Halfway There:
Energy Efficiency Can Cut Energy Use and Greenhouse Gas Emissions in Half by 2050

Steven Nadel, Executive Director

September 18, 2019

ACEEE
American Council for an Energy-Efficient Economy

- Non-profit research organization
- Founded in 1980
- 58 staff and US $10 million/year budget
- Act as a catalyst to advance energy efficiency policies, programs, technologies, investments, & behaviors
- Funding comes from foundations, government agencies, contracts, conferences and corporate memberships

aceee.org @ACEEEdc

ACEEE
American Council for an Energy-Efficient Economy

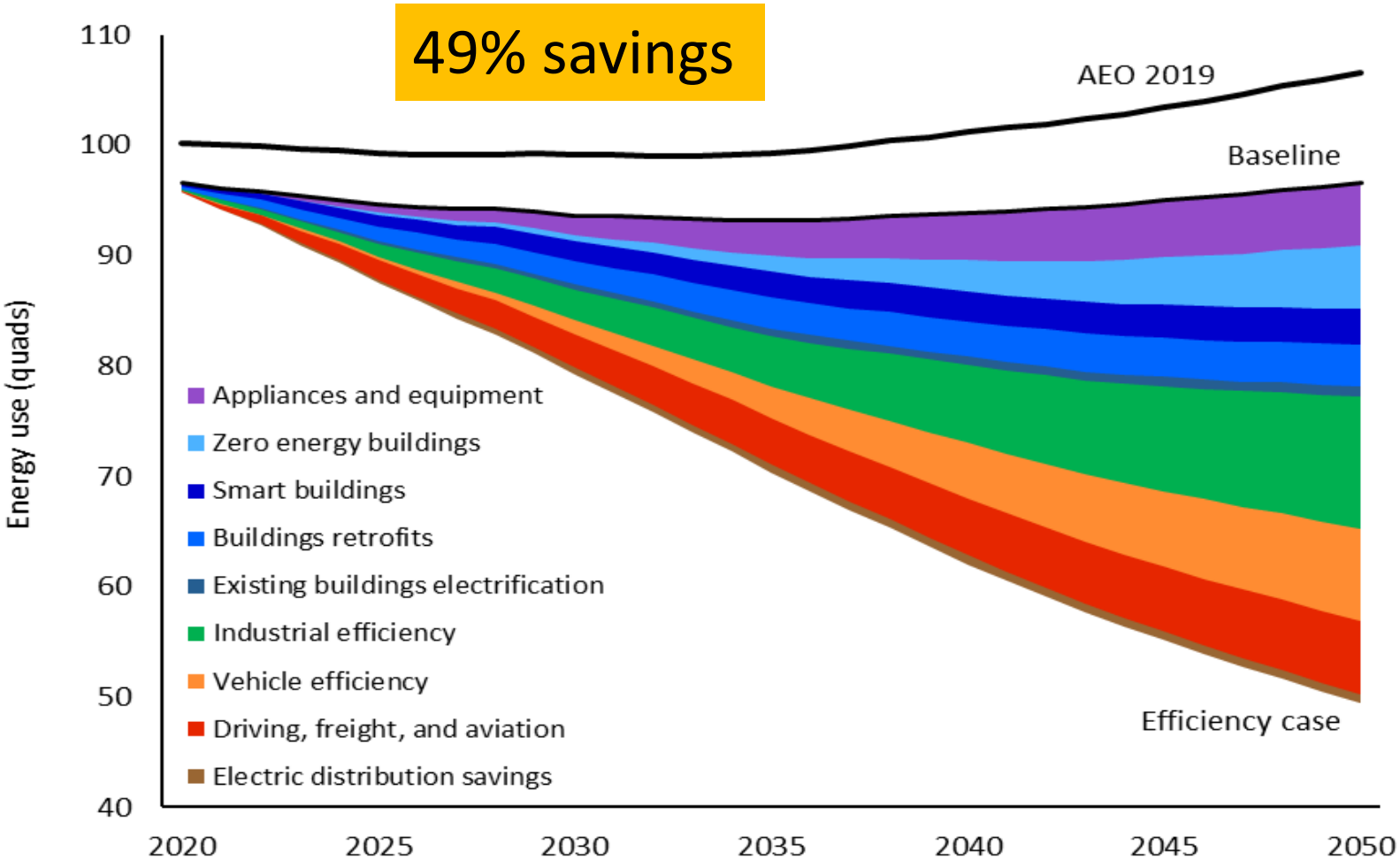
Methodology

- Used EIA's 2019 Annual Energy Outlook as a foundation
- Adjusted baseline for more generation from renewables and less from coal based on projections from Bloomberg and others
- Modeled 11 different energy efficiency measures and 11 different efficiency policies
  - **Likely to be cost-effective**

