2019 Annual Meeting of the Membership

Wednesday, June 19, 2019
Kansas City, MO
Welcome & Meeting Overview

Jim Jerozal, MEEA Chair
Nicor Gas
Today’s Agenda

8:45 – 9:00am  Welcome & Meeting Overview
9:00 – 9:20am   Keynote: Mayor Sly James
9:20 – 10:00am Member Introductions
10:00 – 10:15am Board Elections
10:15 – 10:45am Networking Break
10:45 – 11:30am MEEA Report to the Membership
11:30am – 12:45pm Lunch
12:45 – 1:00pm  State Policy Update
1:00 – 2:15pm   Plenary: Getting to Know GEBs
2:15 – 2:20pm   Closing
2:30pm          Buses depart
3:00pm – 4:30pm Tour of Kauffman Stadium
The Honorable Sly James
Mayor of Kansas City

Keynote Speaker
Thank you to KC P&L for sponsoring the opening reception!
Introductions
Governance Report

Scott Steiner, Governance Chair
Lockheed Martin
Exiting Board Members

Governance Report

Our thanks to the following board members and their organizations for their years of service!

- Alliant Energy: **Bonnie Donnolly** (Anne Carter)
- CLEAResult: **Shaun Dentice** (Lauren Casentini)
- Edison Foundation Institute for Electric Innovation: **Adam Cooper**
Governance Committee

Governance Report

Thanks to the committee for their work to not only choose the next board, but managing the governing rules and policies of MEEA

- Scott Steiner, Lockheed Martin
- Brian File, Kansas City Power & Light
- John Nicol, Leidos
- Sam Mueller, Nexant
- Jeff Erickson, Navigant
- John Boladian, DTE Energy
- Anthony Fryer, MN Dept. of Commerce
Governance Report
Board Election Process Overview

1. Determine open positions on the board
   Sector representation:
   • 36-40% Utilities
   • 36-40% EE Businesses
   • 12% Academic/Research
   • 12% Government

2. Call for candidates

3. Review and score applicants

4. Review scores and develop slate of candidates

5. Board review

6. Send out proposed slate to members

7. Member elections
The Governance Committee considers the candidate’s background and experience

- Organization’s support and involvement with MEEA
- Organization’s and candidate’s energy industry exposure and connections within the industry
- Candidate’s energy efficiency experience
- Candidate’s level and breadth of responsibility for energy efficiency within their organization
- Candidate’s activity and experience with MEEA
Board Election Process

Governance Report

• Internal reviews: staff, Governance & Executive Committees, full Board vote

• 10 candidates applied this year from 4 member sectors

• 4 seats were available:
  – 1 Utilities
  – 1 EE-Businesses
  – 1 State or Local Government
  – 1 Research, Academic and Advocacy

• Electronic voting was open June 7-18, 2019
Election Results: Incumbents

- **Ameren Illinois**: Kristol Whately Simms
- **ICF International**: Michaela Martin
- **KC P&L**: Brian File
- **Lockheed Martin**: Scott Steiner,
- **Michigan Department of Environment, Great Lakes, and Energy**: Dr. Brandy Brown
- **Navigant**: Jeff Erickson
- **Slipstream* (formerly Wisconsin Energy Conservation Corporation)**: Mary Woolsey Schlaefer
Governance Report

Election Results: New Members

- **Academic, Research and Advocacy**
  - **Citizens Utility Board**: Kristin Munsch

- **EE Related Business**
  - **Franklin Energy**: Paige Knutsen

- **Government**
  - **Public Service Commission of Wisconsin**: Jolene Sheil

- **Utilities**
  - **AEP Ohio**: Gary Enama
Meet the New Board Members

Gary Enama  
AEP Ohio (since 1980)  
Energy Efficiency Program Manager  
Manages all aspects of AEP Ohio's prescriptive, custom, self-direct, and advanced lighting programs  

Education  
• Engineering degrees in HVAC Design & General Studies, Kent State University  
• Bachelors in Business Management, Malone University  
• Certified Energy Manager (CEM), certified energy auditor (CEA) and residential certified auditor (REA)
Meet the New Board Members

Governance Report

Paige Knutsen
Franklin Energy Services
Senior Vice President - Regional Operations

Provides program design, implementation and continuous improvement support for the company’s operations.

Builds & maintains relationships with utility clients and assists in the start-up and implementation of grid optimization programs across the U.S. and Canada.

