Stakeholder
MEETING
2017

Prospecting for the Value of Energy Data

Panelists

Gabe Arnold

Moderator

Teddy Kisch

Energy Solutions

Jim Edelson

New Buildings Institute

Lee Featherstone

Schneider Electric

UNLOCKING GREATER SAVINGS WITH DATA

The Networked Lighting Controls (NLC) Data Project

July 11, 2017

PRESENTED TO

Stakeholders

DesignLights Consortium

PRESENTED BY

Teddy Kisch, LC

Energy Solutions

ENERGY SOLUTIONS

WHY DO WE NEED BETTER ENERGY DATA?

A long, long time ago…

when LEDs did **not** rule the earth (or lighting industry)….

Utilities played a tremendous role in scaling SSL adoption

	2007	2017
Product Specifications:	**Limited**	**DLC and ENERGY STAR**
Utility Support:	**Limited**	**Over $600 million from 100's of programs across North America**

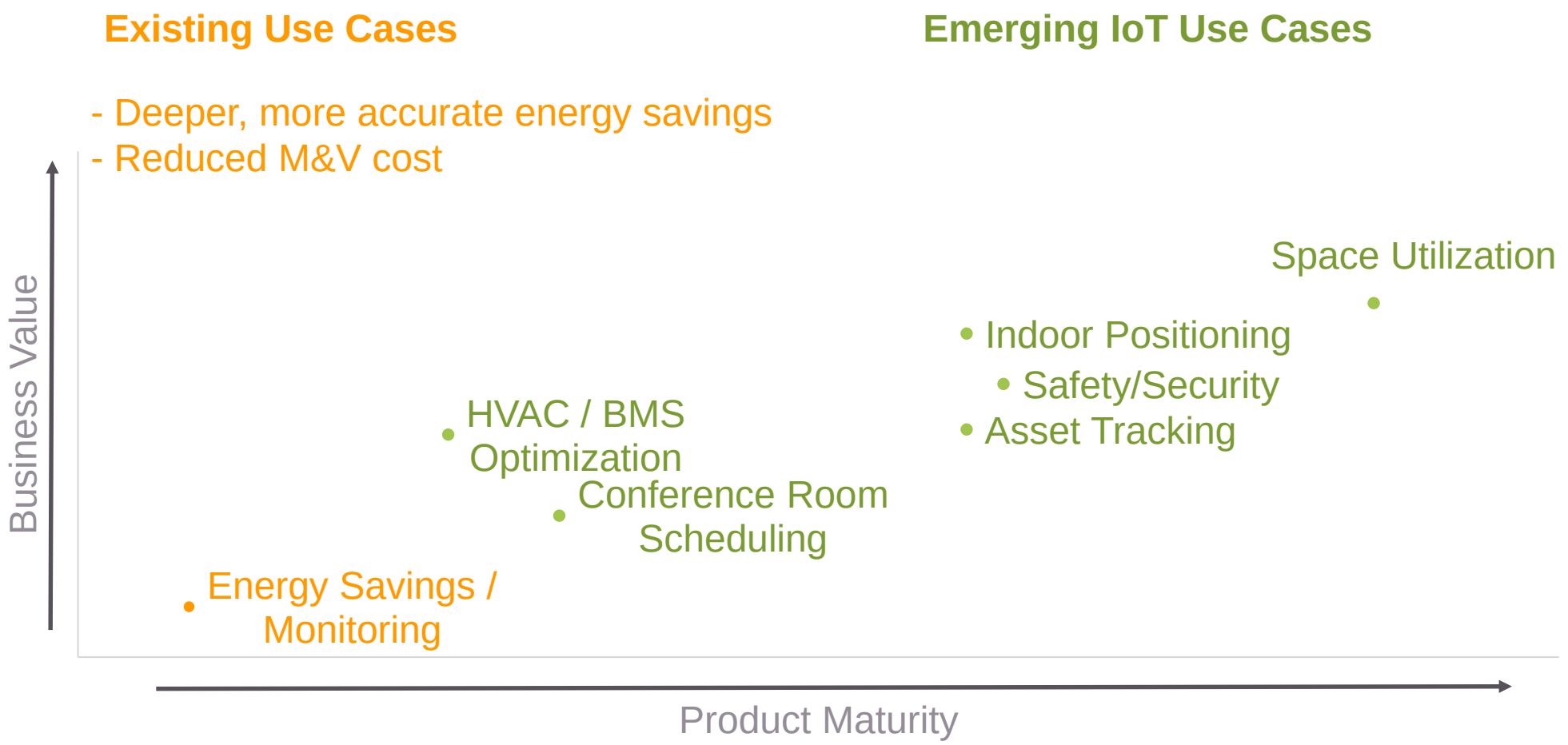
How did utility programs support SSL in achieving scale?

- Information and demonstrations to reduce performance risk
- Industry standardization and transparent reporting
- Financial incentives to reduce product first cost

For NLCs, all three strategies require energy monitoring data

3–30–300 RULE: COMMERCIAL BUILDINGS

Why Focus on Energy Data to Accelerate Adoption?



<u>Right now,</u> energy savings and utility incentives are a major driver that make project economics work

The lack of performance data inhibits utility program and customer investment. What can better data do?

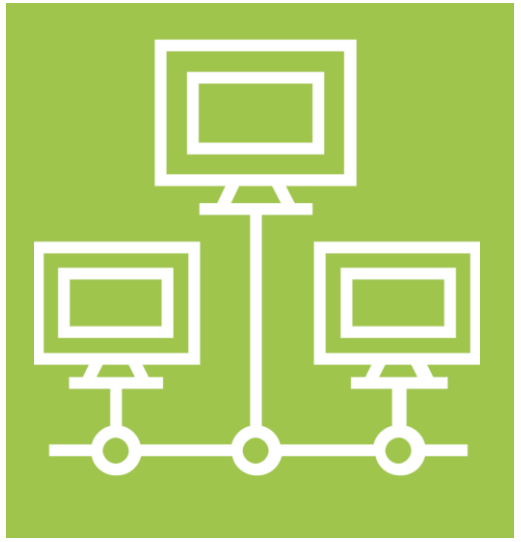
- Reduce performance risk to utilities and customers
- Obtain regulator and utility support for scaling incentive programs beyond early adopters
- Unlock greater energy savings beyond conservative savings claims
- Increase project incentives
- Improve program cost-effectiveness

PROJECT OVERVIEW

PROJECT GOALS

SAVINGS ASSUMPTIONS

Improve savings assumptions for NLC systems



DATABASE COLLECTION

Create a database to collect performance data

REPORTING GUIDELINES

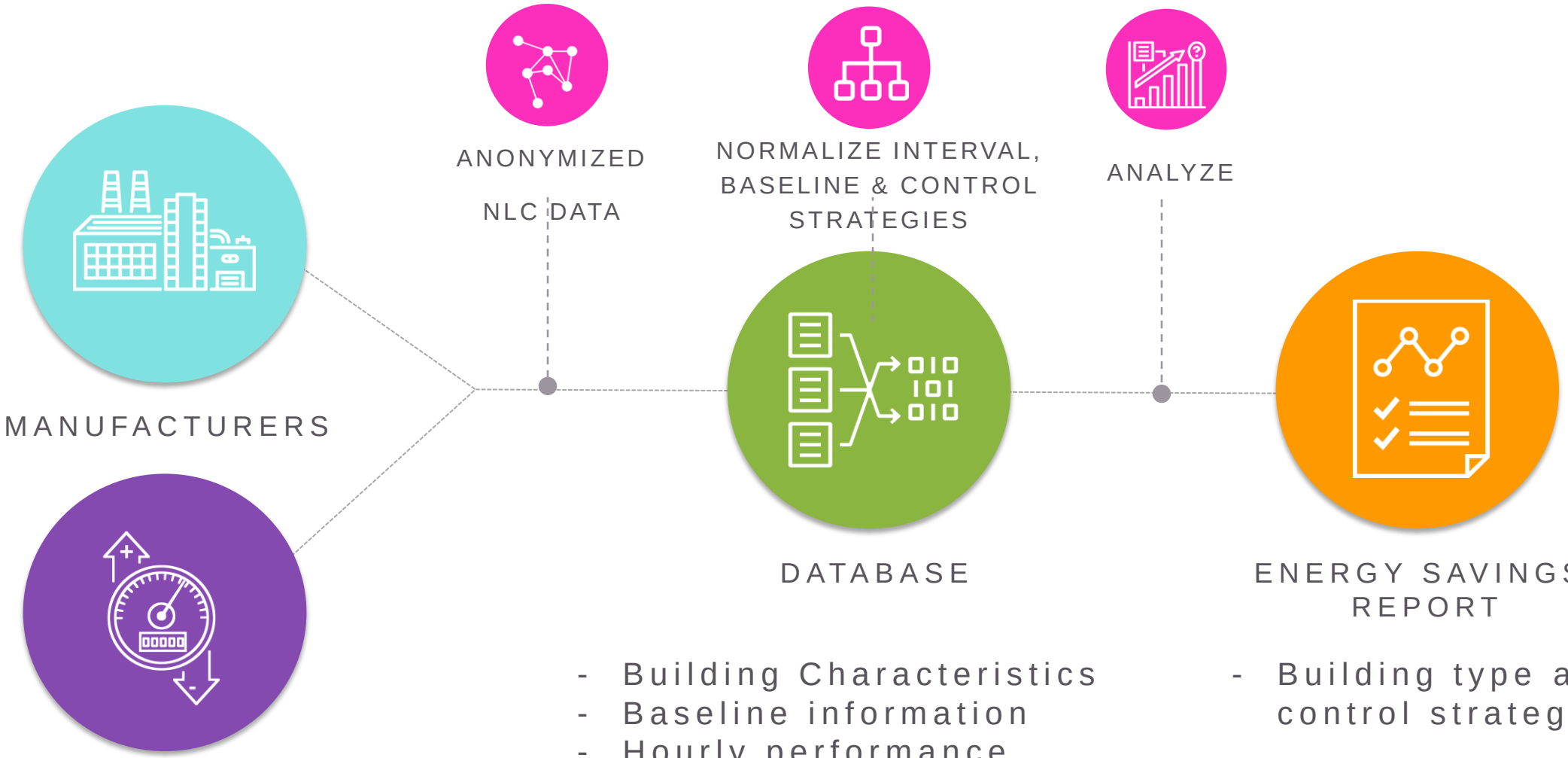
Develop data reporting guidelines for utility programs

