This article describes the progress toward finalizing 40 CFR Part 51, Appendix W, “Guideline on Air Quality Models.”
The U.S. Environmental Protection Agency (EPA) proposed changes to 40 CFR Part 51, Appendix W, “Guideline on Air Quality Models” on July 29, 2015. EPA has promised four major additions to the Guideline. The revised Guideline presented in August 2015 is not complete. More troubling are the effects that the proposed/finalized changes will have on permitting. These include the increased time it will take to obtain a permit, the increased cost of obtaining the permit, and the increased uncertainty of whether the project will require additional pollution control equipment. These effects arise from the need to have each permit modeling analysis methodology decided on a case-by-case basis. Applicants to review and comment on each of the proposals or a fair opportunity to comment on the entire Guideline again, once the public can see how it works.

Secondary Formation
In January 2012, Gina McCarthy, the then Assistant Administrator for Air at EPA, granted a petition that the Sierra Club had made to require modeling analysis of the secondary formation of ozone and PM2.5. (i.e., pollutants such as SOx, NOx, and VOC emitted from a facility transform by atmospheric chemistry into ozone and PM2.5 in the air after release). The letter granting the petition promised to take action so that the next round of revisions to the Guideline would include modeling methodology to address secondary formation. The July 29, 2015, proposal does require that secondary formation be addressed, but does not provide a method to do so.

EPA issued two policy memoranda, one each for ozone and PM2.5, and simultaneously issued a proposed draft “Guidance on the Use of Models.” None of these documents tells the user when detailed modeling is required, what model to select, or what analysis to perform. They only set a framework for some future decisions on the appropriate limits and appropriate model. The modeling conundrum is that single source modeling of atmospheric chemistry differs substantially from multisource atmospheric chemistry modeling. No current regulatory model can address this issue precisely.

Significant Impact Levels
The proposed Guideline also came with a promise that EPA would adopt SILs for ozone and PM2.5. If the modeled air quality impact of a new source by itself is below the SIL, then the source is insignificant and no further model analysis is required. As an example, if a modeled source contribution is 1 part per billion (ppb) of ozone compared to the 70-ppb National Ambient Air Quality Standard (NAAQS), is that impact significant? It is difficult to see that EPA can truly adopt these SILs. The last time the SILs were in front of the DC Circuit Court, the Court remanded the PM2.5 SIL to EPA. The Court also struck down the monitoring concentration levels that EPA and permittees have used since 1980 to avoid

with new projects and modifications are going to find it increasingly difficult to complete the modeling portion of construction permits.
one year’s worth of pre-construction monitoring data. The environmentalists argued that EPA could not assure that if the modeled results were below the SIL, that the NAAQS remained protected.

On August 1, 2016, EPA posted draft SILs for ozone and PM2.5 on the EPA Air Quality Modeling Group’s website (https://www.epa.gov/scram). EPA says these are drafts of proposed guidance. EPA adds that it would like to see how the SILs work in permitting situations before proceeding to the proposed Guideline stage. Final rules on this issue are thus significantly delayed.

Emission Rates Subject to Secondary Formation Modeling

The proposed rule came with a promise to provide a new guidance entitled Model Emissions Rates for Precursors (MERPS) for PM2.5 and ozone. As announced, this guidance would identify emission rates below which extensive secondary formation modeling would not be required. These rates would be for SO2 and NOx emissions when considering PM2.5, and for NOx and VOC emission rates when considering ozone. Presumably, these emission rates would be higher than the 15–40 tons per year thresholds, which, under current Prevention of Significant Deterioration (PSD) rules, exempt sources from modeling for these pollutants as direct pollutants. EPA says now that it will issue the MERPS guidance once the SILs are proposed. The Sierra Club and others have stated their opposition to such raising of thresholds below which modeling is not required. Since MERPS are dependent on the SIL, the delay in the SIL further delays the MERPS.

It is unlikely that many new sources built in the United States will actually need such analysis. This author’s experience, as noted in a prior paper,7 is that sources of reasonable size do not have significant impact on downwind concentrations from secondary formation along the plume path. Others have had similar results except when modeling 1,000-MW coal-fired power plants.8,9 The formation is insignificant, about a few percent of the maximum concentrations, and the secondary concentrations occur at very different distances than the maxima due to the primary emissions of that pollutant.

