year.

Because meteorology conditions cause pollutant transport patterns to vary from year to year, the group consensus recommendation is to model both 2015 *and* 2016. If time and resource constraints allow for only one year, the consensus is to focus efforts on 2016 *if* a choice is required.

Background

The Base Year Selection Workgroup was formed as a subgroup of the Federal-State Technical Work Collaboration Group to evaluate potential modeling base years for future O_3, $PM_{2.5}$, and regional haze SIP development. The group featured representation from RPOs, state regulators, and regional and federal EPA offices. The workgroup is intended to spur collaboration among the members as they develop their next SIP modeling platform. As Jeff Underhill of New Hampshire stated during the first call, the intention is to "focus on the commonality" among the various agencies.

The foundation of the emissions inventory is data provided by state and local agencies to EPA and regional associations. Collaboration among EPA, regulatory agencies and regional associations is necessary to create SIP quality inventories.

EPA's assistance is most important in calculating emissions from on- and off-road motor vehicles, estimating emissions from outside the US, estimating emissions from fires, modeling background pollution concentrations, developing and applying emissions models and emissions database systems, preparing meteorological data inputs, and providing guidance to ensure consistent use of the most up-to-date methods for estimating emissions and modeling air quality.

In general, development of all of the data and systems needed to model air quality takes 3 to 4 years, including preparation and testing of a model using an existing representative year or years (a base year or years) and projecting emissions to future years of interest. In anticipation of the need to run air quality models to assess strategies for meeting air quality standards by 2023, this workgroup was charged with identifying which year or years should be selected for the next base year.

Each workgroup call focused on a specific topic related to developing a SIP modeling platform: regulatory timeline considerations, meteorological and air quality representativeness, emissions inventory development, and exceptional events. A summary of those discussions is presented herein.

Call I: Regulatory Timeline

The regulatory timeline call took place on December 6, 2016. The call featured a table of regulatory milestones presented by Theresa Pella of CenSARA, shown in Table 1. The group was directed to focus on SIPs due in 2018 for interstate transport affecting compliance with the 2015 ozone standard and SIPs due in 2020 for areas that may be designated moderate nonattainment for the 2015 ozone standard, with a 2023 attainment deadline.

ACTIVITY (color coded by activity - state action (blue); EPA reg/guidance (green); EPA tech work (red))	2008 Ozone	2015 Ozone	2018 RH (Option1)	2021 RH (Option 2)
NAAQS effective date		12/28/15		
NEI 2014 V1		9/16/16 out for public review	9/16/16 out for public review	9/16/16 out for public review
Final EE rule and guidance and add'l draft guidance		9/16/16 final rule revisions and wildfire guidance for ozone demos released	9/16/16 final rule revisions and wildfire guidance for ozone demos released	9/16/16 final rule revisions and wildfire guidance for ozone demos released
Final App W rule revisions		expected fall 2016		
LDV/LDT Tier III standards		effective with model year 2017	effective with model year 2017	effective with model year 2017
State Recommendations Due		10/1/16 (2013-15 monitoring data)		
EE demos due		10/1/16 for 2014 and 2015 events		
Proposed Transport FIP	CSAPR - 11/15 (from 2011 modeling platform)	modeled contribution info from EPA - fall 2016 (from 2011 modeling platform)		
Extended Monitoring Seasons		Starts 1/1/17		
Final RH rule and guidance			need by early 2017	need by early 2017
Ozone EE demos due		5/31/17 for 2016 events		
NEI 2014 V2		September 2017	summer 2017	summer 2017
RH SIP Option 1 - need EPA Technical Work			summer 2017	summer 2017 for national modeling results
2016 IMPROVE data available			7/1/17	7/1/17
Area Designations Effective		December?? 2017 (2014-16 monitoring data)		
CAIR Phase II Cap SO2 and NOx expires	1/1/18	1/1/18		
Transport and I-SIPs due	3/1/11	10/1/18		
Ozone EE demos due		5/31/18 for 2017 events		
FinalTransport FIP	CSAPR - 9/7/16 final rule	Sometime after 2018		
Transport Rule compliance	EGUs - summer 2017			
NEI 2017 V1 and V2 (projected)		summer 2019		summer 2019
Emissions Inv. SIP due		10/1/19		
Attain demo SIP due (Marginal)		Oct/Dec?? 2020; Attainment deadline 2020		
Attain demo SIP due (Moderate)	For reclassified areas - 1/1/17	Oct/Dec?? 2021		
Attain demo SIP due (Serious)	7/20/16	Oct/Dec?? 2021		
EPA completes SO2 designations (for non monitoring areas)			12/31/17	12/31/17
SO2 SIP Due (Consent Decree sources)				3/1/18
SO2 SIP Due (Rd 1 finding of failure to submit) states				4/18/18
2017 IMPROVE data available				7/1/18
RH SIP Due (option 1)			7/31/2018 (using 2011 NEI and met data)	
SO2 (Rd 1) attain deadline				10/1/18
2018 IMPROVE data available				7/1/19
SO2 SIP due (Rd 2)				2019
2019 IMPROVE data available				7/1/20
EPA completes SO2 designations for all remaining areas				12/31/20
RH SIP Due (Option 2)				7/31/21
SO2 (consent decree) attain deadline				Sep 2021
SO2 SIP Due (Rd 3)				2022
SO2 (Rd 2) attain deadline				2023
2015 Ozone moderate area attain deadline		2023		
2015 Ozone serious area attain deadline		2026		
SO2 (Rd 3) attain deadline				2026

