

Buildings Working Group Meeting

AEO2018 Model Updates



Office of Energy Consumption and Efficiency Analysis

August 3, 2017 | Washington, DC

By

Buildings Energy Analysis Team

Overview

- AEO release: this year versus last
- Major model updates
- Policy assumptions
- Historical updates
- Discussion

AEO2018 will include a full suite of side cases

- Unlike AEO2017, which included a limited number of side cases, AEO2018 will include additional side cases beyond the standard set
 - Reference (existing law and policy)
 - High/low oil and gas resource and technology
 - High/low oil price
 - High/low economic growth
 - other potential side cases:
 - Extended Policies
 - Energy Storage (excluding buildings)
 - with or without Clean Power Plan (opposite of Reference case)
- AEO2018 will highlight results through 2050

Major model updates

- Major end-use technology menus
 - residential and commercial space heating and cooling, water heating, residential appliances (pending contractor report)
 - LED pricing trends
- Residential and commercial building shells
 - commercial median building age and shape parameters for retirement function; building shell efficiency of new construction relative to existing stock
 - residential shell menu costs and heating/ cooling indices
- Commercial Miscellaneous Electric Loads
 - Telecommunication Equipment: Traditional PBX, Voice-over-IP, Cellular and PCS Networks, Information and Communication Technology Networks
 - Office Equipment: Copiers, Scanners, Multifunction Devices, Fax Machines, Shredders, and Uninterruptible Power Supplies (UPS)

Major model updates (continued)

- Distributed Generation (DG)
 - update contagion effect for residential PV, which uses a ZIP code-level econometric penetration model
 - update sub-Census division niches for commercial DG modeling using CBECS data
 - update regional representation of interconnection limitations/ DG policies affecting DG adoption
 - update historical PV system costs and installed capacities
 - investigating use of EIA-861 historical solar capacity data; however, data doesn't go all the way back through beginning of model projections
 - investigate the impacts of high levels of DG (and in particular PV generation) on electric utility rate structures; examine of how utilities may expect to recover fixed costs, taking into account a reduction in sales along with constant (or increasing) requirements to maintain reliable electricity service

Policy assumptions

- Incorporate federal equipment standard rulemakings finalized since last AEO:
 - commercial pre-rinse spray valves
 - pool pumps & ceiling fans
 - commercial walk-in coolers and freezers
 - *standards for portable air conditioners, uninterruptible power supplies, and commercial boilers were finalized at the end of 2016, but the current administration is revisiting them because final rules must be available for public review for at least 45 days before DOE can send them for official publication in the Federal Register.*
- Identify new ENERGY STAR specifications as they affect major end-use equipment and miscellaneous electric loads (MELs)
- Investigate effects of building code compliance levels on building shell efficiency

Policy assumptions – Clean Power Plan (CPP)

- Modeling of major end-use equipment and residential shell rebates by Census division to represent utility programs
 - CPP rebates at the end-use technology level range from 10%-15% of the installed cost of energy efficient equipment; timing varies by Census division
 - model calculates efficiency program administration costs and savings relative to baseline case – values are available for electricity sector to use in compliance/ price calculations
 - inputs include capability to represent regional incentives for renewable distributed generation and combined heat and power technologies; no added incentives planned for AEO2018

Policy assumptions – California's Assembly Bill 32

- Doubling California's energy efficiency goals
 - in 2016, California passed SB 32, which codifies a 2030 GHG emissions reduction target of 40 percent below 1990 levels
 - modeling double Clean Power Plan rebates for Census division 9 and attributing all of the savings towards California

