September 29, 2017

**MEMORANDUM FOR:** Ian Mead
Assistant Administrator for Energy Analysis

**FROM:** Jim Turnure
Director, Office of Energy Consumption and Efficiency Analysis

**SUBJECT:** Summary of AEO2018 Buildings Working Group 2 held on September 20, 2017

The purpose of this memorandum is to provide an overview of the presentation given at the second AEO2018 Buildings Working Group meeting and a summary of the discussion between participants. The meeting covered updates for AEO2018, including major updates, policy assumptions, energy efficiency modeling refinements, and potential side cases. The full presentation associated with the working group is available in a separate document.

**Model updates**

Major updates include refining and updating historical distributed generation capacity and generation. Specifically, the residential ZIP code-level solar photovoltaic (PV) penetration model was updated with additional historical data and a contagion effect was added. For commercial distributed generation, sub-Census divisions were updated to include 2012 CBECS data. Commercial combined heat and power and wind capacity was updated with new data sources including the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy and EIA-860 data. Utility energy efficiency program rebates are in the process of being updated and tested.

**Discussion**

The main discussion centered on distributed generation, updates to commercial miscellaneous end uses, utility energy efficiency programs, and behavioral parameters.

Distributed Generation

Participants wanted to know why projected residential solar PV capacity is lower between 2040 and 2050 in preliminary AEO2018 runs than in AEO2017. EIA staff explained that the updated parameters for the econometric residential PV penetration model and lower projected electricity prices result in less residential adoption relative to AEO2017 during that time period.

Commercial "Other"' and "Computing" End uses

EIA staff explained that the Other end-use category in AEO2018 will be indexed to non-industrial and service gross output as a basis for projecting non-explicitly modeled consumption. In response to questions, EIA staff noted that commercial computing has been reweighted to eliminate double-counting the effect of floorspace growth on energy use for computing.

Utility Energy Efficiency Programs

EIA staff outlined a draft methodology and preliminary results for modeling utility energy efficiency program rebates. In preliminary runs, lighting is the most heavily subsidized end use, and rebates are higher in Census division 1 (New England) than in other regions. Rebate spending is loosely benchmarked to the utility rebate spending reported through the EIA-861 survey.

Participants asked for more detail on how energy efficiency rebates were applied in the model. EIA staff clarified that the rebates are applied to specific technology vintages as a percentage of installed cost. Rebates are not applied for individual years, but each technology vintage is available during a specific time frame (e.g., a certain vintage of light bulb might be available between 2020 and 2029). Rebates are applied to technology vintages that achieve efficiencies greater than or equal to ENERGY STAR equipment.

Participants asked for clarification on the methodology for capturing utility rebate penetration across Census divisions and asked why this method was chosen. EIA staff explained that they initially tried breaking down rebate levels by Census division, but the sample size was too small to draw robust conclusions about rebate amounts at that level of disaggregation. Therefore, in the most recent analysis, national average technology rebates are used. These are adjusted by Census division based on available data on penetration of utility rebates within divisions. Given how the model is currently structured, it is more feasible to adjust average rebates than to adjust the number of people subject to the rebates. However, according to the current model design, some consumers will not respond to certain rebates if their hurdle rates are too high or if they are programmed to choose within the same fuel or technology type.

A participant noted that light emitting diode (LED) lighting technologies are achieving penetration very quickly, and that Massachusetts is therefore looking at phasing out LED rebates as early as 2020. EIA staff acknowledged that we are monitoring such trends and will adapt to policy changes like these as they arise.

A participant asked why utility rebates are being modeled at all, given the level of uncertainty surrounding them. EIA staff responded that despite the uncertainty, we are interested in enhancing our capability to understand the impacts of utility rebates. With the architecture to incorporate utility rebates explicitly, EIA can better model sub-federal energy efficiency policies in the future. There are also certain technologies, such as LEDs, that do not gain as much market share in our model as observed in the real world unless they are subsidized in the model. A participant also requested that EIA release a No Utility Rebate side case to better enable utilities to apply their own energy efficiency assumptions to projections and to prevent double-counting. Although EIA is not planning to undertake a No Utility Rebate side case, we do plan to release a one-time report on utility energy efficiency rebates and their projected impacts.

Hurdle rates and other behavioral parameters

Participants were interested in more information on behavior rules, regionalization, and about how hurdle rates are developed and used. EIA staff presented supplemental slides at the meeting describing how behavior rules and hurdle rates are applied to energy efficiency decisions. Participants asked how the lifetime of the technology is taken into account and whether costs like lamp replacement are taken into consideration in the Commercial Demand Module (CDM). EIA staff explained that operating and

maintenance costs are considered, including material and labor costs for items like lamp replacement. Participants also asked about the data sources for behavior rule parameters that govern the set of technologies commercial consumers consider when purchasing equipment in the CDM. EIA staff explained that the behavior rules are based on 2012 CBECS data about building ownership and occupants.

**Additional issues**

Participants asked about potential side cases for AEO2018. The side cases for AEO2018 have not been officially set other than the core side cases, but EIA does plan to include alternative policy cases in AEO2018.

**Attendees**

| **Guests (in person)** | **Affiliation** |
|---|---|
| John Agan | DOE |
| Robert Fares | DOE |
| Valerie Nubbe | DOE |
| Jack Mayernik | NREL |
| David Feldman | NREL |

| **Guests (WebEx/phone)** | |
|---|---|
| Youngsun Baek | Union of Concerned Scientists |
| Austin Brown | UC Davis |
| Beth Conlin | EPA |
| Alan Cooke | PNNL |
| Eric Fox | Itron |
| Chioke Harris | NREL |
| Jared Langevin | LBNL |
| Aris Marantan | Navigant |
| Oleg Moskatov | Itron |
| Andrew Nicholls | PNNL |
| Janet Reyna | DOE |
| Kurt Roth | Fraunhofer |
| Mike Russo | Itron |
| Erick Tucker | Leidos |
| David White | Synapse Energy |
| Frances Wood | OnLocation |
| Evelyn Wright | Sustainable Energy Economics |

**EIA Attendees (in person)**

Chip Berry
Jay Olsen
Greg Lawson
Perry Lindstrom
Manussawee Sukunta

***Team Members:***

Erin Boedecker
Meera Fickling
Kevin Jarzomski
Kimmie Klaiman
David Peterson

**EIA Attendees (WebEx/phone)**

Behjat Hojjati
Carolyn Hronis
Janice Lent
Eileen O'Brien