1. Accenture
2. Advanced Energy
3. Alectra Utilities
4. Ally Energy Solutions
5. Alternative Energy Systems Consulting
6. Ameren
7. American Public Power Association
8. Apex Analytics
9. Apogee Interactive
10. Applied Energy Group
11. APTIM
12. Aquanta
13. Arizona Public Service
14. Armada Power
15. Austin Energy
16. Baltimore Gas and Electric
17. Beneficial Electrification League
18. Berkshire Hathaway Energy
19. Black & Veatch Management Consulting
20. Bonneville Power Administration
21. Bristol Tennessee Essential Services
22. Buffalo Niagara Medical Campus
23. Cadmus
24. Calico Energy
25. Central Hudson Gas & Electric
26. Chelan PUD
27. City of Tallahassee Utilities
28. Clean Power Research
29. CLEAResult
30. COI Energy Services
31. Colbun
32. Commonwealth Edison
33. Con Edison
34. Connected Energy
35. Connected Energy Limited
36. Consumers Energy Company
37. Contract Callers
38. CPower Energy Management
39. CPS Energy
40. Customized Energy Solutions
41. Dairyland Power Cooperative
42. DNV GL
43. DTE Energy
44. Duke Energy
45. E Source
46. E4TheFuture
47. Eaton
48. ecobee
49. Edison Electric Institute
50. Efficiency Vermont
51. Emerson Commercial & Residential Solutions
52. EMI Consulting
53. Enbala
54. Encycle
55. Enel X
56. Energy Federation
57. Energy Solutions
58. EnergyHub
59. EnerVision
60. Entergy
61. EPRI
62. ERS
63. Evergy
64. Eversource
65. Extensible Energy
66. FirstEnergy
67. FleetCarma
68. FPL
69. Franklin Energy
70. GDS Associates
71. Generac
72. Georgia Power Company
73. Google (Nest)
74. Great River Energy
75. GridFabric
76. GridOptimize
77. GridPoint
78. Guidehouse
79. Hawaiian Electric Company
80. High West Energy
81. Honeywell Smart Energy
82. ICF
83. Idaho Power
84. IGS Energy
85. Illume Advising
86. Indianapolis Power & Light Co.
87. Integral Analytics
88. IPKeys Power Partners
89. Itron
90. Jackson EMC
91. Landis+Gyr
92. Leap
93. Minnesota Power, an ALLETE Company
94. Modesto Irrigation District
95. National Grid
96. National Rural Electric Cooperative
97. NB Power
98. New Braunfels Utilities
99. New Hampshire Electric Cooperative
100. New York Power Authority
101. Nexant
102. North Carolina Electric Membership Corporation
103. NTC
104. OATI
105. Oklahoma Gas & Electric
106. Olivine
107. Oncor Electric Delivery
108. Open Systems International
109. OpenADR Alliance
110. Opinion Dynamics
111. Opus One
112. Oracle Utilities
113. Orange and Rockland Utilities
114. Pacific Gas & Electric
115. PECO, An Exelon Company
116. Pepco, an Exelon Company
117. Portland General Electric
118. Powerley
119. PowerSouth Electric Cooperative
120. PPL Electric Utilities
121. Public Service Company of Oklahoma
122. Rappahannock Electric Cooperative
123. Resideo
124. RF Demand Solutions
125. Sacramento Municipal Utility District
126. Salt River Project
127. San Diego Gas & Electric
128. Santee Cooper
129. Schneider Electric
130. Scope Services
131. ScottMadden
132. Seattle City Light
133. Sensus USA
134. Shifted Energy
135. Skipping Stone
136. Smart Electric Power Alliance
137. Smartenit
138. Snohomish County PUD
139. SolarEdge Technologies
140. Southern California Edison
141. Southern California Gas Company
142. Steffes
143. Sunverge Energy
144. Tantalus
145. Tennessee Municipal Electric Power Association
146. Tennessee Valley Authority
147. Tetra Tech
148. The Brattle Group
149. Threshold
150. Tierra Resource Consultants
151. TRC
152. Tri-State Generation & Transmission
153. Trickle Star
154. TROVE
155. Tucson Electric Power
156. Uplight
157. Utility Load Management Exchange
158. Vectren
159. Warranty Design
160. Waseda University
161. WaterFurnace
162. West Monroe Partners
163. Xcel Energy
164. Zen Ecosystems
165. Zeuthen Management Solutions

PLMA™
Load Management Leadership

PLMA™
Load Management Leadership

PLMA Load Management Dialogue

US Department of Energy's Future Connected Communities: Validating Buildings as a Grid Resource