OUTREACH PROCESS

Manufacturers
Utilities
National labs

~115 buildings
7 major building types
6 manufacturers

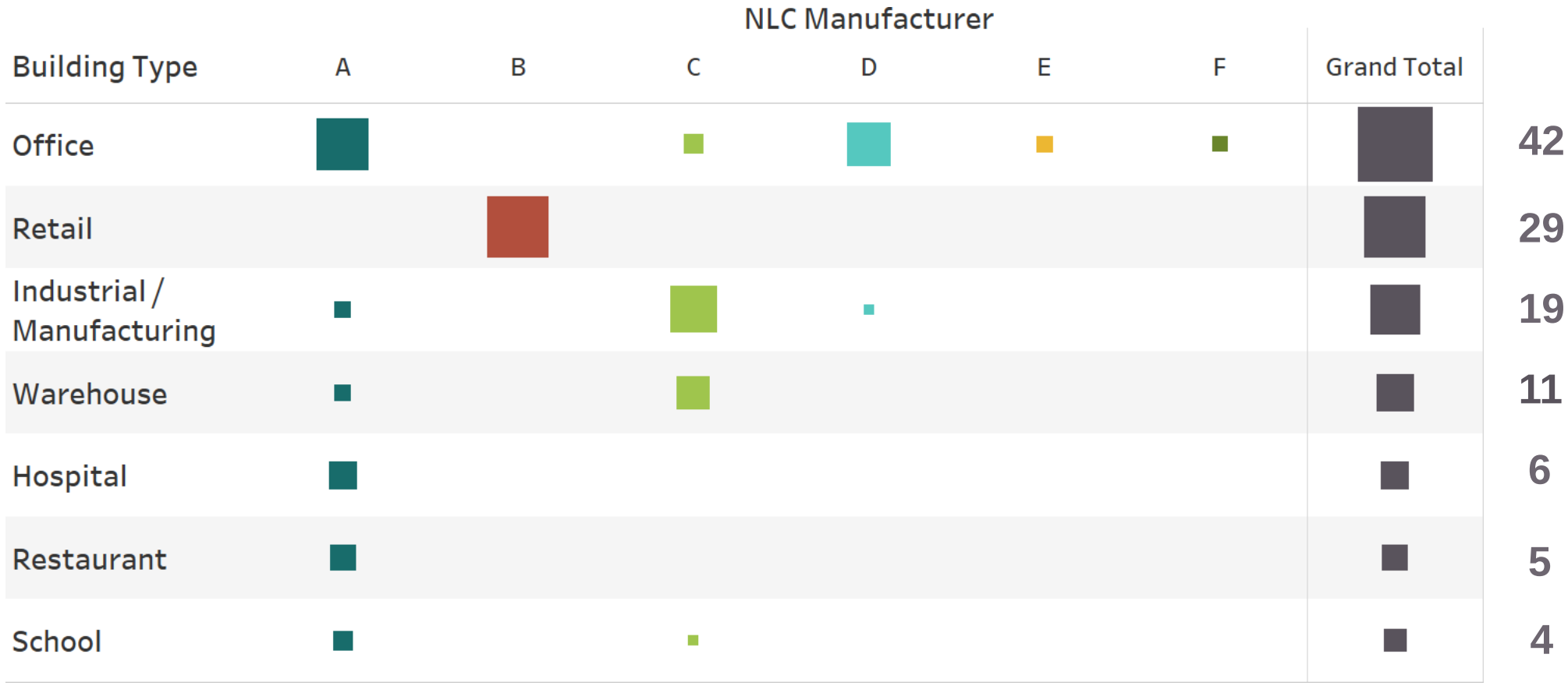
DATA PROCESSING



- Building Characteristics
- Baseline information
- Hourly performance
- NLC control strategies
- Analytical assumptions

