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

New Buildings Institute
U.S. Green Building Council
GridOptimal Initiative - Key Themes

• The way **buildings interact with the electric grid** is evolving rapidly.

• Buildings will face increasing **regulatory and economic pressure** to be able to respond to **changing utility price and delivery structures**.

• Designers will need to understand and incorporate **strategies that allow buildings to directly interact with the utility grid**.

• Adapting to the **Interactive Grid** will be critical to maintaining building services and comfort, and to grid dependability.

• Efforts to **decarbonize the electrical grid** will require better integration of distributed energy resources.
The GridOptimal Initiative’s Supporting Members

NBI and USGBC recognize these leading organizations for their generous support for and participation in the GridOptimal Initiative.
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
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**
Grid Evolution

“Use As Much As You Want, Whenever You Want”
PV Cost Trend Increases Solar Deployment

Source: P. Mints, Navigant Solar Services Program, 2011

2016: 55¢
Grid Parity: Cost of Renewable Energy = Cost of Conventional Energy

https://sunmetrix.com/are-solar-panels-worth-it/
The Ominous “Duck Curve”
The Duck Curve

Renewables offset conventional generation without reducing peak load.
Utility Load Curve

Renewable Offset of Base Load Creates Power Surplus

Peak Load

Mid Load

Base Load
Load imbalance means utilities sometimes have to pay consumers to use energy.

**Negative Electricity Rates from Wind-Power Surplus**

It's been very windy across Europe this week. So much so, in fact, that the high wind load on onshore and offshore wind turbines across much of the continent has helped set new wind power records.
GridOptimal™: Rating Building-Grid Interactions

GridOptimal is a building rating system that aligns the needs of utilities, regulators and buildings to transform inflexible, unresponsive buildings into smart, dynamic grid citizens.

Grid Optimal supports least-cost decarbonization of the grid through better integration of building-scale DERs.
Building Load Curve

How Grid Optimal Targets Building Loads

- Peak Shift
- ADR
- Base Load
- Load Factor
- Energy Efficiency
- Storage

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GridOptimal Methodology Framework

Building-Grid Interaction Elements:

Static Attributes:
- EE, flat load, targeted load shape

Flexible Attributes:
- Seasonal, daily, hourly, instantaneous load modifications

Dispatchable Attributes:
- Flexible Attributes are Grid connected/controlled

Dimensions:
1. Capacity (kW)
2. Duration
3. Time of use
4. Direction (load +/-)
5. Ramp rate/Response time

Features (examples):
1. Generation
2. Storage
3. Building Management System
4. Networked +/- (Open ADR Carbon)
5. Contract vs. behavior
6. Cx (prove out)
7. Power conditioning
GridOptimal™: Grid Signature

Rated building lowers positive grid peak

Rated building contributes to positive grid peak

(Authors: Alexi Miller, PE & Jim Edelson)
GridOptimal™: Grid Signature

Rated building contributes to negative peak

Rated building adds needed demand

(Authors: Alexi Miller, PE & Jim Edelson)
Critical Bridge Between Buildings and the Grid

Letter of Inquiry
Valuing Building-Grid Interactions by Developing and Implementing a New Rating System: The GridOptimal™ Score

February 2017

Summary

The New Buildings Institute (NBI), in partnership with the US Green Building Council (USGBC), is seeking funds to support a multi-year effort to develop a comprehensive Grid Edge Initiative that will refine and disseminate a new building rating system called the GridOptimal™ Score.

Introduction and Issues

The demand for fuels delivered to buildings increased constantly throughout the nineteenth century and into the twenty-first century. Modern electric and gas utilities planned for constant growth. These utilities were generally required to anticipate how the steady increased growth in demand would need to be met with supply from generation resources and distribution infrastructure.

