The GridOptimal™ Initiative
A New Rating System and Metric For Building-Grid Interactions

New Buildings Institute
U.S. Green Building Council
Agenda

• Background: Change is Coming to the Utility Industry
• Introducing The GridOptimal Initiative
• Rating Building-Grid Interactions
• Stakeholders and Applications
• Initiative Plan and Phases
• Participation Opportunities
• Q&A, Discussion
NBI is a national nonprofit working to improve buildings for people and the environment. We drive research, uncover solutions, and advance industry practices and policies that deliver positive change in the built environment.

Program Areas:
1. Best practices in new and existing buildings
2. Continuous code and policy innovation
3. Zero net energy leadership and market development
Change is Coming

What’s Next for the Utility Industry?

• What is the role of buildings, renewable energy, and storage in the utility of the future?

• We are seeking solutions to today’s challenges and opportunities for market transformation.

• We are assembling top experts to help answer these questions.

Source: Jim Lazar, 2016
Zero Energy Buildings
A Growing Trend

![Graph showing the growth of Zero Energy Buildings over the years from 2000 to 2018. The graph indicates an increasing trend in both ZE-Verified and ZE-Emerging buildings.](image)
# A Tale of Two ZE Building Typologies

<table>
<thead>
<tr>
<th>Renewable-Oriented</th>
<th>Efficiency-Oriented</th>
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<tbody>
<tr>
<td>• Minimally to moderately sensitive to the grid</td>
<td>• Highly grid-integrated and responsive</td>
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<tr>
<td>• Higher gross energy use</td>
<td>• Lower gross energy use</td>
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<tr>
<td>• Higher renewable generation</td>
<td>• Lower renewable generation</td>
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<td><strong>Active Strategies:</strong> Mechanical HVAC Systems, Thermal Storage, Night Ventilation, Demand Response</td>
<td><strong>Passive Strategies:</strong> Daylighting, Building Orientation, High Insulation Levels, Passive HVAC, Built-In Shading</td>
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Load Shapes vs. Spot Market

Hourly electricity demand and real-time energy prices in the PJM Interconnection
Saturday, July 13 - Friday, July 19, 2013

gigawatts

0 20 40 60 80 100 120 140 160 180

Saturday Sunday Monday Tuesday Wednesday Thursday Friday

$0 50 100 150 200 250 300 350 400 450 500

dollars per MWh
Consumer Price Signals are Changing

Cost of Storage
Peak Power Price
Cost of Solar PV
Off-Peak Power Price
GridOptimal: Why is it Needed?

There are currently no metrics that define building-level grid citizenship, or rate building-grid interaction quality

• Different players have different language to discuss the topic

• Grid operators and utilities are struggling to integrate renewable energy onto the grid

• Catalyze harmonization of building design with grid interaction to reduce curtailment.
GridOptimal™: Rating Building-Grid Interactions

The GridOptimal Rating System includes a New Quantitative Metric for Building-Grid Interactions

- **Lower score is better**, like zEPI and EUI
  - Passive features
  - Dispatchable / Responsive features

- Defines a building’s “peakiness” and “grid citizenship”

- Improves **integration of DERs** onto the grid

(Authors: Alexi Miller, PE & Jim Edelson)
The GridOptimal™ Score: Rating Building-Grid Interactions

**Start with:** min. 1 year of Load Profile Data
- 8,760 hrs Net Power Balance (kW Demand and kW Production) for Rated Building & Baseline Building

**End with:** Simple, easy-to-understand key number(s)
- GridOptimal Score integrates an asset and an operational rating based on building-grid interactions and capabilities
GridOptimal™: Rating Building-Grid Interactions

Four steps for GridOptimal scoring:
1. Identify critical hours from grid signature, peak, and negative peak
2. Compare rated building to baseline building demand during critical hours
3. Weight, aggregate, and score demand variance above/below baseline building
4. Adjust scoring based on other building characteristics (optional)
GridOptimal™: Grid Signature

Rated building lowers grid peak

Rated building contributes to grid peak
GridOptimal™: Grid Signature

- Rated building contributes to negative peak
- Rated building adds needed demand
GridOptimal™: Rating Building-Grid Interactions

**Calculation Inputs**

1. **Critical hour weight by severity of grid peak (% Peak Demand)**
2. **Sum and weight of peak savings (kWh)**
3. **Sum and weight of peak contribution (kWh)**
4. **Critical hour weight by severity of negative peak (% Negative Peak Demand)**
5. **Sum and weight of negative peak demand addition (kWh)**
6. **Sum and weight of negative peak contribution (kWh)**
7. **Adjustments for other building characteristics (responsiveness, EV/Storage, design features...)**
GridOptimal™: Layering Grid Resources

