

U.S. DEPARTMENT OF
ENERGY

Office of
**ENERGY EFFICIENCY &
RENEWABLE ENERGY**

Building Technologies Office: “Latest & Greatest”

NASEO Winter Meeting

DAVID NEMTZOW, Building Technologies Office
February 7, 2020



Who we are

11 technology/
program offices

EERE's 2020 Budget
increased 19.7%
from FY19 to **\$2.85
Billion**

DOE's 2020 Budget
is **\$38.6 Billion**



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Energy Efficiency &
Renewable Energy

ENERGY EFFICIENCY \$1,091 Million		RENEWABLE ENERGY \$642 Million		SUST. TRANSPORTATION \$806 Million	
\$395 M	Advanced Manufacturing	\$110 M	Geothermal Technologies	\$260 M	Bioenergy Technologies
\$285 M	Building Technologies	\$280 M	Solar Energy Technologies	\$150 M	Fuel Cell Technologies
\$40 M	Federal Energy Management	\$104 M	Wind Energy Technologies	\$396 M	Vehicle Technologies
\$371 M	Weatherization & Intergovernmental	\$148 M	Water Power Technologies		

Our Homes and Buildings



There ~**125 million buildings** in America



They use **40%** of America's **energy**, **75%** of electricity and create **36%** of CO₂ emissions

More than 80% of them are **20 years old or older**

At least **20+%** of this energy is wasted away in buildings

Our Homes and Buildings Use More Energy than Any Other Sector



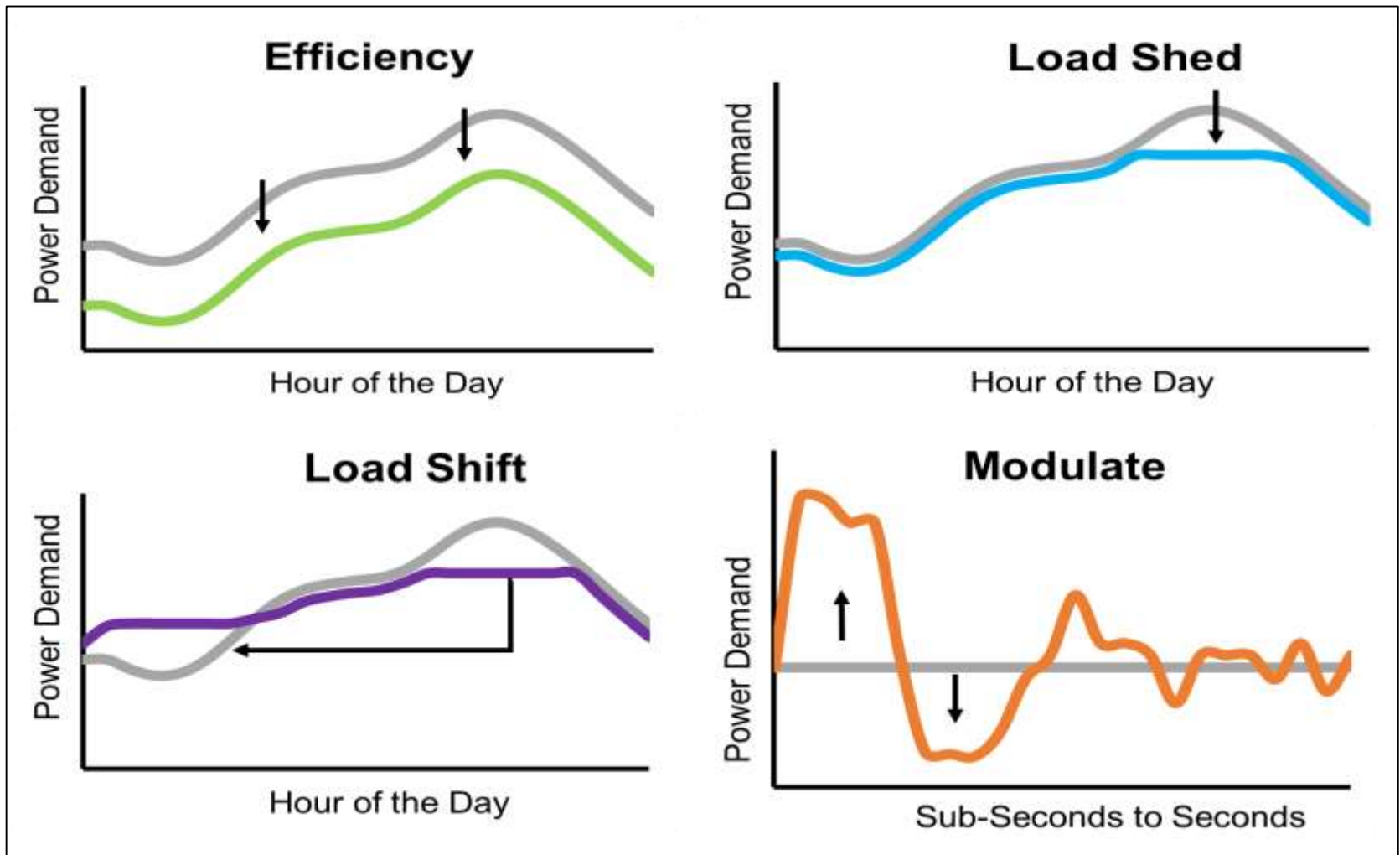
Buildings' **energy bill is \$415 billion annually**, much of which is wasted



