RESOURCES *for the* FUTURE

Comment on C-7 Electricity Utility Modeling Alternatives to IPM

United States Environmental Protection Agency

Dallas Burtraw and Aaron Bergman

Public Comment
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for the

November 2, 2026

US Environmental Protection Agency
EPA Docket Center
Docket ID No. EPA-HQ-OAR-2025-0124
Mail Code 28221T
1200 Pennsylvania Avenue NW
Washington, DC 20460

Submitted via Regulations.gov

Re: Supplemental Notice of Proposed Rulemaking, "Rescission of the Greenhouse Gas Findings for Fossil Fuel-Fired Power Plants and Repeal of Regulations for Power Plant Greenhouse Gas Emissions Under Clean Air Act Section 111" (Docket ID No. EPA-HQ-OAR-2025-0124)

Dear Administrator Zeldin,

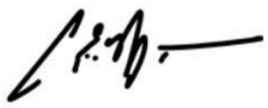
On behalf of Resources for the Future (RFF), I am pleased to share the accompanying comments to the US Environmental Protection Agency (EPA) in response to comment solicitation C-7 in the supplemental notice of proposed rulemaking identified above.

RFF is an independent, nonprofit research institution in Washington, DC. Its mission is to improve environmental, energy, and natural resource decisions through impartial economic research and policy engagement. RFF is committed to being the most widely trusted source of research insights and policy solutions leading to a healthy environment and a thriving economy. While RFF researchers are encouraged to offer their expertise to inform policy decisions, the views expressed here are those of the individual authors and may differ from those of other RFF experts, its officers, or its directors. RFF does not take positions on specific policy proposals.

These comments address EPA solicitation C-7 concerning other electric utility modeling or information that may be more appropriate than the Integrated Planning Model (IPM), including justification for use of a different model and whether that model is open source. Specifically, our comments center on issues of demand representation, distributed energy resources, and considerations of uncertainty in electric utility modeling that should be addressed while reimagining IPM.

If you have any questions or would like additional information, please contact Dr. Dallas Burtraw at burtraw@rff.org and Dr. Aaron Bergman at abergman@rff.org.

Sincerely,



Carlos Martín
Vice President for Research and Policy Engagement

Comment on C-7
Electricity Utility Modeling Alternatives to IPM

Dallas Burtraw
Senior Fellow, Resources for the Future
burtraw@rff.org | 202-328-5087

Aaron Bergman
Fellow, Resources for the Future
abergman@rff.org | 202-328-5105

Summary

The US Environmental Protection Agency (EPA) asks for "Other electric utility modeling or information related to the impacts of this proposed regulatory action that may be more appropriate than the use of the Integrated Planning Model (IPM). Please provide justification for the use of a different model as well as whether it is open source (C-7)."

IPM has been the workhorse of the EPA for over two decades, and we do not presume that it will not continue to function in this role. However, changes in the market structure and the emergence of new technologies in the electricity industry pose new challenges. In 2019, EPA commissioned a peer review of its v6 Reference Case using IPM. One of us (Burtraw) chaired that peer review. The report and EPA's response are available **here**. We encourage EPA to continue to draw on that report for setting priorities for model improvement.

In this brief comment, we wish to emphasize a few points that surfaced in the peer review and the related evolution of the industry to help set direction for further model development and use by EPA. We also provide information about alternative modeling platforms that might provide lessons that could guide further development of IPM or might augment or substitute for IPM.

Representation of Demand

A fundamental limitation of the class of capacity expansion models that includes IPM is an inadequate or entirely missing representation of the demand side of the market. Typically, demand is represented parametrically and, at best, explored through sensitivity analysis. Few models in this class have an endogenous representation of short-term response to changes in electricity prices and importantly the long-term response that changes demand-side investments and behavior.

The 2019 review of IPM called for improvement and elaboration of load duration curves and greater attention in general to the profile of load on a diurnal basis. This is increasingly important with the electrification of the economy, which introduces revolutionary technological opportunities in applications ranging from industry to households. These expanded uses of electricity differ in several ways from conventional 20th century uses. Unlike household applications such as turning on the television which require instant response, electrification of transport and heating and cooling of buildings provide inherent temporal flexibility in electricity consumption. At the industrial level, one observes expanded use of electricity and similar increases in flexibility for thermal storage that allow for adjustments to electricity consumption over time.

A proper representation of demand side opportunities and the empirical response to prices and incentives in both competitive and regulated markets is crucial to identification of two-sided market equilibria and to the characterization of the impacts of regulatory policies.

Representation of Distributed Energy Resources

There is a continuing trend toward distributed energy resources, meaning small-scale resources connected to the electricity distribution system near the point of consumption that produce, store, and modify the use of electricity. Sometimes these resources have environmental impacts including noise, local emissions, land use, and visibility. Beyond their own effects, their use can have important effects on supply from central power stations and environmental impacts from generation connected to the transmission grid. Especially important in this class of resources is the role of batteries and potentially other types of electricity and thermal storage. The usual capacity expansion model looks for a solution to providing adequate and reliable supply to meet a pre-specified temporal profile of demand. However, energy storage provides an opportunity to satisfy demand with resources that do not contemporaneously generate electricity supply.

Investment Behavior Under Uncertainty

Conventional electricity market models solve to find a least net present value cost pathway to represent the expected behavior of agents in the economy. However, investment behavior will follow a somewhat different decision process, accounting for stochastic fuel prices and electricity demand and uncertainty about future regulations and secular changes in economic activity. Investment under uncertainty departs from investment under perfect information. Representation of this in finance involves a characterization of option values of different choices, that is, an accounting of the opportunities that are made available or foreclosed from an investment under different potential future states of the world. A full representation of investment under uncertainty in a national modeling framework is not practical, but recognition of uncertainty when interpreting results and some elementary representation of uncertainty in the model is crucial to the model's reliability.

An initial observation about how uncertainty changes investment behavior is a recognition that investments in the sector are long lived. Large capital expenditures lock in a decision that cannot easily be reversed as new information is learned about uncertain elements of the sector and economy. Smaller, modular investments convey less incremental risk. The failure to recognize the influence of uncertainty in decision making will mischaracterize the expected investment decisions that should be expected.

Alternative Model Platforms

We also strongly endorse EPA moving to an open-source platform for future modeling. There are now multiple, sophisticated open-source capacity expansion models akin to IPM that can serve to evaluate power sector rules. Using an open-source model will make EPA's work more transparent to the public and other stakeholders. We would encourage each Regulatory Impact Analysis to be accompanied by a full set of code, documentation, and data to enable replication of all the findings in the analysis. The use of an open-source model will also enable EPA to take advantage of the latest modeling techniques and to potentially fund outside researchers to provide modeling improvements, such as those described above that can be used by EPA and the modeling community more widely. We also encourage EPA to make public all the data underlying its modeling available in a well-documented machine-readable format. This will both further transparency and help the ecosystem of electricity modelers to incorporate EPA's data in their analyses.

Conclusion

IPM has provided powerful analysis to support environmental regulation of the electricity sector at least cost over multiple decades. We now observe changes in the sector including expanded use of electricity and the introduction of new technologies that call for an expanded set of model capabilities to be evident in IPM or in modeling complements or alternatives.

A 21st century electricity sector model must include a representation of distribution-level resources, including flexible electricity demand, behind the meter resources, and energy storage to properly characterize the future of the electricity system. Explicit recognition of uncertainty in exercising a model and interpreting its results is crucial to improving its representation of the evolution of the electricity sector. Finally, the use of an open-source platform for future modeling would strengthen agency analysis, transparency, and accessibility for the public.