

**Summary Minutes of the
U.S. Environmental Protection Agency
Science Advisory Board
Computable General Equilibrium (CGE) Model Review Panel Teleconference
August 22, 2019**

CGE Model Review

Panel Members:

Dr. Peter Wilcoxon, Chair
Dr. W. David Montgomery
Dr. Sergey Paltsev
Dr. Ron Sands
Dr. Dominique van der Mensbrugghe
Dr. Alan Fox
Dr. Mun Ho
Dr. Tom Rutherford

Purpose: The CGE Model Review Panel received a briefing from EPA's National Center for Environmental Economics (NCEE) on its CGE model named SAGE.

Designated Federal Officer: Dr. Holly Stallworth, Designated Federal Officer

Other EPA Staff: Ann Wolverton, Alex Marten, Andrew Schreiber, David A. Evans

Public: Maria Hegstad (Inside EPA); Sugandha Tuladhar (NERA Consulting)

SAB Webpage for Meeting Materials:

<https://yosemite.epa.gov/sab/sabproduct.nsf/a84bfee16cc358ad85256ccd006b0b4b/d0754b077d2c1f8525843a006ec259!OpenDocument&Date=2019-08-22>

August 22, 2019

Dr. Holly Stallworth, Designated Federal Officer for the CGE Model Review Panel, gave her opening statement noting the compliance of the Panel with the Federal Advisory Committee Act and federal ethics laws. Dr. Wilcoxon also welcomed the Panel and reviewed the agenda for the teleconference as well as the schedule for the Panel's review, emphasizing an October 14, 2019 deadline for submitting individual comments to the DFO prior to the November 22, 2019 face-to-face meeting in Washington, DC.

Background on Economy-Wide Modeling at EPA by Dr. Ann Wolverton of the National Center for Environmental Economics (NCEE)

Dr. Ann Wolverton's presentation is captured in the above-titled slides posted on the meeting webpage (URL above). Dr. Wolverton summarized the regulatory context for most of EPA's economic analysis and stressed the large variations in EPA regulations in terms of the form of

the standard, method of compliance, regulated sources and other attributes, all of which can affect the choice of analytic model. Dr. Wolverton said the use of CGE models may be appropriate when EPA regulations are expected to affect multiple markets and cited the SAB's recommendations on the use of CGE models from September 2017 (see [https://yosemite.epa.gov/sab/sabproduct.nsf/4B3BAF6C9EA6F503852581AA0057D565/\\$File/EPA-SAB-17-012.pdf](https://yosemite.epa.gov/sab/sabproduct.nsf/4B3BAF6C9EA6F503852581AA0057D565/$File/EPA-SAB-17-012.pdf)). Dr. Wolverton said NCEE's development of the SAGE model was part of its response to the SAB's September 2017 advice and remains an element of NCEE's commitment to developing economy-wide modeling capacity.

Briefing on the SAGE CGE Model by Dr. Alex Marten (NCEE) and Dr. Andrew Schreiber (NCEE)

Dr. Alex Marten presented the slides on the SAGE model posted on the meeting webpage (URL above), beginning with the 8 principles of best CGE practices from the SAB's September 2017 report. Dr. Marten covered the key features of the dynamic, inter-temporal SAGE: its trade structure, default sector resolution, depiction of production sectors and household behaviors, government, dynamics and baseline. Dr. Rutherford engaged NCEE on the ability of SAGE to capture different abatement requirements and regulatory structures. In response to a question from Dr. Montgomery, Dr. Marten confirmed the presence of tax-interaction effects in the model. The NCEE team conducted literature reviews to inform parametric assumptions. Dr. Marten reviewed the elements of the modeling package: a PDF of the model's documentation and a zip file that contains the entire model and build stream.

Continuing on the same slides, Dr. Andrew Schreiber (NCEE) presented an overview of versioning for the SAGE model, describing a semantic version control system that utilizes 3 digits to covers patches, minor changes and major changes as shown in the flow diagram on slide 22. Dr. Schreiber said the version control system could also be used to signal whether changes are substantial enough for further peer review. Dr. Schreiber described three near-term model updates: the use of flexible functional forms for consumer demand systems, the use of large open economy specifications and the separation of production, sales and excise taxes.