Education
- Master’s degree in sustainable agriculture, Iowa State University
- Certified energy manager (CEM) and LEED AP certified

Started her energy efficiency career at MEEA
Meet the New Board Members

Jolene A. Sheil
Public Service Commission of Wisconsin
Portfolio Manager

Oversaw transition of Focus on Energy from Dept. of Administration to the Public Service Commission in 2007

Previously managed the Focus on Energy Business programs and pilot

Education
• B.A. in Public and Environmental Administration and Political Science from the University of Wisconsin-Green Bay
• Master’s in Political Science with an emphasis on energy and environmental policy, University of California-Riverside and the University of Wisconsin-Madison
Meet the New Board Members

**Governance Report**

**Kristin Munsch**
Illinois Citizens Utility Board
Deputy Director

Focuses on regulatory policy, rate design, utility data access and challenges in designing a “utility of the future”

Current member of the Illinois Smart Grid Advisory Council, Energy Foundry Board of Directors, and Board President for the Consumer Advocates of PJM States

Previous Assistant Attorney General for State of Illinois, Public Utilities Bureau

**Education**
- Graduate of Northwestern University and the Chicago-Kent College of Law
Our thanks to all applicants & members for participating in the election process!
Governance Report
FY20 MEEA Officers

- **Chair** - Shawn White, Xcel Energy
- **Vice Chair** – Mary Schlaefer, Slipstream
- **Secretary** – Nate Baer, Staples Energy
- **Treasurer** – Jim Jerozal, Nicor Gas
Networking Break
MEEA Update

Stacey Paradis, Executive Director
MEEA
MEEA Board

• MEEA Board of Directors
• Thank you!
• The support and guidance is essential for MEEA to ensure that we achieve our mission and serve our members
MEEA Staff

- MEEA staff
- True professionals committed to our mission and driven to increase the energy savings through energy efficiency
- We are all here to work with you
- Our job as a membership organization is to serve our members as well as our mission
What MEEA did in 2018

- Research
- Connections
- Advocacy
- Training
- Certification
- Outreach
Promote the value and impact of energy efficiency (EE) among key stakeholders, including elected officials and regulators. Position EE as a resource and ensure that EE is defined as an essential pathway to achieving clean energy goals.

Ensure that MEEA members receive the maximum value for their membership investment.
Strategic Action Plan
FY2020-2025 Goals

Expand the organization’s expertise in areas of the energy sector adjacent to energy efficiency.

Increase the level of energy efficiency understanding and opportunity across the region through training and education, research, collaboratives, market transformation, direct outreach and other future identified efforts.
Develop, support and promote innovative and impactful policies and actions to strengthen the EE industry by prioritizing equity, inclusion, access and diversity.

Ensure that MEEA’s organizational structure, staff development and engagement of the Board of Directors is conducive to stable, healthy organization.
## Program Committee Report
### FY19 Program Snapshot

<table>
<thead>
<tr>
<th>TRAINING &amp; EDUCATION</th>
<th>COLLABORATIVES</th>
<th>MARKET TRANSFORMATION</th>
</tr>
</thead>
</table>
| - Building Operator Certification (BOC)  
- Illinois Home Performance  
- Illinois Science and Energy Innovation Foundation work  
- Appraisal Education | - Intelligent Efficiency  
- Midwest LUMEN  
- Midwest Home Performance  
- Utility R&D | - Midwest Market Transformation collaborative  
- Building America  
- Municipal Streetlighting  
- TRM Project  
- National Lab Work  
- Home Buyer Access  
- K-12 Outreach |
Program Committee Report
Training & Education

- Building Operator Certification
- Illinois Home Performance
- Illinois Science & Energy Innovation Foundation
- Michigan Agency for Energy
- Midwest Energy Efficiency Alliance
Collaboratives: Midwest LUMEN

Program Committee Report

• **Members**: Utility lighting program managers

• Provides common ground for discussions around current programs, future technologies and program design, challenges and successes

• In-person meetings held twice a year

• Webinar meeting held during summer
  – Will be held in July focusing on online applications for utility programs
Collaboratives: Utility R&D Program Committee Report

- **Members:** Utility staff in emerging tech or research & development
- Platform to share R&D pilots and initiatives being pursued in their service territories.
- Utilities can share research, reports, and lessons learned through these initiatives.
- Meetings held quarterly (in-person and via conference line).
Program Committee Report
Market Transformation

• Midwest Market Transformation Collaborative
  – Utility forum to develop market transformation practices, methods and initiatives to allow multi-year energy savings
  – Facilitates a pooling of resources to implement MT initiatives regionally and nationally
  – Administered by MEEA and Resource Innovations
Program Committee Report
Homebuyer Access

• Researching national best practices to engage the real estate sector on energy efficiency
  – Working with Elevate Energy, funding from ComEd

• Developing a 3-hour training geared towards real estate agents in ComEd territory

• Piloting an energy scorecard specific to the City of Chicago

• Conducting outreach to real estate professionals to educate them on the energy eCompliance tool
FY19 Programs

Program Committee Report

K-12 Outreach

- MEEA provides education and application assistance to K-12 schools located in ComEd service territory
- Key Metrics in FY19
  - Facility assessments requested: 38
  - Facility assessments completed: 151
  - Total Annual kWh Savings Achieved: 6,896,190
  - Outreach to 1,208 schools
**Municipal Streetlight Assistance**

- MEEA provides technical assistance to local communities to upgrade outdoor lighting.

