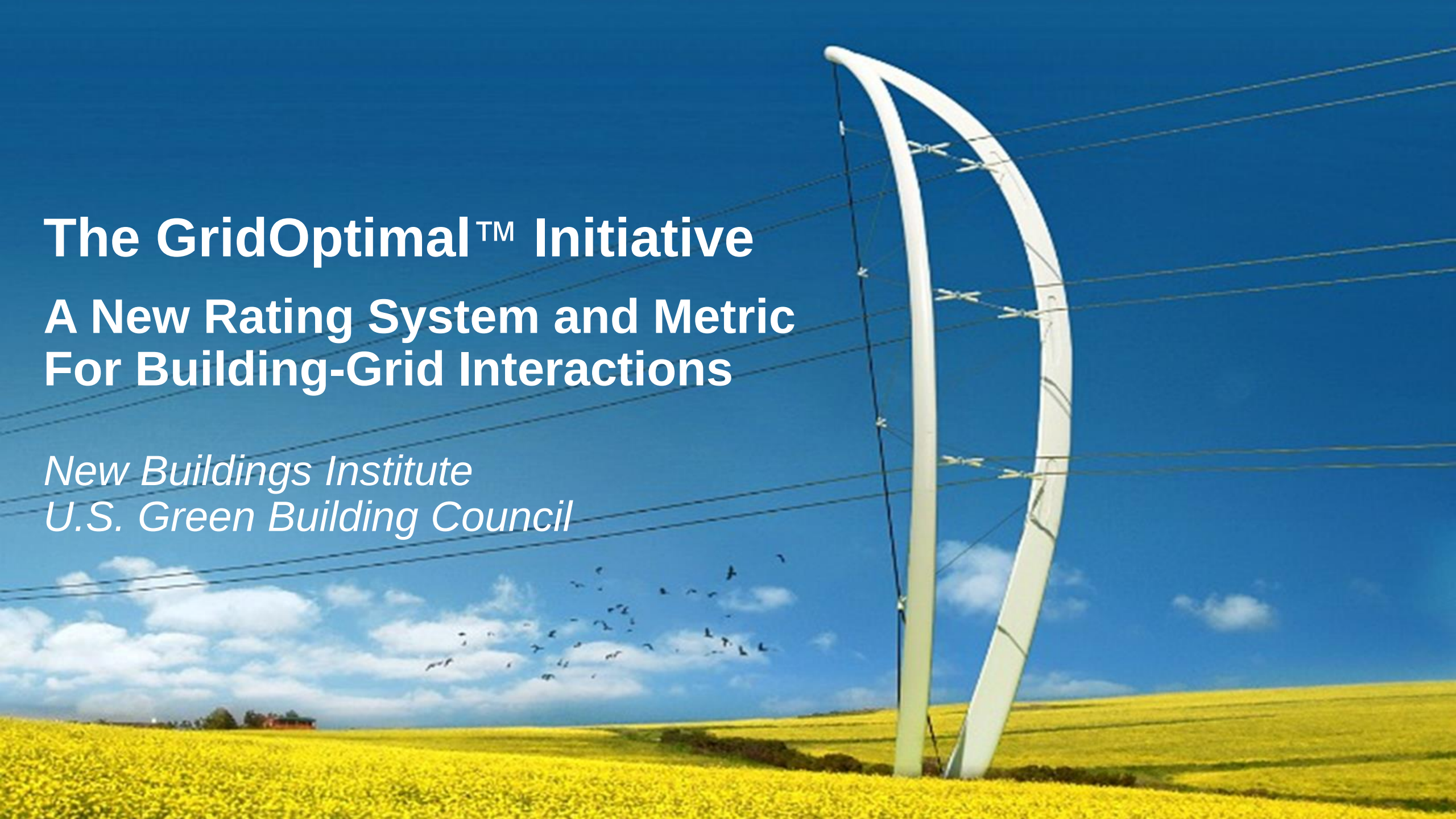
The GridOptimal™ Initiative

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.**

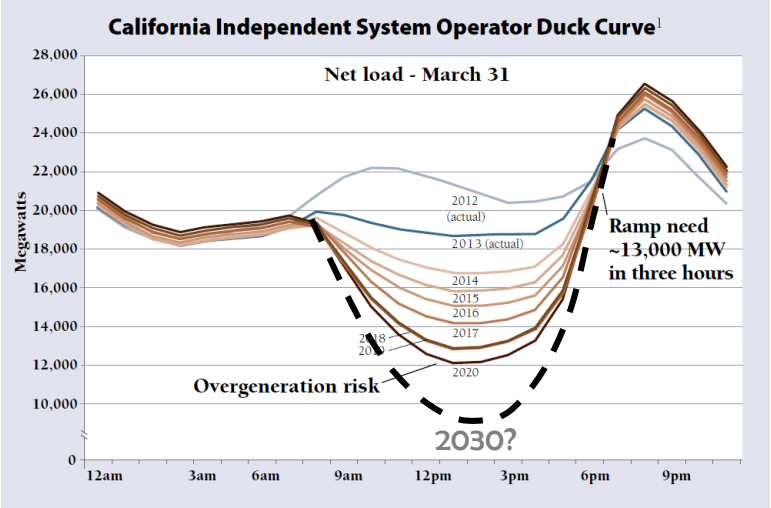
The GridOptimal Initiative's Supporting Members

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?

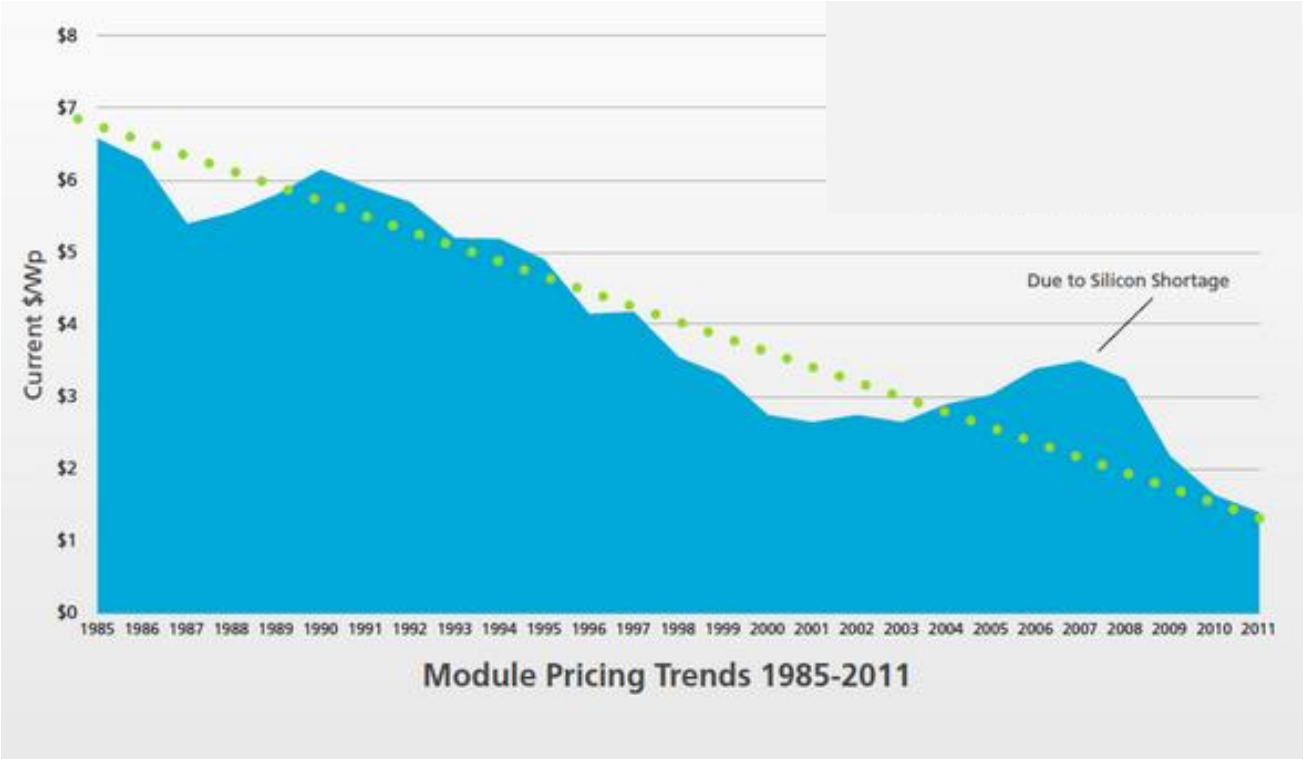
There are currently no metrics that define building-level grid citizenship, or rate building-grid interaction quality