David Nemtzow
U.S. Department of Energy

Mary Ann Piette
Lawrence Berkeley National Laboratory

Teja Kuruganti
Oak Ridge National Laboratory

Allison Hamilton
National Rural Electric Cooperative Association

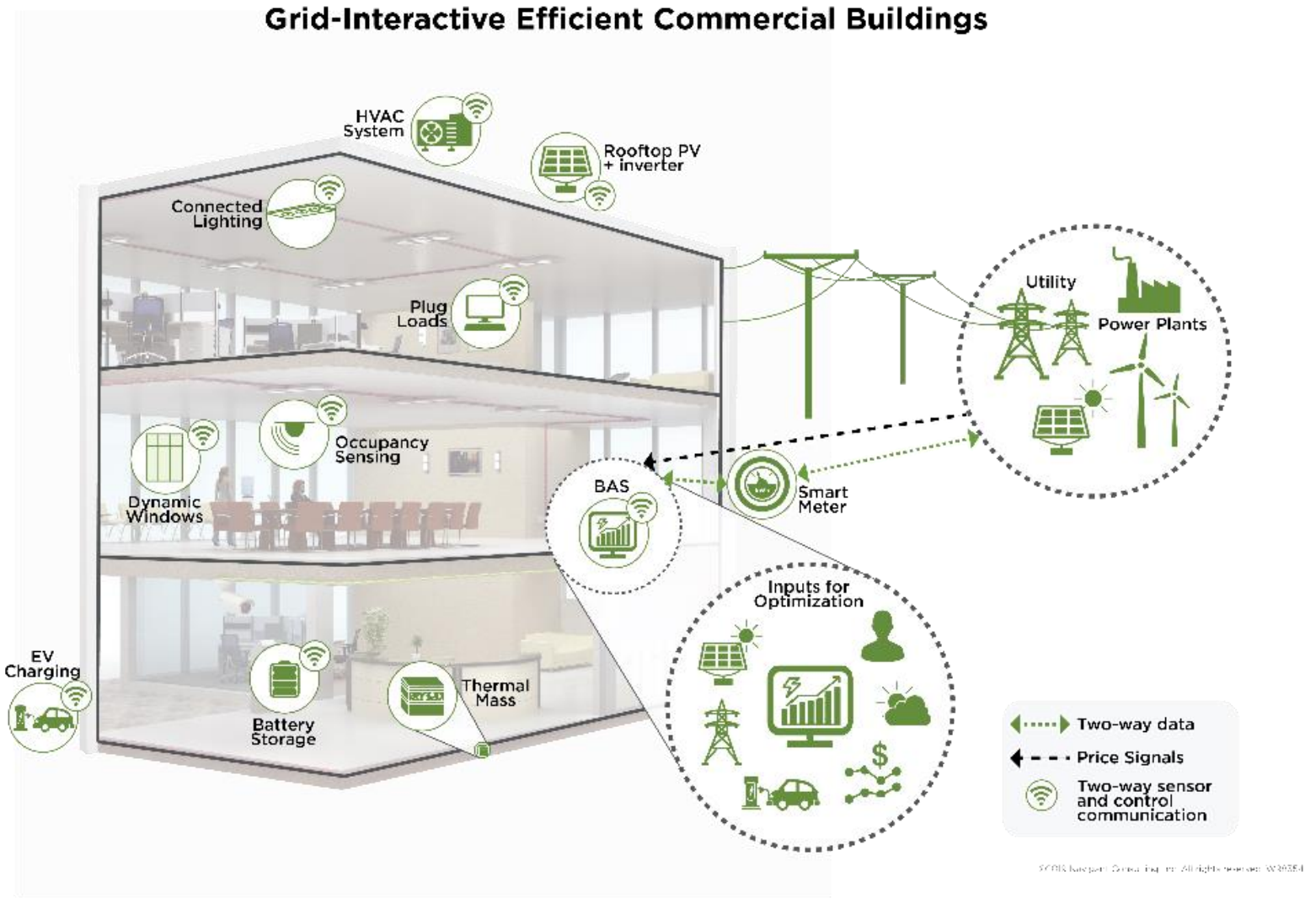
U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Connected Communities