Clean Power Plan energy efficiency rebates vary by end use

percent of installed cost as subsidy for high efficiency equipment

	New England	Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific	Pacific including California SB32 (commercial)
Space heating	10% in 2020 15% in 2022	10% in 2020 15% in 2022	10% in 2020 15% in 2022	10% in 2020 15% in 2022	10% in 2020 15% in 2022	10% in 2020 15% in 2022	10% in 2020 15% in 2022	10% in 2020 15% in 2022	10% in 2018 15% in 2022	20% in 2018 30% in 2022
Space cooling	10% in 2020 15% in 2022	10% in 2020 15% in 2022	10% in 2020 15% in 2022	10% in 2020 15% in 2022	10% in 2020 15% in 2022	10% in 2020 15% in 2022	10% in 2020 15% in 2022	10% in 2020 15% in 2022	10% in 2018 15% in 2022	20% in 2018 30% in 2022
Water heating	15% in 2022	15% in 2022	15% in 2025	15% in 2025	15% in 2025	15% in 2025	15% in 2025	15% in 2022	15% in 2022	30% in 2018
Ventilation	10% in 2022 15% in 2025	10% in 2022 15% in 2025	10% in 2022 15% in 2025	10% in 2022 15% in 2025	10% in 2022 15% in 2025	10% in 2022 15% in 2025	10% in 2022 15% in 2025	10% in 2022 15% in 2025	10% in 2022 15% in 2025	20% in 2022 30% in 2025
Lighting	10% in 2020 15% in 2022	10% in 2020 15% in 2022	10% in 2020 15% in 2022	10% in 2020 15% in 2022	10% in 2020 15% in 2022	10% in 2020 15% in 2022	10% in 2020 15% in 2022	10% in 2020 15% in 2022	10% in 2020 15% in 2022	20% in 2020 30% in 2022
Refrigeration	10% in 2022 15% in 2025	10% in 2022 15% in 2025	10% in 2022 15% in 2025	10% in 2022 15% in 2025	10% in 2022 15% in 2025	10% in 2022 15% in 2025	10% in 2022 15% in 2025	10% in 2022 15% in 2025	10% in 2022 15% in 2025	20% in 2022 30% in 2025
Building envelope (Residential)	15% in 2020	15% in 2020	15% in 2025	15% in 2025	15% in 2025	15% in 2025	15% in 2025	15% in 2020	15% in 2020	30% in 2020
Level of efficiency activity	active	active	startup	startup	startup	startup	startup	active	active	active

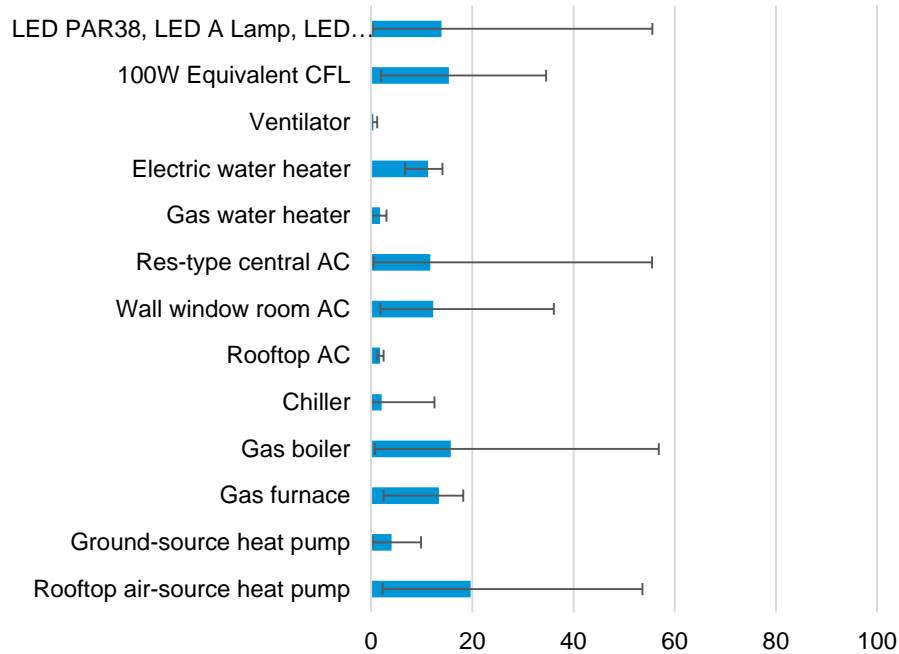
Note: Some subsidies allowed to start in 2020 to account for potential early investments in support of the Clean Energy Incentive Program