- 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"

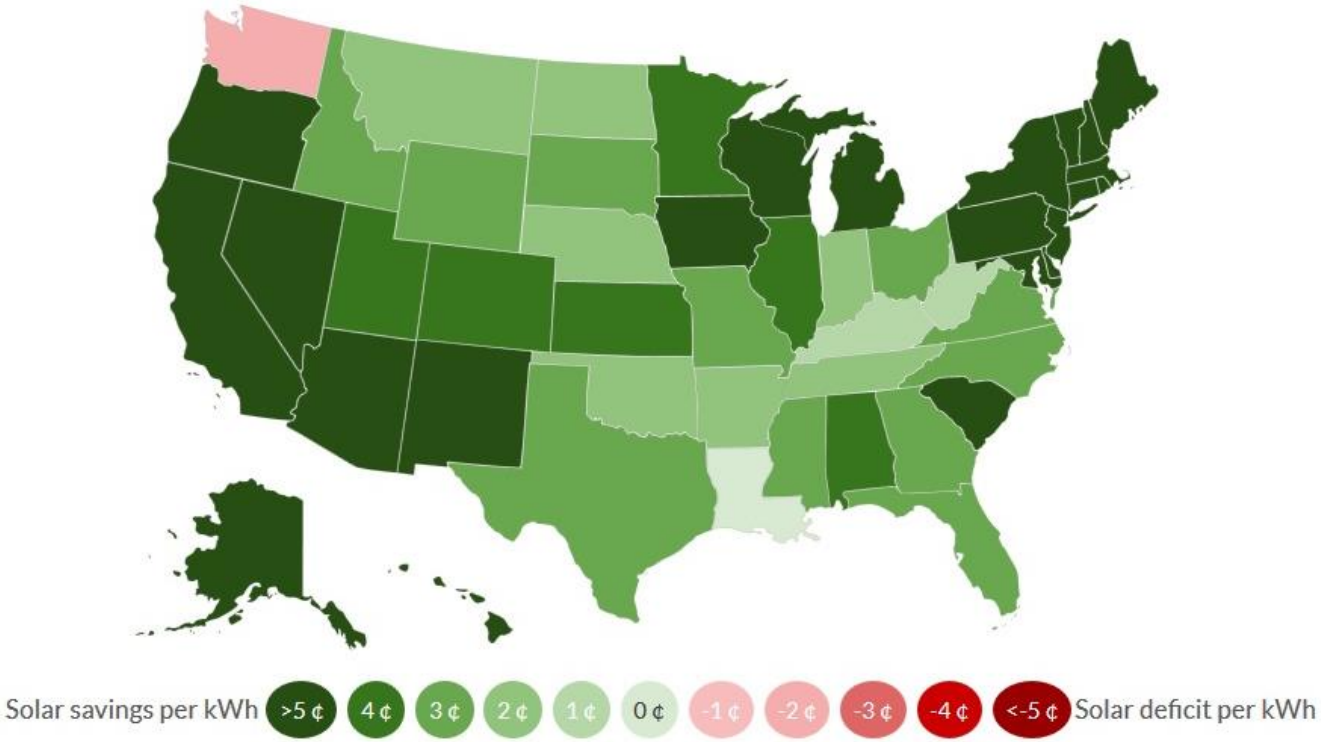
PV Cost Trend Increases Solar Deployment