DOE Investment in Efficient, Smart, Flexible Buildings of the Future

Grid-interactive Efficient Buildings Initiative



PLMA™
Load Management Leadership

Key Characteristics of GEBs

EFFICIENT

Persistent low energy use minimizes demand on grid resources and infrastructure

CONNECTED

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

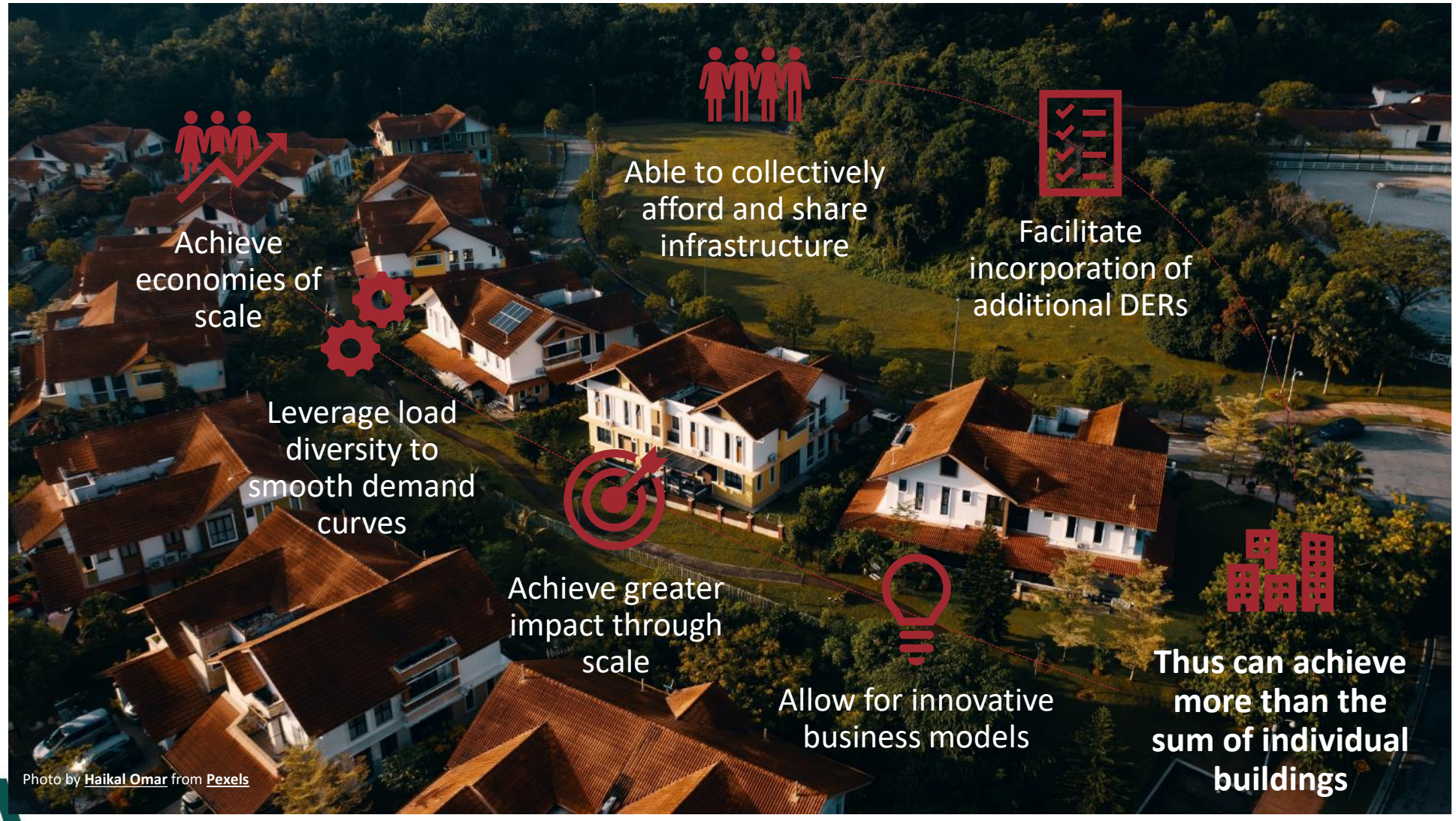
SMART

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

Groups of GEBs Can Provide Added Value



PLMA
Load Management Leadership

“Communities” Could Take Many Forms

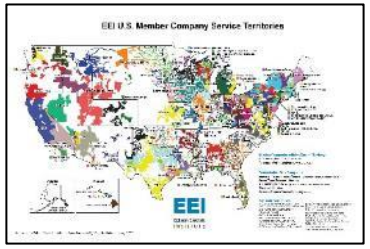
Residential neighborhood

Mixed-use development

Downtown commercial district

University or corporate campus

Geographically-dispersed building portfolio



Utility territory

New construction and existing building retrofits

PLMA™
Load Management Leadership

DOE Intends to Invest $42 Million into “Connected Communities”

Connected Community:

A group of grid-interactive efficient buildings (GEBs) with diverse, flexible end use equipment that collectively work to maximize building and grid efficiency without compromising occupant needs and comfort

Funding opportunity would enable regional GEB communities to share research results and lessons learned on projects that increase grid reliability, resilience, security and energy integration well into the future.

Demonstrate and evaluate the capacity of buildings as grid assets by **flexing load** in both **new developments and existing communities** across diverse climates, geography, building types and grid/regulatory structures

Share research results and lessons-learned on projects that improve energy affordability, increase grid reliability, resilience, security and energy integration

PLMA™
Load Management Leadership

What We're Looking For When the FOA is Released

- ✓ Teams of strategic stakeholders
- ✓ Sets of multiple buildings
- ✓ Multiple DER integration
- ✓ Ability and willingness to share data
- ✓ Diversity of projects (geography, building type, vintage, regulatory)

What We Hope to Achieve

- Measured impact of building as grid assets
- Solutions that address diverse grid needs that can be scaled in size and in other communities
- Input from occupants on impact and comfort level
- Demonstrated new business models for demand flexibility and DER coordination and optimization
- Online solutions center on best practices

