Building Technologies Office: “Latest & Greatest”
NASEO Winter Meeting

DAVID NEMTZOW,  Building Technologies Office
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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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<thead>
<tr>
<th>ENERGY EFFICIENCY</th>
<th>RENEWABLE ENERGY</th>
<th>SUST. TRANSPORTATION</th>
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<td>$1,091 Million</td>
<td>$642 Million</td>
<td>$806 Million</td>
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<tr>
<td>$395 M Advanced Manufacturing</td>
<td>$110 M Geothermal Technologies</td>
<td>$260 M Bioenergy Technologies</td>
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<td>$285 M Building Technologies</td>
<td>$280 M Solar Energy Technologies</td>
<td>$150 M Fuel Cell Technologies</td>
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<tr>
<td>$40 M Federal Energy Management</td>
<td>$104 M Wind Energy Technologies</td>
<td>$396 M Vehicle Technologies</td>
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<tr>
<td>$371 M Weatherization &amp; Intergovernmental</td>
<td>$148 M Water Power Technologies</td>
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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.

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

- **Efficiency**
- **Load Shed**
- **Load Shift**
- **Modulate**
Interactions with Building Occupants

- Interoperable, integrated systems
- Continuously optimized operation for maximum comfort and efficiency
- Grid-responsive

Outdoor Conditions

Lighting Controls

HVAC EMS

Occupant Preferences

Utility

Sensor/Occupant Inputs

Control Signal

Utility Communication

Signal

Applicable to Other Technologies, e.g.:

- HVAC EMS
- Lighting Controls
- Outdoor Conditions

- Occupant Preferences
Smart Neighborhood: Hoover, Alabama

Efficient – 3.2 kW/home average energy use
Flexible - ~100 - 200 kW of load shifting capability
Resilient - Community can be islanded on its microgrid
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

New approaches to envelope, heating, cooling, & hot water
State adoption of building energy codes

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/rdyU6CzIf2