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

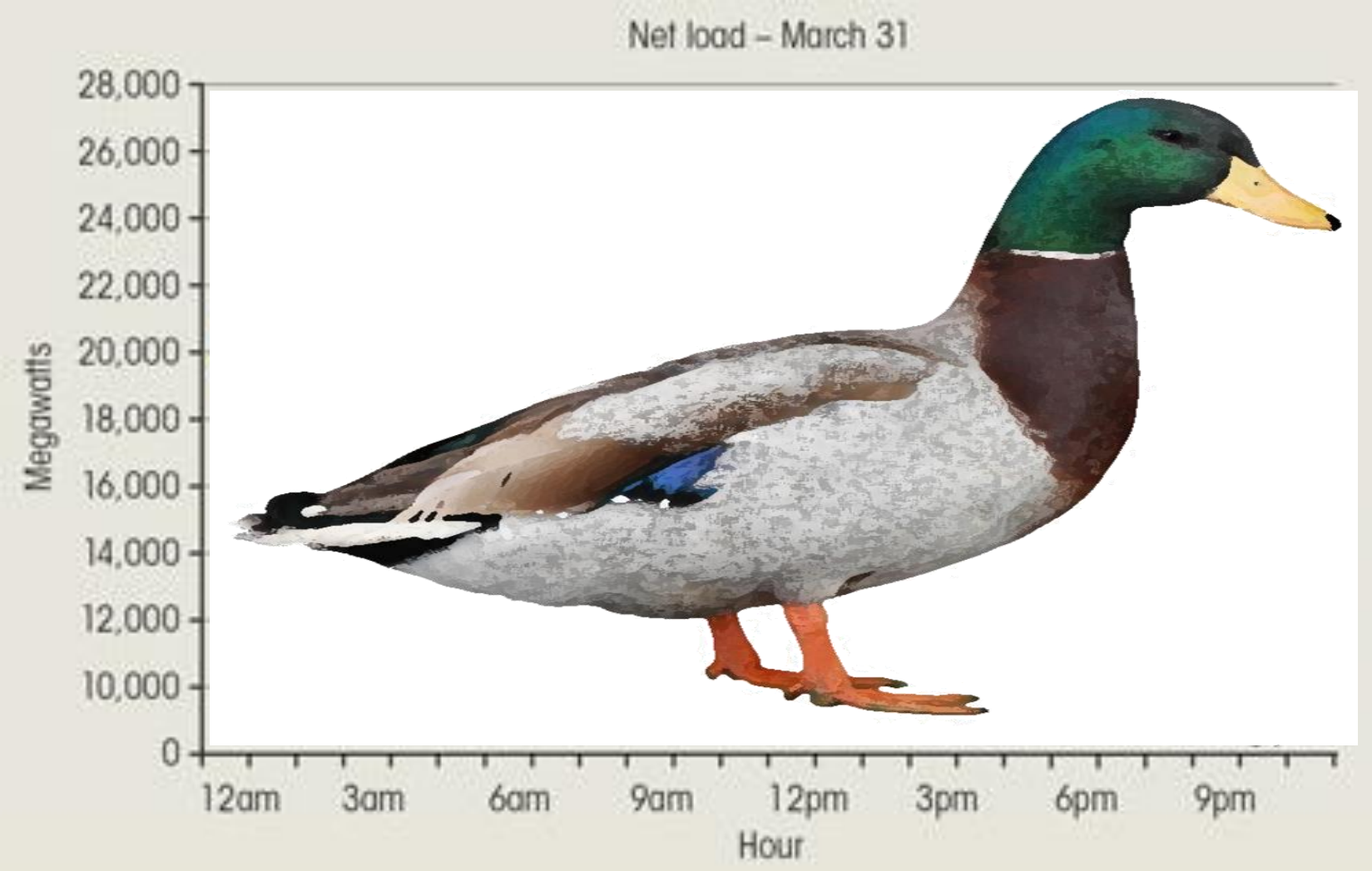
2016: 55¢

Grid Parity:
Cost of Renewable Energy = Cost of Conventional Energy



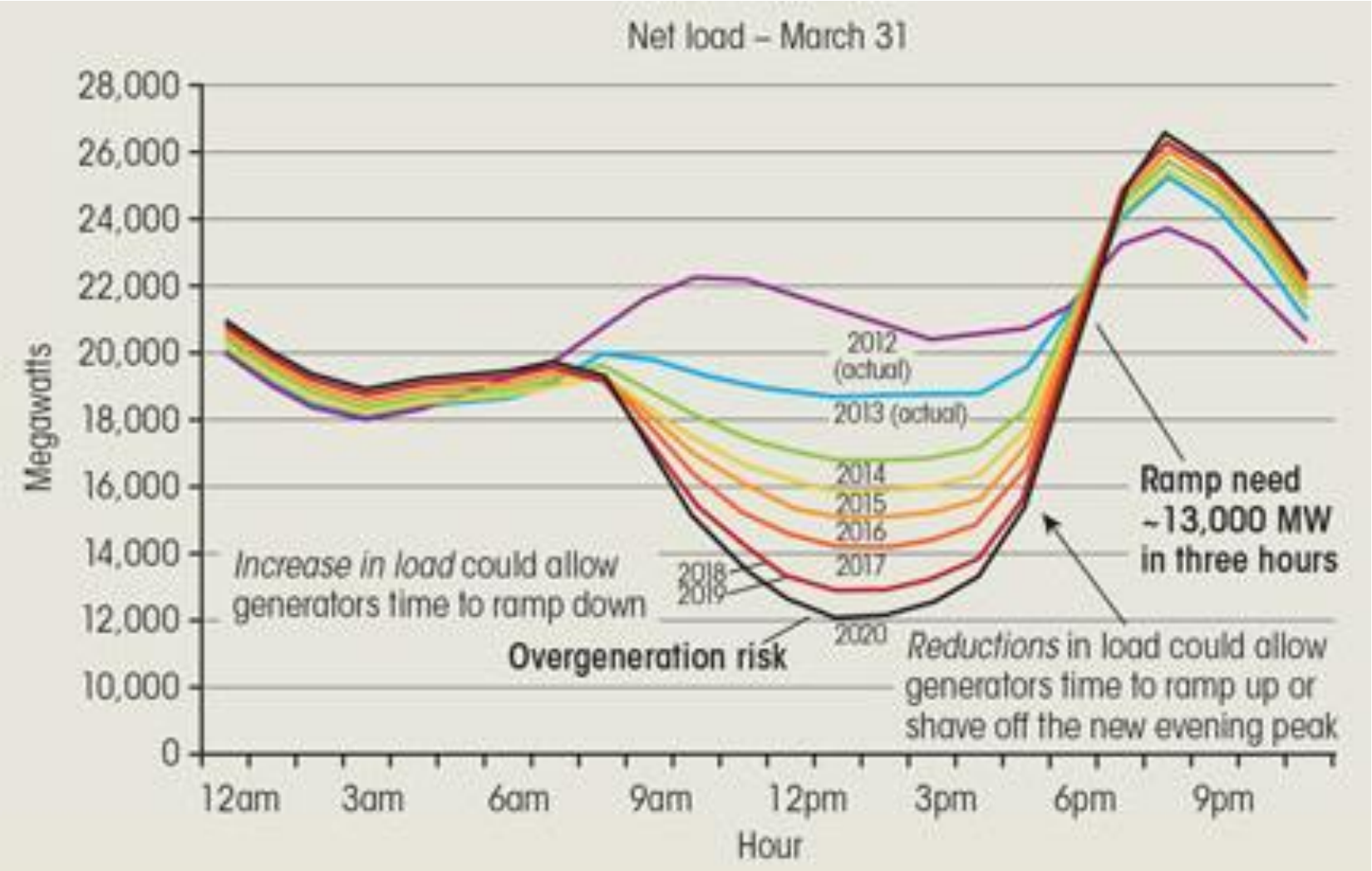
https://sunmetrix.com/are-solar-panels-worth-it/

The Ominous "Duck Curve"