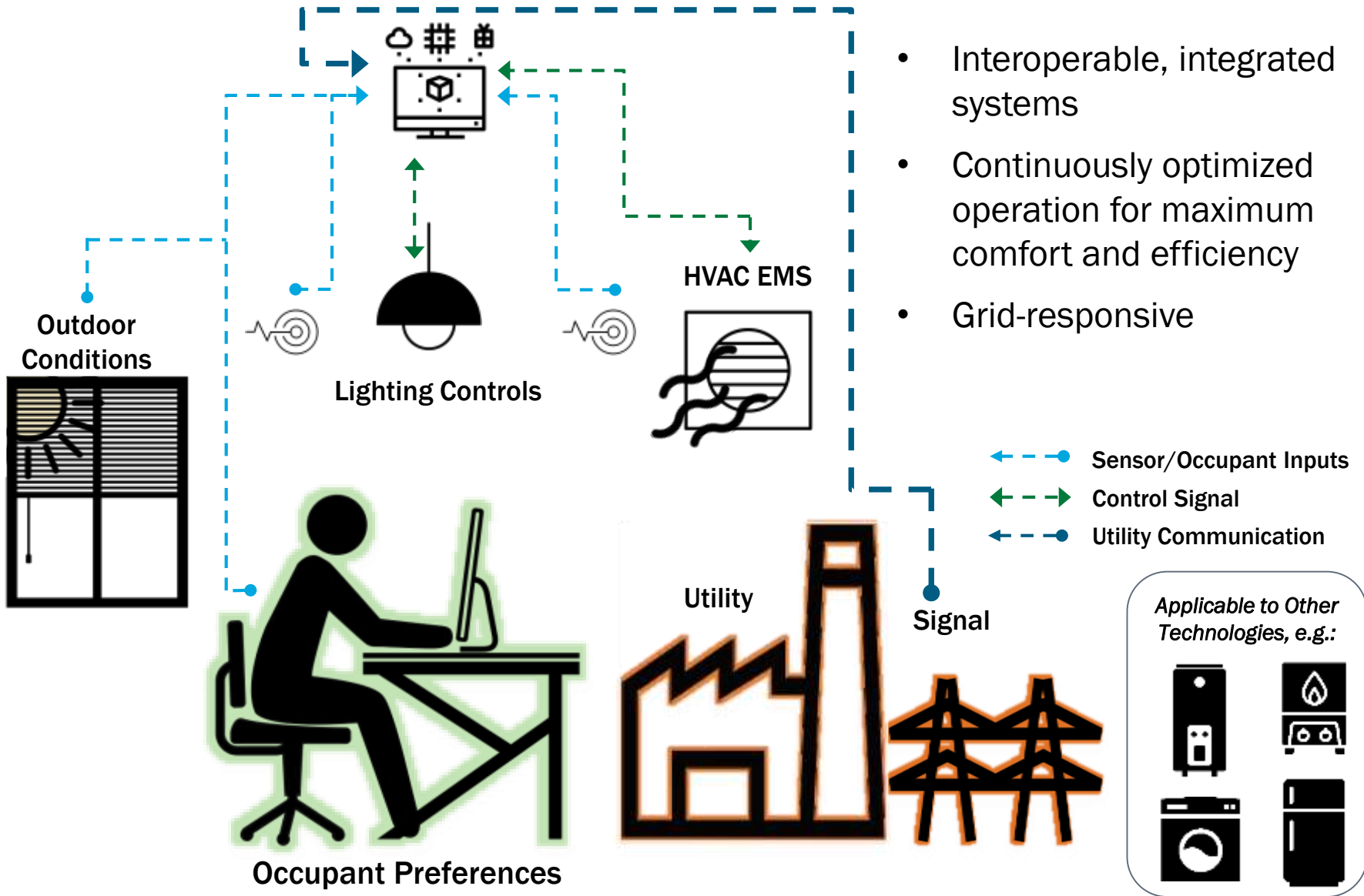
Buildings consume **up to 80% of peak electricity**, often the dirtiest and most expensive electricity utilities can make

