

Buildings Working Group Meeting

AEO2021 debrief and AEO2022 updates



Office of Energy Consumption and Efficiency Analysis

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By

Buildings Energy Consumption and Efficiency Modeling Group

Overview

- AEO2021 debrief
 - COVID-19
 - Major model updates
- AEO2022
 - Major model updates
 - Policy assumptions
 - Historical updates
 - Upcoming projects
- Upcoming projects
- Discussion

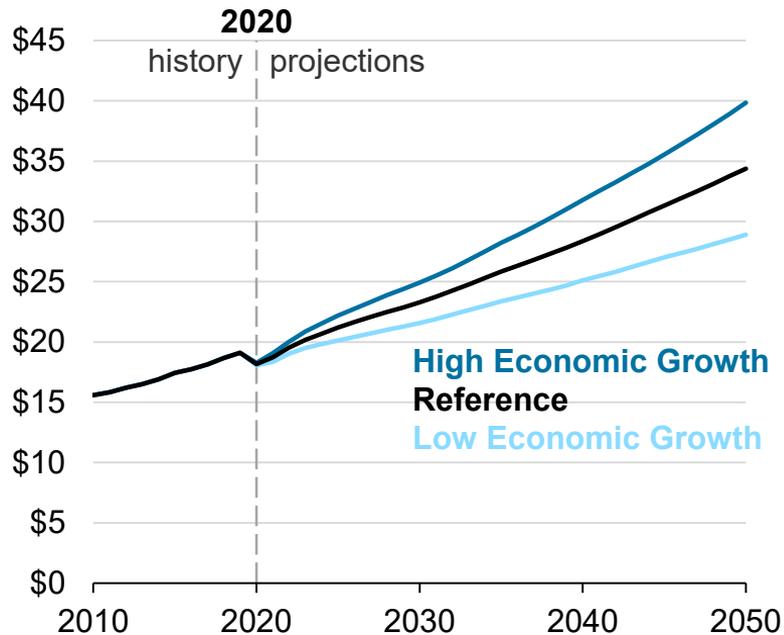
AEO2021 Debrief

AEO2021 and COVID-19

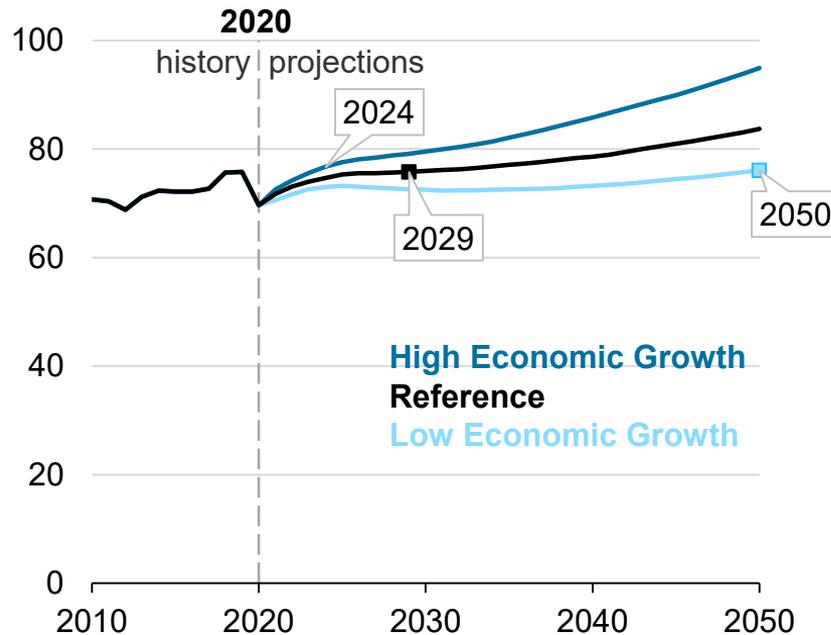
- The *Annual Energy Outlook 2021* (AEO2021) reflects macroeconomic projections from IHS Markit (including housing starts and commercial floorspace builds).
- The forecasts in the *Short-Term Energy Outlook* (STEO) reflect the near-term impacts of the pandemic and subsequent mitigation efforts.
- We released an [Annual Energy Outlook Trends and Expectations](#) report that discusses some of the early impacts of responses to COVID-19 on different energy sectors.