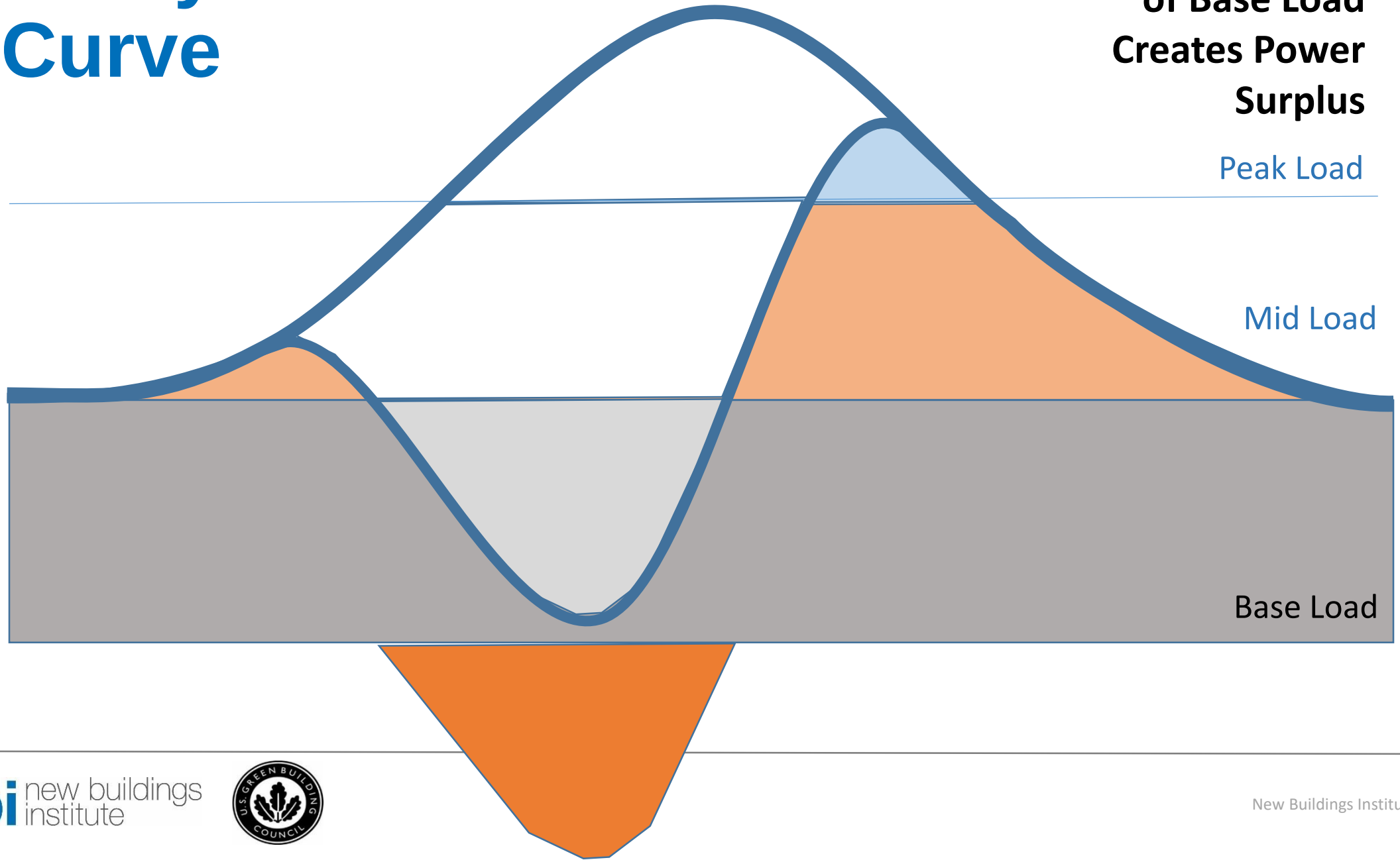
The Duck Curve

Renewables offset conventional generation without reducing peak load



Utility Load Curve

Renewable Offset of Base Load Creates Power Surplus



nbi new buildings institute

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

NP Newswire Post.

News Commentary Entertainment

News | Politics | Health | Science & Tech | Political

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.

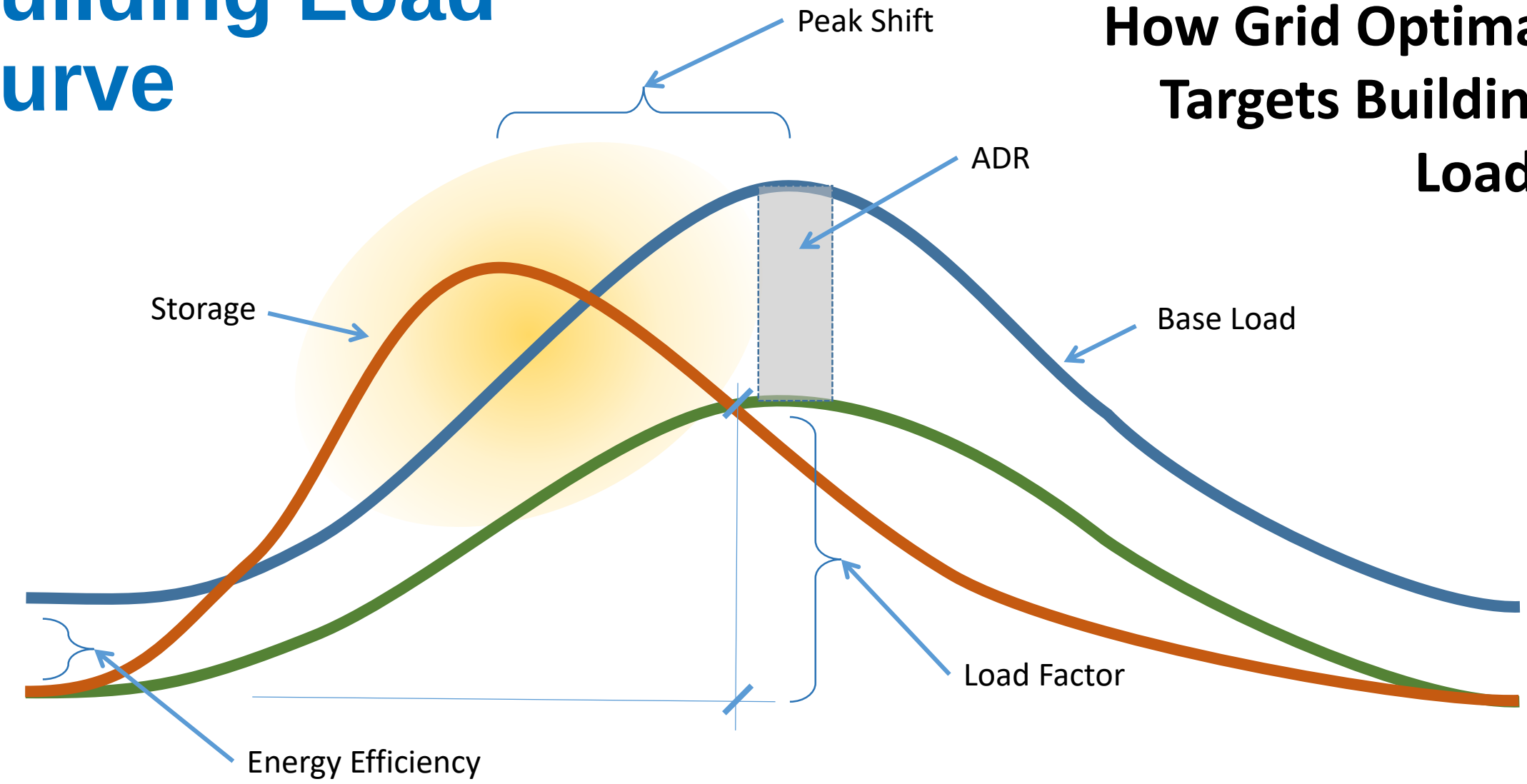
GridOptimal™: Rating Building-Grid Interactions