Source: EIA Monthly Energy Review;; U.S. Energy Information Administration (CBECs 2012/RECS 2015); NAREIT Reits by the Numbers; Census Bureau Quarterly Retail E-Commerce Sales 4th Quarter 2016

Demand Flexibility Provided by GEB Taxonomy



Interactions with Building Occupants



Smart Neighborhood: Hoover, Alabama



Key Stakeholder Engagement Activities

▪ NASEO-NARUC led state working group

- ✓ Recruited 14 states: Colorado, Connecticut, Florida, Hawaii, Massachusetts, Michigan, Minnesota, New Jersey, New York, Oregon, South Carolina, Tennessee, Virginia, Wisconsin
- ✓ Just completed interviews with above states to determine areas of interest and have working groups established by September Fall meeting
 - Areas of interest include buildings role in resiliency, microgrids, grid integration of renewables, storage, cybersecurity
- ✓ Monthly webinars; Resources in development
- ✓ States and utilities are starting to incorporate GEB aspects

▪ SEEACTION Report Series

- Developed outlines and received extensive feedback from Executive Group members on need for three initial reports:
 - GEB Overview for State & Local Leaders
 - How Grid-Interactive Efficient Buildings Add Value to the Electricity System
 - Key Aspects of Assessing and Valuing Performance of Grid-Interactive Efficient Buildings
- Draft reports to be review by Executive Group over summer; final reports in Fall

▪ Better Buildings Alliance Renewable Energy Integration across commercial sectors

- Newly established to work with commercial building owners across sectors to determine how to integrate and optimize across DERs for improved building functions and lower costs

▪ Many other efforts

- Efficient and Flexible Building Load RFI
- BENEFIT FOA
- GMLC
- International collaboration via IEA (TCPs and several annex projects, nascent EE Hub)
- Technical advisory groups on all BTO projects
- AESI/RTIC
- Collaboration with OE, within EERE

Advanced Building Construction: Retrofits

Energy retrofits today are...

- Too slow
- Too disruptive
- Too costly
- Too short on energy savings
- Not commoditized (*“Can I buy it on Amazon?”*)



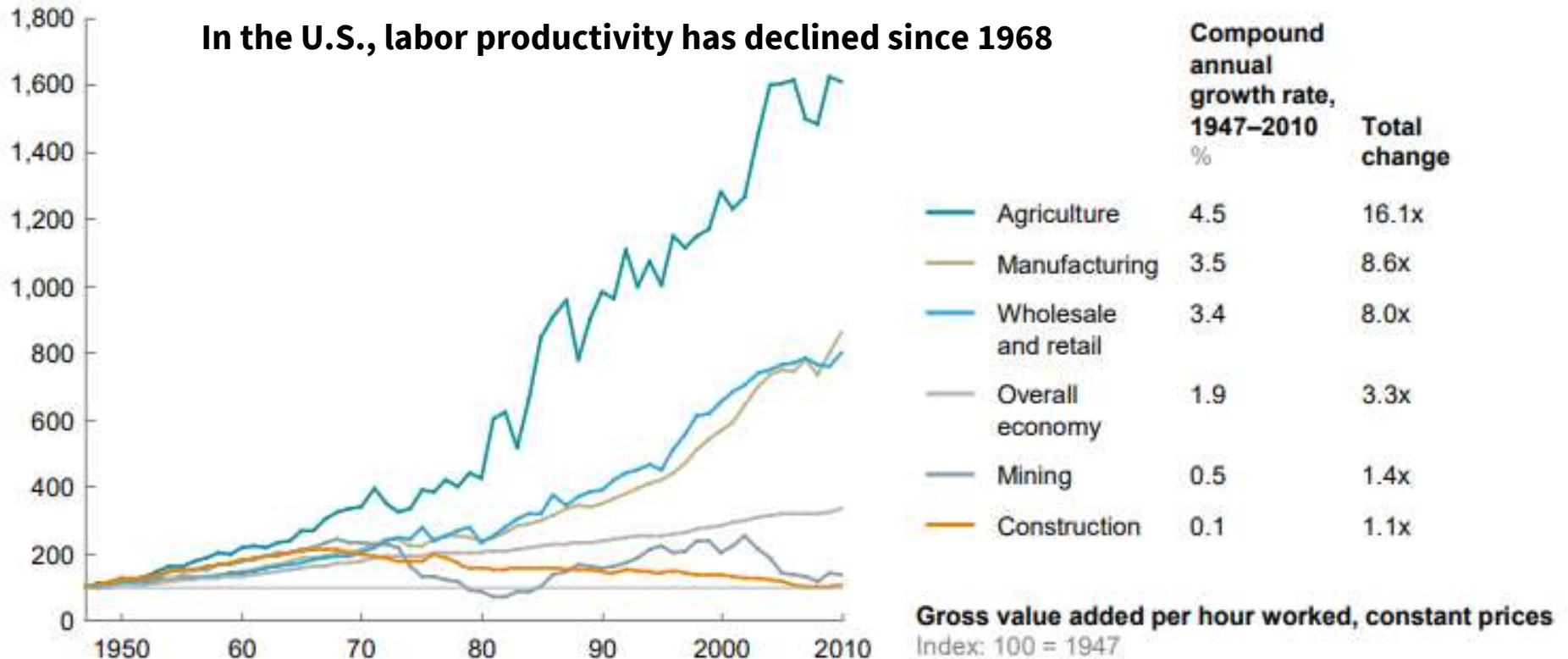
For these reasons, retrofits are few and far between, unappealing to majority of home owners, and many building owners