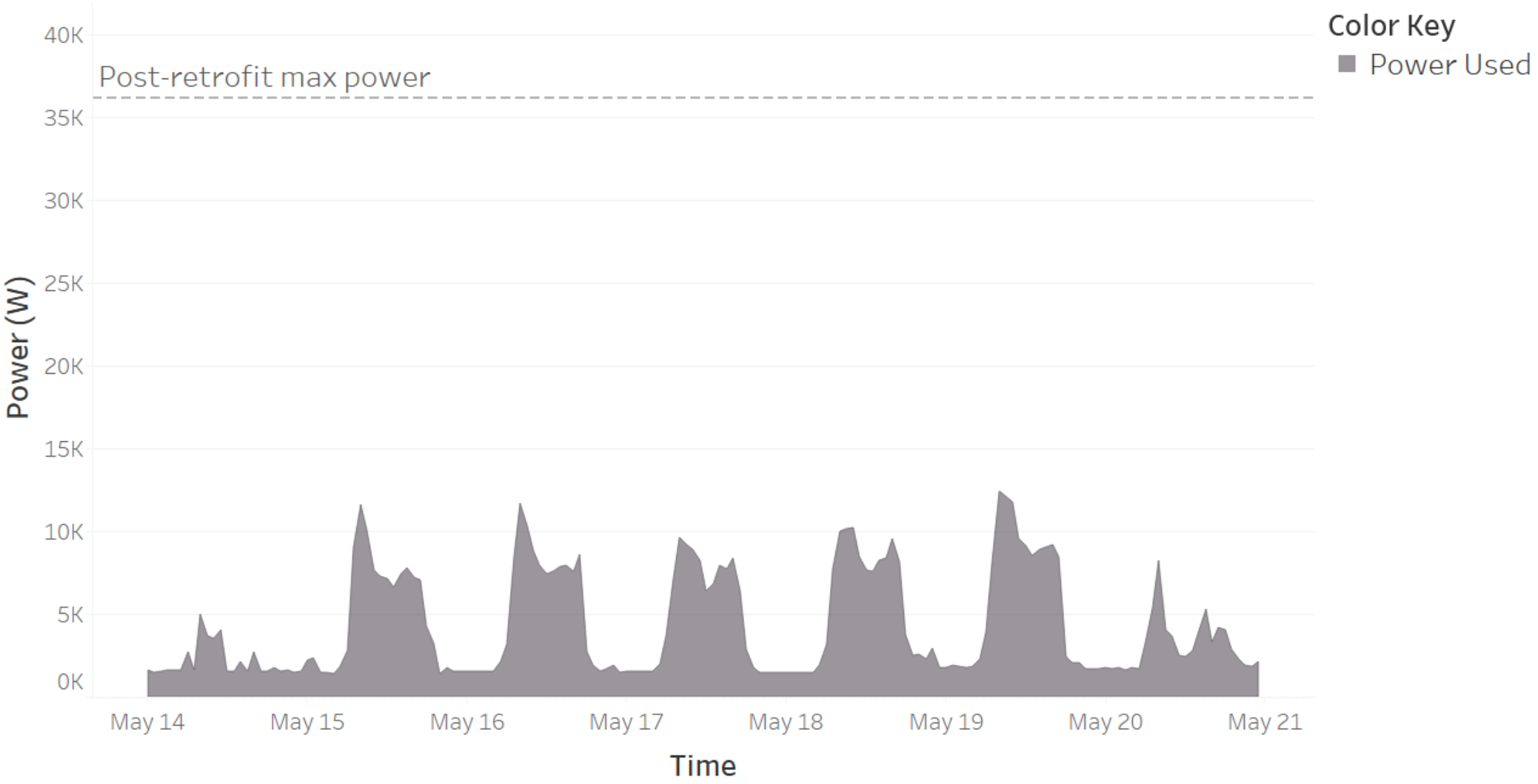
- Building type and control strategy

Number of Buildings by Type and NLC Manufacturer

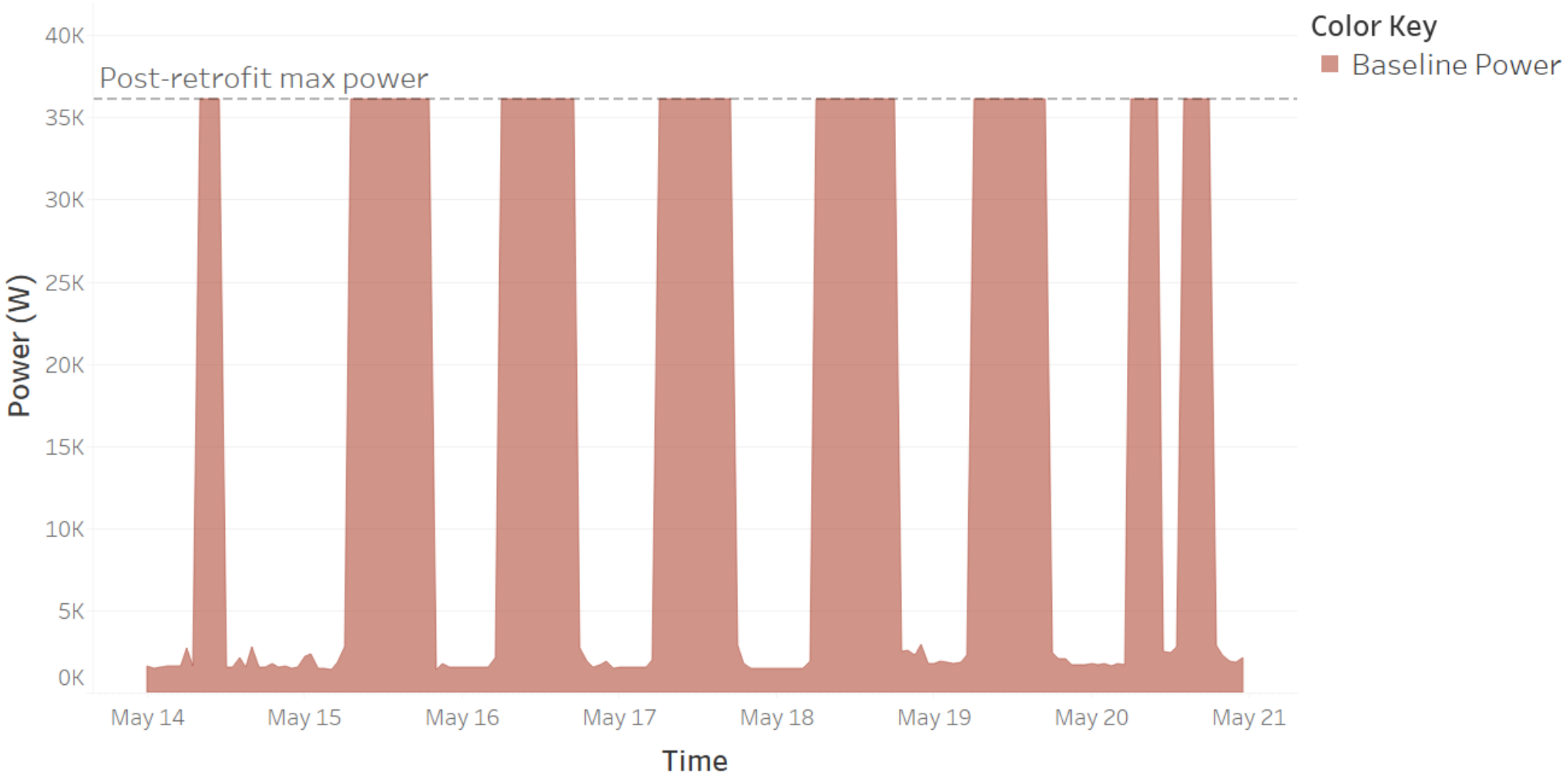


SAMPLE ANALYSIS

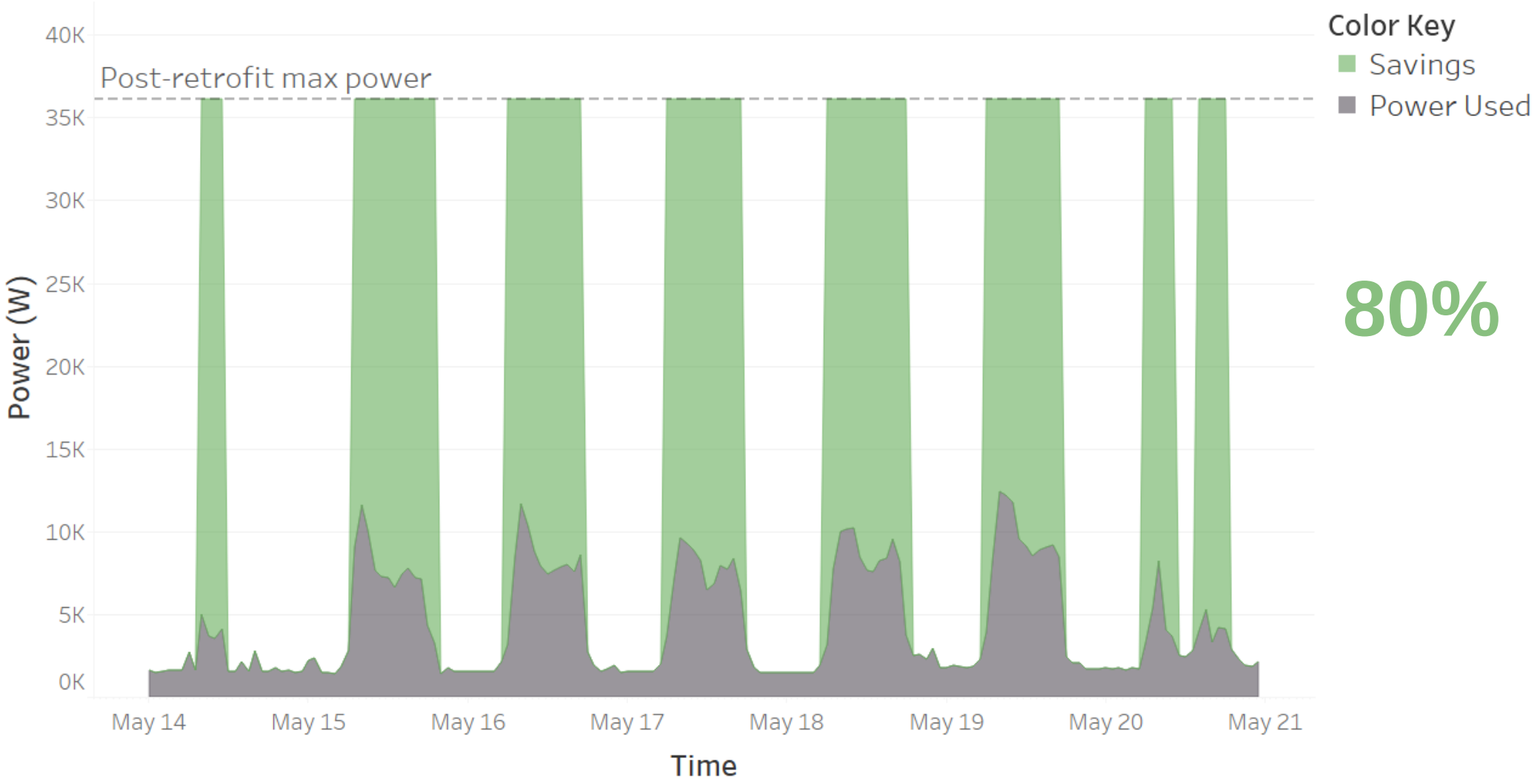
Post-Retrofit Interval Data - [1 Open Office Building, 1 week]