- **Key Metrics in FY19**
  - Provided assistance to
  - Le Roy, IL 500 streetlights
  - Urbana, IL 2900 streetlights
  - Lincoln, NE roughly 30,000 streetlights
  - Effingham, IL roughly 30 streetlights
Ways to Engage

• Join the Program Committee
  – Guide which topics we should be researching and presenting to our members

• Call for webinar topics – July 18\textsuperscript{th} 3pm, CST
  – Email with info to follow; sign up for program committee to receive

• Join the Steering Committee to review topic ideas
  – Contact Bill Angelos at wangelos@mwalliance.org
Membership Report

Overview

• 167 members
• Benefits:
  – Connection to MEEA network: committees, working groups, collaboratives
  – Invitation to member-only events: Annual Meeting, Member Receptions
  – Access to MEEA resources, including member directory, policy briefings
  – Promotion of member news and events in MEEA Minute, Twitter and LinkedIn
  – Ability to present on MEEA webinars
  – Discounts on MEEA programs and events
Membership Report
Welcome, New Members!

- Argonne National Laboratory
- American Efficient
- Applied Energy Group
- Blue Line Innovations
- Bradford White Corporation
- Celia Johnson Consulting
- Chicago Bungalow Association
- Daikin North America LLC
- Ecotagious
- Energy Management Solutions
- EnergyX Solutions Inc.
- Erthe Energy Solutions
- EZ Green Home
- Illume Advising
- JadeTrack
- Lennox Industries
- MaxLite
- Milepost Consulting
- The National Energy Improvement Fund (NEIF)
- NMR Group, Inc.
- OpenEE
- PACENation
- Pearl Certification
- Slipstream
- Tendril, Inc.
- Village of Oak Park
- Walker-Miller Energy Services
- WPPI Energy
Membership Report

2019 Midwest Energy Solutions Conference

**Highlights**
- Largest MES conference
- Highest rated MES
- New workshops on diversity, intelligent efficiency and energy equity

**Featured Speakers & Topics**
- Dr. Tony Reames, University of Michigan
- Impact of Nov 2018 Elections
- Market Transformation
- Beneficial Electrification

**Attendees by Sector**
- Implementer 28%
- Utility 24%
- Data/Software 15%
- Government 3%
- Academic, Research, Advocacy 9%
- Other 5%

**Attendees by Title**
- Manager 35%
- Consultant 5%
- Specialist 5%
- Engineer 4%
- Associate 3%
- Coordinator 3%
- Analyst 6%
- C-suite 9%
- Director 22%
- VP 8%
Chairman’s Award
• Lauren Casentini

Innovation
• Focus on Energy, Wisconsin SEM Leaders Initiative

Leadership
• Mayor Rahm Emanuel, City of Chicago
• Richard Mark, Ameren Illinois

Education
• Ameren Illinois Program Allies

Impact
• Minnesota Army National Guard

Marketing
• Focus on Energy, “Wisconsin is In” Campaign
SAVE THE DATE

2020 MIDWEST ENERGY SOLUTIONS CONFERENCE

FEBRUARY 26-28, 2020
CHICAGO, IL
2020 MES Conference
Sponsorship Opportunities

• Sponsorship Prospectus in folders
  – MEEA members receive 20% discount
  – Open to members first

• Sign up early to get first choice on booth space
  – Get your logo on conference lanyards, keep everyone caffeinated by sponsoring coffee or choose your own adventure with sponsorships
  – All add-ons are first come, first served
2020 MES Conference
Call for Topics & Agenda Development

• MEEA members only
• Submit topics and ideas for keynote speakers, plenary discussions and break-out sessions

• How to Submit
  – Online: Visit meeacconference.org

• Due by August 9, 2019
Honoring the Midwest’s best & brightest in energy efficiency

Categories
- Education
- Impact
- Innovation
- Leadership
- Marketing
- Chairman’s

Call for nominations now open
Apply by Sept. 13 at meeaconference.org/awards

Awards Dinner & Gala
Thursday, February 27, 2020 (during MES 2020)
Chicago Marriott Downtown
SAVE THE DATE

NOVEMBER 13-14
Omaha, NE

2019 Midwest Building Energy Codes Conference
Policy Report

John Nicol, Policy Committee Chair
Leidos
Policy Report

- Advancing Energy Efficiency Policy
- Facilitating Energy Efficiency Programs
- Regional Representation in National Dialogues
- Promoting Best Practices
- Coordinating Utility Programs Efforts
- Evaluating & Promoting Emerging Technology
- Delivering Training and Workshops
Energy Efficiency Investment in the Midwest