The pace of economic growth directly affects energy consumption's return to 2019 levels

U.S. GDP assumptions
AEO2021 economic growth cases
 trillion 2012 dollars



U.S. delivered energy across end-use sectors
AEO2021 economic growth cases
 quadrillion British thermal units

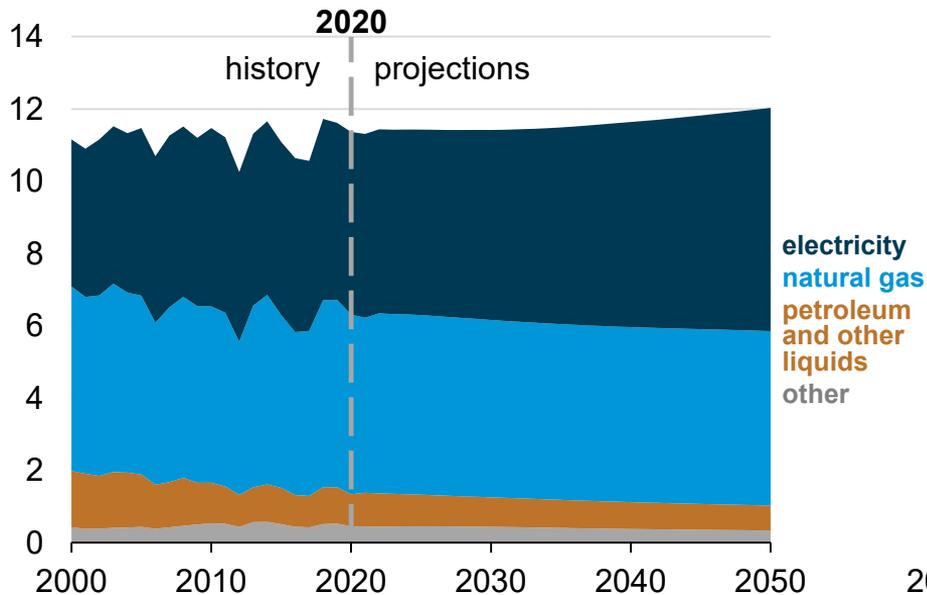


AEO2021 major model updates

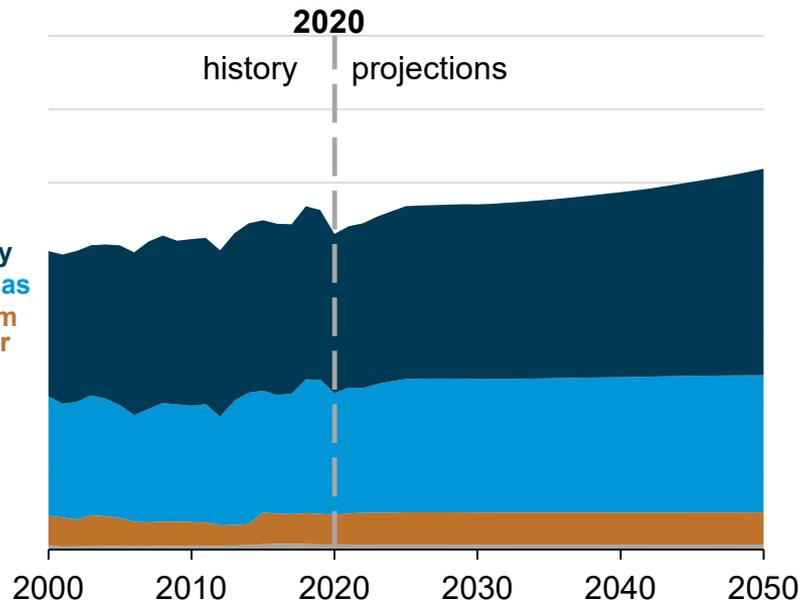
- Revise reporting of residential and commercial end-use electricity consumption and distributed generation
- Update representation of building codes as well as sensors and controls in the Commercial Demand Module
- Revise residential housing decay rate using latest housing start and stock data from the Macroeconomic Activity Module and IHS Markit
- Develop new solar photovoltaic cost estimates based on the National Renewable Energy Laboratory's latest *Annual Technology Baseline*
- Update representation of LED lighting and eliminate the backstop lighting standard set by the Energy Independence and Security Act (EISA) of 2002

Residential and commercial energy consumption grows slowly in the AEO2021 Reference case

Residential sector delivered energy consumption
AEO2021 Reference case
quadrillion British thermal units



Commercial sector delivered energy consumption
AEO2021 Reference case
quadrillion British thermal units