Open Office Building – Baseline

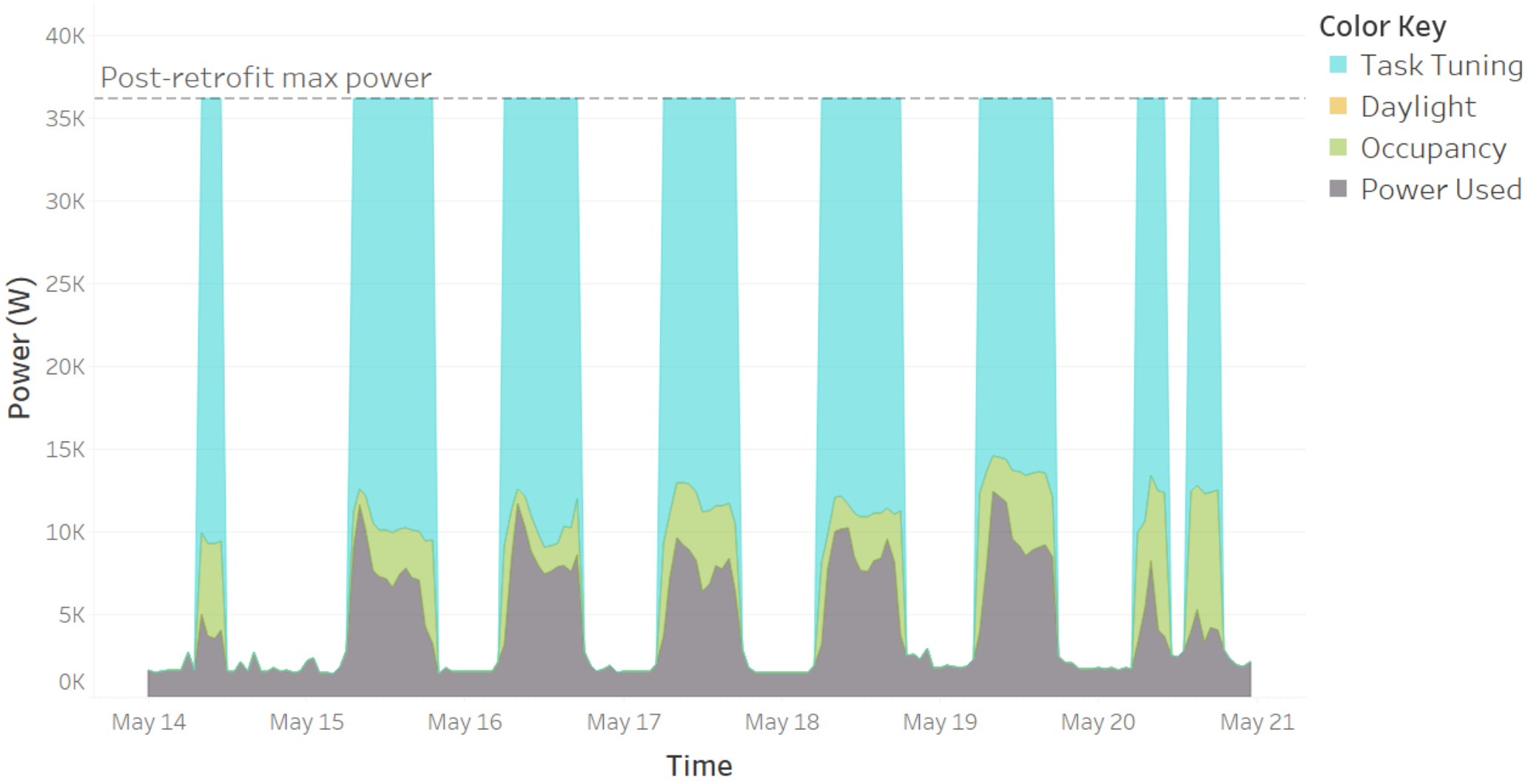


Open Office Building – Energy Savings

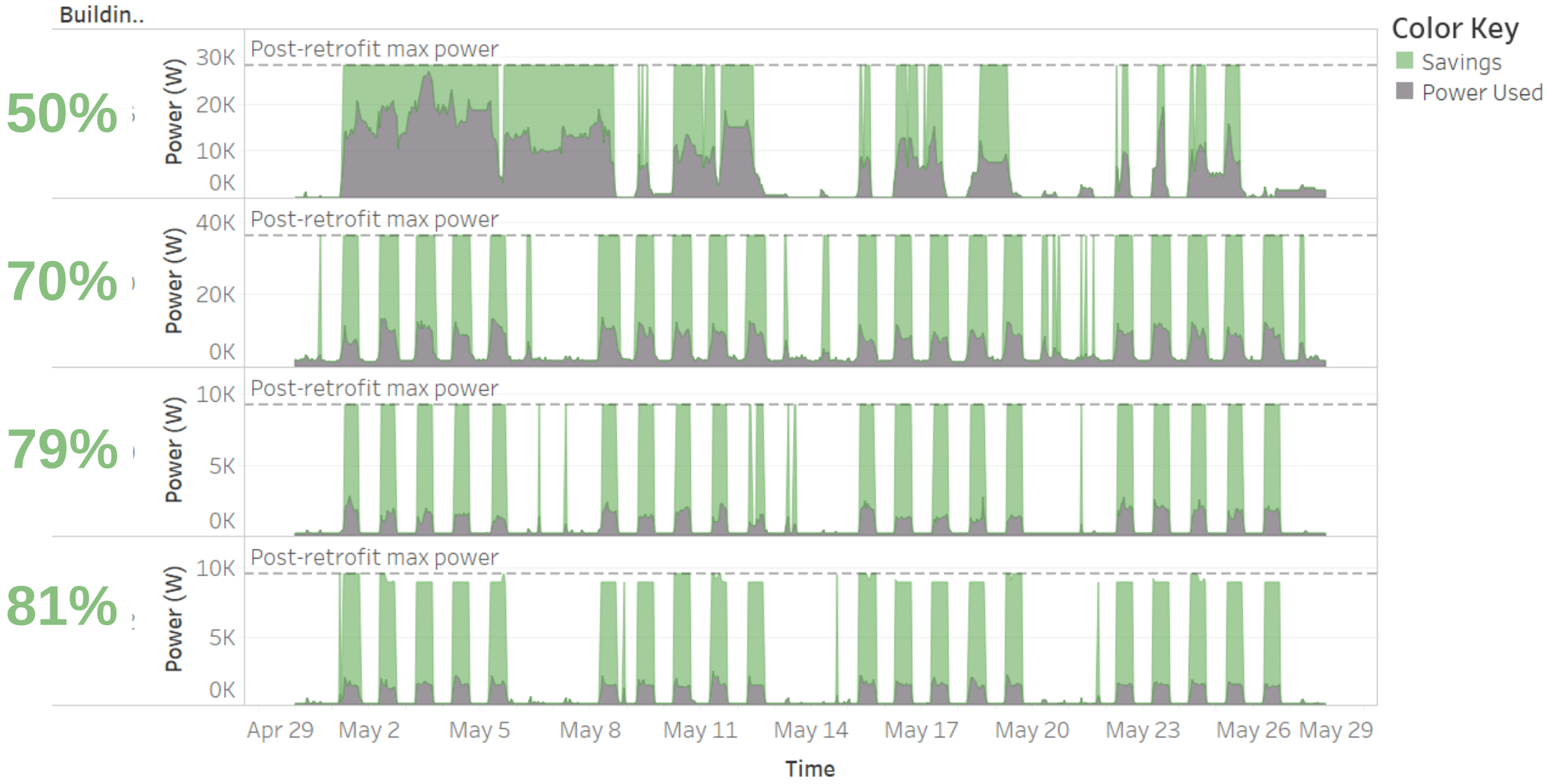


80%

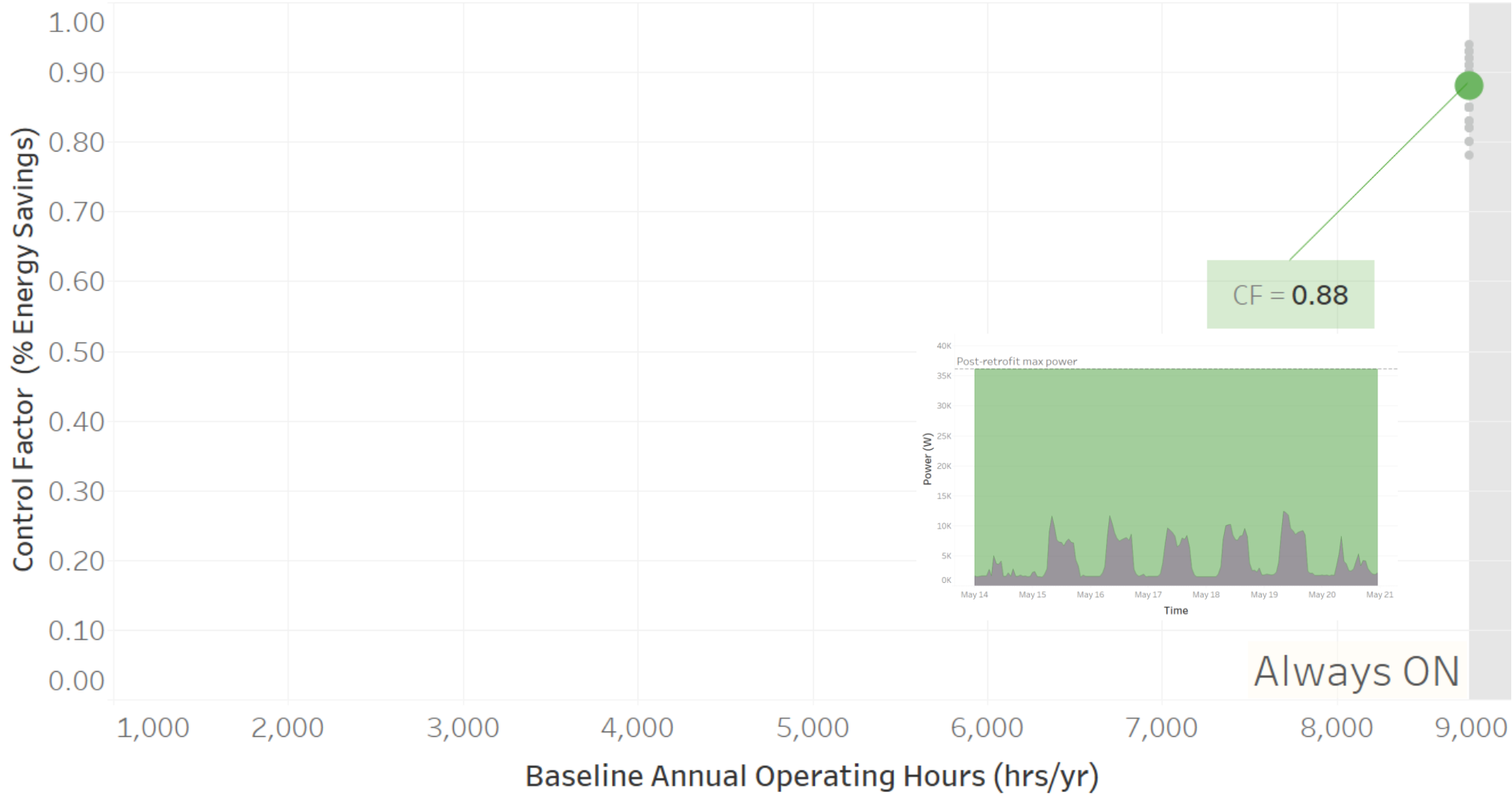
Open Office Building – Savings by Control Strategy



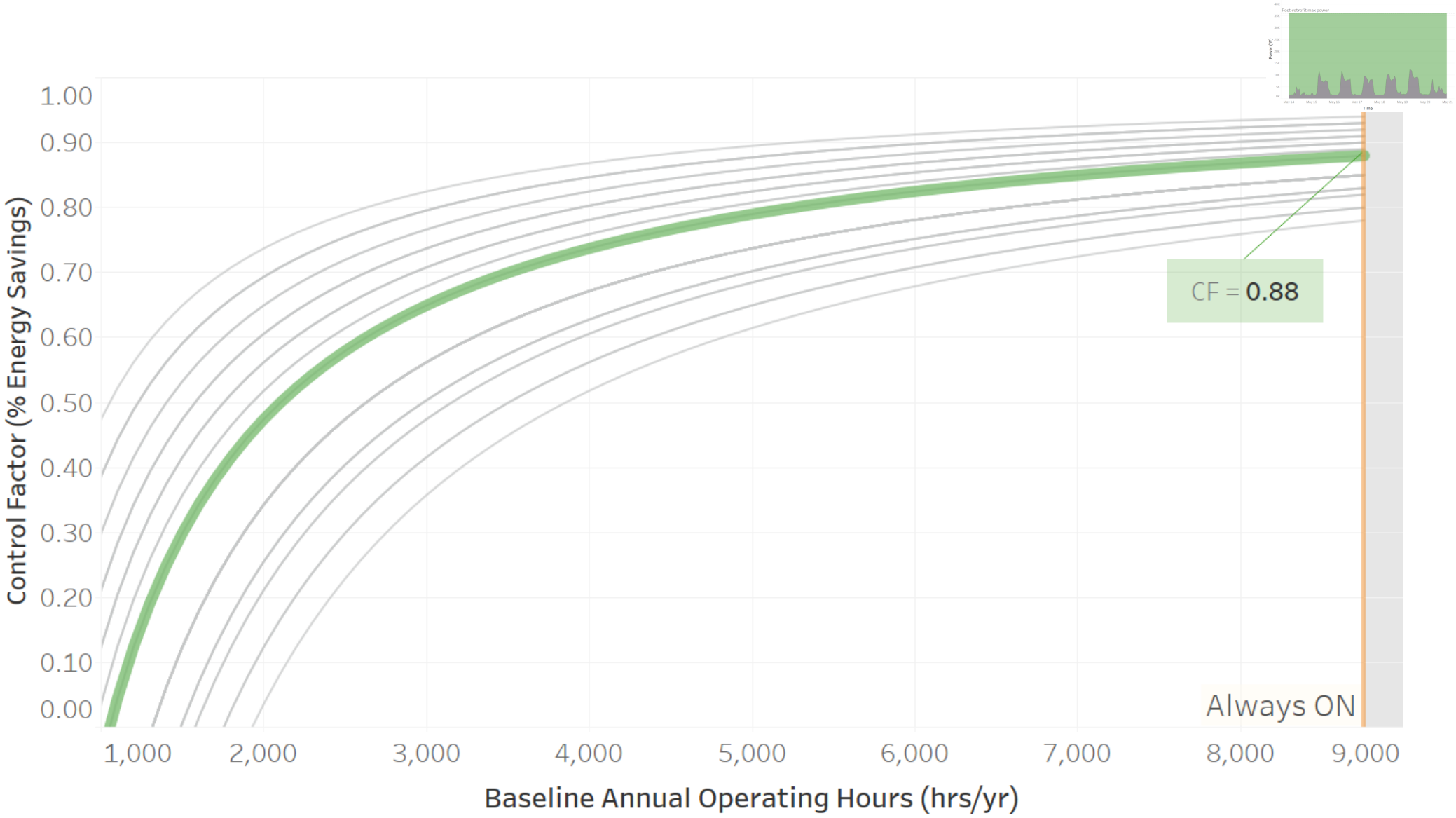
Replicable Performance Increases Confidence – [4 office buildings, 1 month]



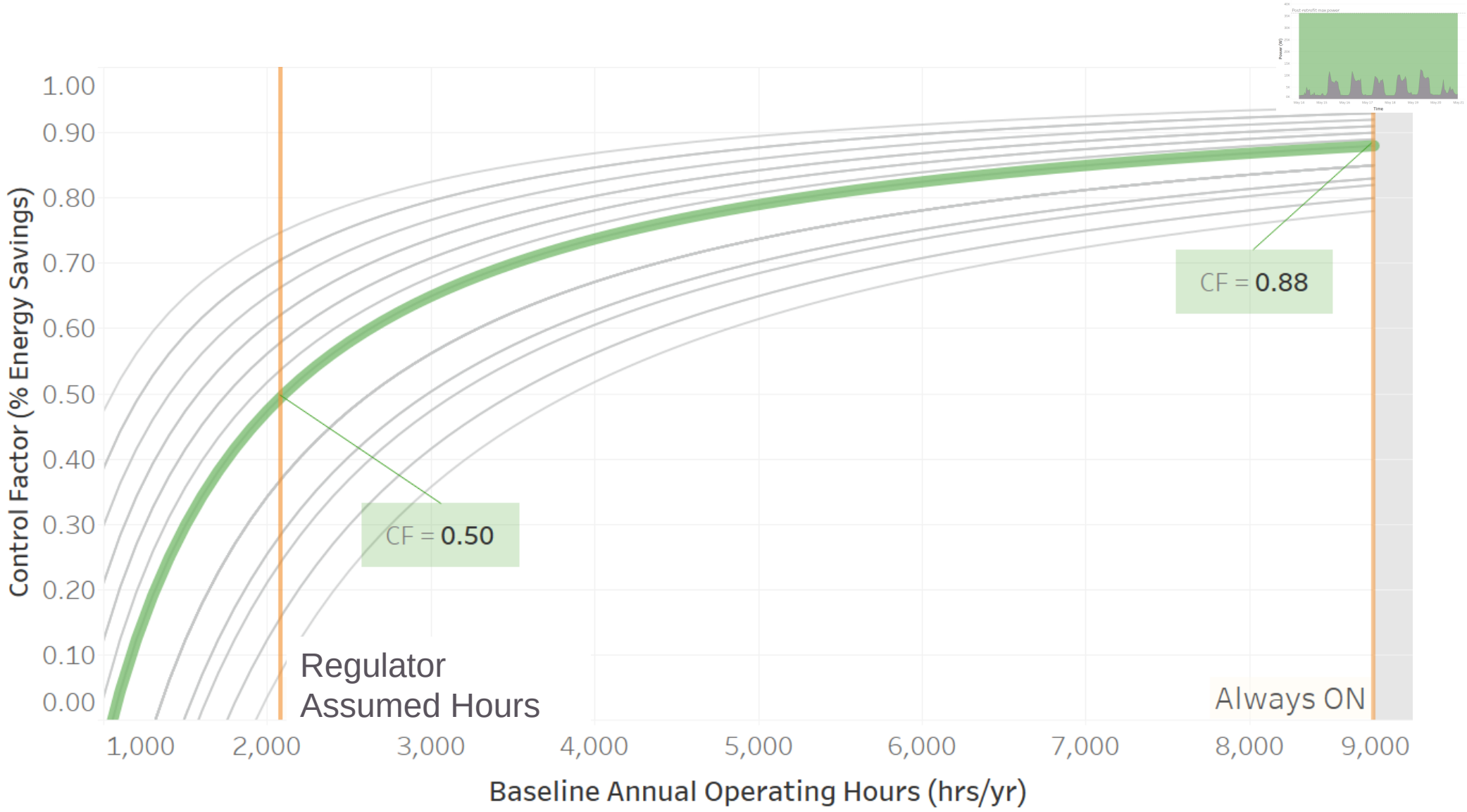
% Savings Relative to an Always ON Baseline Assumption [Hypothetical Data]