But this established paradigm is shifting. Several factors are aligning to bring major changes to the sector’s utility industry. The COP21 Paris accord, now ratified by more than 195 countries representing 65% of global CO2 emissions, will go into effect this year. Climate change is now considered a clear and present danger by nearly all major governments and policy makers around the world, and the building sector has been identified as providing the best near-term actions to stem greenhouse gas emissions. Here in the United States, buildings consume 70% of all electricity and are responsible for nearly half of all energy consumption, making the building sector key to achieving climate goals.
“Teaching the Duck to Fly”
“Teaching the Duck to Fly”
Overlapping Interests Support Grid Integration

Buildings
- Economical Operation
- Dependable Power
- Sustainable Features
- Stable Rates

Utilities
- Demand Response
- Stable Loads
- Grid Control
- Asset Utilization
- Predictable Resources

Regulators
- ZNE
- Resiliency
- Decarbonization
- RPS
- Stable Rates
- Improved Efficiency

Stable Rates
Improved Efficiency
Economical Operation
Dependable Power
Sustainable Features
Stable Rates
## GridOptimal Stakeholders and Value Proposition

<table>
<thead>
<tr>
<th>Key Groups</th>
<th>Stakeholders</th>
<th>Value provided to each stakeholder</th>
<th>Collective Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designers,Owners, Operators</td>
<td>Architects, Owners, Engineers, Operators, Developers</td>
<td>Decarbonize better and cheaper, access new revenue</td>
<td>Reveal DER’s and engaged owners</td>
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<tr>
<td></td>
<td></td>
<td>• Increase building asset value</td>
<td>• Predictable and adjustable loads</td>
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<td></td>
<td></td>
<td>• Minimize cost/risk</td>
<td>• Rewards DER’s and owners</td>
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<tr>
<td></td>
<td></td>
<td>• Resilient and decarbonized buildings</td>
<td>• Buildings as “new” zero-CO2 balancing resources</td>
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<td></td>
<td></td>
<td>• Incentives and rate benefits</td>
<td>• Reduce future distribution infrastructure and stranded assets</td>
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<tr>
<td></td>
<td></td>
<td>• New revenue stream</td>
<td></td>
</tr>
<tr>
<td>Utilities</td>
<td>Resource and distribution planners and operators</td>
<td>Reveal DER’s and engaged owners</td>
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<tr>
<td></td>
<td>• Customer programs</td>
<td>• Predictable and adjustable loads</td>
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<tr>
<td></td>
<td>• Rates department</td>
<td>• Rewards DER’s and owners</td>
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<td></td>
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<td>• Buildings as “new” zero-CO2 balancing resources</td>
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<td></td>
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<td>• Reduce future distribution infrastructure and stranded assets</td>
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<tr>
<td>Regulators and Policy Makers</td>
<td>Governments, Regulators, Building rating system</td>
<td>A new path to least cost and least carbon grid</td>
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<tr>
<td></td>
<td>• Codes and standards</td>
<td>• Overall CO2 and cost savings to operate grid</td>
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<td></td>
<td>• Alignment of building standards to larger grid needs</td>
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<td></td>
<td></td>
<td>• Increased reliability</td>
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<tr>
<td>Services and Industry</td>
<td>Aggregators, Energy service providers, Vendors</td>
<td>Reveal new customers</td>
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<td></td>
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<td>• New markets</td>
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<tr>
<td></td>
<td></td>
<td>• Lower acquisition costs</td>
<td></td>
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<tr>
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<td>• Understand market size and potential</td>
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GridOptimal™: How will we do it?

• Bring together key stakeholders and experts to develop standards and metrics
• 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**
How Can You Participate?

• Become a Founding Member the GridOptimal Initiative
• Join the Technical Advisory Committee
  • Guide GridOptimal development and implementation
  • Access to leading experts in a collaborative environment
• Participate in Webinars, Workshop(s)
• Pilot the GridOptimal Score in managed buildings
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 – Q3-Q4, 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
## Membership Opportunities

Become a Founding Member of the GridOptimal Initiative

<table>
<thead>
<tr>
<th>Participant Type</th>
<th>Annual Contribution (Three Year Term)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate</td>
<td>$10,000/year</td>
</tr>
<tr>
<td>Municipal/Co-Op Utility</td>
<td>$25,000/year</td>
</tr>
<tr>
<td>Investor Owned Utility</td>
<td>$50,000/year</td>
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alexi@newbuildings.org
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