



## **Residential Grid-Interactive Efficient Building Technology and Policy**

*NASEO-NARUC GEB Working Group  
Roundtable and Workshop*

**Kara Saul Rinaldi**

President/CEO  
AnnDyl Policy Group, LLC

2019 NASEO Annual Meeting  
September 16, 2019

# Residential Grid-Interactive Efficient Building Technology and Policy: Harnessing the Power of Homes for a Clean, Affordable, Resilient Grid of the Future



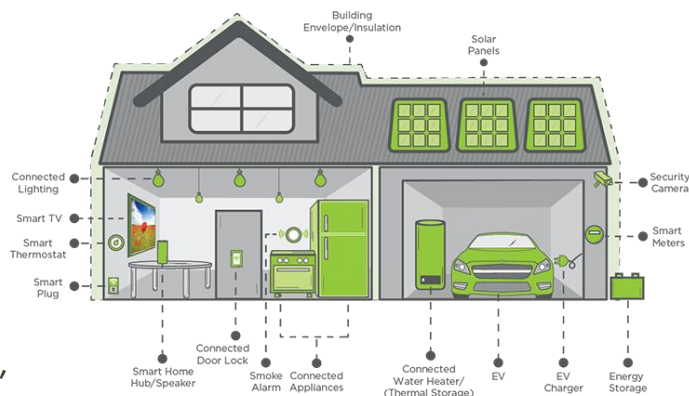
[www.anndyl.com/GEB\\_Report.html](http://www.anndyl.com/GEB_Report.html)

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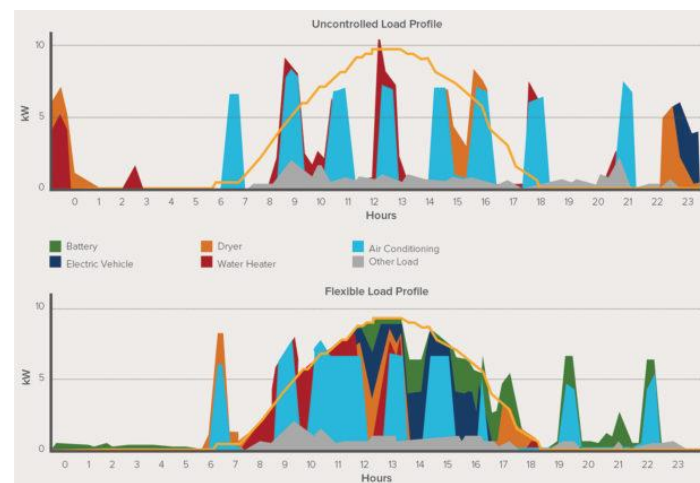
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# Why Connected Homes?

- Changing electric grid
  - Variable renewable energy requires demand flexibility
  - DERs, two-way power flows
  - Goals: clean, affordable, resilient, reliable
- Residential buildings consume more electricity than any other sector and are an under-addressed contributor to peak demand
- *GEs provide occupant and grid benefits*



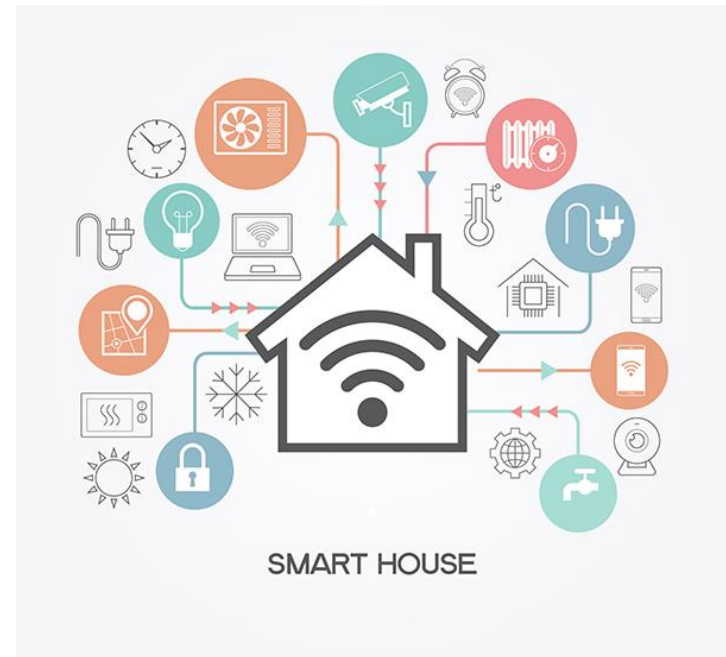
Source: Navigant



Source: Rocky Mountain Institute, Demand Flexibility: The Key to Enabling a Low-Cost, Low-Carbon Grid, February 2018