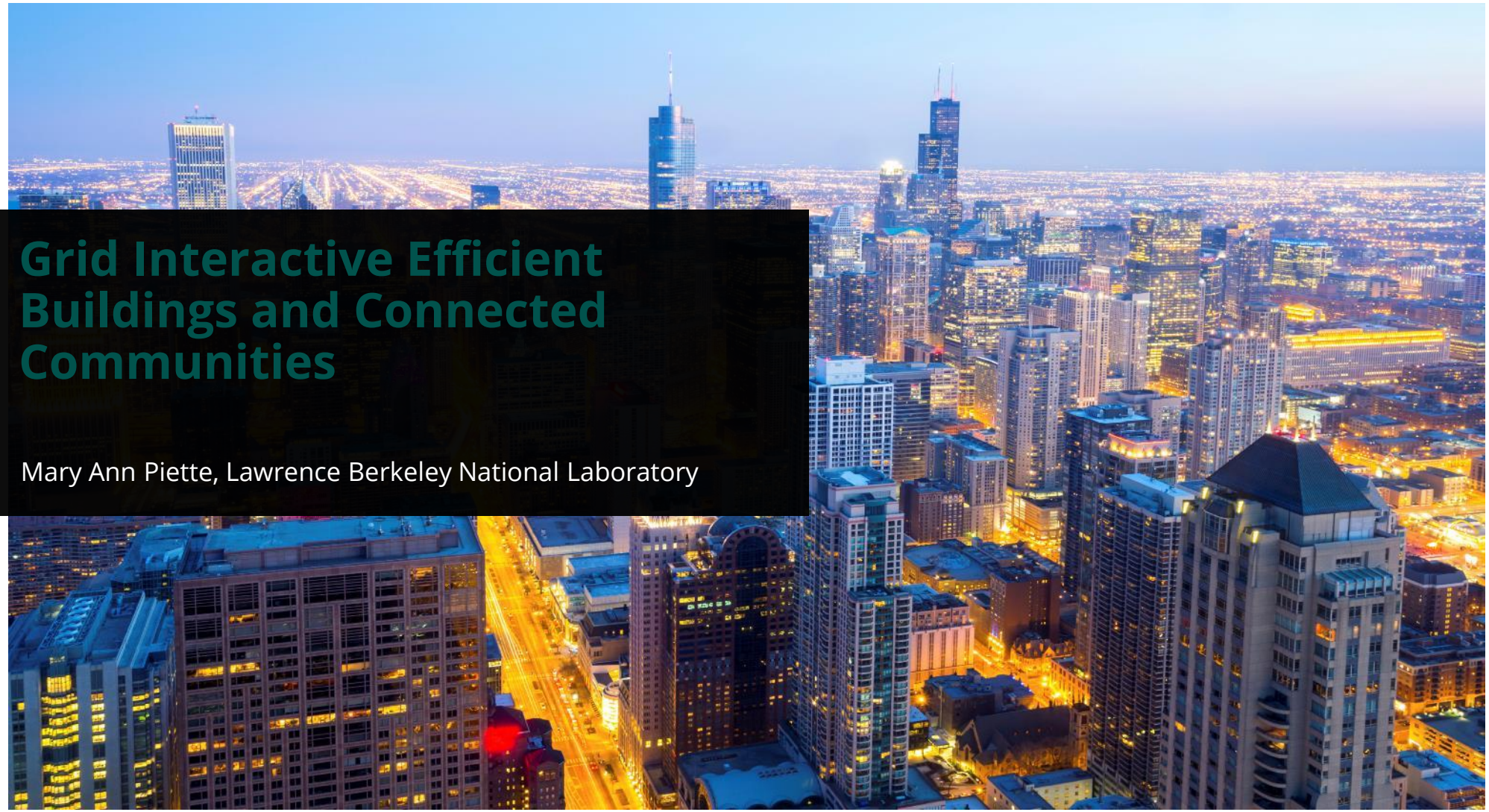
Request for Information on Connected Communities

We Look Forward to Your Feedback

Visit eere-exchange.energy.gov or Scan the QR Code for the Request for Information:

"DE-FOA-0002291: **Request for Information**: Funding Opportunity Announcement 2206: "Connected Communities"

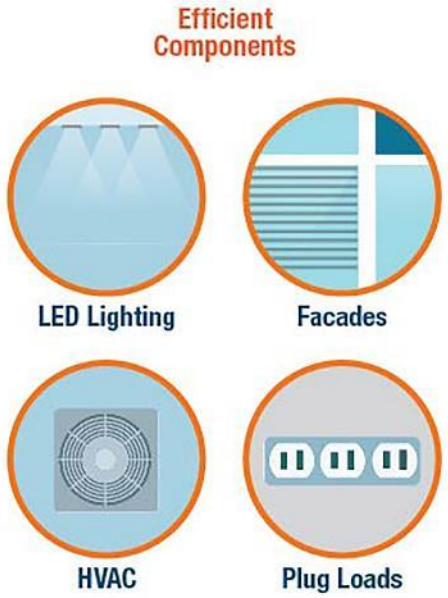
PLMA™
Load Management Leadership



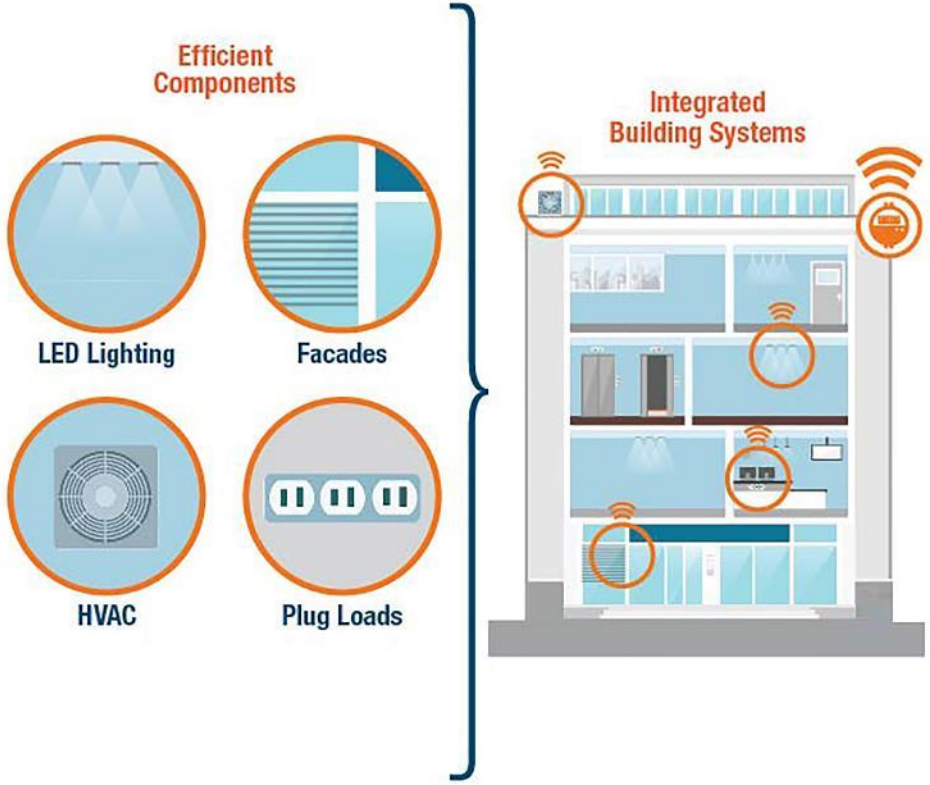
Grid Interactive Efficient Buildings and Connected Communities

