

Next Steps and Meeting Summary
EMF 25 Third Working Group Meeting
Energy Efficiency and the Shape of Future Energy Demand

Resources for the Future, Washington, DC
October 28-29, 2009

Next Steps

The project has reached a stage where preliminary results should be prepared and organized into a summary report for policymakers. To facilitate this process, the working group agreed upon the following next steps:

- The EMF staff will begin organizing the preliminary results into sample charts for the summary report. Each sample chart will focus on an important issue discussed at the meeting. These charts will be circulated to working group members for their comments in about one month.
- Modelers will review and revise their second-round results and send them to Hill Huntington, hillh@stanford.edu, by **January 29, 2010**. They should simulate the same second-round scenarios discussed at this meeting and that are described in the revised study design. They should report their results in the same excel spreadsheet that is available on the EMF website.
- By the middle of February, the EMF staff will revise the sample charts (see first bullet) based upon comments from members and update them with the new data submitted by modelers. The staff will decide whether to hold another meeting or separate conference calls to review the new results.
- In the next few weeks, the EMF staff will approach several energy journals to explore their interests in a special issue focused on the current study. Each article will be authored by a single modeling team and will focus on the key insights derived by the group for this study. Additional articles may discuss data development issues for representing energy-efficiency frontiers or understanding how results from energy and climate models differ from more detailed estimates from individual technologies.
- A brief description of the purpose and contents of the special issue is attached to the end of this summary. Please update if you are interested (or not interested) in participating. Indicating interest at this point does not commit you to doing an article. At this point, EMF needs a simple statement of purpose and possible contributors to send to the journal.
- If we find a journal interested in a special issue, preliminary papers will be due by **June 25, 2010**, and revised papers should be completed by **October 29, 2010**.

Key Discussion Points

Presentations by each modeling group and on the development of energy-efficiency cost curves are available on the EMF website under the EMF 25 project. The detailed model comparison charts by Hill Huntington, however, are not being released until modelers have had the opportunity to review and revise these results.

The working group discussed a range of important issues covering very diverse topics. Among the more interesting and important topics were the following issues:

- The working group much appreciated the significant efforts by participating modeling teams in submitting the second-round results.
- Results were very preliminary. Some models have been recently revised. Additionally, some modelers had not simulated the tax or other cases previously. Although the modelers learned a lot in simulating these cases, they wanted to revise results in future simulations.
- As often happens, some important caveats apply. Most modelers did not submit until the last minute and found significant mistakes in their submissions; EMF had no time to adjust for different definitions across models; a few remaining glitches in formats for charts, etc. The EMF staff can almost create real-time charts comparing the results reported in the spreadsheets. More careful and thoughtful comparisons, however, are not possible within the tight time constraints between submitting results and the meeting.
- The EMF staff plans to compare energy consumption responses that are standardized on the observed energy price changes in future charts. These adjustments are important because modelers did not necessarily standardize on the oil price and GDP paths in the reference case and energy and climate taxes had very different effects on energy prices across different models.
- A reoccurring theme, in this meeting as well as in previous ones, concerns the basic objective of the study. Is this a study on the shapes of the energy demand curves in the various models or one on global climate change? Some participants thought that this study offered an opportunity to explore an important issue often ignored in policy modeling: what is the nature of the energy demand relationships in the models and how comfortable are we with these specifications? Other participants asserted that policymakers today are interested in energy efficiency only for its implications for global climate change policy. Despite the strong arguments on both sides, no consensus emerged.
- Several participants noted that the energy and climate models may be measuring total delivered energy differently. This point led to extensive discussion of the importance between total primary and total delivered energy and on the approach used for valuing electric power from renewable energy sources. It was suggested that the report should contain a clear discussion of the problem with examples of how different approaches can result in fundamentally different estimates.

- Energy efficiency is notoriously difficult to define and measure. For this reason, the study will probably focus on sectoral energy intensity, such as delivered commercial sector energy per square foot of commercial floor space. At the aggregate level, the study may focus on total delivered energy per dollar of inflation-adjusted gross domestic product.
- Some models have slower reductions in energy intensity in their reference cases than do other models. This finding raised the possibility that there may be greater opportunities to reduce energy intensity with taxes, standards or subsidies in these models.
- Modelers simulated the energy tax case differently. The suggested approach called for an excise tax on all delivered energy prices of 15 percent in the first year (2010). The tax levels in the following years would be raised by 5% per year in inflation-adjusted terms.
- Industrial demand appeared to be less sensitive to energy and carbon taxes in some models with more energy-economy detail (e.g., MARKAL-LIFT or NEMS).
- The rebound effect refers to the offsetting increase in energy use when standards reduce energy operating costs. An important issue is what percent of the energy-efficiency improvement is lost because the costs of operating the equipment (furnace, car, etc.) are lower. Model estimates were as high as 40% for home heating, although other estimates were lower (about 15%). In reviewing the literature, Sorrell (2009) suggested a value of approximately 20%, spread across many different applications.
- Subsidies were implemented differently in the models. Some estimates allowed rebates on both building shells and equipment, while others allowed rebates only on equipment.
- Subsidies and standards in the residential and commercial sector may be partially offset by higher industrial energy demand, if these policies reduce energy prices through declining demand in the regulated sectors.
- Standards (or subsidies) and carbon taxes are not purely additive in most models. Combining standards with carbon taxes produces a smaller net effect than considering standards and carbon taxes as separately implemented policy instruments. The net difference, however, is not dramatic in most models.
- It was recommended that models do their best to report total opportunity costs associated with different policies. Some models may be capable of reporting only equipment costs while others may be capable of incorporating more of the indirect costs.
- The McKinsey “out-of-pocket” costs for achieving energy efficiency improvements can be adjusted for some important indirect costs, such as heterogeneous consumers, energy market feedback effects and policy and monitoring costs. Although there is considerable uncertainty about the size of these indirect effects, modest adjustments can significantly increase the full opportunity costs of efficiency improvements and reduce the size of the energy-efficiency “gap”.