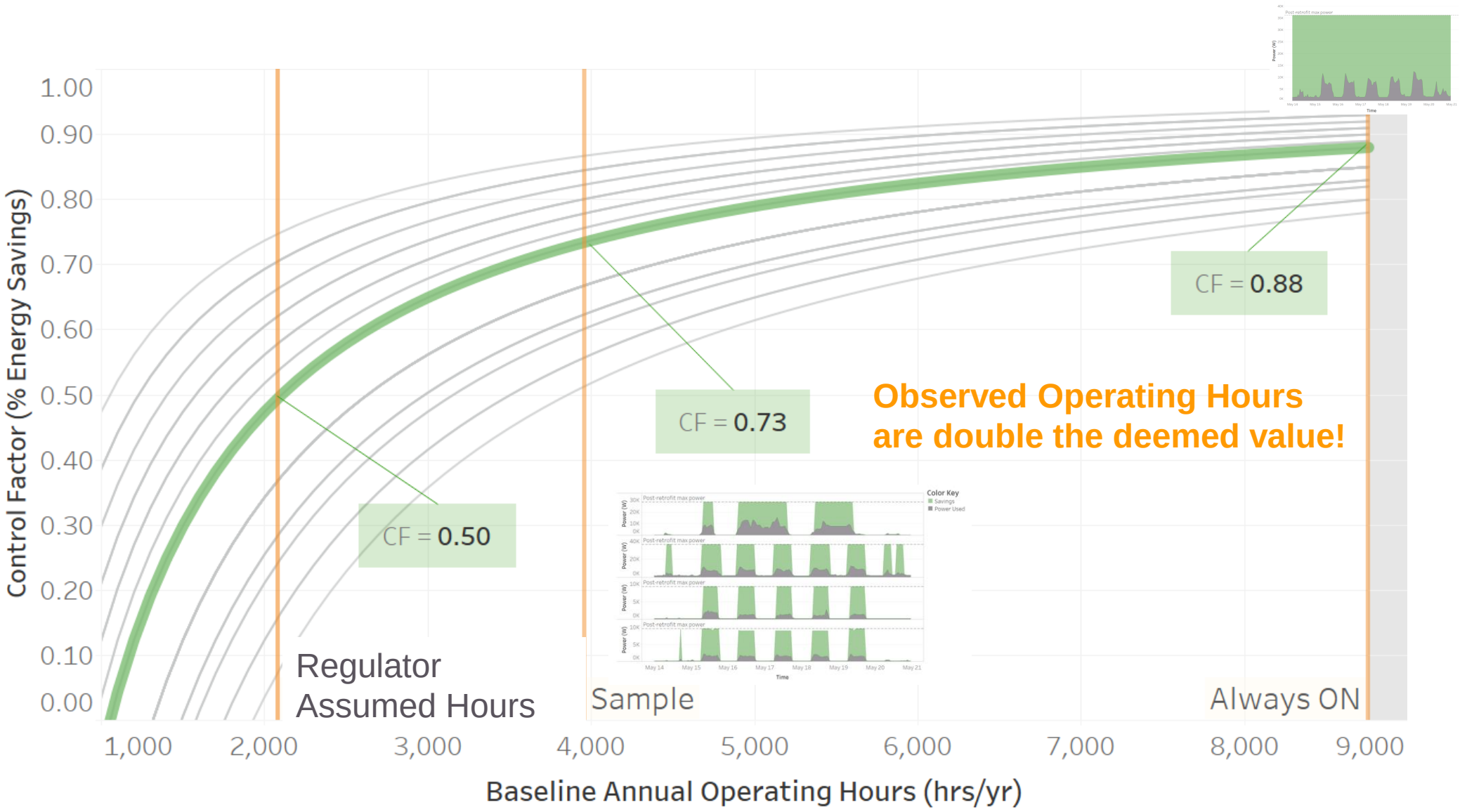
% Savings Relative to a Custom Baseline Assumption [Hypothetical Data]



% Savings Relative to a Custom Baseline Assumption [Hypothetical Data] – ex. Regulator Claimed Hours



% Savings Relative to a Custom Baseline Assumption [Hypothetical Data] – ex. Project-Specific Hours



Lessons Learned and Recommendations

- Obtaining **DATA AUTHORIZATION** has been a major barrier
  - We recommend that 2018 utility NLC programs require and/or incentivize anonymized data sharing authorization
  - We recommend manufacturers consider including anonymized data reporting in customer agreements

- **STANDARDIZED PERFORMANCE DATA** is critical to quantifying savings
  - We encourage NLC utility programs to adopt uniform data reporting guidelines
  - Draft data reporting guidelines will be part of the September report

Next Steps

July 2017	September 2017	Q1 2018
• Finalize datasets for report	• Publish report, host webinars • Utilities incorporate findings into 2018 program planning	• Consider an additional update study leveraging new programs and install data

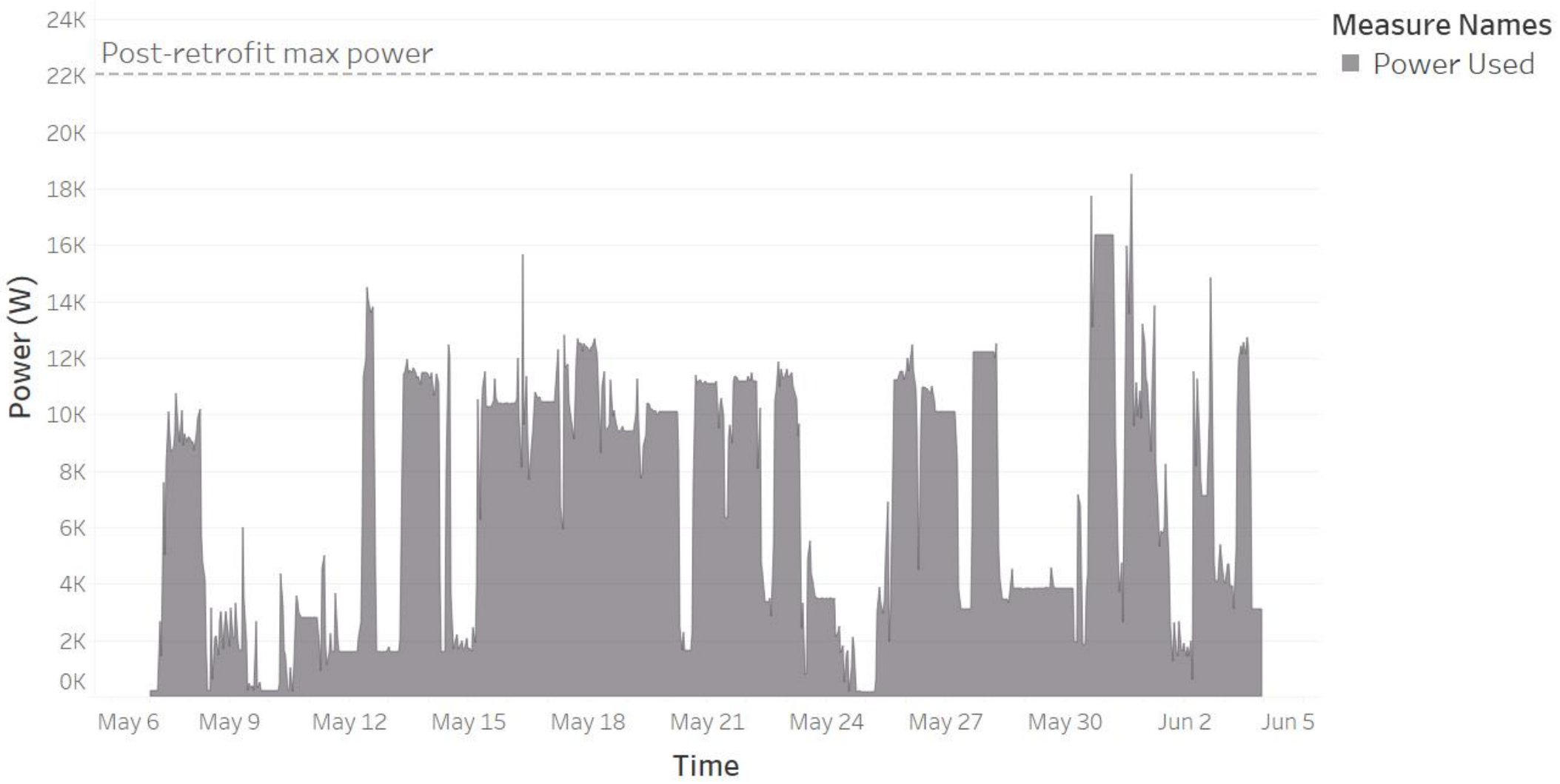
THANK YOU

Teddy Kisch, LC
Senior Project Manager, Technology Development and Commercialization