Mary Ann Piette, Lawrence Berkeley National Laboratory

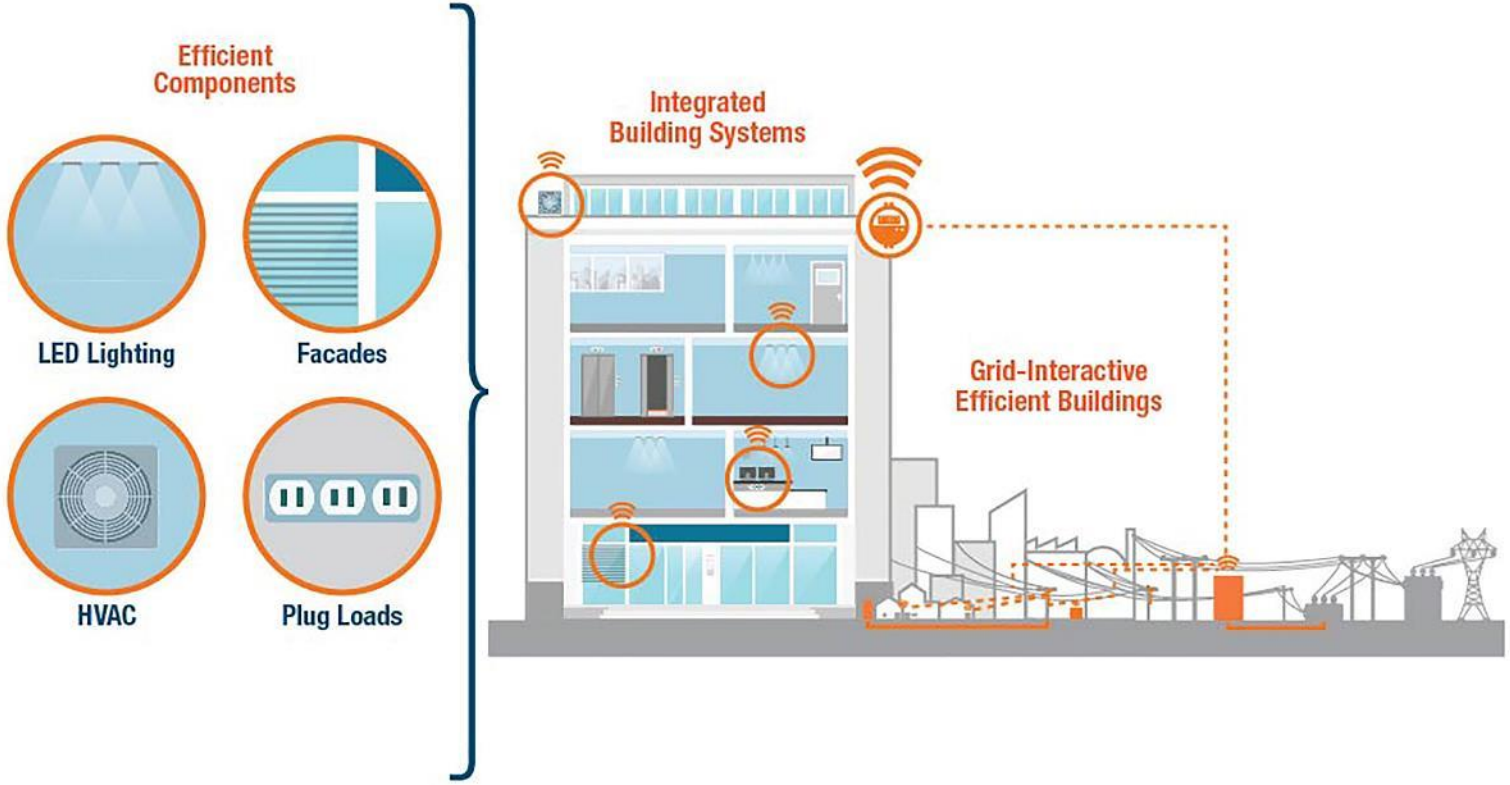
Grid Interactive Efficient Buildings Begin with Efficient Components