Statewide Total Energy Efficiency Budget

Utility EE Investment [$billions]

2019: $1.85 billion
2019 Midwest Efficiency Savings

Electric

2019: 8 million MWh
2019 Midwest Efficiency Savings
Natural Gas

2019: 154 million therms


Nat. Gas Savings [million therms]

Planned Savings Therm
0 50,000,000

MEEA
Midwest Energy Efficiency Alliance
Policy Report

Legislative and Regulatory Successes

• Ohio
  – Last year HB 114 successfully stopped. The bill would have weakened the EERS and hurt EE investment.
    • Working groups continue in 2019 on distribution system planning and data.

• Michigan
  – The PSC re-established the Low-Income Energy Waste Reduction Working Group.
• Illinois
  – Clean Energy Jobs Act (CEJA) a comprehensive clean energy and environmental bill:
    • Expands gas utility energy efficiency requirements
    • Repealing the industrial exemption
    • Increasing spending on income-qualified programs
  – Potential action on the bill this fall.

• Iowa
  – SF 638 was signed into law: places hard spending caps for energy efficiency plans - 1.5% (gas) and 2% (electric) of annual retail rate revenue.
• Ohio
  – The House has passed HB 6, which eliminates the EERS after 2020 and creates new surcharges for nuclear and coal plants.

• Minnesota
  – The House passed the Clean Energy First Act as part of a larger jobs and energy package.
    • This would have implemented Governor Walz’s plan for 100% carbon-free by 2050, and created a process that prioritizes EE and renewables before building new fossil fuel generation.
  – Senate and House could not agree so the provisions were removed from the omnibus bill.
Residential Building Energy Codes
Current Status of Midwest States

Adopted Energy Code

- No mandatory code
- 2006 IECC
- 2009 IECC
- 2012 IECC
- 2015 IECC
- 2018 IECC

*Stripes indicate code update in progress

As of May 2019
Commercial Building Energy Codes
Current Status of Midwest States

Adopted Energy Code
- No mandatory code
- 2009 IECC
- 2012 IECC
- 2015 IECC
- 2018 IECC

*Stripes indicate code update in progress

As of May 2019
Code Adoption Success FY 2019

- Nebraska: 2009 – 2018 IECC
- St. Louis, MO: 2009 – 2018 IECC*
- Chicago, IL: 2015 – 2018 IECC*
- Illinois: 2015 – 2018 IECC*
- Ohio: 2009 – 2018 IECC* (Residential)

* Includes Amendments
Policy Report
Code Compliance

- 5 Code Compliance Collaboratives
  - IL, MI, MN, MO, NE

- 3 Code Compliance Studies
  - IL, MN, NE

- 1 Energy Code Support Program
  - Ameren MO Code Support Program
Building Energy Code Impacts in the Midwest
Cumulative Savings 2009-2018

- $272,717,208
  1,846,224 tons CO2e

- $143,330,131
  1,026,199 tons CO2e

- $308,164,765
  2,295,852 tons CO2e

- $364,962,904
  2,615,447 tons CO2e

- $180,594,769
  1,968,293 tons CO2e

- $131,373,205
  999,094 tons CO2e

- $622,901,598
  4,366,467 tons CO2e

- $217,736,498
  1,620,341 tons CO2e

- $214,258,636
  1,549,764 tons CO2e
Local Benchmarking Legislation
Current Status of Midwest States

Public and Private Commercial Building Benchmarking Ordinances

Mandatory Program
- Minneapolis, MN
- Chicago, IL
- Evanston, IL
- Kansas City, MO
- St. Louis, MO
- Des Moines, IA

Voluntary Program
- Columbus, OH
- Grand Rapids, MI
- Madison, WI
MEEA Policy Resources

http://www.mwalliance.org/initiatives/policy

• MEEA Policy Insider
• Midwest Building Efficiency Report
• Midwest Energy Efficiency Spotlight
  http://www.mwalliance.org/resources/spotlight
• White papers, fact sheets, issue briefs, blogs
  http://www.mwalliance.org/resources/advocacy-toolkit
• Policy issue webinars and state action calls
  http://www.mwalliance.org/resources/meea-publications
Policy Committee

• Policy Committee
  – Policy webinars with issue specific focus
  – State briefings calls
  – All of MEEA’s policy resources
  – Creating Policy Steering Committee to identify topics for research, webinar topics, additional advocacy activities and resources

• Board Policy Committee
  – Provide strategic guidance on the direction of MEEA’s advocacy efforts
Finance Report

Mary Schlaefer, Finance Co-Chair
Slipstream
Finance Committee

- **Treasurer/Chair:** Shawn White, Xcel Energy
- **Co-Chair:** Mary Schlaefer, WECC
- Adam Cooper, Edison Foundation
- Scott Drake, East Kentucky Power Cooperative
- Shaun Denticce, CLEAResult
- Brandon Renaud, City of Columbia (MO)
- E’Lois Thomas, SEEL LLC.
- Stacey Paradis, MEEA

**Staff contact:** Bill Angelos & Gillis Buckingham, MEEA
In fiscal 2019, the FY18 (06/30/18) audit was completed with a clean result.