- Energy intensities have tended to converge across OECD countries at an aggregate level and have done so rapidly for electricity within the commercial and industrial sectors. Convergence is less obvious for developing countries in the Latin America and the Caribbean, Middle East and North Africa, and Sub-Saharan Africa regions and for different regions within China where two clubs appear to be forming. Measuring intensities can be challenging, and analysts frequently use different definitions of the process.
- The Lawrence Berkeley Laboratory has updated its estimates of the energy-efficiency frontier in the residential, commercial and transportation sectors. Several modelers indicated that they have used these frontiers in their work, although the approach differed across models.

Notes Prepared by Hillard Huntington, November 6, 2009.

**Special Issue on
Strategies for Mitigating Climate Change Through Energy Efficiency:
A Multi-Model Perspective**

The proposed special volume, *Strategies for Mitigating Climate Change Through Energy Efficiency: A Multi-Model Perspective*, focuses on policies for promoting delivered energy efficiency improvements as a response to the climate change problem.

Policy makers often view energy efficiency as the low-hanging fruit or “silver bullet” for decoupling greenhouse gas emissions and economic growth. This special issue focuses on three critical issues that explore this topic:

- How important is end-use energy efficiency relative to other market responses and policies for reducing carbon dioxide emissions over the next several decades?
- How effective are standards and subsidies in reducing delivered energy consumption and carbon dioxide emissions relative to economic instruments such as a carbon tax?
- To what extent do standards and subsidies complement a carbon tax and to what extent do they simply replace or substitute for a carbon tax?

Contributed articles to this special issue will address one or more of these above points from the perspective of an energy or climate model, focused largely but not exclusively on the United States. The models are used to help structure the discussion of which issues are most important for this development rather than to provide precise estimates of this industry’s likely future. The papers will be based upon extensions of work conducted for a recent Energy Modeling Forum study on this topic. This study is comparing 13 different energy and climate models for eight different scenarios using a common set of standardized assumptions.

Additional articles will focus on several important related issues that have been discussed during the study. One paper will discuss recent data developments for representing the frontier between end-use energy efficiency and costs for the residential, commercial and transportation sectors. Another paper will explain the key differences between the results from energy and climate models and those from engineering cost estimates for each individual technology as reported in the McKinsey analysis.

Hillard Huntington will serve as special issue editor(s). The editor would agree to help organize the review process. Reviewers could be outside experts who did not participate in the study, authors of other chapters, or some combination of the two approaches.

Expected Date for Initial Drafts: June 2010.

Expected Date for Completed Manuscripts: October 2010.

Contents

- Overview of EMF-25: Introduction, Results, Policy Recommendations - Hillard Huntington (Stanford University).

Planned articles¹ on individual models:

- G-Cubed: Adele Morris (Brookings Institution) and Peter Wilcoxon (Syracuse University)
- Thomas Rutherford and Jan Imhof (Centre for Energy Policy & Economics, ETH Zurich)
- IMACLIM: Louis-Gaëtan Giraudet (CIRED, France)
- Leon Clarke and Page Kyle (Joint Global Change Research Institute, U. of Maryland)
- NEMS-GRPA: Frances Wood (Onlocation, Inc.)
- ADAGE: Martin Ross (Research Triangle Institute)
- HAIKU: Karen Palmer, Anthony Paul and Matt Woerman (Resources for the Future)
- CIMS: Mark Jaccard and Rose Murphy (Simon Fraser University)
- NEMS: Erin Boedecker, Owen Comstock, John Conti, John Cymbalsky (Energy Information Administration)

Planned articles on other related issues:

- Energy-Efficiency Frontier Curves - Data, Status and Applications: Jayant Sathaye (Lawrence Berkeley Laboratory) and John (Skip) Laitner (American Council on Energy Efficiency).
- Policy Perspectives on Energy Efficiency Cost Curves: Hillard Huntington (Stanford University).

¹ This list is based upon my memory and will be revised. Others who might eventually contribute include:
Central Research Institute for Electric Power Industry (Japan)
Charles River Associates
MIT Joint Program on the Science and Policy of Global Change
MITRE (MARKAL-LIFT)
Did I forget anyone?