- Passive Design Elements
- Active Dispatchable Elements (ADR)
- Distributed Energy Resources
- EV / Storage Technologies
GridOptimal™: Building Strategies

Load Shedding
• Thermostats, lighting, pumps…

Peak Shifting
• Night ventilation, thermal storage, solar shading, occupancy shift, PV orientation…

Dynamic Response
• Controls, software, dynamic vehicle charging schedule…

Addressable Energy Storage
• Batteries, vehicles…
Stakeholders and Market Applications

Grid Perspective (Regulators, Utilities, Program Administrators):

- Incentive Programs: Distributed Energy Resources & Buildings
  - Upfront incentive for GridOptimal design
  - Favorable rates
  - “New Business” charge for connecting a building to grid upon completion
- Target building upgrades for grid operation/stability
- Provide predictable building load reductions to grid managers and for bidding into electricity markets
- Reduced demand ramp up/down leads to greater overall generation efficiency and reliability for grid operator

Building Perspective (Customers, Developers, Designers):

- Design & Specification Process
- Real Estate & Building Asset Valuation
- Insulation against demand charge changes

Regulatory and Policy Framework:

- Aligns with ZE Building Goals and Policies
- Regulatory and Policy Frameworks (e.g. CA Title 24, New York REV)
- Model Codes & Standards (e.g. ASHRAE 189.1, IECC, etc.)
GridOptimal™: Rating Building-Grid Interactions

Key Technical Benefits:

• Provide common language and **consistent metrics** to measure **grid citizenship**
• Allow utilities to provide incentives by referencing a **common, transparent, reliable standard**
• Ensure that **building staff are engaged** in energy performance
• Encourage **grid-sensitive, responsive building design AND operations**
• Reduce renewable energy **curtailment**
• Reduce strains on **voltage regulation**
• Provide **circuit-level production and demand management**
• Lower **distribution upgrade costs**
• Reduced **transmission loss**
• Increased **redundancy/backup**
• Improved **load matching flexibility**
• Lower **risk**
GridOptimal + Commercial Real Estate

Key Benefits

• Create a new revenue stream from existing assets
• Enhance access to utility incentives & programs
• Improve building valuation
• Return value to investors
• Improve Risk Management
  • Insulate against demand charges
  • Reduce bottom-line impacts of rate structure changes
• Meet Corporate Social Responsibility / Sustainability goals
GridOptimal™: How will we do it?

- Bring together **key stakeholders and experts** to develop standards
- Establish **framework for rating system** that will result in program implementation
- Develop the **rating system**, leveraging existing standards
- Identify **pilot projects** and participants
- Outline **incentive programs** and financing mechanisms
- Provide **Educational Guidance**
GridOptimal™: Tools & Resources

- Determine **performance-based data** needed
  - Meter-based performance analysis
- **Building modeling software methodology**
  - Building load shape – key characteristics and levers
  - Load shape by building type – baseline
  - Asset-based rating
- **Utility-based data** for each service territory
  - Understand critical constraints / opportunities
  - Prioritizing parameters and scenarios
- **Metric and Rating tool**
- Non-wires alternative **Application Guide**
- **Utility program criteria**
- **Model code criteria**
Initiative Phases and Schedule

Phase 1 – Technical Development – now
  • Launch TAC and Market Scan
  • Develop building modeling methodology/utility data framework
    • Scan available modeling software and systems
    • Standardization of utility data collection
  • Initiate data collection and analysis/understanding

Phase 2 – Metric and Rating System Creation and Standardization – Q2 2018
  • Defining Metrics – which characteristics make up metric
  • GridOptimal Score and Rating System – which elements determine score

Phase 3 – Market Deployment – 2019
  • Utility Program Criteria and Business Planning
  • LEED and PEER integration – Pilot Credits
  • Develop code criteria/venues for proposals
How Can You Participate?

• Become a Founding Sponsor of the GridOptimal Initiative
• Join the Technical Advisory Committee
  • Guide GridOptimal development and implementation
  • Access to leading experts in a collaborative environment
• Host/Participate in Website, Webinars, Workshop(s)
• Use GridOptimal scores in utility programs
  • DER, building incentive programs
  • Prioritize energy efficiency projects by grid operation/stability
• Improve overall generation efficiency and reliability
GRIDOPTIMAL INITIATIVE

https://newbuildings.org/gridoptimal-initiative/
Thank You!

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