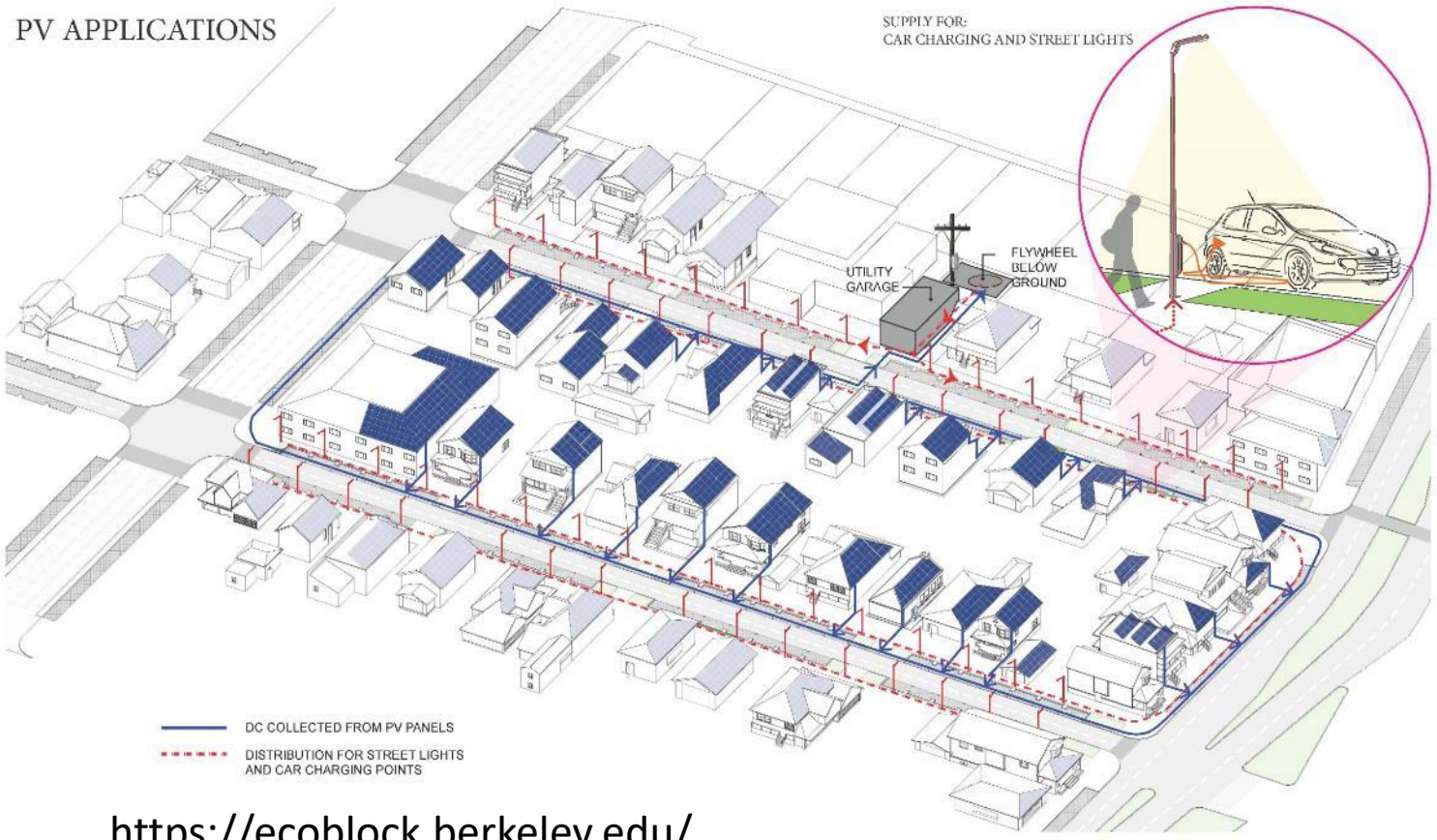
Grid Interactive Efficient Buildings Support Integrated Building Systems



Grid Interactive Efficient Buildings Integrate with the Electric Grid



Ecoblock – from UC Berkeley for Oakland CA



https://ecoblock.berkeley.edu/

Grid-Interactive Efficient Neighborhoods

Two smart home communities testing energy efficiency, distributed energy resources, and grid integration

- 62 single-family homes
- Birmingham, Alabama
- **Utility owned, gri connected microgrid**
- Grid integration of microgrid, water heating & HVAC

- 46 townhomes
- Atlanta, Georgia
- **Homeowner owned solar + storage**
- Grid integration of solar, storage, HVAC, water heating & EV charging