Measures in the Analysis

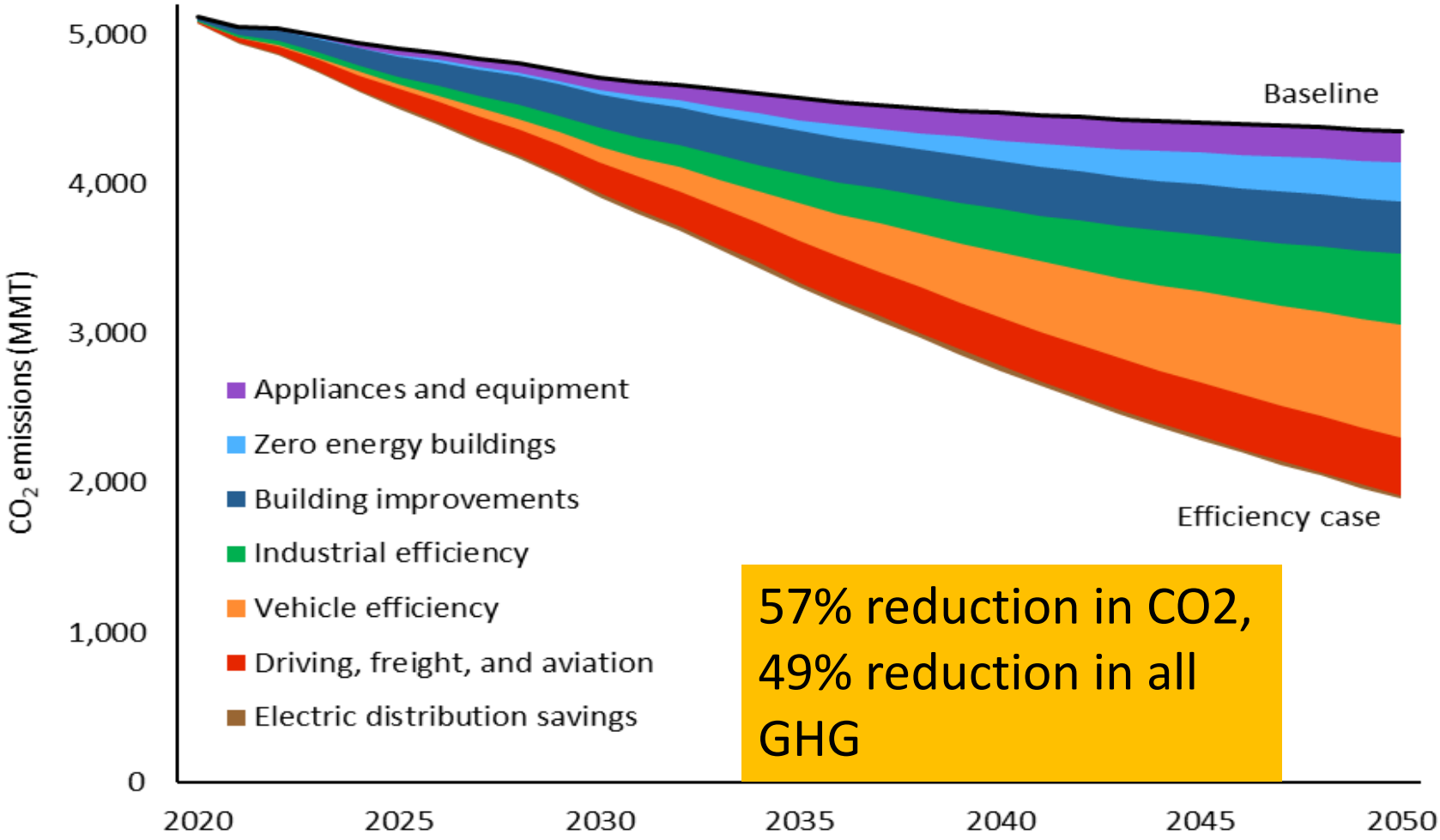
Opportunity analysis	Policy analysis
Appliance and equipment efficiency	Appliance efficiency standards and ENERGY STAR® labeling
Zero net energy (ZNE) new buildings and homes	Building energy codes
Smart buildings and homes	Commercial building energy use benchmarking and standard
Home and building retrofits	Home energy efficiency labeling and upgrade requirement for sale or lease
Electrification of residential and commercial building space heating and water heating loads	Incentives for electrification of homes and commercial buildings
Industrial efficiency improvements	Industrial efficiency programs and research
Light- and heavy-duty vehicle fuel economy improvements including electrification	Light- and heavy-duty vehicle fuel economy and electric vehicle standards
Reductions in passenger vehicle miles traveled (VMT)	Light- and heavy-duty VMT and congestion fees
Reductions in freight transport energy use	
Aviation efficiency improvements	Airplane efficiency standard
Conservation voltage reduction and reductions in losses from transmission and distribution systems	Regulation of conservation voltage reduction and of transmission and distribution losses
Multiple	Energy efficiency resource standard