- Total Assets-$4,070,060
- Total Liabilities-$770,251
- Total Net Assets-$3,299,809

- Operating Reserve-Fully Funded at $775,000
- Strategic Reserve -funded at $921,881
• Under MEEA’s conservative budgeting process, FY19 began last July with a deficit forecast.

• As of May 31st, MEEA is on track to come in ahead above of budget expectations for FY19.
Finance Report
FY19 at May 31, 2019

- Total Assets - $4,023,676
- Total Liabilities - $541,430
- Total Net Assets - $3,482,245

- Operating Reserve - Fully Funded at $775,000
- Strategic Reserve - Funded at $912,289
MEEA Goals

• Sound Financial Position
• Diversified Funding Base
  – Programs: Federal, state & corporate funding
  – Policy: Foundation, federal & state grants
  – Membership: Dues
  – MES Conference
• Healthy Operating Reserve and Net Asset levels
• Effective Fiscal and Financial Strategies
• Active Finance Committee Oversight
Lunch

Sponsored by EZ Green Home
State Policy Update
Nick Dreher, Senior Policy Manager
Nick Hromalik, Policy Manager
Ian Blanding, Building Policy Manager
Policy Report
Successes & Opportunities

• Nebraska
  – Adopted strongest energy code in the Midwest

• Des Moines, IA
  – Passed Mandatory Benchmarking Ordinance

• Illinois
  – Clean Energy Jobs Act (CEJA) a comprehensive clean energy and environmental bill:
    • Expands gas utility energy efficiency requirements
    • Repealing the industrial exemption
    • Increasing spending on income-qualified programs
  – An energy package could pass this fall
Challenges & Calls to Action

Policy Report

• Iowa
  – SF 638 was signed into law: places hard spending caps for energy efficiency plans
    • 1.5% (gas) and 2% (electric) of annual retail rate revenue

• Ohio
  – The House has passed HB 6, which eliminates the EERS after 2020 and creates new surcharges for nuclear and coal plants
  – Senate action likely this summer
2019 MIDWEST ENERGY EFFICIENCY SPOTLIGHT
Getting to Know GEBs

Plenary discussion
Getting to Know GEBs
Plenary discussion

• Anthony Fryer, Minnesota Department of Commerce
• Monica Neukomm, U.S. Department of Energy
• David South, West Monroe Partners
• Dan York, ACEEE
MEEA Annual Meeting
June 19, 2019

Minnesota Perspective: Grid-interactive Efficient Buildings

Anthony Fryer
Minnesota Department of Commerce
Overview

1. Minnesota Background
2. State Energy Office
3. Minnesota PUC
4. Next Steps
### Central Division

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<th>Team</th>
<th>W-L</th>
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</table>
• Minnesota State GHG Reduction Goals
  • 30 percent below 2005 levels by 2025, at least 80 percent below 2005 levels by 2050, across all sectors

• Xcel Energy Carbon Reduction Goal
  • Reduce carbon emissions by 80% in the Upper Midwest by 2030, completely carbon free by 2050

• Regulatory Framework
  • State Energy Office – Purview over implementation of State’s EERS. Separate unit represents public interest before the PUC
  • MN PUC – Regulates IOUs (and one coop) rate cases and IRPs
Minnesota Utilities

Electricity

Natural Gas

Cooperatives (by G&T)
- Great River Energy
- Dairyland Power Cooperative
- East River Electric Cooperative
- Minnkota Power Cooperative
- Independent Cooperatives

Municipals (by G&T)
- Central Municipal Power Agency and Services
- Minnesota Municipal Power Agency
- Missouri River Energy Services
- Northern Municipal Power Agency
- Southern Minnesota Municipal Power Agency
- Independent Municipals

Investor-Owned
- Minnesota Power
- Otter Tail Power
- Xcel Energy

Municipals (non-exempt)
- Great Plains
- Greater MN Gas
- Minnesota Energy Resources
- Xcel Energy
- CenterPoint
GEB-Related SEO Initiatives

• Sustainable Buildings 2030
• Conservation Improvement Program
• Pay-for-Performance
REQUIREMENT

Meet energy performance targets (Energy Standards) that reduce the use of carbon producing fuel for building operations* by:

- 60% (for buildings designed) in 2010
- 70% in 2015
- 80% in 2020
- 90% in 2025
- 100% in 2030

*from a baseline of representative buildings in existence in 2003
Positive Impact

- CIP incentivizes purchase of efficient equipment
- Reduces energy usage through educational outreach/behavioral programs
- Incidental peak reduction

Restrictive Impact

- Load shifting programs not permissible
- Fuel switching prohibited
- Compensate building owners for energy performance over time, as opposed to a one-time incentive given upfront for design and equipment decisions.