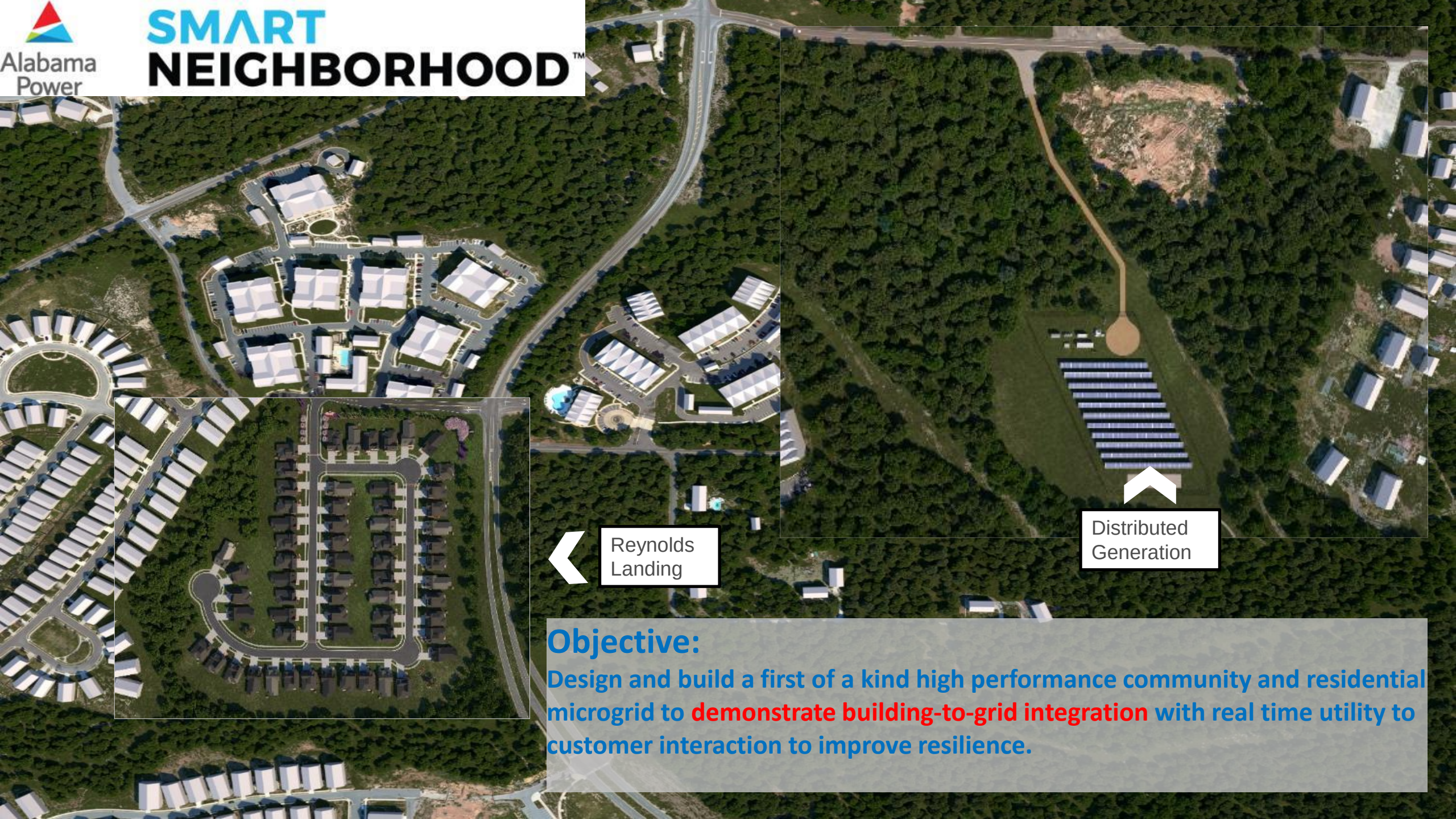
Leveraging in-home technologies
Smart thermostats, Solar Panels, Battery storage, Vivint security & home automation

Gaining a better understanding of
Energy Efficiency, Distributed Energy Resources and Home Automation on residential energy loads of the future

Partnerships
Southern Company
Oak Ridge National Laboratory
DOE Building Technologies Office
Electric Power Research Institute (EPRI) and

Alabama Power

SMART NEIGHBORHOOD™



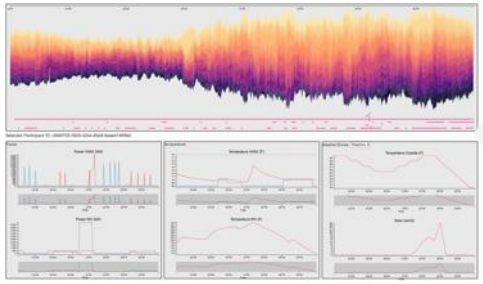
Objective:

Design and build a first of a kind high performance community and residential microgrid to demonstrate building-to-grid integration with real time utility to customer interaction to improve resilience.

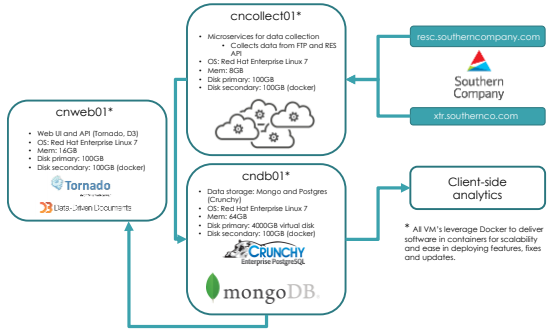
Technical Approach

- Quantify the value to the grid of operating microgrid with controllable loads
- Develop and demonstrate control algorithms for generating macroscopic load shapes
- Evaluate price/incentive signal design with a microgrid and controllable loads.
- Develop scalable system-level architecture for performing control at-scale