Opportunity Analysis: Energy Savings



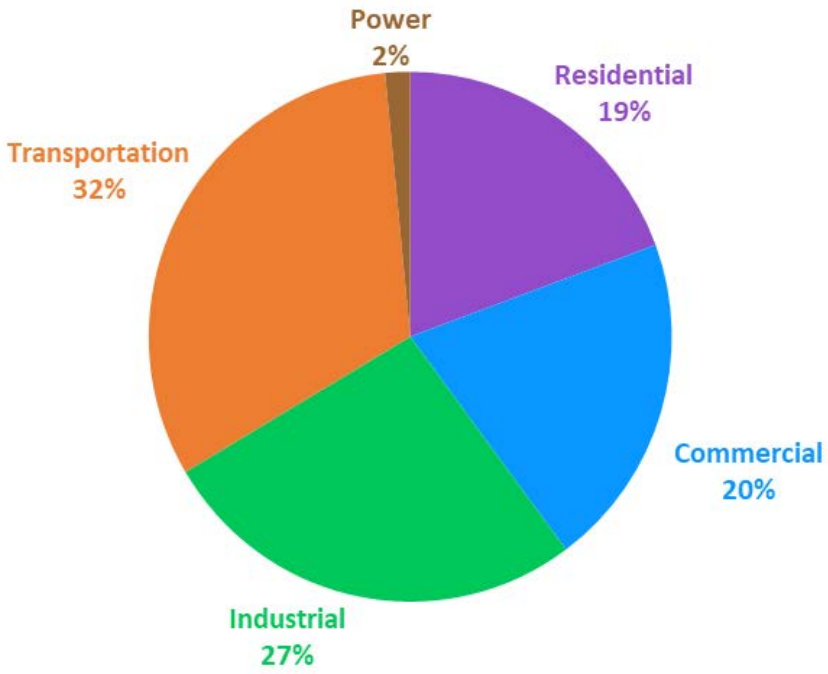
ACEEE
American Council for an Energy-Efficient Economy