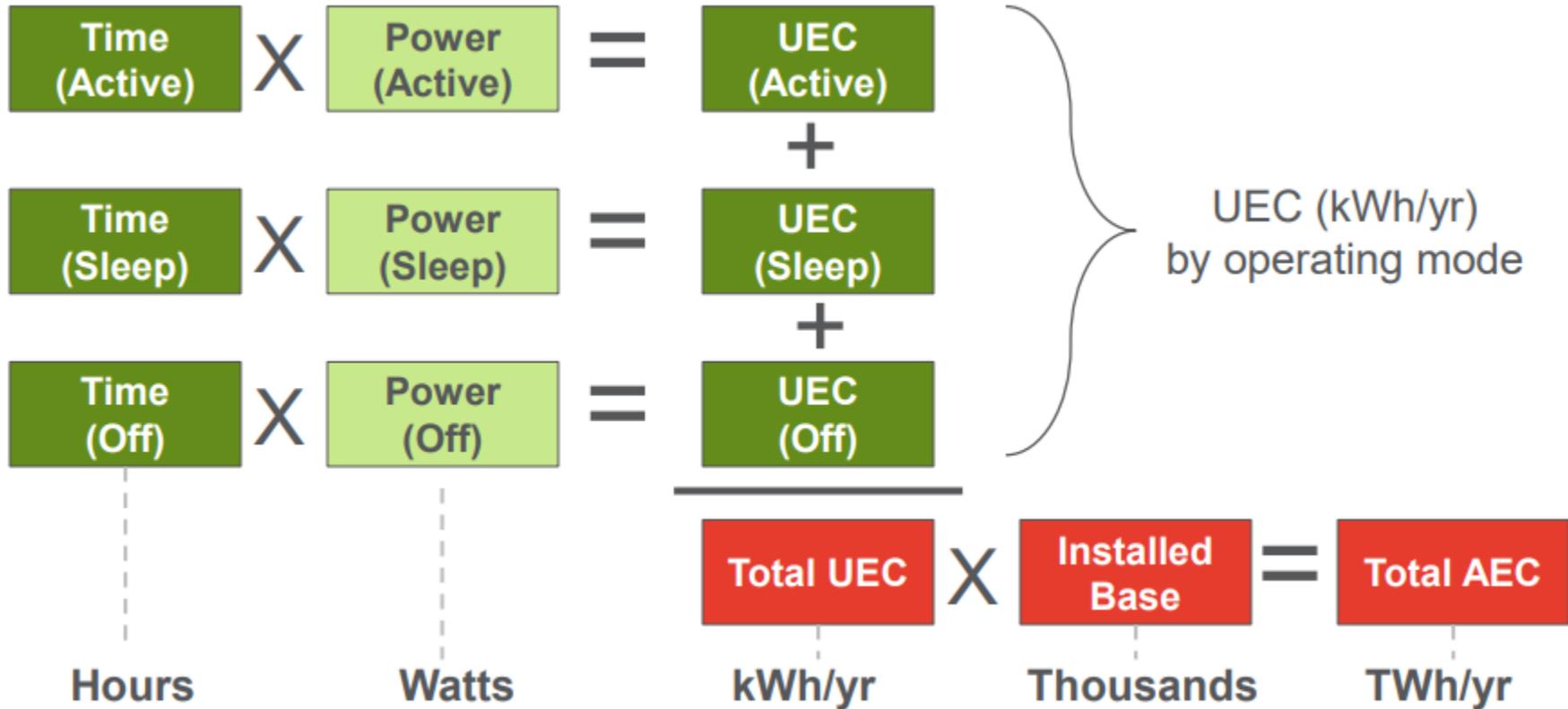


AEO2022 (and beyond)

AEO2022 major model updates

- Update miscellaneous electric loads (MELs)
 - Based on [Analysis and Representation of Miscellaneous Electric Loads in NEMS](#) report
 - Add new end uses and improve modeling to make it easier to add end uses in the future
- Endogenize calculation of residential housing decay rates
 - More dynamic across AEO side cases (for example, High Economic Growth and Low Economic Growth cases) that vary levels of macroeconomic activity in AEO projections
- Develop new solar photovoltaic cost estimates based on Lawrence Berkeley National Laboratory's latest *Distributed Solar Data Update* (formerly *Tracking the Sun*).

MELs data are derived from bottom-up analysis of usage in different modes and number of devices



Residential MELs

- Audio equipment
 - Ceiling fans
 - Coffee makers
 - Dehumidifiers
 - Desktop pcs
 - Laptop pcs
 - Monitors
 - Microwaves
 - Miscellaneous refrigeration products
 - Network equipment
 - Non-pc rechargeable electronics
 - Pool heaters
 - Pool pumps
 - Portable electric spas
 - Residential security systems
 - Set-top boxes
 - Over-the-top streaming devices
 - Small kitchen appliances*
 - Smart speakers*
 - Smartphones
 - Tablets
 - Televisions
 - Video game consoles
- existing end use
disaggregated end use
new end use/ not in 2013 report
* *not currently modeled*