- Building owners have the potential to receive a larger incentive compared to the traditional one-time, upfront incentive.

- Helps keep energy use optimized over time.

- Potential barrier to participation is the uncertainty of future performance as building owners weigh the likelihood of hitting energy use targets.
- Minnesota Integrated Resource Plans

  • Used to determine:
    • Size, type and timing of energy needs and resources
    • Least cost supply, energy efficiency, and demand response options considering environmental effects
  • All G&T utilities file roughly every two years, including
    • 5-year action plan (near-term actionable investments)
    • Planning horizon of 15 years
- Rate Design
  - Time-of-use Rates
    - Xcel Energy residential pilot – 15,000 participants
    - Minnesota Power C&I pilot
  - Interruptible tariffs
    - Provide commercial and industrial customers a lower electricity rate in return for the ability to curtail demand during emergency events
- Participation in NASEO/NARUC working group
- SEO restructuring
- Administrative options for CIP modernization
  - Electrification action plan development (U.S. DOE funded)
  - Fuel switching stakeholder process
  - Load shifting study (Slipstream)
Thank You!

Anthony Fryer
Conservation Improvement Program Coordinator
Minnesota Commerce Department
anthony.fryer@state.mn.us – 651.539.1858
Grid-interactive Efficient Buildings
MEEA Annual Meeting

Monica Neukomm
Building Technologies Office, DOE
www.energy.gov/eere/buildings/geb
US BTO approach

BTO invests in energy efficiency & related technologies that make homes and buildings more affordable and comfortable, and make the US (and beyond) more sustainable, secure and prosperous. Budget ~US$226M/year; activities include:

- **R&D**
  Pre-competitive, early-stage investment in next-generation technologies

- **Integration**
  Technology validation, field & lab testing, metrics, market integration

- **Codes & Standards**
  Whole building & equipment standards technical analysis, test procedures, regulations
Our Homes and Buildings

There **124 million buildings** in America.

They use:
- 40% of US energy
- 75% of electricity
- up to 80% of peak power

More than 80% are **20 years old or older**.

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

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
Flexible building loads

Provide options to increase electricity system reliability & energy affordability

Support renewables & all generation options resulting from grid modernization

Optimize energy use based on customer preferences

Respond to innovations in the energy economy
Key Characteristics of GEB

EFFICIENT
Persistent low energy use minimizes demand on grid resources and infrastructure

CONNECTED
Two-way communication with flexible technologies, the grid, and occupants

SMART
Analytics supported by sensors and controls co-optimize efficiency, flexibility, and occupant preferences

FLEXIBLE
Flexible loads and distributed generation/storage can be used to reduce, shift, or modulate energy use
Demand Flexibility Provided by GEB

- **Efficiency**: Graph showing power demand over the hour of the day.
- **Load Shed**: Graph showing power demand with load shedding over the hour of the day.
- **Load Shift**: Graph showing power demand with load shifting over the hour of the day.
- **Modulate**: Graph showing power demand with modulation over sub-seCONDS to seconds.

## Efficiency
- Baseline
- Efficiency

## Efficiency + Generate
- Efficiency + Generate
- Solar PV
- Generate

## Efficiency + Generate + Shed/Shift
- Efficiency + Generate + Shed/Shift
- Shed/Shift
# Potential Grid Services Provided by Demand Flexibility in Buildings

<table>
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<tr>
<th>Grid Services</th>
<th>Potential Avoided Cost</th>
<th>Potential Market Size Addressable by Demand Flexibility in Buildings</th>
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<tbody>
<tr>
<td><strong>Generation Services</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generation: Energy</td>
<td>Power plant fuel, operation, maintenance, and startup and shutdown costs</td>
<td>Large</td>
</tr>
<tr>
<td>Generation: Capacity</td>
<td>Capital costs for new generating facilities and associated fixed operation and maintenance costs</td>
<td>Large</td>
</tr>
<tr>
<td><strong>Ancillary Services</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contingency Reserves</td>
<td>Power plant fuel, operation, maintenance, and associated opportunity costs</td>
<td>Moderate</td>
</tr>
<tr>
<td>Frequency Regulation</td>
<td>Power plant fuel, operation, maintenance, and opportunity costs associated with providing frequency regulation</td>
<td>Small</td>
</tr>
<tr>
<td>Ramping</td>
<td>Power plant fuel, operation, maintenance, and startup and shutdown costs</td>
<td>Small</td>
</tr>
<tr>
<td><strong>Delivery Services</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Wires Solutions</td>
<td>Capital costs for transmission &amp; distribution equipment upgrades</td>
<td>Moderate</td>
</tr>
<tr>
<td>Voltage Support</td>
<td>Capital costs for voltage control equipment (e.g., capacitor banks, transformers, smart inverters)</td>
<td>Small</td>
</tr>
</tbody>
</table>
Potential Benefits of Flexible Building Loads