Data



Situational Awareness



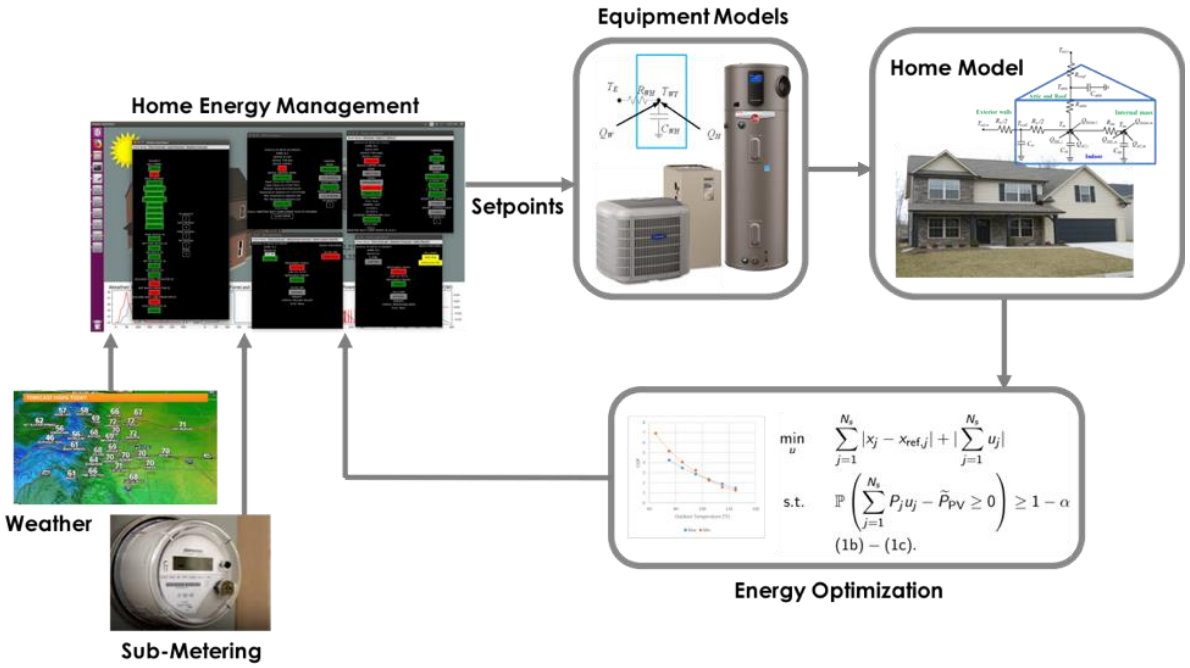
Analytics

PLMA™
Load Management Leadership

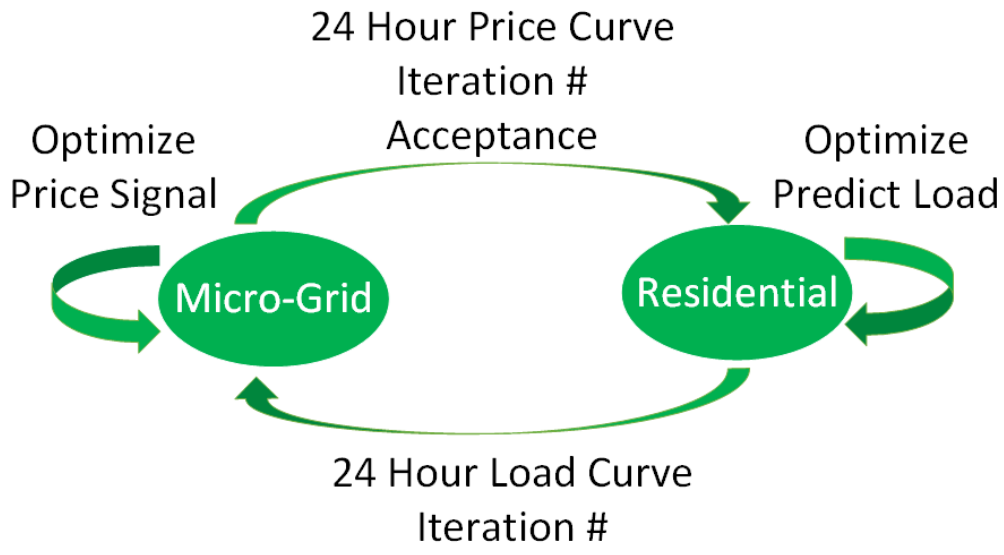
Neighborhood performing two-levels of optimization

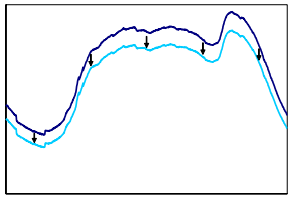
It is a balancing act to effectively manage resource efficiency and homeowner comfort

Residential-Level Optimization

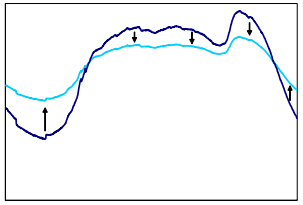


Neighborhood-Microgrid Optimization

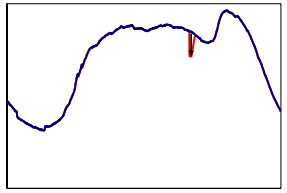




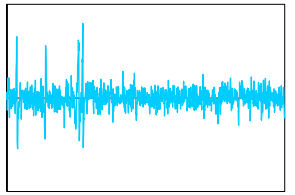
Energy Efficiency



Adaptive Load Shape



Reliability response



Regulation response

PLMA™ Load Management Leadership

PLMA™
Load Management Leadership

PLMA Load Management Dialogue

US Department of Energy's Future Connected Communities: Validating Buildings as a Grid Resource

David Nemtzow
U.S. Department of Energy

Mary Ann Piette
Lawrence Berkeley National Laboratory

Teja Kuruganti
Oak Ridge National Laboratory

Allison Hamilton
National Rural Electric Cooperative Association

PLMA Webcasts Coming Up:

April 20-22 – 41st PLMA Conference

PLMA™
Load Management Leadership
41ST PLMA Conference
April 20-22, 2020

May 7 - Calculating Cost-Effectiveness for Energy Efficiency and Demand Response Impacts