Table 1. Regulatory timeline courtesy of Theresa Pella (CENSARA).

Based on the discussion of the first call, the group decided to focus on selecting a base year among 2014, 2015, and 2016.

Call II: Meteorological and Air Quality Representativeness

The meteorological and air quality representativeness call took place on January 18, 2017. The call featured presentations from Donna Kenski of LADCO, Michael Geigert of CT DEEP, James Boylan of GA EPD, Jim Smith of TCEQ, and Elliot Tardif, Nick Witcraft, and Bradley McLamb of NC DEQ.

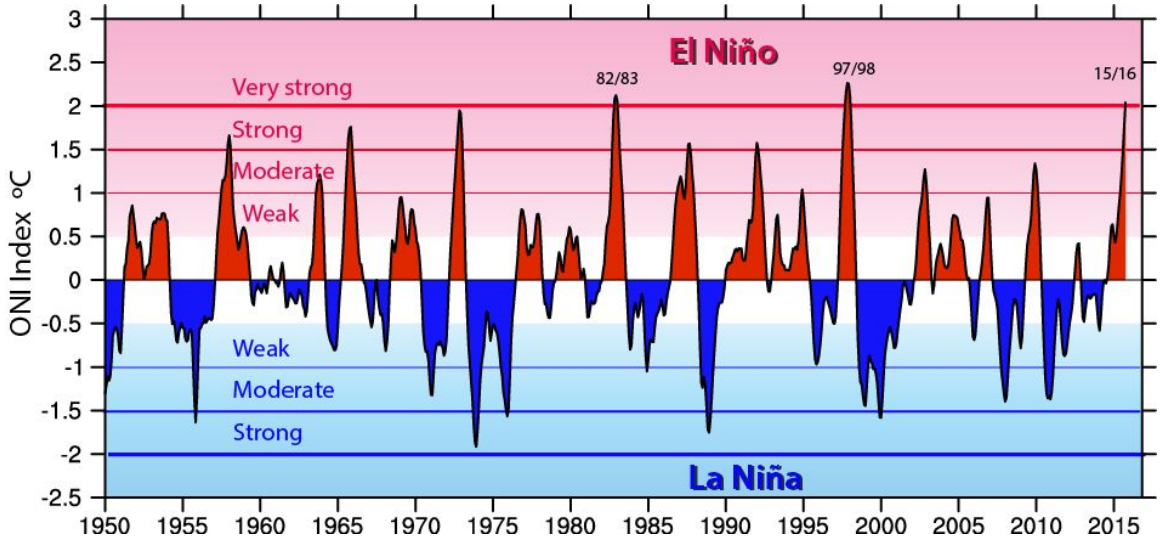

Figure 1. El Nino Southern Oscllation (ENSO). Courtesy of NC DEEP.

A number of the presentations reference unusual weather patterns in 2015 possibly due to El Nino effects. Several regions reported higher or lower than usual ozone in 2015 causing many to conclude that 2016 was more representative than 2015 or 2014.

It was also noted that ozone transport patterns can vary from year to year, leading to much different ozone contributions, which led some parties to express an interest in modeling both 2015 and 2016 for base years.