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



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

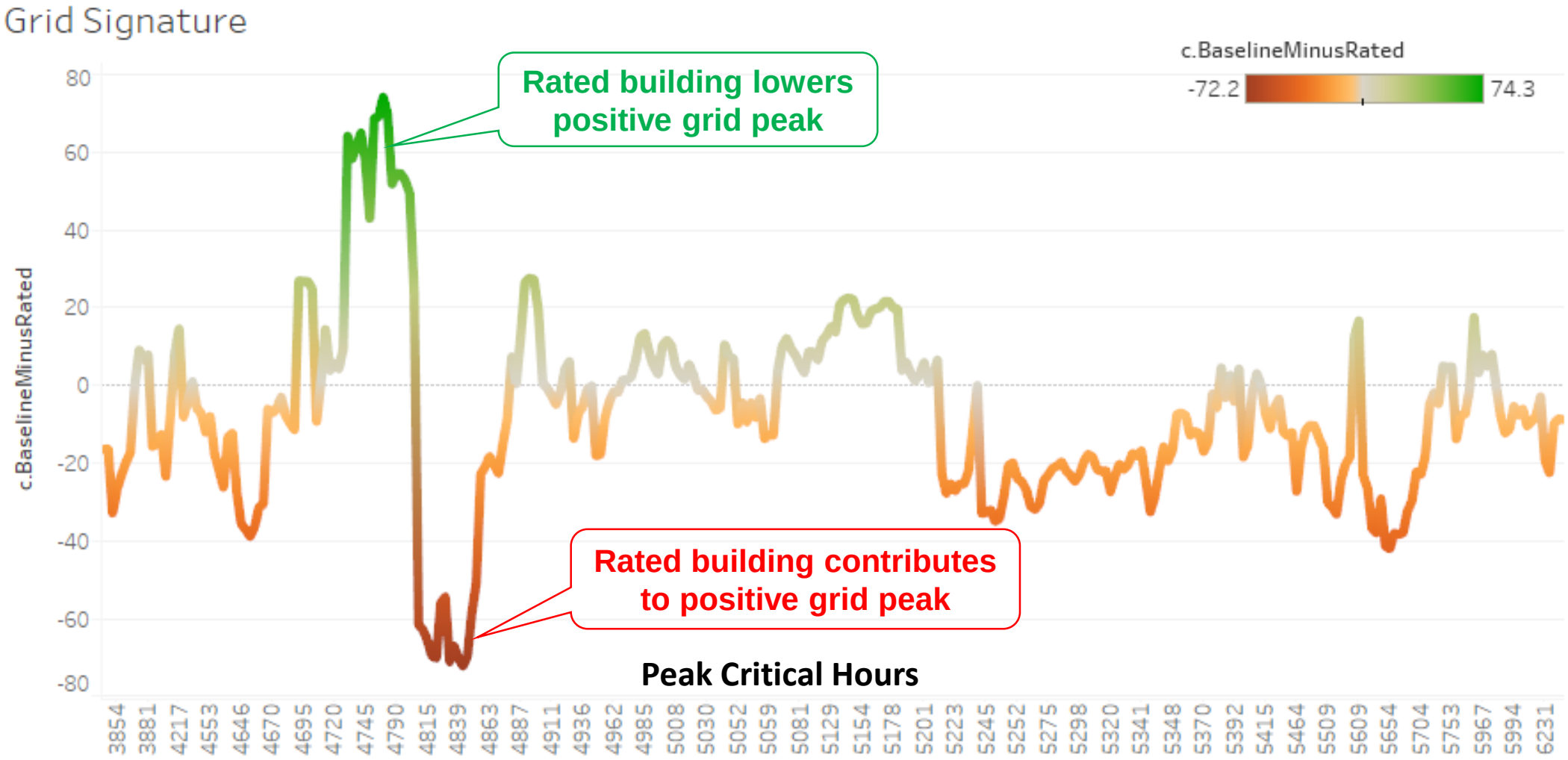
Dimensions:

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

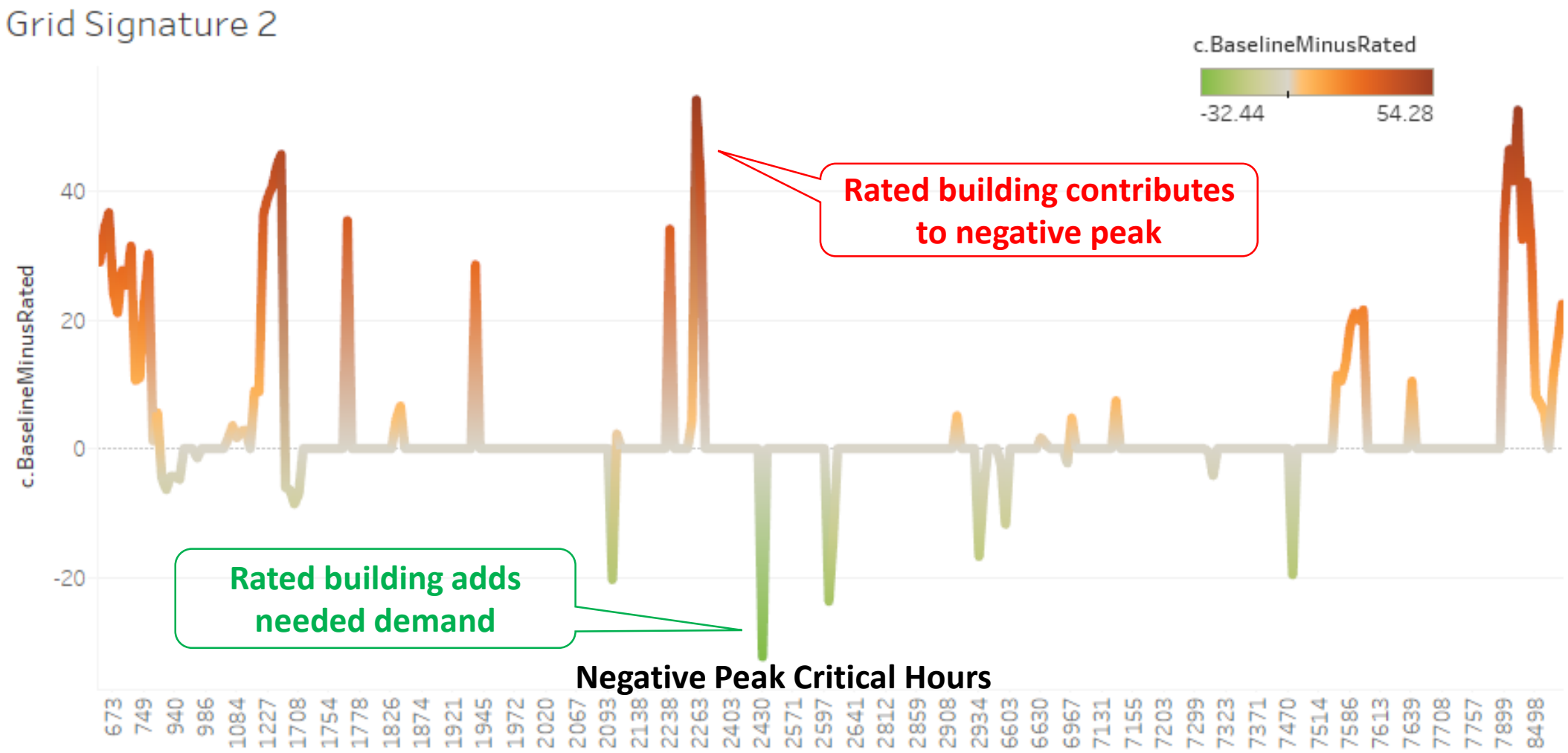
GridOptimal™: Grid Signature



nbi new buildings institute

(Conference Papers: ASHRAE, January 2016 & January 2017)
(Authors: Alexi Miller, PE & Jim Edelson)