Historical utility energy efficiency

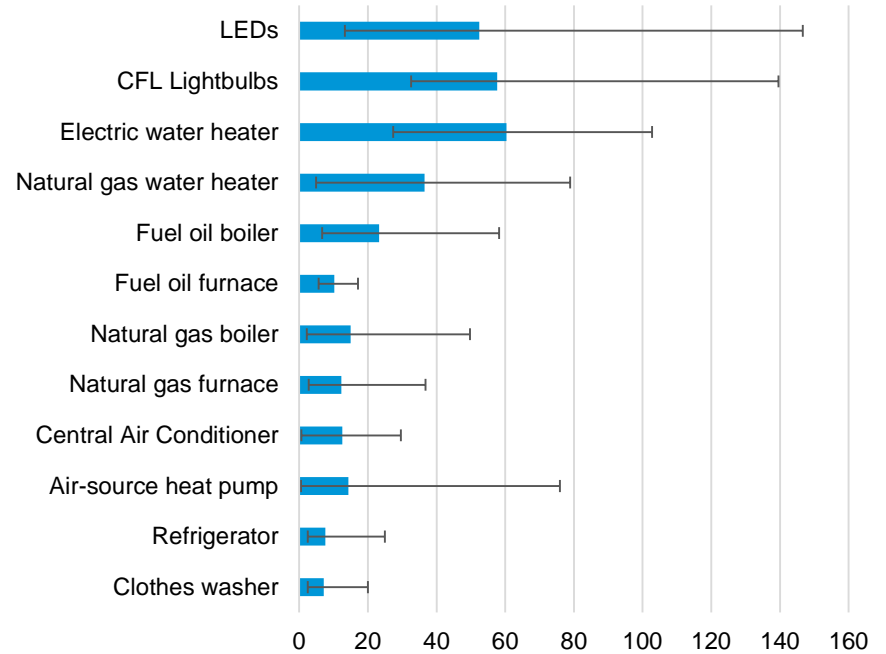
- Utility energy efficiency in AEO2017
 - AEO2017 incorporated existing “investment portfolios” of utility energy efficiency programs for specific end-use technologies into NEMS. Rebates were adjusted by region and applied alongside existing and anticipated federal rebates.
 - consumer choice parameters were adjusted to match projected consumption to levels that had been estimated without the rebates.
- Anticipated AEO2018 updates
 - benchmark total modeled residential and commercial utility program spending to latest available data from EIA-861 survey
 - refine rebate levels for individual end uses to reflect available information on energy efficiency program spending by end use
 - refine commercial hurdle rates by end use

Historical Utility Energy Efficiency Update

Average Rebate: Commercial (%)



Average Rebate: Residential (%)



Source: ICF, 2016; ENERGY STAR, 2014 (for residential lighting)

Other historical updates

- Sectoral energy consumption by fuel
 - Monthly Energy Review (MER)
 - Short-Term Energy Outlook (STEO)
- NOAA weather data and forecast

For more buildings information

Kevin Jarzomski | phone: 202-586-3208
| email: kevin.jarzomski@eia.gov

David Peterson | phone: 202-586-5084
| email: david.peterson@eia.gov

Behjat Hojjati | phone: 202-586-1068
| email: behjat.hojjati@eia.gov

Meera Fickling | phone: 202-586-0765
| email: meera.fickling@eia.gov

Kimberly Klaiman | phone: 202-586-1678
| email: kimberly.klaiman@eia.gov

Erin Boedecker | phone: 202-586-4791
Team Lead | email: erin.boedecker@eia.gov

For more information

U.S. Energy Information Administration home page | www.eia.gov

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 | <http://www.eia.gov/state/seds/>

International Energy Portal | <http://www.eia.gov/beta/international/>

Monthly Energy Review | www.eia.gov/mer

Residential Energy Consumption Survey | <http://www.eia.gov/consumption/residential/>

Commercial Building Energy Consumption Survey | <http://www.eia.gov/consumption/commercial/>

Bonus Slides

Policy assumptions – regulations

- Federal equipment standards
 - all federal equipment efficiency standards that are currently “on the books”
- Building codes
 - states assumed to meet goals defined in ARRA, then continue trends in code adoption
 - residential: IECC 2009 or better by 2017
 - commercial: ASHRAE 90.1-2007 or better by 2016; ASHRAE 90.1-2013 or better by 2024 (near-term adoption rate may be adjusted for AEO2017 based on updated information)

Policy assumptions – tax credits

- Tax credits
 - includes American Taxpayer Relief Act of 2012 enacted January 2013
 - residential equipment/ envelope credits included for 2012 and 2013
 - 2016 expiration of investment tax credit for small wind, fuel cells, geothermal heat pumps,
 - EPACT 2005, EIEA: 30% of cost with no upper limit (except fuel cells)
 - 2016 expiration of investment tax credit for microturbines, CHP
 - EPACT 2005 (microturbines only), EIEA : 10% of installed cost
 - Consolidated Appropriations Act, 2016
 - phased expiration of solar investment tax credit
 - 30% through 2019; 26% for installations in 2020; 22% for installations in 2021; no residential tax credit and 10% commercial tax credit in 2022 and beyond