Call III: Emissions Inventory

The emissions inventory call took place on February 1, 2017. The call featured discussions with Alison Eyth of EPA OAQPS, Julie McDill of MARAMA, and Mark Janssen of LADCO. Concerning the question of what base year should be selected, there is no inventory reason to choose 2015 or 2016. Either year can be developed with an equal level of effort. Selection of a single year would reduce the level of effort. The approach taken to develop 2015 and/or 2016 will be to project sectors, including nonpoint, from 2014. For these sectors no additional information would be derived from developing two separate base years.

Once a base year is selected, and development of the input files begins, coordination among EPA, RPOs, and states is paramount to developing a new modeling platform. For example, states would like to provide growth factors for use in projection from NEI2014 to the selected pseudo-base year, whether it be 2015 or 2016. States need to know when those factors will be applied to 2014 so they can accommodate development of the factors to meet EPA's schedule. There is great interest in using EPA's developed files, but can only if they include the state specific growth factors.

Onroad emissions modeling was identified as a potential bottleneck in the emissions development process because the SMOKE-MOVES model is so complex and resource intensive. Therefore, it is key that EPA develop at least on-road emission factors for the selected pseudo-base years and also a suite of future year projections identified by states.

In addition to MOVES runs, nonroad, and fire emissions are also key sectors that states need EPA to run nationwide.

As noted above, emissions inventory development requires coordination among the states, EPA, and regional organizations. This coordination effort is constrained by the time available for back and forth review. The schedules are largely directed by national EPA offices releasing modeled/QAed emissions estimates in various versions. It is somewhat rare to have a comprehensive review of methods and results across the various sectors' activity, chemistry, and emission rates, in terms of the unmerged input files to a modeling platform by RPO and/or by states. MARAMA applies the EMF (Emissions Modeling Framework) for their members to accomplish review of EPA-released platforms; EMF is also already in routine use by OAQPS.

Call IV: Exceptional Events

The exceptional events call took place on February 15, 2017. The call featured presentations from Michael Geigert of CT DEEP, Erik Gribbin of TCEQ, and Sylvia Vanderspek of CARB. The discussion focused on prevalence and impact of wildfires in 2015 and 2016.

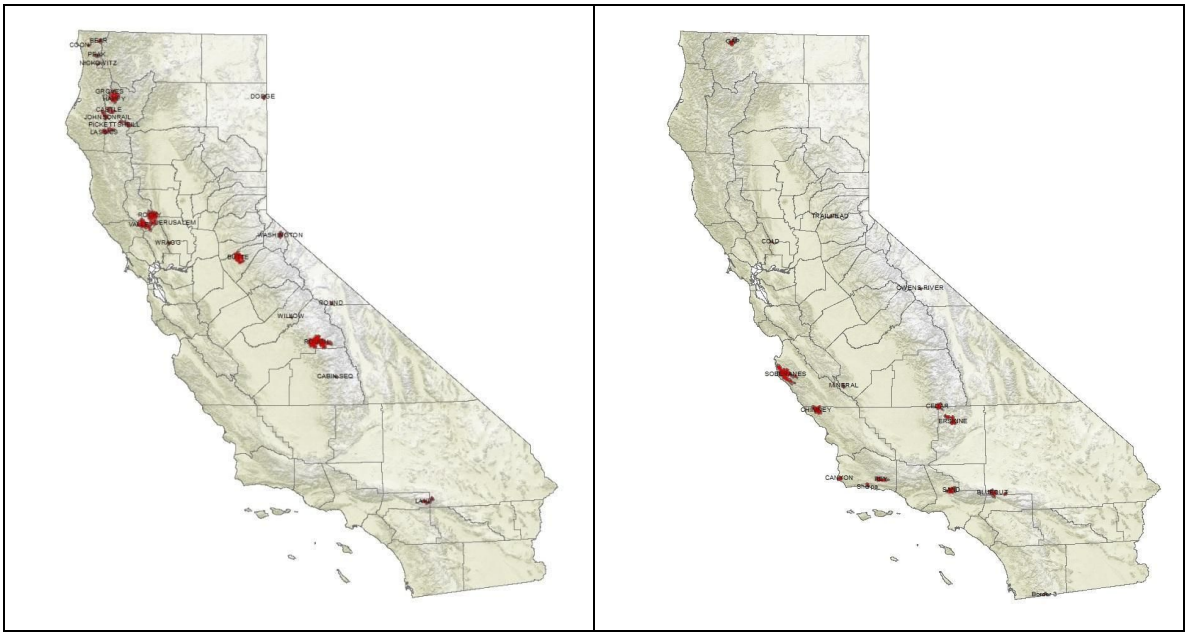

Figure 2. 2015 and 2016 CA wildfires shown on the left and right, respectively. Taken from Sylvia

Vanderspek of CARB.