# Residential GEB Technologies: Current and Future Potential

1. Energy Efficiency
2. Smart Home Technology/  
Home Energy Management  
Systems (HEMS)  
(sensors, intelligent control,  
optimization)
3. Storage: Battery, Thermal, EV  
chargers
4. Distributed Generation
5. Smart Meters &  
Interoperability



# Barriers & Challenges



- EE, DR, other DERs are siloed
- Valuing all GEB benefits
- Traditional utility planning + infrastructure investment
- Educating and engaging homeowners & contractors
- Interoperability/data access/ standard communications protocols
- Equity and rural broadband access

# Policy/Regulatory Opportunities

- Integrated Demand Side Management (IDSM)
- Cost-Effectiveness Testing
- Utility planning & incentive structures
- Time-Varying Rate Structures
- Measured savings models (P4P)
- Use real-time granular data to verify savings, improve programs
- Access to utility data
- Low and Moderate Income (LMI)
- Building codes
- Interoperability Incentives/Requirements
- Energy Policy Goals: *RPS, EERS, Clean Peak Standard (CPS), emissions targets*

# Industry Experts Offer Insights

*There should be some good video product for contractors to show to homeowners that says here's what GEB is, in layman terms."*  
Jonathan Waterworth, AZ Energy Efficient Home/Southwest Sustainable Structures Inc.:  
*"If you had state officials or DOE-sponsored videos that could be a powerful part of the presentation.*  
Scott Needham, Princeton Air

*I think developing and deploying technologies that make it simple for consumers to 'set it and forget it', and allow for some degree of control and flexibility, will be key to success. Consumers have to understand and experience the tangible value in order to create acceptance and engagement.*  
Kim Burke, Colorado Energy Office

*Media can play an important role in making people aware and moving the needle. We're taking our cues from each other and we are reflected in our media. Our media is a reflection and a prognostication of where we're going... It's possible to respectfully guide and be a part of the conversation.*  
Beth Karlin, See Change Institute

*Most smart home and energy management systems to date have been more engineering centric and point solution focused. Bot-enabled artificial intelligence (AI) microservices changes the game by learning the patterns of the home and serving as an intuitive digital assistant—saving energy in the background of end users' lives and proactively enabling a conversation with and control of the home via text messaging.*  
Chris Ebert, People Power

*You'll get a lot of kickback from people if they feel like they're being required to throttle their appliances up and down because their utility says so. But if they opt in and have the opportunity to save money, are shown what they're doing and how it's making the grid better and cleaner, then that's a very different thing.*  
Damian Hodkinson, Halco

## Industry Experts Offer Ideas for Educating and Engaging Homeowners

*Get people thinking bigger picture. I think most people want to do their part, but you've got to provide an easy path for them.*  
Dan Thomsen, Building Doctors

*Contractors and real estate agents who are on the frontlines interacting with homeowners can be translators and cheerleaders for the different technologies, and help homeowners make informed decisions.*  
Claire Miziolek, Massachusetts Executive Office of Energy and Environmental Affairs (formerly with Northeast Energy Efficiency Partnerships)

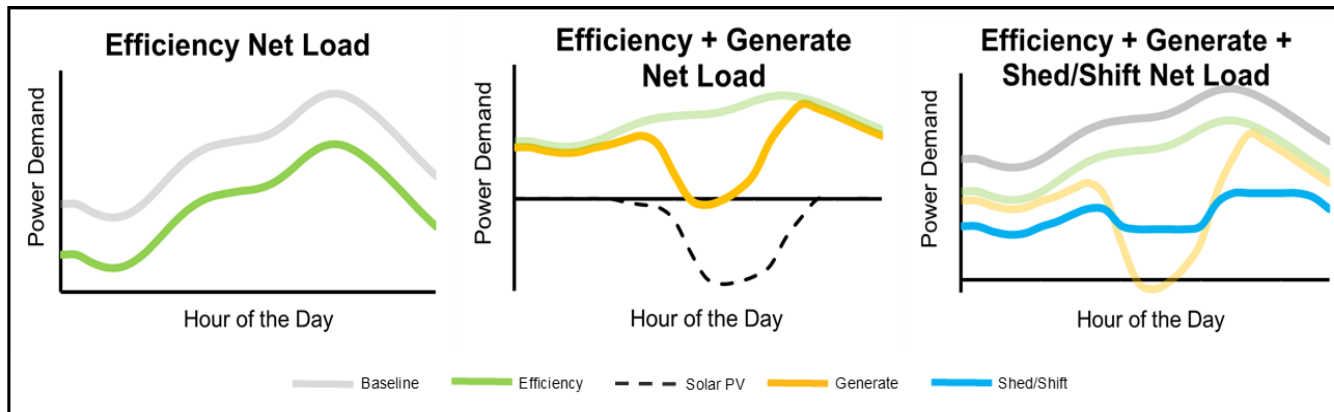
*I think the home performance contractor is best suited to educate homeowners. That's what we do. We're doing that for energy efficiency—envelope and mechanical—and now we're just adding more on top of that. It all starts with the whole sit-down education, this is where you're at, this is what you could do, this is why you should do it.*  
Jonathan Waterworth, AZ Energy Efficient Home/Southwest Sustainable Structures Inc.