- Energy Affordability
- Improved reliability
- Reduced grid congestion
- Enhanced services
- Environmental benefits
- Customer choice
GEB Strategy Update and Next Steps

Engage Stakeholders

Establish Role & Objectives

Understand Stakeholder Needs

Determine Research Opportunities

Identify Potential

Develop R&D goals & targets

Develop Workstreams

Phase 1 - Value Conceptualization

Phase 2 – Research & Analysis

Phase 3 – Strategy Formulation
The GEB Technical Report Series will help inform and guide BTO’s R&D portfolio and serve as a foundational resource for the larger building research community.

Reports will be published in Summer 2019 in partnership with Navigant, NREL, PNNL.

**GEB Technical Report Series:**
- Overview
- Heating, Ventilation, & Air Conditioning (HVAC); Water Heating; and Appliances
- Lighting
- Building Envelope & Windows
- Sensors & Controls, Data Analytics, and Modeling

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**Research & Analysis: Determine Research Opportunities**

1. **Establish Frameworks**
   - Defines grid-interactive efficient buildings and demand flexibility
   - Establishes potential grid services and some basic requirements for buildings to provide needed flexibility

2. **Assess Flexibility Potential**
   - Evaluate state-of-the-art and emerging building technologies that have the potential to provide grid services
   - Considers implementation attributes

3. **Discuss Research Opportunities**
   - Identify major research challenges of technologies with significant potential for grid benefits and opportunities for additional technology-specific research and development.
Research & Analysis: Understand Stakeholder Needs

Ongoing
- Efficient and Flexible Building Loads RFI
- Quarterly Stakeholder Calls

Focused
- Working Groups: Utility/States/Building Owners
- REEO Landscape Report

Topic Specific
- Technical Advisory Groups for GEB projects
- Workshops

Crosscutting
- GMLC
- DOE Programs

STAKEHOLDER ENGAGEMENT
Identify Potential

**GEB Technical Report Series**
establishes demand flexibility modes and potential grid services along with associated grid requirements

**Metrics Projects**
establishes flexibility metrics for both measurement & grid requirements
3 year projects; Metrics will be finalized by September 2019

**Technology Characteristics**
establishes attribute framework
Multi-lab effort
May expand to standardize attribute options across framework

**SEE Action Report Series**
metrics and attributes included in the report on assessing performance
Reports will be completed in 2019-2020

**GEB Potential Study**
will establish GEB potential with peak and overall reduction measurement
Complete in September 2019
BTO’s grid-interactive efficient buildings portfolio

<table>
<thead>
<tr>
<th>VALUATION</th>
<th>TECHNOLOGY OPTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>How do <em>time &amp; the interaction of flexibility options</em> impact value?</td>
<td>Which <em>end use technologies</em> provide solutions to specific grid needs?</td>
</tr>
<tr>
<td>Identify values to stakeholders, quantification of national value.</td>
<td>Prioritize technologies / solutions based on grid services.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OPTIMIZATION</th>
<th>VALIDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>How to maintain or improve services while optimizing for flexibility?</td>
<td>Do technologies perform as predicted and meet grid &amp; occupant needs?</td>
</tr>
<tr>
<td>Solutions that meet grid operator &amp; building occupant needs.</td>
<td>Verification of technologies / strategies, increasing confidence in the value of energy flexibility.</td>
</tr>
</tbody>
</table>
Collaboration across DOE offices and activities

- GEB visions focuses on the integration and optimization of DERs – including EE, DR, solar, EVs, and battery storage.

- Example Collaboration (SETO Project with BTO Support): AI Smart Communities
- Rooftop Solar, Batteries, foresee
- GW scale modeling and simulation over 400 homes
- 20-40 home field validation planned in Fort Collins, CO
- Community aggregation across neighborhood to minimize solar curtailment
- In partnership with Thrive Home Builders and City of Fort Collins (municipal utility)
Questions & Challenges

- How do grid-interactive efficient buildings fit into broader renewables integration and grid modernization?
- What are the top priority benefits that buildings provide the grid?
- How critical are better
  - Technologies? Analytics? Policies & programs?
- What are key barriers to adoption of advanced controls, technologies, practices?
  - Making the case? Complexity? Cybersecurity concerns?
- Will efficiency get its ‘fair share’?
- Is this a ‘bridge too far’ (at least today) for buildings, utilities, utility regulators, governments?
- How to best work with other national, state governments
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Building Technologies Office, U.S. DOE
www.energy.gov/eere/buildings/geb
Utility Grid Modernization

David South
Senior Principal
Energy & Utilities Practice

June 19, 2019
Transformation of the Grid is underway...