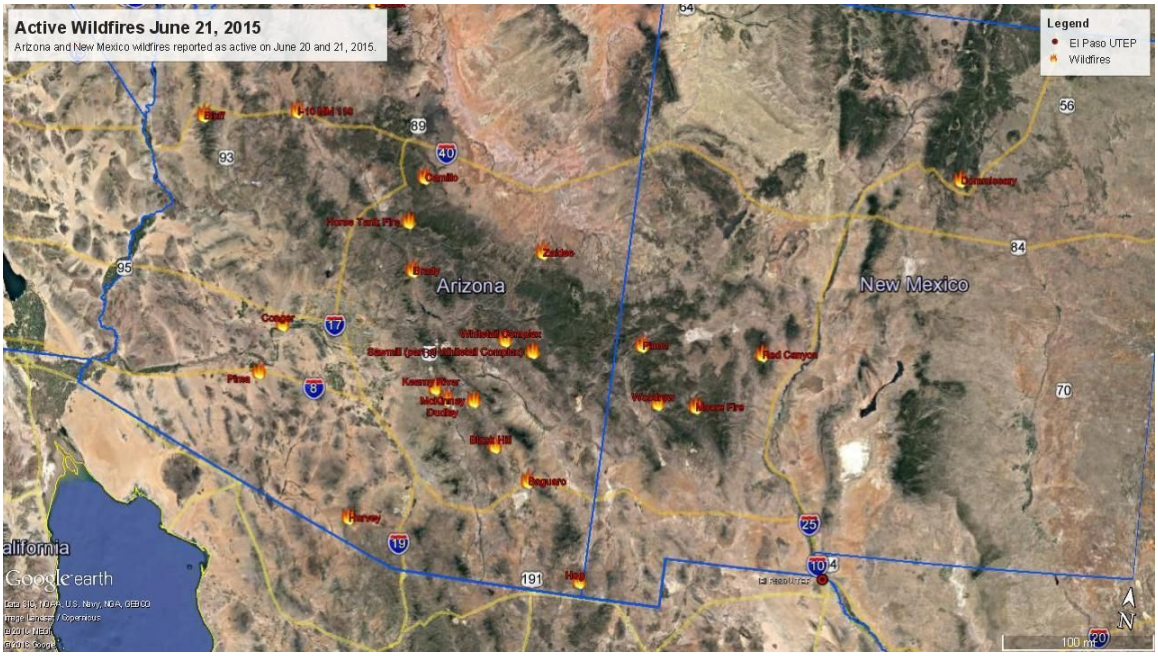

Figure 3. Wildfires active near west TX on June 21, 2015. Taken from Erik Gribbin of TCEQ.

CARB identified a number of CA wildfires during August through November of 2015 and June through October of 2016. It was noted that CARB only submits exceptional event demonstrations when the event can be shown to impact a regulatory determination for that state.

TCEQ identified a June 21 2015 wildfire event that took place in Southern New Mexico and Arizona that impacted TX. This event was related to regulatory determination for Ozone in El Paso TX.

CT DEEP identified a May 18-25, 2016 wildfire originating in Fort McMurray and impacting most of the east coast. CT DEEP presented modeling results indicating the fire may have increased local ozone by as much as 20 ppb.

The 12 km modeling domain should include more of Canada and Mexico including Alberta, Yucatan peninsula, Mexico City, and Oaxaca to better reflect the impact of fires and other sources.