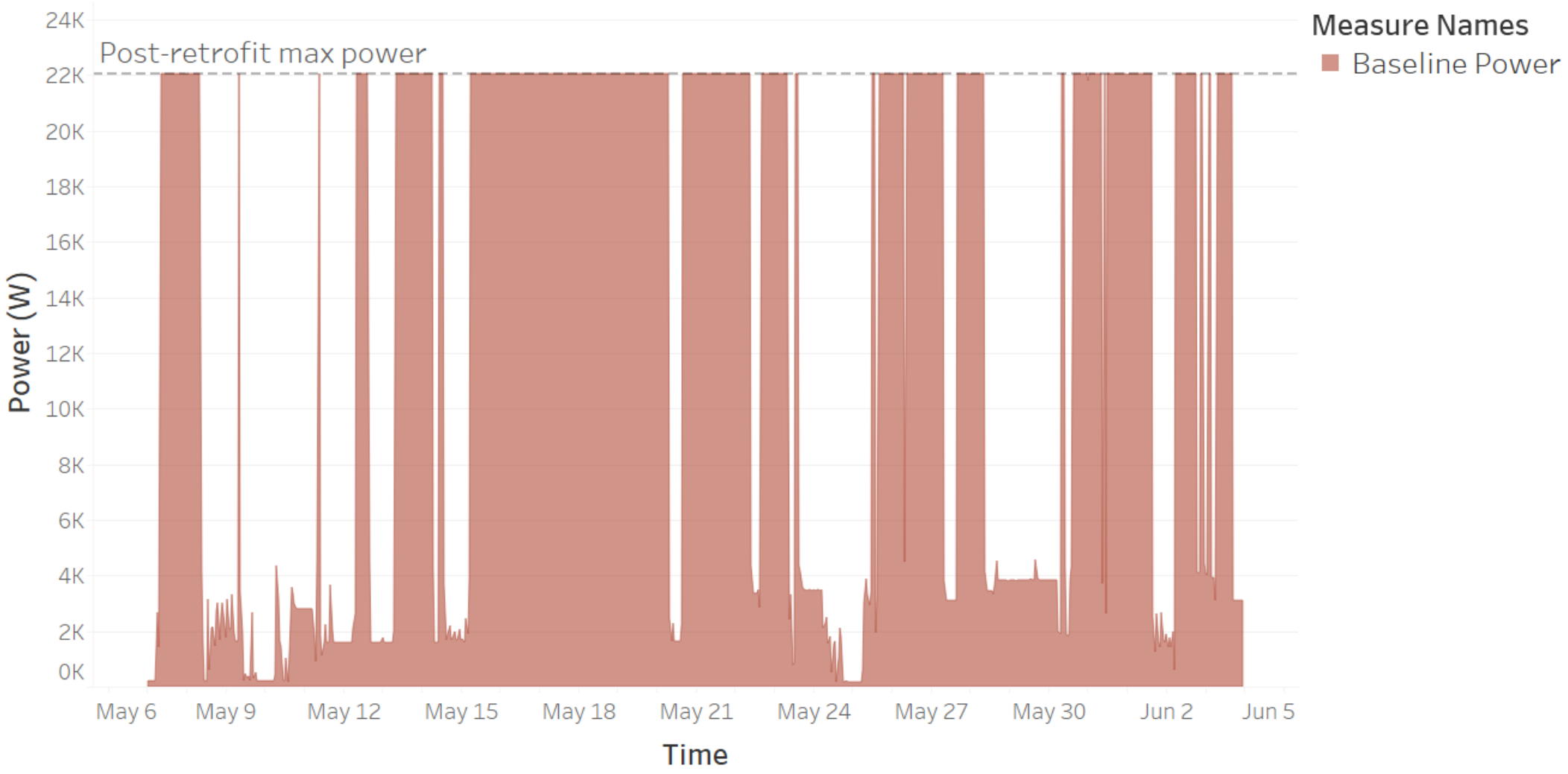
tkisch@energy-solution.com

APPENDIX

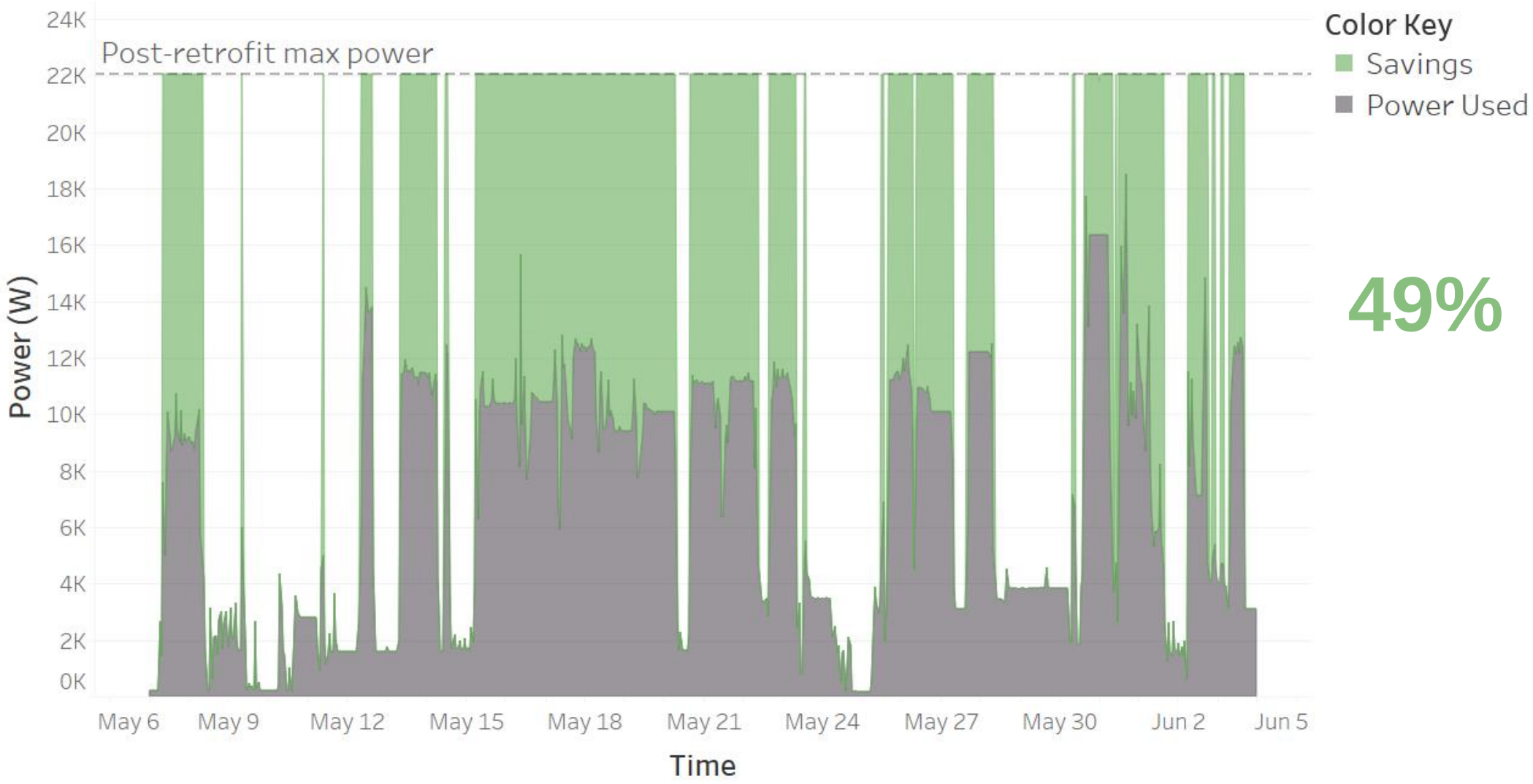
1 Month, 1 Building of Warehouse Data – post-retrofit