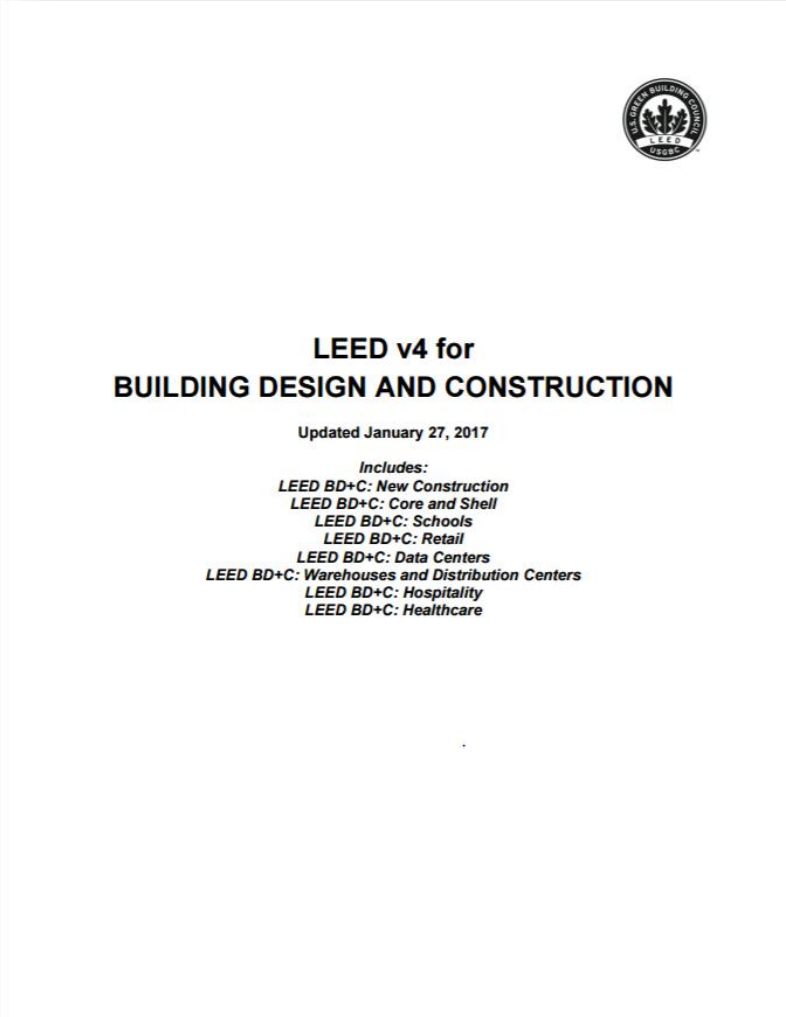
GridOptimal™: Grid Signature



nbi new buildings institute

(Conference Papers: ASHRAE, January 2016 & January 2017)
(Authors: Alexi Miller, PE & Jim Edelson)

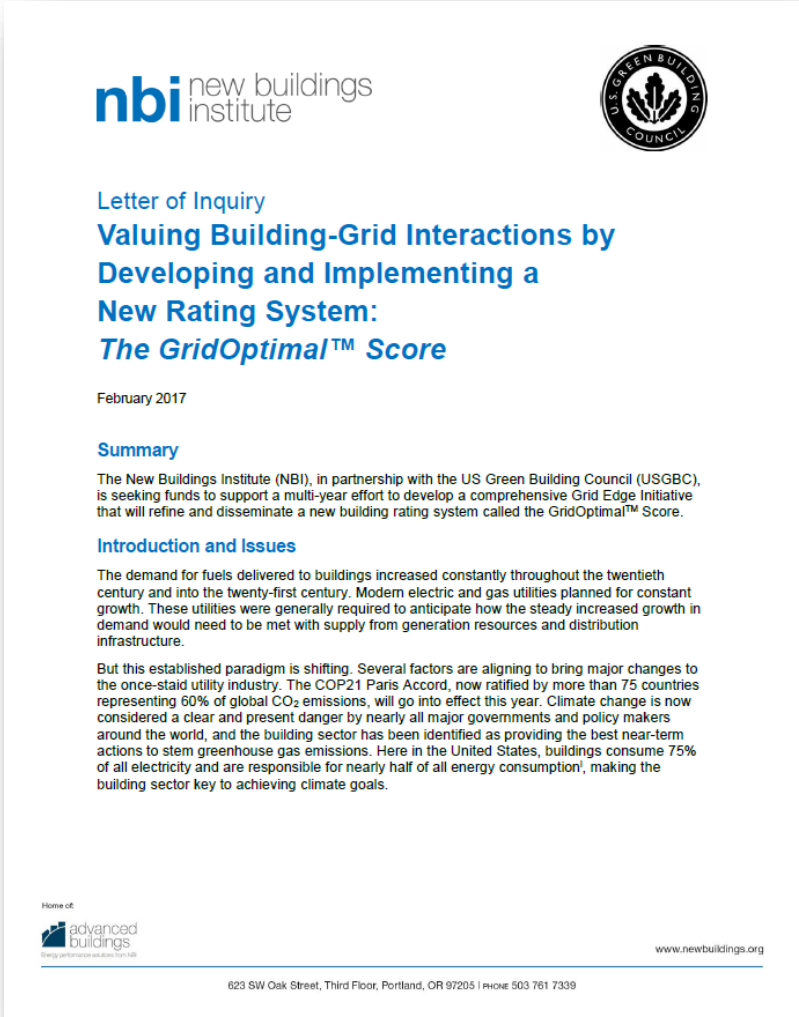
Critical Bridge Between Buildings and the Grid



LEED v4 for
BUILDING DESIGN AND CONSTRUCTION

Updated January 27, 2017

Includes:
LEED BD+C: New Construction
LEED BD+C: Core and Shell
LEED BD+C: Schools
LEED BD+C: Retail
LEED BD+C: Data Centers
LEED BD+C: Warehouses and Distribution Centers
LEED BD+C: Hospitality
LEED BD+C: Healthcare



nbi new buildings institute

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

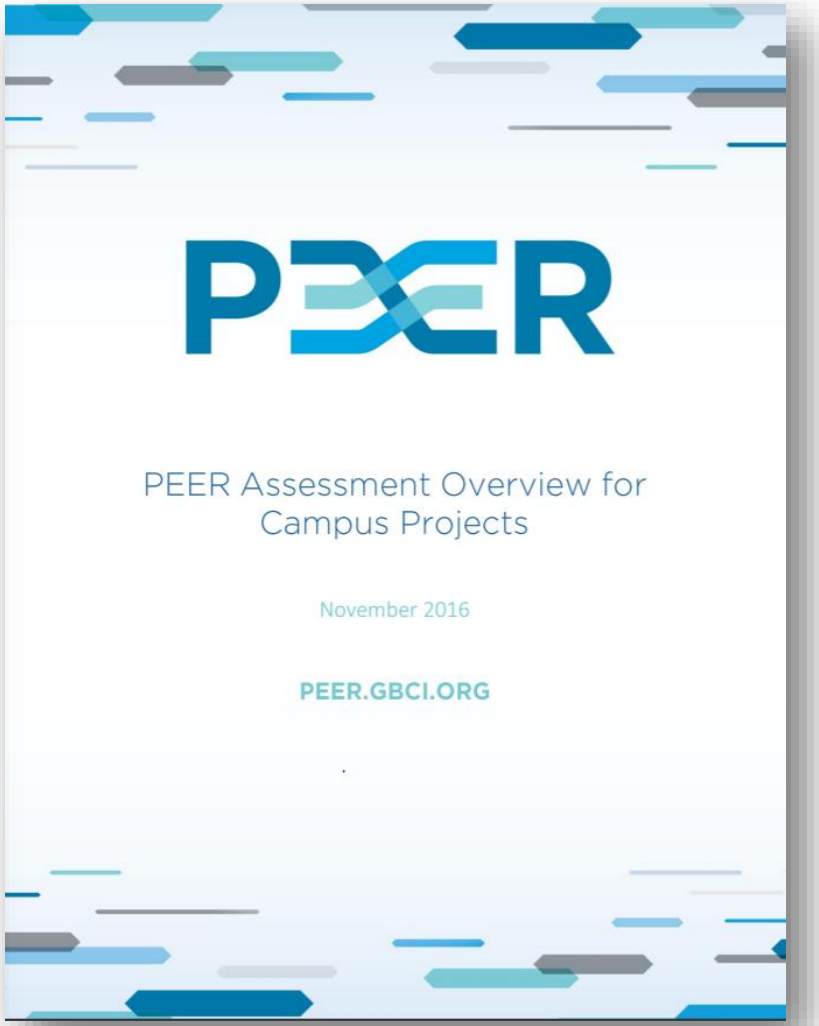
The demand for fuels delivered to buildings increased constantly throughout the twentieth century and into the twenty-first century. Modern electric and gas utilities planned for constant growth. These utilities were generally required to anticipate how the steady increased growth in demand would need 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 once-staid utility industry. The COP21 Paris Accord, now ratified by more than 75 countries representing 60% of global CO_2 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 75% of all electricity and are responsible for nearly half of all energy consumption[1], making the building sector key to achieving climate goals.