*There is a need not only for a good marketing campaign but also for attractive sales materials for contractors to enable them to talk easily and comfortably about grid-interactive efficient home solutions.*  
Robin LeBaron, Pearl National Home Certification

*Have a dialogue with the customer in a fairly lightweight manner that helps homeowners understand why they should remain in this program, and how these smart technologies are helping them without much effort on their part. I don't think homeowners want to take an active role in this. I think homeowners want to take a minimal approach, but they want to live their worldview.*  
William Burke, Virtual Peaker

# Recommendation #1

- **Break down the siloes between renewable energy, energy efficiency, and DERs**
  - Advance Integrated Demand Side Management (IDSM)
  - Include residential EE and technology incentives in energy policy goals, renewable and GHG targets



Source: U.S. Department of Energy



# Recommendation #2

- **Ensure proper valuation of residential DERs (including energy efficiency)**
  - Update Cost-Effectiveness Testing
  - Require planning models to include residential DERs and capture their value

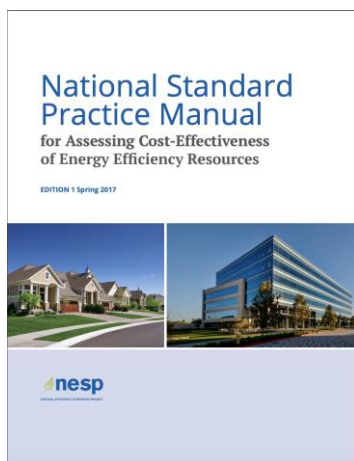


Image credit: NESP, U.S. EPA

# Recommendation #3

- **Incentivize residential energy efficiency and load flexibility**
  - Advanced rate structures for residential customers
  - Modernize utility incentive structures



Image credit: 123RF

# Recommendation #4

- **Engage the public and design policies that work for everyone**

- Consumer education about advanced rate structures
- Information campaigns using all forms of media
- Access to utility data (+security protocol best practices)
- Ensure equitable access, consider LMI impacts
- Provide market flexibility



Image credit: 123RF

# Recommendation #5

- **Establish necessary infrastructure to pave the way to a grid-interactive efficient future**
  - Complete residential AMI penetration
  - Promote interoperability
  - Include smart technology in residential energy stretch codes for efficiency.



Image credit: Engerati, Shutterstock



# Research & Development Needs

## **Develop and Promote Standards for Residential GEB Technologies**

- Connected/grid-interactive appliance standards
- Standards for interoperability and communications protocols

## **Identify Security Risks and Best Practices**

- Investigate specific cybersecurity risks for residential IoT in the energy space
- Formulate security protocol best practices for third-party data access

## **Conduct Behavioral Science Research and Usability Studies**

- Research to define and remove barriers to GEB technology adoption
- User engagement and usability studies

## **Advance Workforce Education**

- Develop contractor curriculum on smart technology

## **Develop Strategies to Maximize GEB Potential of Homes**

- Potential of retrofit measures to increase energy efficiency, grid interactivity, and demand flexibility
- Energy optimization strategies across different technologies
- Utilize EM&V 2.0 strategies to streamline program administration
- Physical and regulatory research pilots on smart technologies' benefits to low-income homes

## **Quantify the Value of Residential GEBs and Benefits**

- Advanced performance measurement to quantify value of GEB
- New methods and tools for valuing the hard-to-quantify benefits such as energy resiliency and non-energy benefits

# Thank you!

Kara Saul Rinaldi  
President & CEO  
AnnDyl Policy Group  
202.276.1773  
[kara@anndyl.com](mailto:kara@anndyl.com)

[www.anndyl.com/GEB\\_Report.html](http://www.anndyl.com/GEB_Report.html)

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