



Independent Statistics & Analysis

U.S. Energy Information  
Administration

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MEMORANDUM FOR: Angelina LaRose  
Assistant Administrator for Energy Analysis

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

SUBJECT: Summary of AEO2021 Buildings Working Group held on  
September 10, 2020

This memorandum provides an overview of the presentation given at the *Annual Energy Outlook 2021* (AEO2021) Buildings Working Group meeting and summarizes the discussion. The meeting covered preliminary AEO2021 Reference case results compared with AEO2020 Reference case results. It also highlighted the major modeling and data updates incorporated in the AEO2021. The presentation for this meeting is available in a separate document.

#### **Debrief of AEO2020 results**

The meeting began with a high-level overview and debrief of AEO2020 results. EIA presenters described updates on residential and commercial cost and performance characteristics for distributed generation and combined heat and power (CHP) systems for AEO2020. They also described a modeling revision to commercial distributed generation using Bass diffusion parameters. In addition, AEO2020 incorporated a rollback of a January 2017 revision to the definition of general service lighting (GSL) under the Energy Independence and Security Act of 2007 (EISA2007).

EIA then presented AEO2020 Reference case residential sector energy consumption, showing an upward consumption trend for electricity and a downward consumption trend for natural gas, liquids, and other fuels. AEO2020 projected that commercial sector electricity and natural gas consumption would increase through 2050, whereas liquids and other fuels remained flat.

## Overview of preliminary AEO2021 results

EIA began its overview of AEO2021 results with the anticipated impacts of the COVID-19 pandemic. AEO2021 reflects updated macroeconomic projections from IHS Markit, including lower housing starts and commercial floorspace relative to AEO2020. AEO2021 also reflects the short-term impacts of COVID-19 and its mitigation efforts as forecast in EIA's *Short-Term Energy Outlook*, including lower building energy consumption in 2020. EIA's [Annual Energy Outlook Trends and Expectations](#) report discusses some of the early impacts of COVID-19 on different energy sectors.

Several major model updates differentiate AEO2021 from previous years. Starting with AEO2021, EIA will not deduct distributed generation consumed onsite from electricity consumption for specific end uses. Instead, AEO2021 will deduct distributed generation from aggregate sectoral electricity consumption only, allowing stakeholders to make their own assumptions about how onsite generation affects end-use consumption. Previous AEOs deducted distributed solar PV generation from electricity consumed by residential and commercial space cooling, commercial ventilation, commercial lighting, and residential and commercial other uses based on the overlap between the time of day buildings were expected to require those end uses and the time of day PV generation was expected to occur. EIA also deducted distributed generation from wind and CHP based on end use shares of electricity consumption.

During its presentation of the change in distributed generation reporting, EIA polled participants to find out whether they preferred the term *purchased electricity* or *delivered electricity* to represent electricity delivered at the meter. Of the participants, 40% preferred *delivered electricity*, while 28% preferred *purchased electricity*, and 32% did not respond.

In a subsequent slide, EIA presented the results of two model changes: an updated representation of commercial building codes and a new representation of increased adoption of sensor and control technologies over time. Combined, these two updates result in lower energy consumption for space heating and higher consumption for space cooling in the commercial sector by 2050.

Based on recent historical housing stock and housing starts, AEO2021 projects that mobile homes will be removed from stock less quickly than previously projected. In 2015, mobile homes accounted for 5.7% of occupied housing units. The preliminary AEO2021 Reference case projects that the mobile home share of occupied housing units will be 4.2% in 2050, compared with 3% in the AEO2020 Reference case.

AEO2021 incorporates updated installed cost projections for residential and commercial distributed solar PV, leading to greater projected capacity. Installed cost declines for distributed PV in the AEO are based on the National Renewable Energy Laboratory's (NREL) *Annual Technology Baseline (ATB)*. NREL revised their methodology in the 2020 ATB to adopt a techno-economic approach, leading to greater reductions in residential and commercial PV costs by 2050 than in previous projections. For AEO2021, EIA averaged the 2020 ATB Conservative and Moderate cases to develop installed cost path assumptions.