Construction sector productivity lagging considerably

Typical new construction today is characterized by...

- ✓ Poor productivity compared to other industries
- ✓ Cost and schedule overruns

In the U.S., labor productivity has declined since 1968



Source: <https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/improving-construction-productivity>

New approaches to envelope, heating, cooling, & hot water



State adoption of building energy codes

Commercial: Current

Residential: Current

Commercial: Current

Residential: Current



Updated as of December 2018



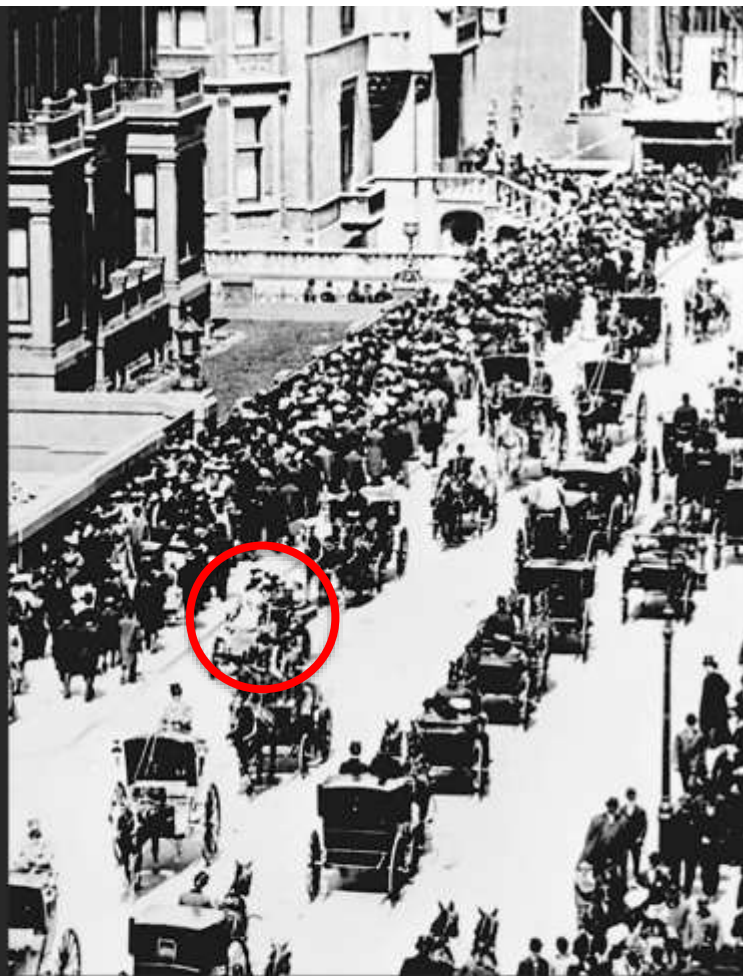
Updated as of December 2018

www.energycodes.gov

BTO Priorities and SEO-centric activities

- ✓ Grid-interactive Efficient Buildings (GEB)
- ✓ Advanced Building Construction (ABC) incl. retrofits
- ✓ Applied R&D in general
- ✓ Building energy codes (tech. assist for development, adoption)
- ✓ Appliance standards
- ✓ Field validation/demonstration
- ✓ Zero Energy Ready Homes, buildings
- ✓ Workforce development
- ✓ Thermal energy storage, flexible loads
- ✓ EE/resilience nexus
- ✓ ***What else is on your mind?!***

Easter in New York in 1900: 1 car. 1913: 1 horse.



<http://www.fastned.nl/investpic.twitter.com/rdyU6Czlf2>