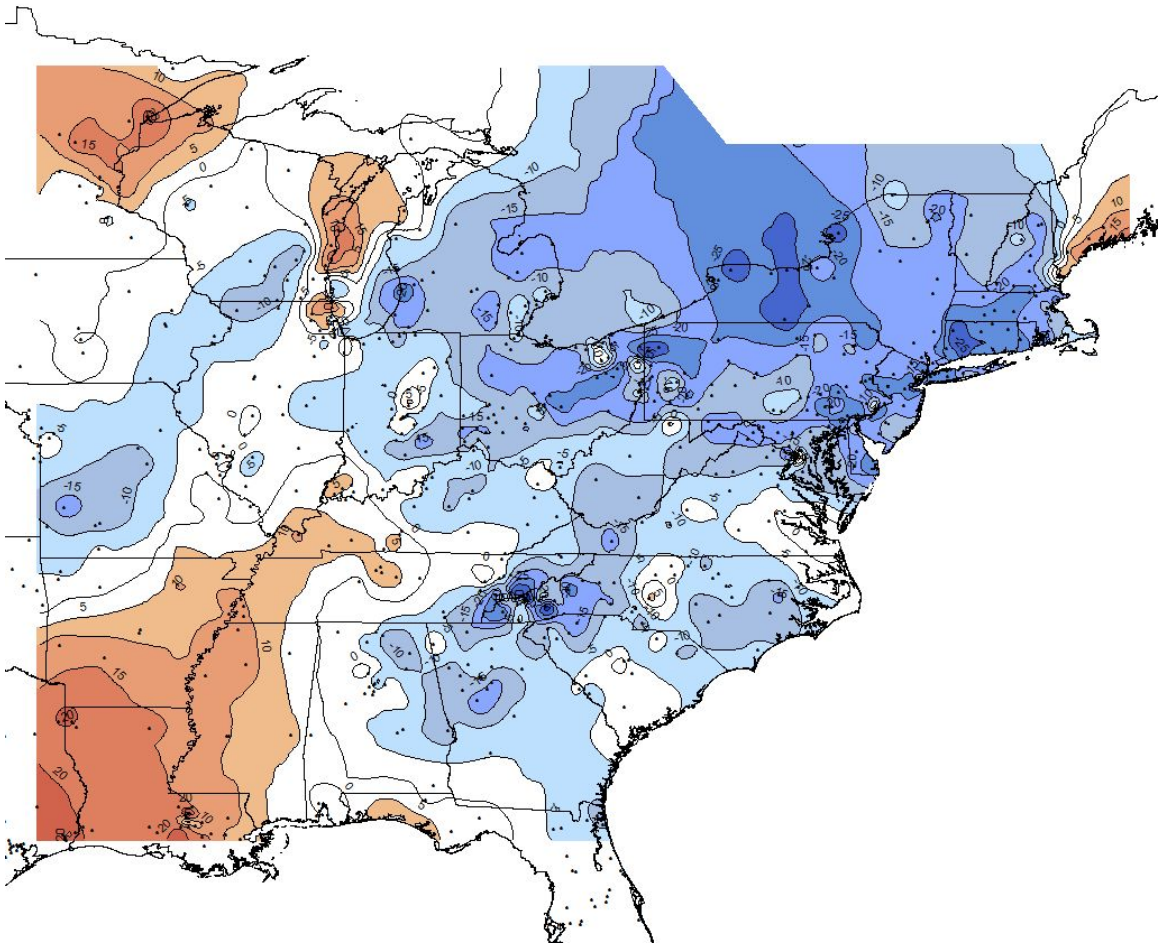

Figure 4. CT DEEP Modeled bias (ppb) of May 25, 2016 attributed to Fort McMurray wildfire. Taken from Michael Geigert of CT DEEP.

Looking Ahead

Benefits to states, RPOs, and EPA would further accrue if each year and every year were modeled routinely with effort to develop input data scaled to to available resources , providing opportunity for continuous improvements in model performance and data quality. The "every-year" approach, if well-documented and evaluated robustly and transparently, could provide retrospective study results that various jurisdictions can assess and apply for their regulatory needs, as well as a broader and more complete basis to assess future potential outcomes. With the continuing trend of increased fire and dust emissions activity, a warming climate affecting emissions of all sectors and associated changes to atmospheric photochemistry, and the advent and continuing evolution of the Exceptional Events Rule guidance and implementation approaches - the more frequent application and

practice of regional photochemical modeling is necessary, as is routinely done currently with global models used as boundary conditions for regional models.

Evaluation of observational data, emission data and estimates, and meteorology and air quality modeling results require time, available technical resources, clear protocols, and significant coordination efforts. Resources limitations preclude development of SIP quality inventories every year. Emission inventory development is concentrated on triennial NEI cycle years. Annual modeling is useful and necessary for some purposes. The focus of this report has been on the development of SIP quality inventories in a resource constrained environment.

Conclusion

A partnership between EPA and state and regional modeling centers is critical to enable states to develop cost-effective plans to protect the health of their citizens. Modern air quality models require extremely large and complex data inputs that are well beyond the resources available to individual states and that reflect the interstate nature of the air pollution problem in this country.

The conclusion of this work group is to recommend that EPA prepare to model both 2015 *and* 2016, and to focus efforts on 2016 *if* a choice is required. Many regions expressed an interest in modeling both 2015 and 2016 for SIPs, but are unsure of how to submit a multi-year SIP.

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