Commercial MELs

- Data center servers
- Desktop pcs
- Laptop pcs
- Monitors
- Distribution transformers
- Elevators
- IT equipment
- Kitchen ventilation
- Laboratory fume hoods
- Laboratory refrigerators/freezers
- Medical imaging equipment
- Point-of-sale (POS) machines*
- Security systems
- Televisions
- Video displays
- Warehouse robots*
- Wastewater treatment
- Water supply and purification

existing end use

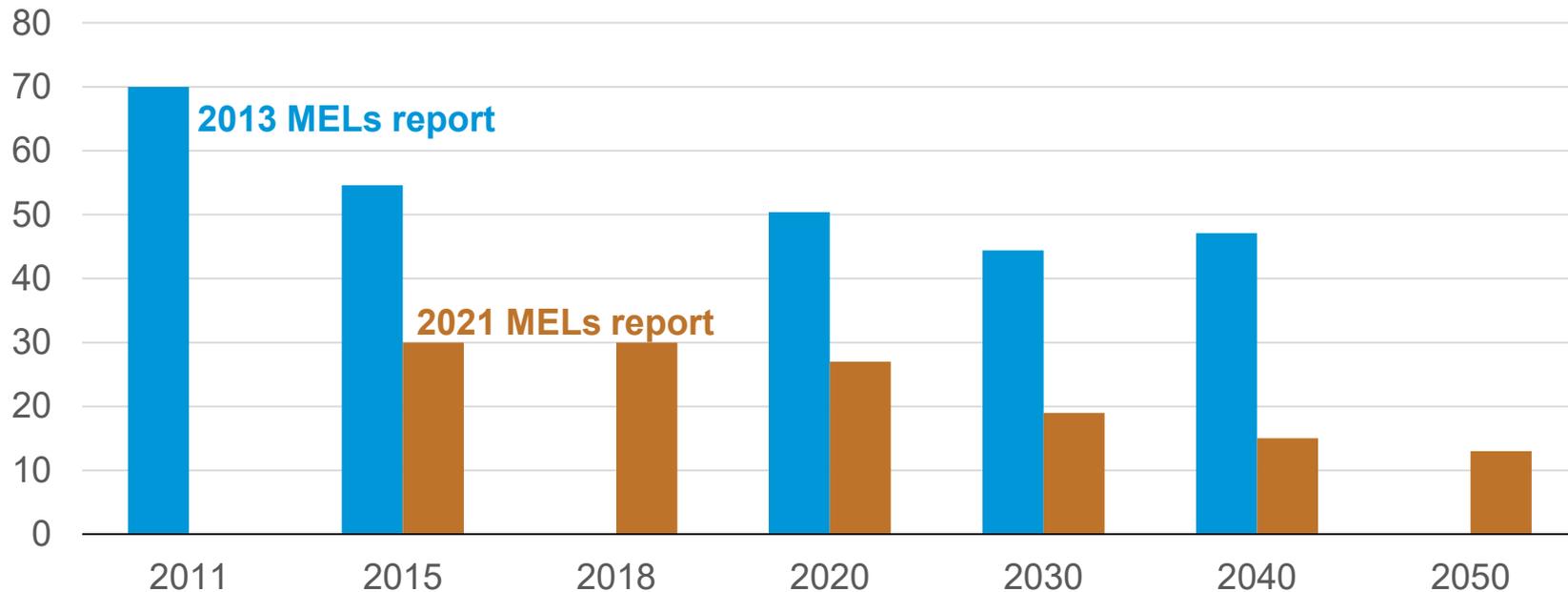
disaggregated end use

new end use/ not in 2013 report

** not currently modeled*

The new report projects television energy consumption to be lower based on higher adoption of efficient LCD sets despite increasing average screen size

annual energy consumption
terawatt-hours per year



AEO2022 policy assumptions

- Incorporate new federal rulemakings if and when finalized
- Identify any new ENERGY STAR specifications for major end-use equipment and MELs
- Incorporate extended federal energy efficiency rebates and renewables tax credits (such as those from the Consolidated Appropriations Act, 2021)