Dr. Wilcoxon pondered how NCEE's version control system could accommodate the need for a family of models, e.g. the use of a more disaggregated electricity sector model in the future and the possibility of linking models. Other panelists noted various version control problems that could arise. Dr. Sands noted the need to maintain consistency in energy balances as the model steps through time. In response to a similar question by Dr. Paltsev, Dr. Marten noted that the current version of SAGE relies on IMPLAN social accounting data with no adjustments for energy balances. Dr. Montgomery noted that implicit prices gave a glimpse of when energy accounts did not match the Social Accounting Matrix. Dr. Ho asked whether there was consistency between the tax rates and observed revenue in national accounts. In response, Dr. Marten noted that marginal tax rates are assigned to each household type and implicit transfers adjust tax revenues to mirror levels in the underlying social accounting matrix.

Overview of Charge Questions by Dr. Ann Wolverton

Dr. Wolverton presented the Overview of Charge slides posted on the meeting webpage (URL above), dividing the charge questions into three sections: technical accuracy, approach to versioning and priorities for near-term improvement. Dr. Wolverton enumerated the charge questions in each of the three categories, as shown in the slides. After Dr. Wolverton's presentation, Dr. Wilcoxon probed the meaning of "reasonable" in the charge questions by asking if that meant acceptable given the constraints faced by NCEE in building a model that can be quickly adapted to different uses. Subsequent discussion between panelists and NCEE suggested that "reasonable" should be interpreted as broadly "appropriate": that is, that the structures, parameters, and inputs are suitable for EPA's purposes, but with the understanding that the model's suitability for any specific application would still be subject to public comment and potentially additional peer review.

Dr. Rutherford spoke about defining when CGE modeling could be useful. Dr. Montgomery said it would be useful to provide an example of when a CGE model can improve the analysis of a policy question and to what extent additional complexities impact model results. Dr. Fox spoke about the multiple menu options at each juncture of the model, suggesting the panel could suggest adding options at various points going forward. Dr. Ho said the priorities for near-term improvement should be related to EPA's analytic agenda. Dr. Wolverton noted that EPA is asking for peer review of the general CGE modeling framework and not its use in a specific application, and that the goal is to ensure that CGE modeling is integrated into regulatory analysis not just in the immediate term but also longer term. In response to a question from Dr. Sands, Dr. Wolverton said the primary user community would be NCEE but with substantial input from EPA program offices. In response to a question from Dr. Montgomery, Dr. Wolverton said she would send the link for EPA's most recent regulatory agenda. In response to a question from Dr. Wilcoxon, Dr. Marten spoke about how the model closed the government budget and the international trade balance. In response to another series of questions from Dr. Wilcoxon and Dr. van der Mensbrugghe, Dr. Marten confirmed that labor productivity growth was assumed to be the same across sectors of the economy. In response to another panelist, Dr. Wolverton stated that benefits had not been incorporated into the model. Dr. Paltsev wondered how energy intensity could be tracked if not in physical terms to which Dr. Marten explained that SAGE was proxying for energy intensity through adjustments in value shares based on the Annual Energy Outlook (AEO) for fuel input use as a share of output. In response to a question by Dr. Ho, Dr. Wolverton noted that the current database does not include emissions but that is a future research priority. Dr. Wolverton also noted that use of the CGE model would not be limited to air regulations. Dr. Montgomery asked if the model's baseline assumes a balanced growth path or has sector specific growth rates to which Dr. Marten replied that the sectoral growths will differ in the default version of the model and are endogenously determined. Dr. Montgomery asked about how commodity taxes are applied. Dr. Marten replied that they are ad valorem taxes on production. Dr. Ho emphasized that taxes on gasoline are often imposed on retail trade but would be better moved to petroleum refining. Dr. Marten agreed but mentioned that it is difficult at the regional level.

Next Steps

Dr. Wolverton said that panelists would soon be receiving the zip files for the SAGE model with IMPLAN data included. The zip files posted on the SAB website would not have

IMPLAN data since it was proprietary. A Microsoft account would be needed in order to access the zip files.

To conclude the meeting, Dr. Wilcoxon reminded panelists that individual comments were due to the DFO by October 14, 2019.

Dr. Stallworth thanked everyone and adjourned the meeting.

Submitted by:

Holly Stallworth, Ph.D. /s/
Designated Federal Officer

Certified as Accurate:

Peter Wilcoxon, Ph.D. /s/
Chair, SAB Economy-Wide Modeling Panel

NOTE AND DISCLAIMER: The minutes of this public meeting reflect diverse ideas and suggestions offered by committee members during the course of deliberations within the meeting. Such ideas, suggestions, and deliberations do not necessarily reflect definitive consensus advice from the panel members. The reader is cautioned to not rely on the minutes to represent final, approved, consensus advice and recommendations offered to the Agency. Such advice and recommendations may be found in the final advisories, commentaries, letters, or reports prepared and transmitted to the EPA Administrator following the public meetings.