Example: 1 Month, 1 Building of Warehouse Data – Baseline

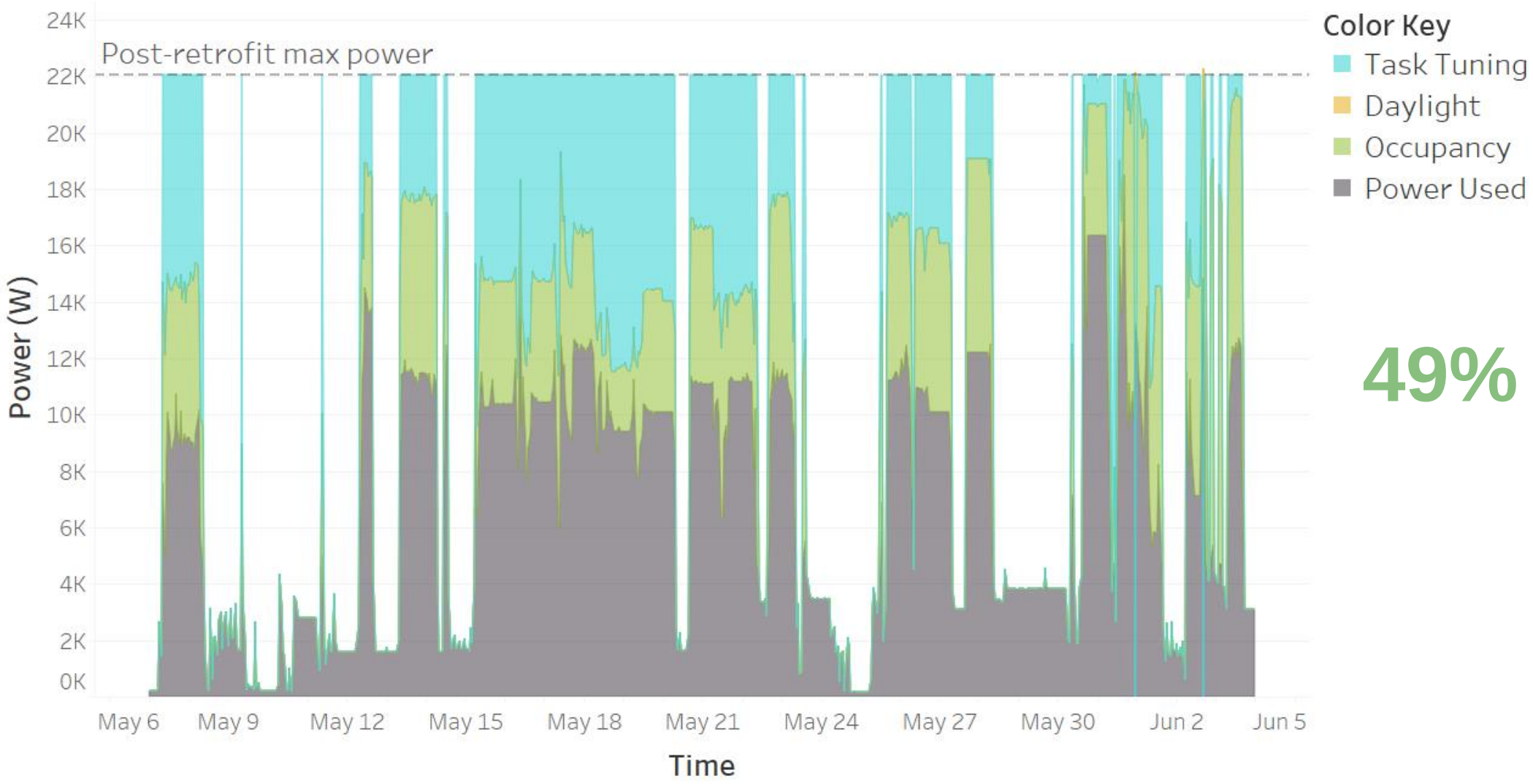


Example: 1 Month, 1 Building of Warehouse Data – Savings



49%

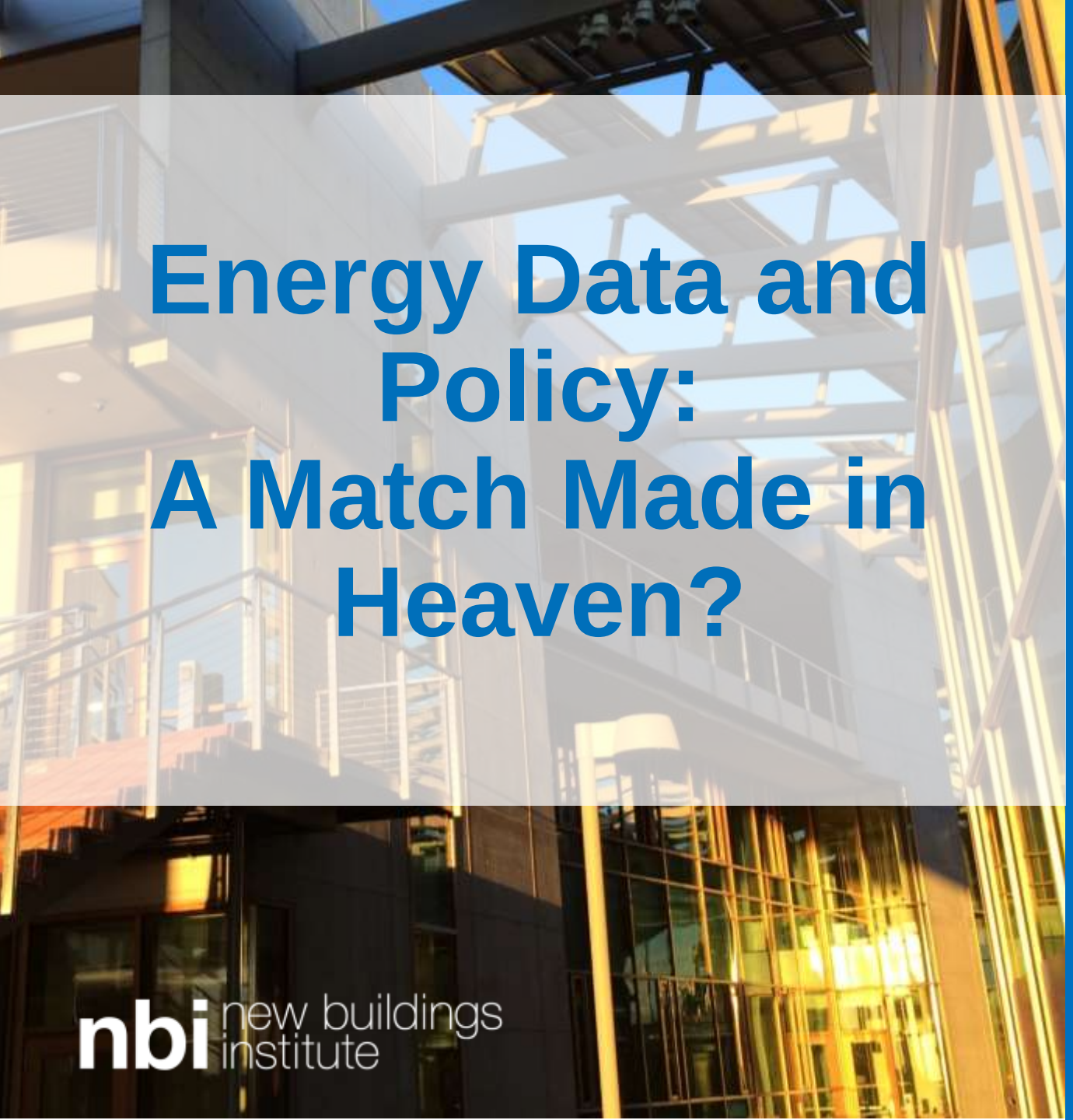
Example: 1 Month, 1 Building of Warehouse Data – Breakdown



49%

Baseline Approach Options

Approach	Description	Drawbacks	Benefits
Actual	Best estimate of incumbent controls system in that building based on audit and/or interview data	Often unavailable, especially for specific space types. Can be time intensive to quantify recorded information.	Most accurate
Inferred from post-retrofit	Use the post-retrofit data to estimate the occupied hours; assume X% wattage during occupied hours and Y% the rest of the time	Time intensive	Approximates actual baseline; requires assumptions about controls system
Standard	Refer to a standard assumption about lighting hours of use in that building/space type	Does not capture variation between sites; does not reward buildings with unusual high baseline energy use	Fast, easy to explain, and approximates average building stock
Custom	Calculate savings relative to a 24/7, always ON baseline from the NLC data. From this, we can calculate savings relative to any custom hours of use. Also recommend a default hours of use assumption (e.g., standard)	Recommended default has the same drawbacks as whatever method is used to create it.	Shows what baseline hours of use you would need to get X% savings



Energy Data and Policy: A Match Made in Heaven?

nbi new buildings institute

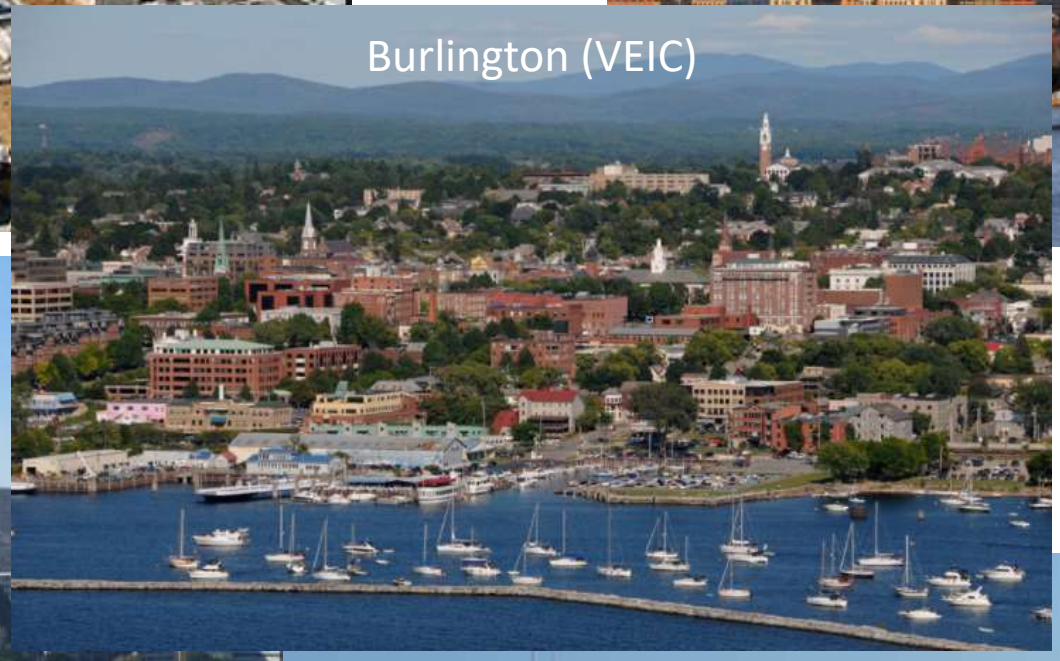
Jim Edelson

Design Light Consortium

June 15, 2017


Santa Ana (SCE)


Boston (NGrid)


Burlington (VEIC)


Portland (NEEA)


Chicago (ComEd)

Aggressive Code/Performance Goals Widely Adopted

2030 Challenge (Architecture 2030, ASHRAE, USGBC)

2030 Commitment (AIA)

CA Big Bold Goals

Carbon Neutral Cities Alliance/Urban Sustainable Directors Network

Federal, State, and City Jurisdictions

~~Paris Accord ?~~

T-24 Code Cycles to ZNE

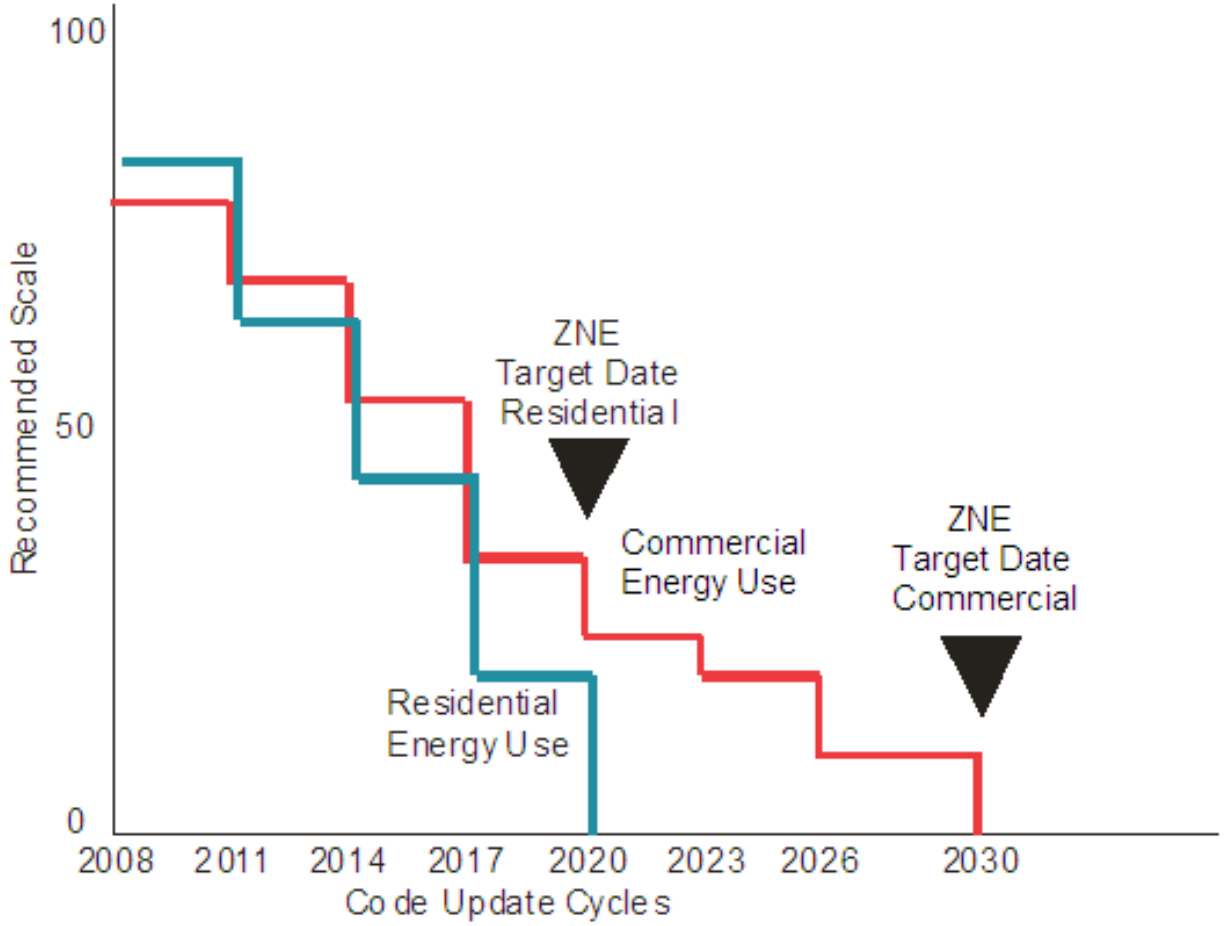
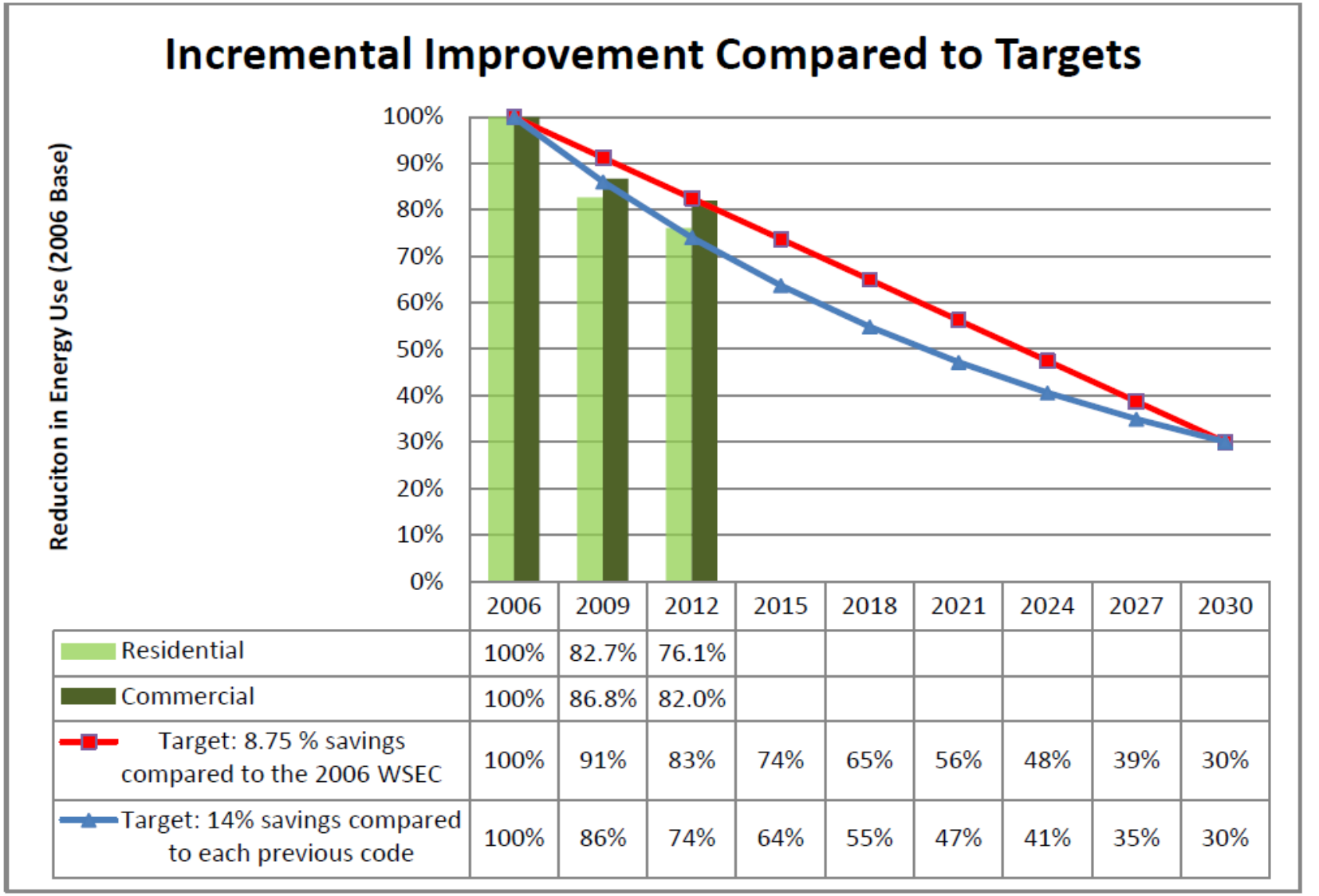