Opportunity Analysis: Emissions Reductions

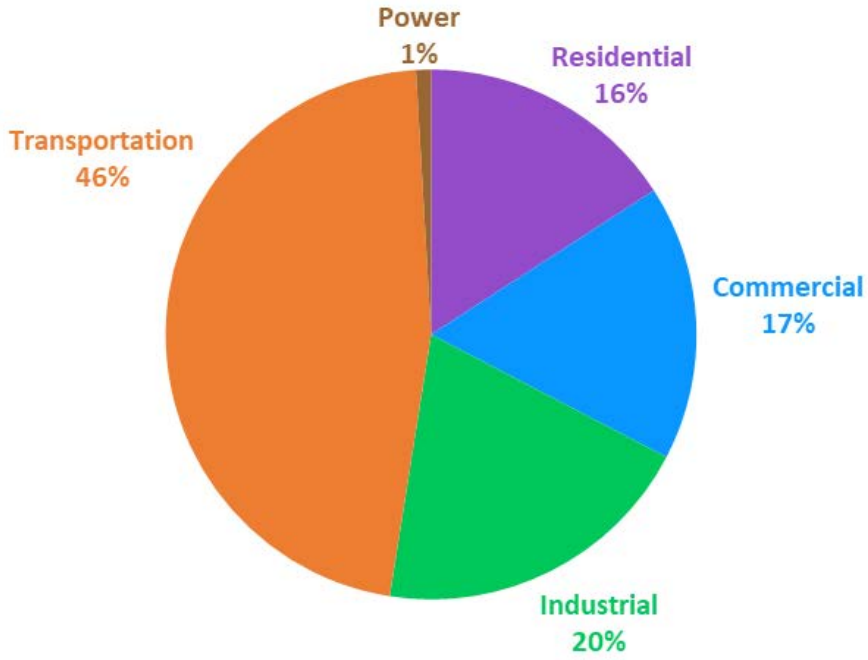


ACEEE
American Council for an Energy-Efficient Economy

Savings by Sector



Energy

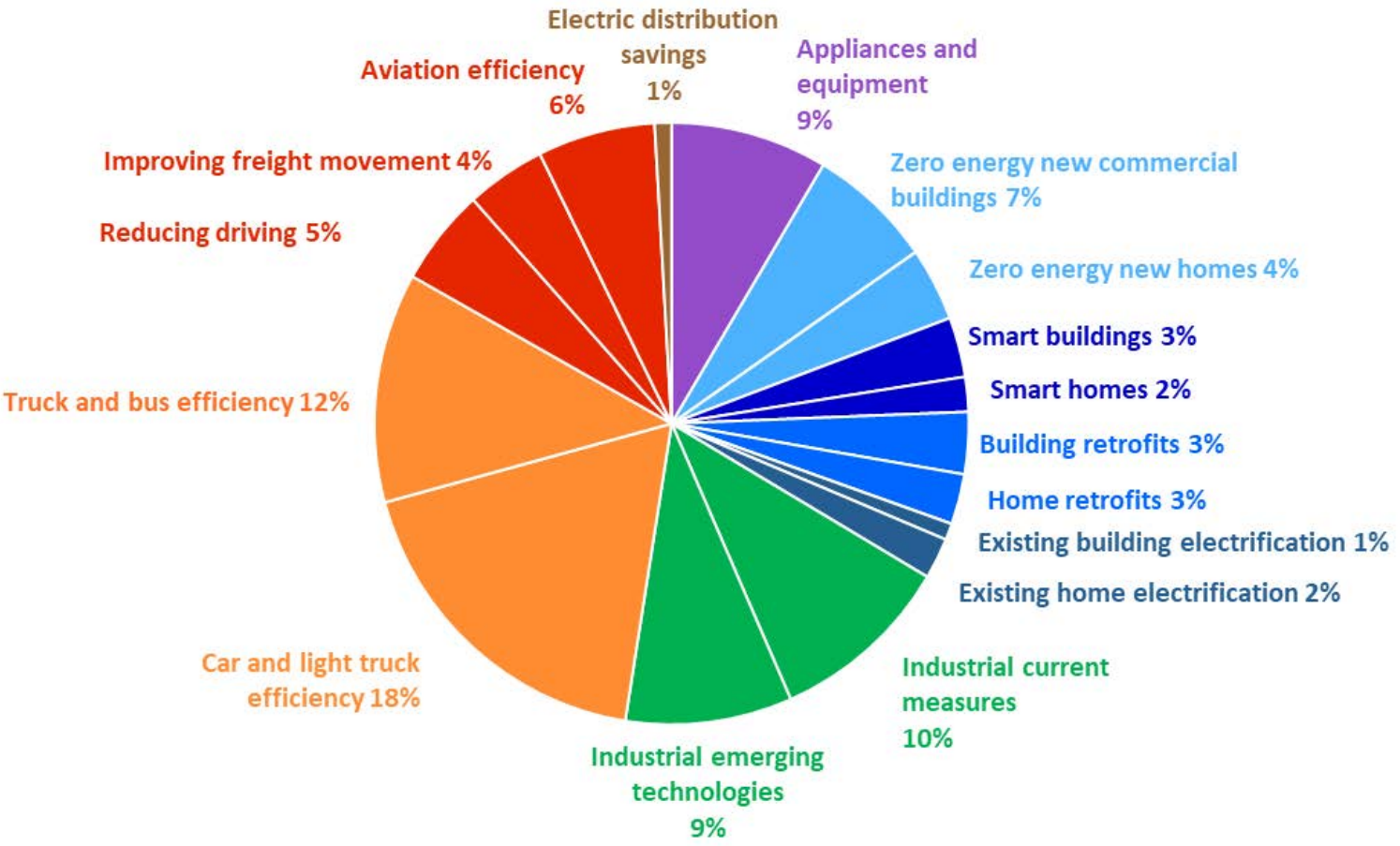


GHG Emissions

Top Opportunities

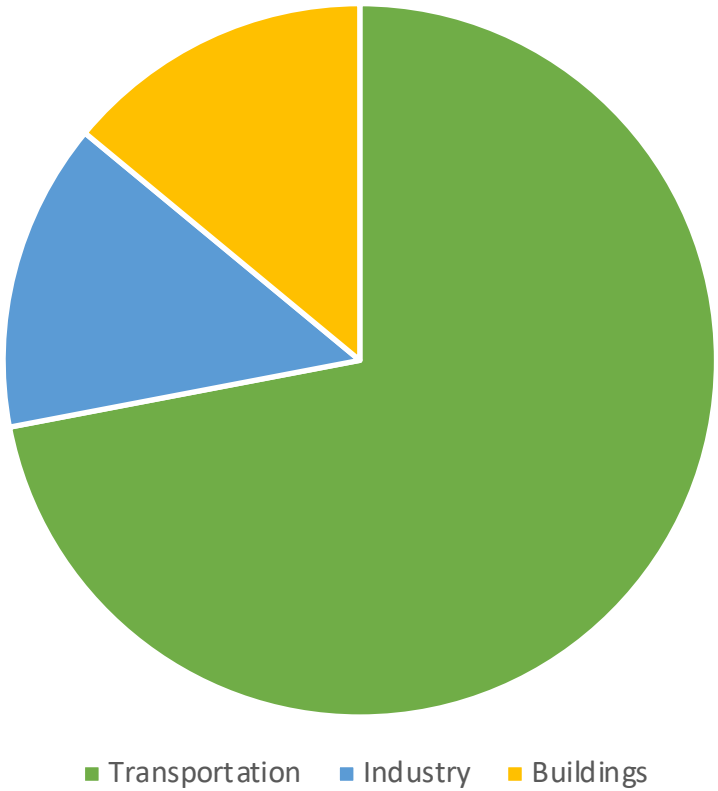
- *Efficient and electric vehicles.* A shift to electric cars and trucks (80% of light- and 45% of heavy-duty vehicles) and continued fuel economy gains under new standards could cut vehicle carbon dioxide emissions in 2050 by about 50%.
- *Industrial efficiency and decarbonization.* Strategic energy management and smart manufacturing could cut industrial energy use and emissions by 15%, and new technologies, industrial processes, and feedstocks (including electrification strategies) could save an additional 14%.
- *Transportation system efficiency.* Less driving in cars and light trucks, improved freight system efficiency, and more efficient airplanes and aviation could reduce emissions by 30%, 25%, and 53%, respectively.
- *Upgrades to existing buildings and homes.* Energy efficiency upgrades could cut energy use and emissions by about 18% for homes and 23% for commercial buildings, and smart control technologies could cut another 11% for homes and 18% for commercial buildings. Electrification of remaining loads adds an additional 13% in emissions reductions.
- *Zero energy new buildings and homes*. Efficient design of new homes and commercial buildings, including electrification, and use of renewable electricity to meet average annual loads could cut their emissions by 80%.
- *Efficient appliances and equipment.* Updated efficiency standards and growth in the ENERGY STAR® program could cut total home and building emissions by 13%.