A **smart grid** is an electrical **grid** which includes a variety of operation and energy measures including **smart** meters, **smart** appliances (IOT), renewable energy resources, and energy efficient resources.
Grid Modernization encompasses all the changes needed in the generation, transmission and distribution of electric power to deliver resilient, reliable, flexible, secure, sustainable, and affordable electricity.

Utilities are being asked to transform their traditional business model to adapt to new customers’ expectations and meet Grid Modernization objectives….and do it quickly.
To meet our aggressive GHG goals, the Grid needs to undergo a major transformation to accommodate DERs deployment at scale

- The Grid needs to support thousands of small-scale DERs coming online daily
- The Grid needs to manage and gain access to third-party owned DERs
- The Grid must become flexible and dynamic to handle intermittent load

... while reducing interconnection costs
More energy is being supplied by a portfolio of local, distributed resources, adding complexity to grid planning and operations

The Grid needs to control DERs individually and/or in aggregates

Some DERs have two-way power flow

The Grid must have visibility over all DERs and be flexible and dynamic

... while maintaining a safe and reliable Grid
Grid modernization activity is happening in states of all sizes and market structures

Source: Grid Modernization Index 2018, GridWise Alliance
Grid Modernization Drivers

- **American Recovery and Reinvestment Act** of 2009 (ARRA)
  - Provided DOE with $4.5 billion to modernize the electric power grid
  - Under the Smart Grid Investment Grant (SGIG), DOE and the electricity industry jointly invested $8 billion in 99 cost-shared projects involving more than 200 participating electric utilities and other organizations to modernize the electric grid, strengthen cybersecurity, improve interoperability, and collect an unprecedented level of data on smart grid operations and benefits

- **State Programs**
  - CA
  - NY—Reforming the Energy Vision (REV)
  - MN—e21
  - IL—NextGrid
  - OH—PowerForward
  - WI--tbd
AMI penetration by state, as of 2017

Alaska and Hawaii have reached 34% and 6%, respectively.

Legend
- 75-100%
- 50-75%
- 25-50%
- < 25%
The next phase of Grid Modernization will require a coordinated and integrated plan to focus on all these areas:

- Customer Engagement
- Technology
- Cyber Security & Reliability
- Regulatory Compliance
- 3rd party aggregators / operators / utility role
- Transmission / Distribution Planning
- Transmission / Distribution Operations

Grid Modernization Plan
HOW THE GRID WILL OPERATE IN THE FUTURE

Transformation to an information-enabled and highly interconnected network between electricity Suppliers and Consumers

Move From...
- Limited Consumer Choice
- One-Way Communication
- Few Sensors & Analog Controls
- Reactive Maintenance
- Blind to Events

To...
- Many Consumer Choices
- Two-Way Communication
- Digital Monitoring & Controls
- Condition-Based Maintenance
- Self-Monitoring and Self-Healing

Result...
- Consumer Control & Convenience
- Innovation
- Efficiency
- Simplicity
- Competitive Marketplace
### US smart grid: key takeaways

| **AMI market in the US is well developed but not yet saturated** | The US has the largest installed base of AMI meters in the world (China primarily has AMR meters). But AMI penetration has only recently reached 50% and there are still enormous market opportunities. |
| **Federal SGIG program was a major source of investment** | The federal Smart Grid Investment Grant program (SGIG) ran from 2010 to 2015 and led to nearly $8 billion in smart grid investment and over 16 million smart meters deployed across the US. Investment slowed after completion of the program, but is beginning to pick up again. |
| **Several major US utilities have not deployed smart meters** | Some of the largest electric utilities in the US, both investor-owned and municipal, have installed less than 5% smart meters across their residential customer base. |
| **Regulations are state-based and vary widely** | Differing state regulations have led to a select few states completing rollouts while many more have either not begun or have made very little progress. State PUCs will help determine the pace at which smart grid deployments grow. |
| **The DA market continues to grow and converge with the AMI market** | DA infrastructure investment continues to grow and is increasingly converging with AMI as DA devices—such as line sensors, voltage regulators, capacitor banks, and others—are connected via AMI communications networks. |
The Future is:

Smart power +
Smart grids +
Smart buildings
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Energy & Utilities Practice
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CP: 703.795.2274
Please join us for a tour of Kauffman Stadium,
Home of the Kansas City Royals

sponsored by Leidos