The preliminary AEO2021 projections incorporate one major regulatory change from AEO2020: the elimination of the EISA2007 GSL backstop standard for 2020, which would have increased the minimum

efficiency for GSL bulbs to 45 lumens per watt. The U.S. Department of Energy (DOE) promulgated the final rule eliminating the backstop in December 2019.

Upcoming medium- and long-term projects include updated base-year and projected miscellaneous electric load equipment stocks and energy consumption; an updated characterization of residential and commercial lighting, commercial refrigeration, and commercial ventilation technologies; and potential modeling of thermal and battery storage technologies in buildings.

## **Discussion**

A participant asked whether efficiency of mobile homes was less than other residences. EIA staff confirmed this was the case on average. Mobile homes and multifamily housing units both have higher energy intensity than single-family homes.

A participant asked about the rate of solar PV installed cost declines over time. EIA confirmed that declines were steeper at the beginning of the projection period, declining less rapidly toward the end.

EIA confirmed that its forthcoming analysis of storage technologies would include thermal storage.

A participant asked for more detail on EIA's commercial building code assumptions. EIA staff clarified that building code assumptions were sourced from a 2018 contractor report, which based near-term evolution of building codes on DOE research and development goals for 2030. Later building code improvements were extrapolated based on projected near-term trends.

EIA provided more information about the building sensors and controls report to a participant who was interested in learning how the Commercial Demand Module accounts for the effects of building energy management systems on consumption projections.

EIA staff provided more detail on LED market shares for lamps removed from the EISA backstop standard to an audience member following the session.

A participant asked about whether EIA breaks out electric vehicle charging loads by building sector; EIA referred the participant to the Transportation Energy Efficiency and Consumption Analysis Team, which models vehicle electricity consumption in the transportation sector.

A participant requested information about EIA's data tools at [eia.gov](http://eia.gov). EIA followed up after the session to provide additional information.

## Attendees

<b>Name</b>	<b>Affiliation</b>
Arthur Yip	NREL
Bob Hershey	consultant
Mike Russo	Itron
Jack Mayernik	NREL
Michael Leitman	National Rural Electric Cooperative Association
Alexander Maki	DOE
Eric Fox	Itron
Chioke Harris	NREL
Glen Salas	SMS
Rory Gahagan	Institute for Market Transformation
Peter Kobylarek	Leidos
Marina Sofos	DOE Building Technologies Office
John Cymbalsky	DOE Building Technologies Office
Kurt Roth	Fraunhofer
Chris Bolduc	LBNL
Alan Cooke	PNNL
Yuting Chen	LBNL
Konica Mulani	OnLocation
Amir Roth	DOE Building Technologies Office
Carolyn Sarno Goldthwaite	Northeast Energy Efficiency Partnerships
Andy Winslow	Northeast Energy Efficiency Partnerships
Janet Reyna	NREL
Jared Langevin	LBNL
Frances Wood	OnLocation
Elizabeth McNamee	DOE
Austin Lannes Brown	University of California, Davis

## EIA staff attendees

Erin Boedecker  
Meera Fickling  
Behjat Hojjati  
Kevin Jarzowski  
Courtney Sourmehi  
Nicholas Skarzynski  
Jay Olsen  
Peter Gross  
Tyler Hodge  
Thomas Leckey  
Fred Mayes

Manussawee Sukunta  
Greg Lawson  
Perry Lindstrom  
Jim Diefenderfer  
Edward Thomas  
Richard Bowers  
Ruey-Pyng Lu  
Joelle Michaels  
William McNary  
Edward Thomas  
Ian Mead  
Laura Martin  
James Turnure  
Kenneth Dubin  
Andri Rizhakov  
Kevin Nakolan  
Kelly Perl  
Stacy Angel

