Independent Statistics & Analysis
U.S. Energy Information Administration

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MEMORANDUM FOR: Ian Mead
Assistant Administrator for Energy Analysis

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

SUBJECT: Summary of AEO2019 Buildings Working Group 2 held on October 4, 2018

This memorandum provides an overview of the presentation given at the second *Annual Energy Outlook* 2019 (AEO2019) Buildings Working Group meeting and summarizes the discussion. The meeting covered preliminary AEO2019 results, including a comparison with AEO2018 results for major buildings indicators and for areas with model updates. In addition, presenters highlighted differences as a result of the update to the 2015 *Residential Energy Consumption Survey* (RECS). The presentation for this meeting is available in a separate document.

**Preliminary AEO2019 Results**

Preliminary AEO2019 results for residential and commercial energy consumption by fuel show electricity as the fastest growing energy source for buildings use. Residential use of all fossil fuels declines slightly during the projection period while commercial natural gas use continues to show modest growth.

*Comparison with AEO2018*

End-use fuel prices are generally lower in preliminary AEO2019 results than in AEO2018 projections, especially electricity prices. Preliminary residential prices are about 10% lower and commercial electricity prices are about 8% lower on average than projected in AEO2018 from 2020 through 2050. Commercial floorspace growth in preliminary AEO2019 results is similar to AEO2018 projections. The number of residential households is projected to grow more slowly than in AEO2018, although the RECS update shows more households in 2015 than had been projected in AEO2018 based on the previous 2009 RECS and housing starts.

The differences in sector drivers, combined with updated sector and technology characteristics, lead to faster growth in residential electricity use but slower growth in residential natural gas use relative to AEO2018. Commercial sector electricity and natural gas use show similar growth to that seen in AEO2018 with differences in sector drivers offsetting the effects of updated district service and end-use technology characteristics.

The residential solar photovoltaic (PV) hurdle models used in projecting PV adoption have been updated to include data from 40 states in AEO2019, up from the 5 states used in AEO2018. The expanded data set and lower electricity prices result in slower growth in installed capacity relative to AEO2018. Preliminary AEO2019 results project an increase in commercial PV adoption in the near term relative to AEO2018 based on lower projected installed costs.

*RECS and residential technology updates*

In addition to the change in residential household levels indicated above, macroeconomic housing start trends have been updated for AEO2019. In addition, average household tenure—the amount of time a consumer lives in a home—was increased from seven to nine years. Additional historical data may allow for future breakout of tenure by housing type.

EIA staff highlighted changes in residential end-use consumption from AEO2018 to AEO2019 to depict the effects of updated major end-use equipment technology cost and efficiency projections as well as base-year inputs developed from 2015 RECS data. The changes affected all end uses. Residential refrigeration and freezing, for example, reflect an increased number of efficiency options, as well as updated shares by appliance configuration. Clothes washers were also expanded to reflect the relative shares of top- versus front-loading equipment.

**Discussion**

The discussion that followed the presentation focused on updates to end-use technology cost and performance assumptions and on the update to 2015 RECS estimates.

*End-Use Technology*

A participant asked whether the projected decline in commercial sector air-source heat pump costs was only based on time or on increased adoption. EIA staff clarified that NREL projections included costs in selected years. EIA calculated a compound annual growth rate and applied that to the costs in the contractor report that Navigant completed for EIA.

Participants were also interested in what causes the change from AEO2018 in residential energy consumption for lighting. EIA staff responded that AEO2019 projections include a more rapid switch to LED lighting based on recent historical shipments, an expansion of the definition of what is covered in the lighting standards included in the Energy Independence and Security Act of 2007, and energy efficiency rebates. EIA staff also verified that AEO2019 assumed subsidies for residential LED lighting end in 2020.

*2015 RECS*

A participant inquired about the change in the clothes washer consumption pattern. Buildings team staff pointed to the change in modeling to include both top- and front-loading equipment, the latter of which is increasing in market share and uses more motor energy than the former.

A participant asked if dishwasher consumption includes heating energy as well as motor energy. EIA staff mentioned that appliances typically intake heated water, but they acknowledged that additional heating may depend on the dishwasher model and usage. RECS staff pointed out that previous iterations of RECS had not included any published dishwasher consumption estimates. They also noted that 13% of

homes that have dishwashers installed do not use them, and 25% of homes don't have or don't use dishwashers.

**Attendees**

| **Guests (in person)** | **Affiliation** |
|---|---|
| John Agan | DOE |
| Ben King | DOE |
| Jack Mayernik | NREL |

| Guests (WebEx/phone) | **Affiliation** |
|---|---|
| Austin Brown | UC Davis |
| Torrey Beek | DC Government |
| Matthew Cleaver | Leidos |
| Mike Russo | Synapse |
| Elizabeth Titus | Northeast Energy Efficiency Partnership |
| David White | Synapse |

**EIA Attendees (in person)**
Chip Berry
David Daniels
Greg Lawson
Bill McNary
Ian Mead
Eileen O'Brien
Manussawee Sukunta

***Team Members:***
Erin Boedecker
Meera Fickling
Behjat Hojjati
Kevin Jarzomski

**EIA Attendees (WebEx/phone)**
Danni Mayclin