



Independent Statistics & Analysis

U.S. Energy Information
Administration

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MEMORANDUM FOR: Stephen K. Nalley
Acting Assistant Administrator for Energy Analysis

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

SUBJECT: Summary of AEO2020 Buildings Working Group 1 held on May 23, 2019

This memorandum provides an overview of the presentation given at the first *Annual Energy Outlook 2020* (AEO2020) Buildings Working Group meeting and summarizes discussion. The meeting covered possible AEO2020 updates, including near-term modeling changes and long-term projects that may affect results in subsequent AEOs. The presentation for this meeting is available in a separate document.

AEO2019 debrief

The discussion began with a debrief of AEO2019. The U.S. Energy Information Administration (EIA) staff reminded participants that AEO2019 results included updates to both residential and commercial major end-use equipment cost and performance characteristics, as well as an update of the residential model's base year using *2015 Residential Energy Consumption Survey* (RECS) data.

EIA then shared consumption by sector and fuel and solar photovoltaic (PV) capacity projections in the residential and commercial buildings sectors. One participant asked what EIA assumes regarding PV installation costs in new versus existing construction. EIA staff clarified that PV costs represent national averages and do not differentiate between new and existing construction; however, the models do make assumptions regarding limits on the amount of PV penetration into existing construction because of possible technical constraints.

Another participant asked if EIA has investigated any low-demand scenarios. EIA noted that it is still finalizing side cases for AEO2020, although typical side cases include both High and Low Macroeconomic Activity cases.

A participant asked if the models include explicit net metering assumptions for solar PV. For the residential sector, electricity is sold to the grid at the retail rate, but commercial generation is sold at the wholesale price of electricity.

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AEO2020 model updates

Major updates anticipated for AEO2020 include updating distributed generation (DG) and combined heat and power technology menus based on updated contractor data. AEO2020 will also incorporate residential wood consumption from the 2015 RECS.

Additional model changes for AEO2020 include an updated representation of commercial distributed generation. This effort will use statistical methods to better project DG adoption, updating assumptions and penetration constraints (e.g., rooftop area suitable for PV and new versus existing construction) to fit recent historical data. Commercial sector minor fuel consumption projections will also be revised to use more recent historical prices and consumption data for propane, motor gasoline, residual fuel oil, kerosene, and coal.

New future federal energy efficiency standards, including those related to portable air conditioners, uninterruptible power supplies, and commercial boilers, remain uncertain. These new standards have not been published in the *Federal Register*. If these new standards are promulgated before the Reference case is finalized, AEO2020 will reflect the new specifications as they affect major end-use equipment and miscellaneous electric loads. Based on the U.S. Department of Energy's (DOE) recently released spring regulatory agenda, no additional standards are likely to be finalized during AEO2020 production. Any new ENERGY STAR® specifications will be incorporated. EIA is also tracking the status of a Notice of Proposed Rulemaking to roll back the January 2017 expanded definition of general service lamps and general service incandescent lamps. The definition change will be incorporated if finalized during AEO2020 production.

AEO2020 will also include updates to historical data on sectoral energy consumption, weather, new heating equipment shares, and utility energy efficiency incentives.

Medium-term research

Two medium-term contractor tasks are under development. The first contractor report will investigate the impacts of low-income energy efficiency and weatherization projects, including utility, state, regional, or federal incentives, on residential energy consumption. In addition, model inputs will be developed to project the effects of both low-income and non-low-income weatherization of homes.

The second contractor report will characterize whole-building sensor and control technologies. These technologies include lighting and heating, cooling, and ventilation controls; wired and wireless sensors and sensor networks; building energy management systems software; automated fault detection and diagnosis; and whole-building sub-metering.

Some of the efforts involving these tasks may be incorporated into AEO2020 as time and data availability permit; otherwise, these reports will be used in future AEO cycles. Final reports should be available and posted to the web in the fall of 2019.

Long-term research

The EIA Buildings Analysis Team is currently conducting research that may affect the results of AEOs subsequent to this release. EIA currently plans to investigate how battery storage technologies for buildings—included in the ongoing DG report—could be modeled within the National Energy Modeling System (NEMS).

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EIA also currently plans to research alternative rate policies for distributed generation electricity (i.e., retail versus wholesale rate for sales back to the grid).

Discussion

The RECS survey manager provided a brief overview of the 2020 RECS and noted that a webinar on the upcoming survey will take place in July 2019.

EIA reminded attendees that they could access AEO data via an online [data table browser](#) that can display customized year ranges and generate comparison graphs. EIA's [Application Programming Interface \(API\)](#) add-on tools for Microsoft Excel and Google Sheets can also be used to analyze various EIA product and survey data.

An attendee asked if EIA is considering modeling time-of-use (TOU) electricity rates. EIA staff discussed investigating the interactions between supply and demand modules of NEMS and how to account for wholesale, retail, or blended electricity rates. The demand modules are annual and therefore do not have daily load shapes, while the supply modules do account for some seasonality/greater time granularity.

A participant asked how EIA is using Stanford University's *DeepSolar* data (specifically whether satellite-imaging timestamps are used). Imaging timestamps are not explicitly used in EIA's econometric hurdle models for residential PV adoption.

Regarding historical residential equipment market shares, one participant asked if only space heating equipment is benchmarked annually or if other end uses are adjusted as well. Because the residential model makes space *cooling* decisions based on space heating equipment choices, EIA has focused on the space heating end use, aligning with Characteristics of New Housing data from the U.S. Census Bureau's [Survey of Construction](#).

Following a question about EIA's treatment of fuel-switching activities in New England, staff noted that the NEMS residential and commercial demand modules operate at the U.S. census division level rather than state level although EIA is keeping an eye on electrification trends in general.

When asked what side cases would be included for AEO2020, EIA mentioned the typical side cases included with each release: Reference, High/Low Economic Growth, High/Low oil price, and High/Low Oil and Gas Resource and Technology. In addition, EIA will include High/Low Renewables Cost cases for AEO2020.

Onsite attendees

Name	Affiliation
Jared Langevin	Lawrence Berkeley National Laboratory (LBNL)
Jack Mayernik	National Renewable Energy Laboratory (NREL)
John Agan	U.S. Department of Energy
Amir Roth	U.S. Department of Energy
Frances Wood	OnLocation

Remote attendees (Webex/phone)

Name	Affiliation
Alan Zhong	Citadel LLC
Brenna Walraven	CSS Strategies
Alex Fisher	DC Department of Energy & Environment
Anthony Grillo	Hydro-Quebec
Eric Fox	Itron
Mike Russo	Itron
Oleg Moskatov	Itron
Matt Cleaver	Leidos
Pete Kobylarek	Leidos
Paritosh Das	National Renewable Energy Laboratory (NREL)
Elizabeth Titus	Northeast Energy Efficiency Partnerships (NEEP)
Glen Salas	SMS Results
Rachel Goldstein	Solar Energy Industry Association (SEIA)
David White	Synapse Energy
Austin Brown	UC Davis
Eric Mackres	World Resources Institute
Jennifer Layke	World Resources Institute

EIA onsite attendees

Chip Berry
Angelina LaRose
Greg Lawson
Bill McNary
Ian Mead
Joelle Michaels
Jennifer Palguta
Manussawee Sukunta
Terry Yen

Team Members

Erin Boedecker
Meera Fickling
Behjat Hojjati
Kevin Jarzomski
Courtney Sourmehi (contractor)
Bailey Weinstein (intern)

EIA remote attendees (Webex/phone)

David Daniels
Tyler Hodge
Eileen O'Brien
Kelly Perl