AEO2022 historical updates

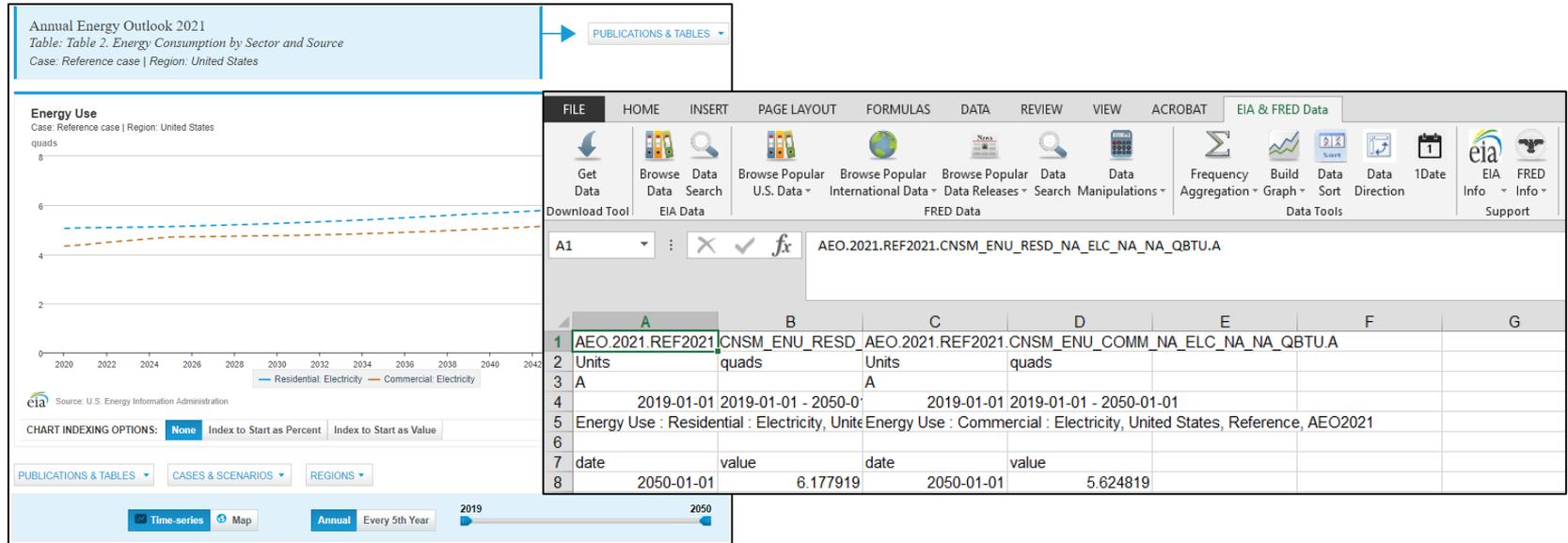
- Update sectoral energy consumption by fuel
 - *State Energy Data System (SEDS) / Monthly Energy Review (MER)*
 - *Short-Term Energy Outlook (STEO)*
- Continue to refine historical (and projected) impacts of utility energy efficiency incentives
- Include the National Oceanic and Atmospheric Administration's (NOAA) updated weather data and forecast
 - NOAA is releasing revised 30-year (1991–2020) average weather normals and incorporating data from the 2020 Census
- Calibrate new residential heating equipment shares and average household square footage based on U.S. Census Bureau data

Upcoming projects

- Update characterization of residential and commercial lighting, commercial refrigeration, and commercial ventilation technologies
- Investigate modeling of storage technologies for buildings
- Identify ways in which we can use the residential and commercial models to analyze various types of buildings-related electrification

Interactive graphs and data

- [Online data table browser](#)
- [Application Programming Interface \(API\)](#)



Buildings-related reports

- [Updated Buildings Sector Appliance and Equipment Costs and Efficiency](#)
- [Analysis and Representation of Miscellaneous Electric Loads \(MELs\) in NEMS](#)
- [Distributed Generation System Characteristics and Costs in the Buildings Sector](#)
- [Modeling Distributed Generation in the Buildings Sectors](#)
- [Price Elasticities for Energy Use in Buildings of the United States](#)
- [Trends in Commercial Whole-Building Sensors and Controls](#)
- [Development of Commercial Building Shell Heating and Cooling Load Factors](#)
- [Residential and Commercial sector Energy Code Adoption and Compliance Rates](#)

For more buildings information

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EIA is hiring! www.eia.gov/about/careers/

For more information

U.S. Energy Information Administration homepage | www.eia.gov

Buildings Working Group materials | www.eia.gov/outlooks/aeo/workinggroup/buildings

Today in Energy | www.eia.gov/todayinenergy

Annual Energy Outlook | www.eia.gov/aeo

Short-Term Energy Outlook | www.eia.gov/steo

State Energy Data System | www.eia.gov/state/seds

Monthly Energy Review | www.eia.gov/mer

Residential Energy Consumption Survey | www.eia.gov/consumption/residential

Commercial Building Energy Consumption Survey | www.eia.gov/consumption/commercial

International Energy Portal | www.eia.gov/international

Questions or comments