Home of: advanced buildings

www.newbuildings.org

623 SW Oak Street, Third Floor, Portland, OR 97205 | PHONE 503 761 7339



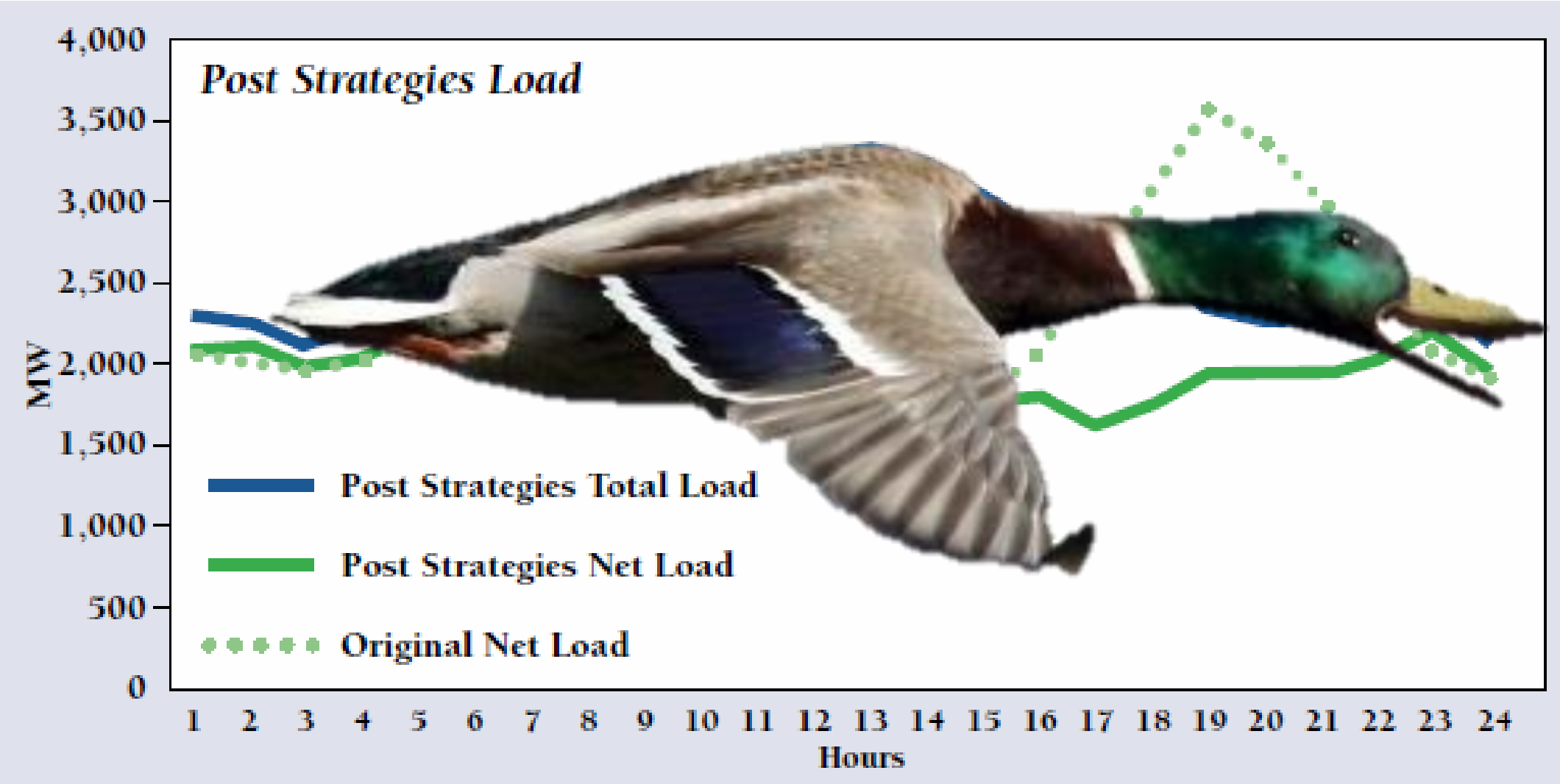
PEER

PEER Assessment Overview for Campus Projects

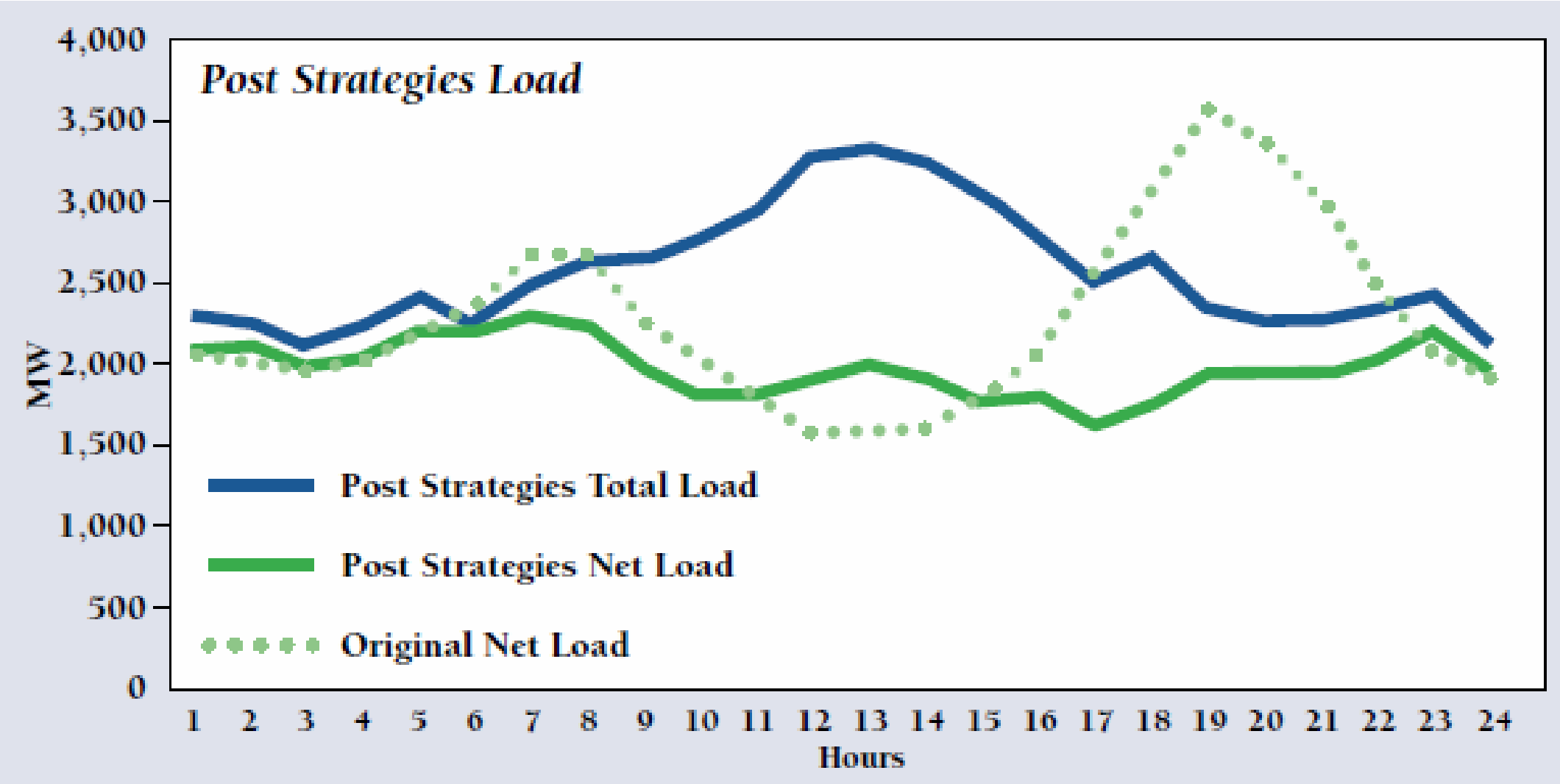
November 2016

PEER.GBCI.ORG

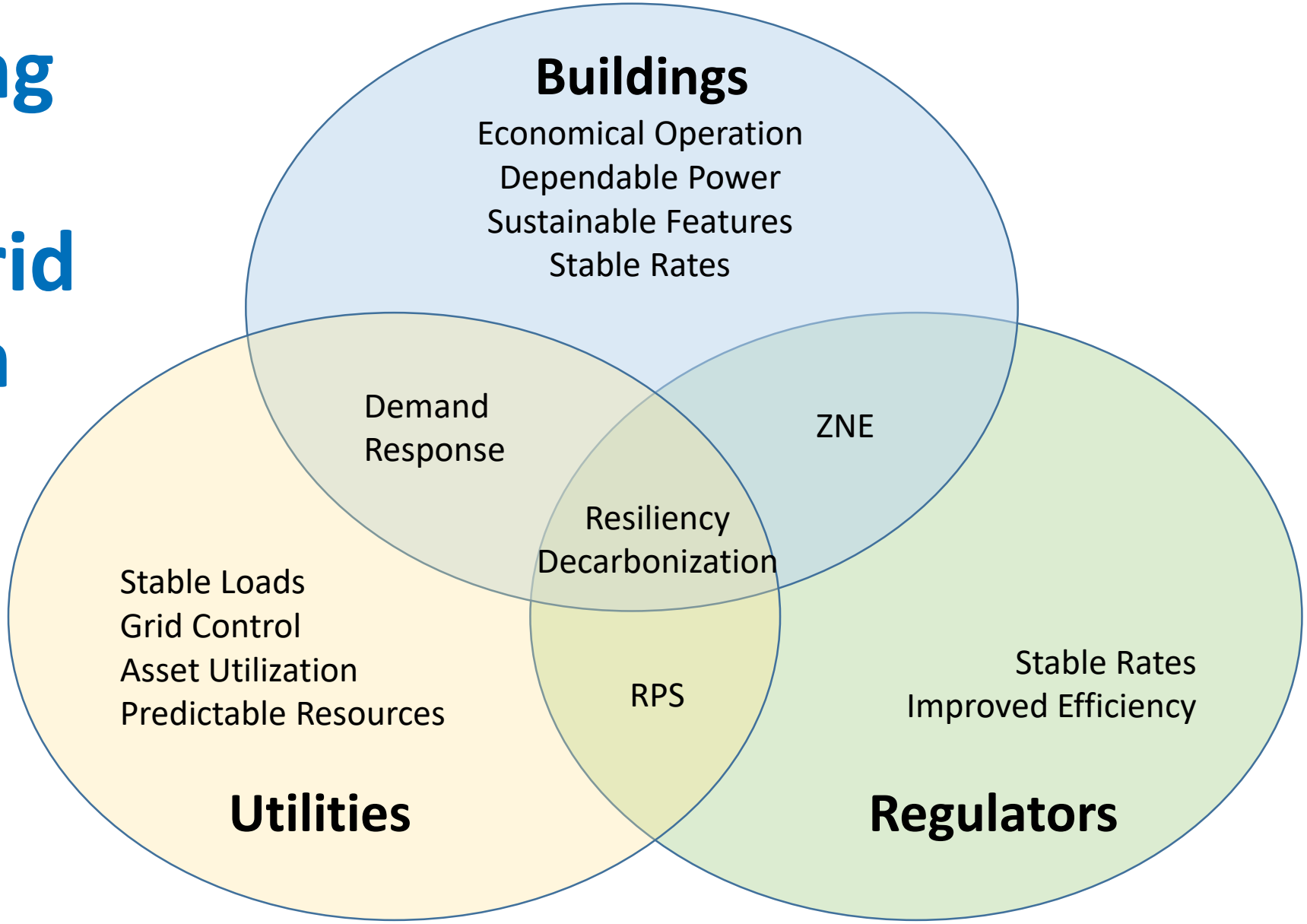
“Teaching the Duck to Fly”



“Teaching the Duck to Fly”



Overlapping Interests Support Grid Integration



GridOptimal Stakeholders and Value Proposition

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

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

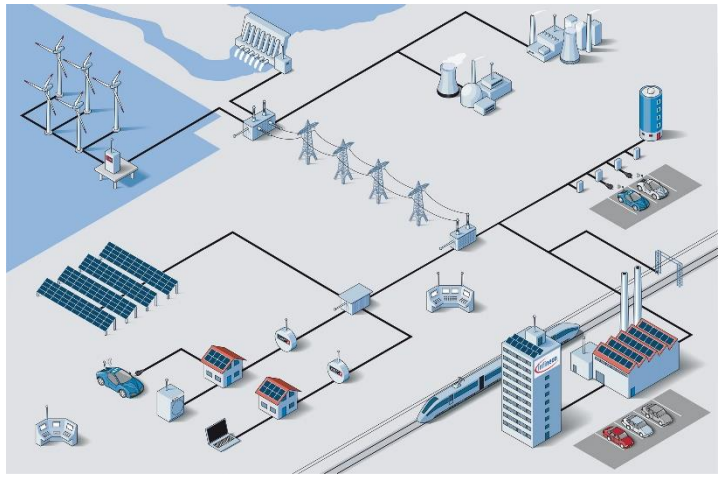
Initiative Phases and Schedule

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

GRIDOPTIMAL INITIATIVE

https://newbuildings.org/gridoptimal-initiative/

Membership Opportunities

Become a Founding Member of the GridOptimal Initiative

Participant Type	Annual Contribution (Three Year Term)
Corporate	$10,000/year
Municipal/Co-Op Utility	$25,000/year
Investor Owned Utility	$50,000/year

For More Information, Contact:

Alexi Miller, Senior Project Manager
alexi@newbuildings.org

The GridOptimal™ Initiative

A New Rating System and Metric For Building-Grid Interactions

New Buildings Institute
U.S. Green Building Council