Allocation of Emissions Reductions by Opportunity

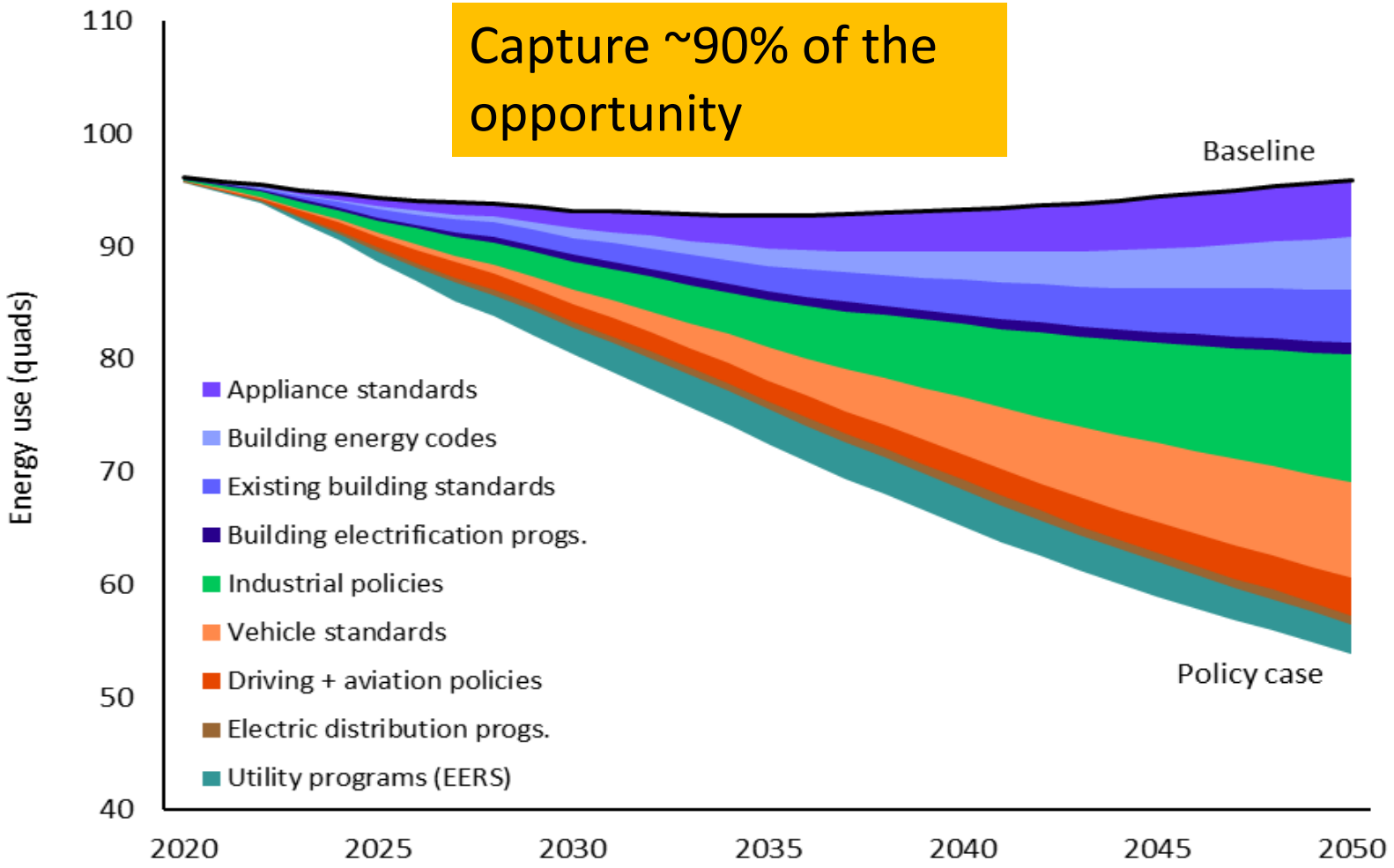


Role of Electrification

35% of GHG reductions
Allocation by sector:

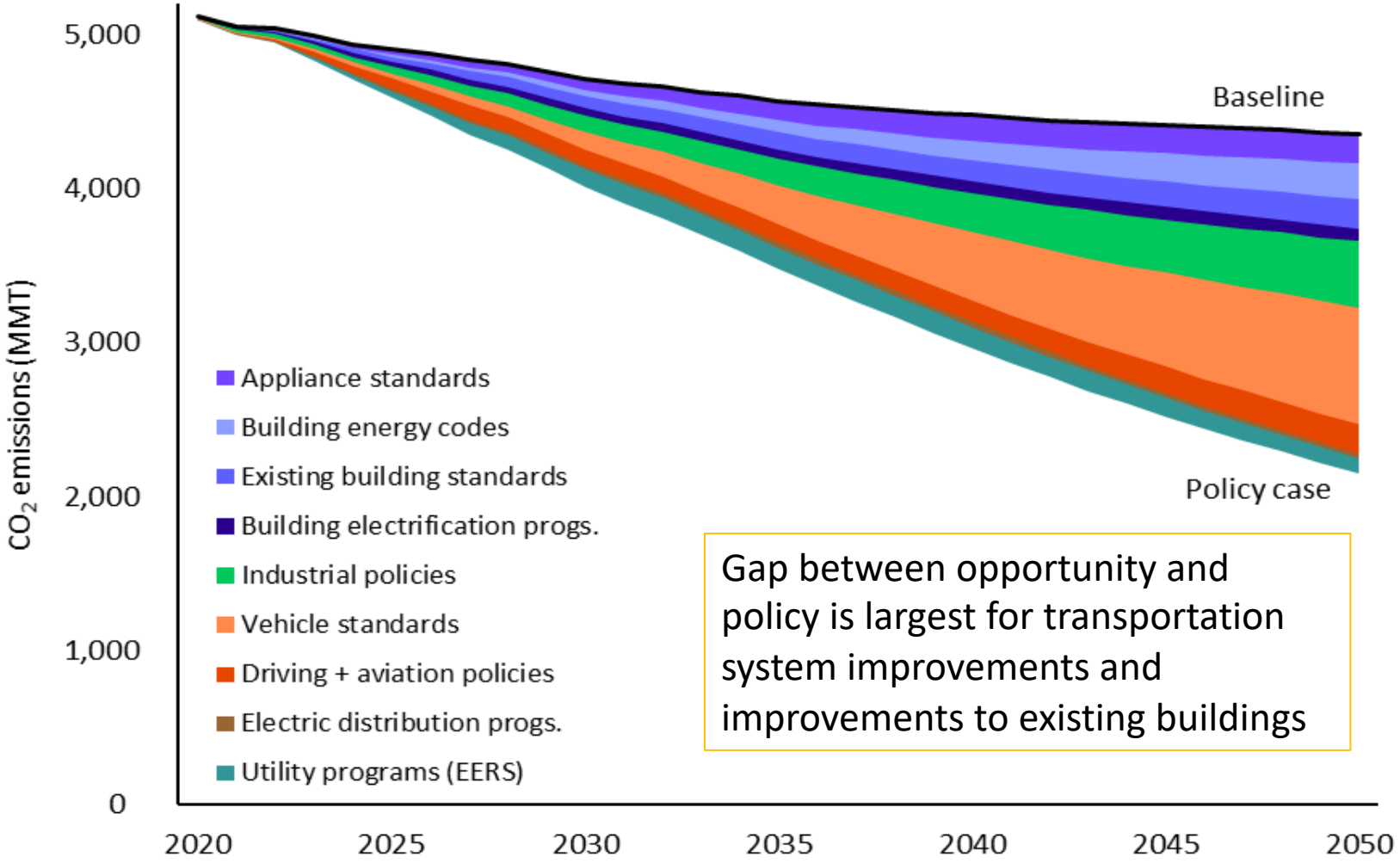


Policy Analysis: Energy Savings



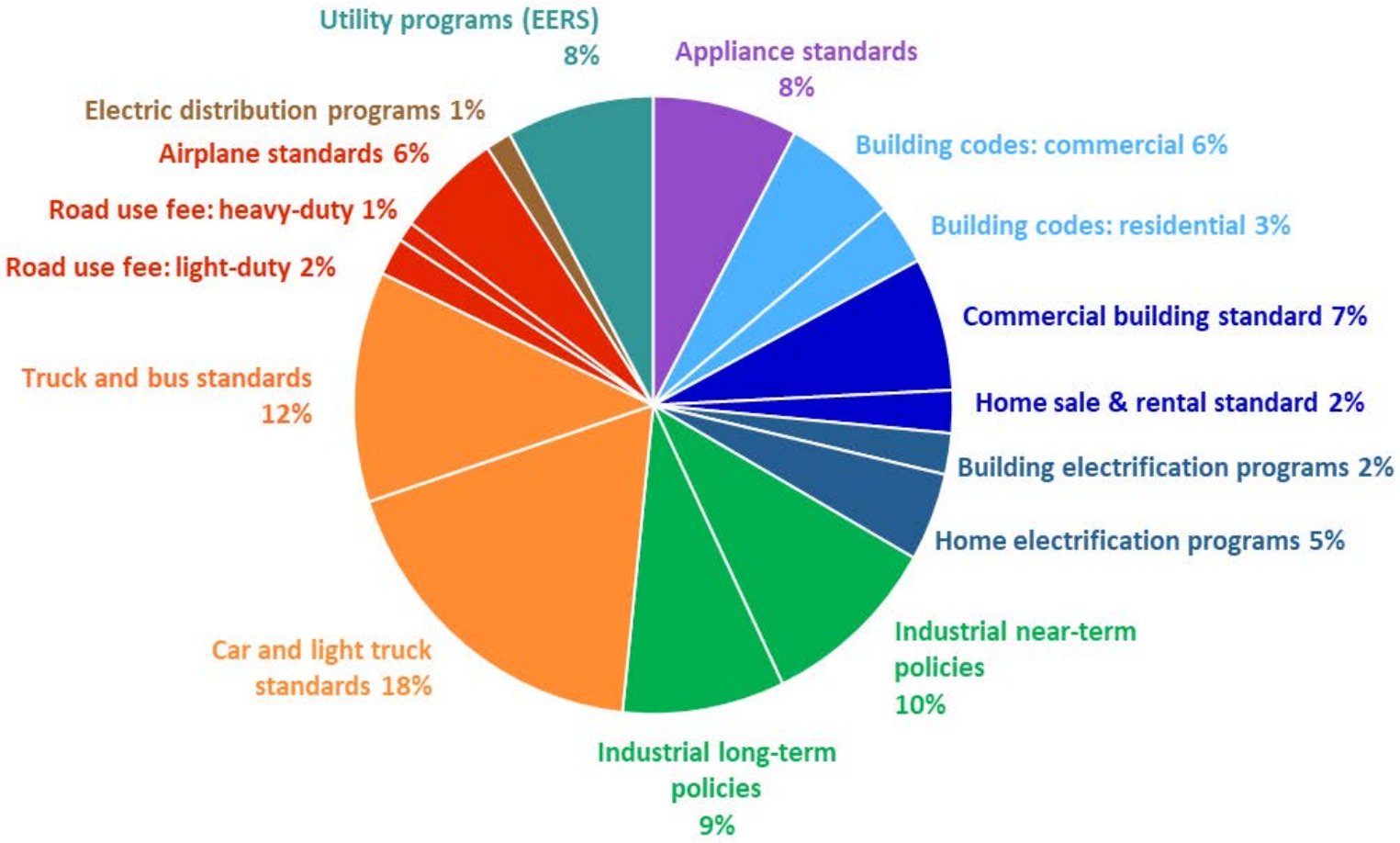
ACEEE
American Council for an Energy-Efficient Economy

Policy Analysis: Emissions Reductions



Gap between opportunity and policy is largest for transportation system improvements and improvements to existing buildings

Allocation of Emissions Reductions by Policy



ACEEE
American Council for an Energy-Efficient Economy

Discussion

Achieving these savings will require expansion of energy efficiency efforts well beyond business as usual, including:

- Rapid upgrades to vehicle standards, building energy codes, equipment efficiency standards, ENERGY STAR specifications, and energy efficiency resource standards
- Substantial improvements to existing factories, homes, commercial buildings, and the electric grid and better management of energy use in all of them, spurred by government investment and requirements
- More mobility options and better management of freight and aviation energy use, including through user fees
- A switch to electric vehicles, equipment, and industrial processes (along with a more efficient and cleaner power sector)
- Greater investment in research and development for new efficiency options in every sector, especially improved industrial processes

Conclusion

- Through these opportunities and policies we can not only reduce energy use but also improve productivity, the economy, personal comfort, air quality, and public health.
- And we can slash greenhouse gas emissions, getting roughly halfway to our long-term energy and climate goals.

Contact Information

Steven Nadel

snadel@aceee.org

202-507-4011

Lowell Ungar

lungar@aceee.org

202-507-4xxx