Impact on Class I Areas

Because EPA has proposed to remove CALPUFF as a preferred model for long-range transport (distances beyond 50 km), there is no preferred model for these analyses of PSD increment consumption at Class I areas (i.e., national parks and wilderness areas, as specified in 1982). The increment consumption in Class I areas is a requirement of EPA and is a subject of the Guideline. Without a preferred model, the applicant must guess what model to use and what methodology to adopt. Additionally, Federal Land Managers require an evaluation of the regional haze impact, as well as sulfate and nitrate disposition in Class I areas. EPA added to the July rule docket three items: a memorandum10 and two summary reports11,12 on the activities of the Interagency Workgroup on Air Quality Models. Each of these documents tries to explain (not convincingly) that the 2005 CALPUFF version that is the current EPA preferred model does not meet EPA requirements and that there is no model recommended at this time. In this situation, the applicant has no guidance at all.

Modeling Process for PSD Permit Applicants

EPA proposes that each PSD applicant prepare a modeling protocol for pre-approval by EPA. The proposal indicates that states and EPA regional offices are to check with EPA headquarters—the "Clearinghouse for Air Quality Models". While it has been traditional to prepare a protocol, in the past, the states approved the protocol in most cases. This was because if you met the specifications in the Guideline, you could assume that the protocol was approvable. In many cases, applicants just proceeded with modeling without waiting for approval, because the state either never approved the protocol or took too long to provide the approval. Now, without an approved model for long-range transport or secondary formation, the acceptability of a protocol becomes more problematic. There may now be as many as four government agencies involved. Because of the complexity of these models and methods, the expense and risk of modeling before the protocol is finally approved increases dramatically.

The applicant does not know what modeling is required until there is an approved protocol and therefore does not know the cost of the modeling. Even using AERMOD, the applicant...
will not know which buttons to push until there is an approved protocol. The EPA proposal centralizes the approval of protocols in one small group at headquarters, potentially resulting in a backlog of protocol reviews and even more time added to the permit process.

EPA has proposed that AERMOD be the only preferred model. EPA even insists that long-range transport modeling can be done by modeling with AERMOD out to 50 km and if the impact is below the regulatory threshold at 50 km, no further modeling need be done. A Gaussian steady-state model should not be used for this purpose or for any purpose beyond the transport distance of one hour. For instance, if the wind speed is 10 miles per hour the model is only reasonable out to 10 miles.

Even if the applicant does not need to evaluate long-range transport (i.e., no Class I area within 300 km) or secondary formation, there are numerous additional changes to AERMOD itself that EPA has not yet approved, which the applicant might wish to use. Use of those changes, until the proposal is finalized, are not available unless EPA grants an exemption.

**Practical Results**

The filing and processing of a PSD permit application will take much longer due to the proposed added requirements of the Guideline. Getting the protocol approved by four or more agencies and not being able to move forward with the modeling until approved is a formula for excessive time delays.

We know this because of the excessive times required now for permitting when states and regional EPA offices have required these types of modeling in anticipation of these changes to the Guideline. Time is money and an applicant's business decisions depend on timing, as much as any other factor in determining the viability of the permitting process.

The costs of providing the modeling for PSD permits will rise substantially. The preparation of a protocol, the defense of the proposed protocol, the modeling with more advanced and complex models, which are executable by fewer consulting organizations, and the preparation of much longer, and more complex modeling reports will all add costs to the preparation of a permit. The potential exists for the modeling to predict impacts that will require further controls at the source.

**Summary**

The proposed revisions to the Guideline do not meet the Congressional intent (as noted in the 1977 Amendments to the U.S. Clean Air Act) to specify with “reasonable particularity” the modeling to be done in a PSD application or any regulatory requirement for modeling. The case-by-case approach required by individual protocols for each project is not “reasonable particularity”. There are many unknowns ahead because EPA has not completed its work. It appears that the permit applicant's modeling will require more time, cost, and uncertainty without any yet discernable benefit to the environment. In the interim, applicants are at a complete loss as to what modeling to do. It is likely that businesses will shy away, even more so than in the past, from the PSD permitting process. It will simply be easier, cheaper, and quicker to build elsewhere.

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**References**

1. Revision to the Guideline on Air Quality Models: Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches to Address Ozone and Fine Particulate Matter; Proposed Rule, Fed. Register 2015, 80 (145), 45340-45387.