Figure 2. Code Cycles to ZNE, Source: SCE & AEC, 2009

nbi new buildings institute

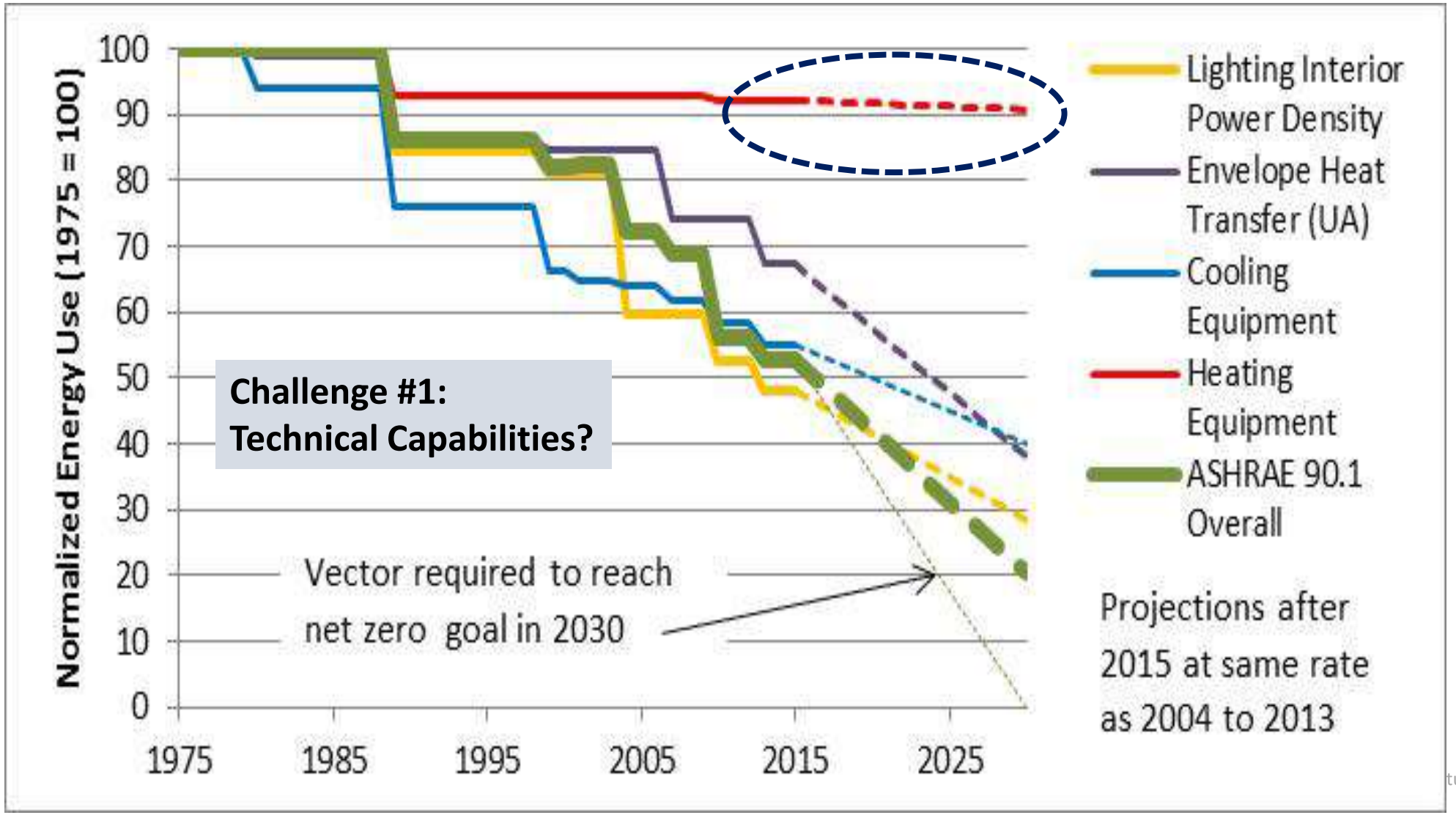
WA Code Improvement Targets



	2006	2009	2012	2015	2018	2021	2024	2027	2030
Residential	100%	82.7%	76.1%						
Commercial	100%	86.8%	82.0%						
Target: 8.75 % savings compared to the 2006 WSEC	100%	91%	83%	74%	65%	56%	48%	39%	30%
Target: 14% savings compared to each previous code	100%	86%	74%	64%	55%	47%	41%	35%	30%

Code Mechanisms/Challenges

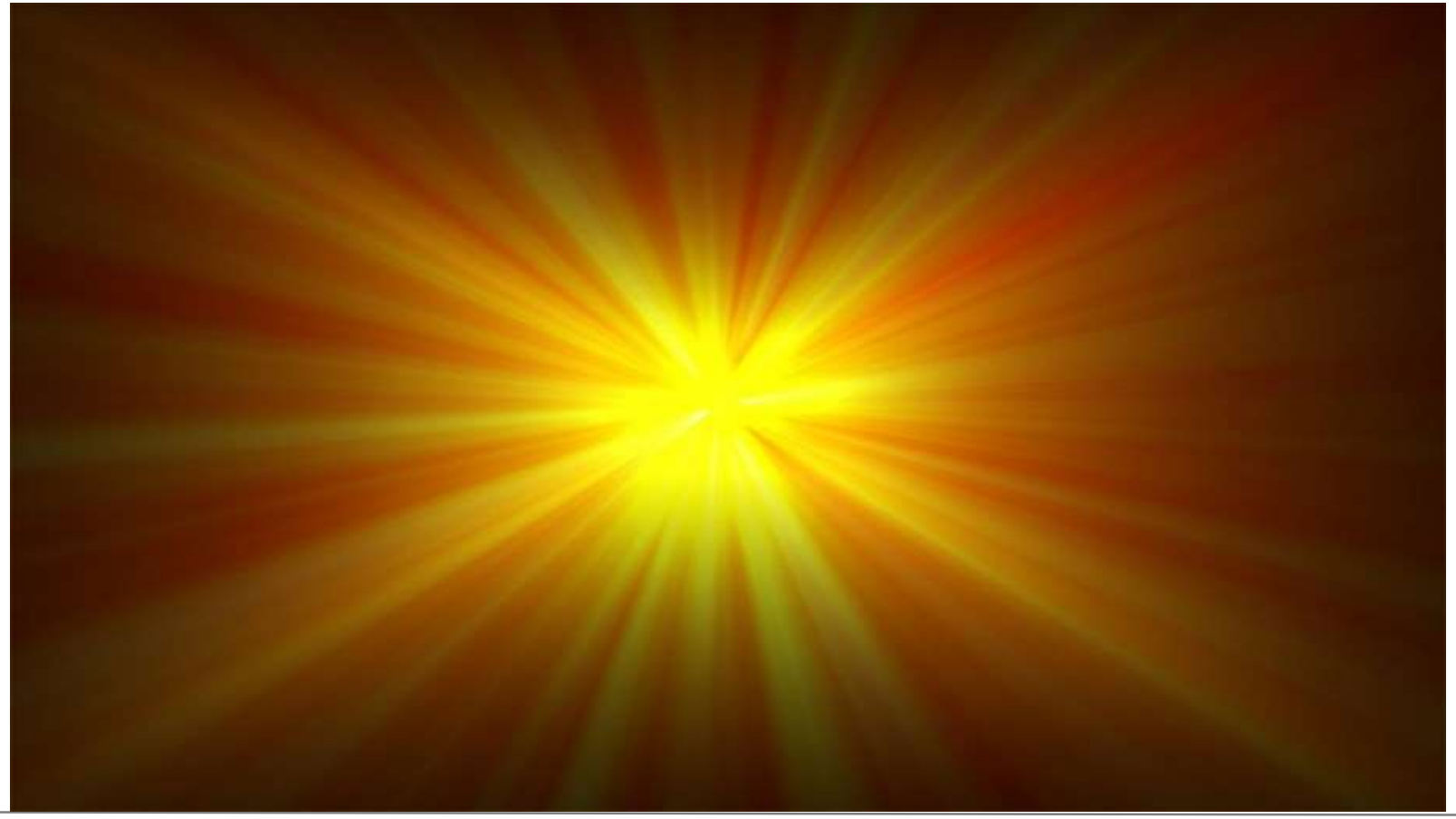
Technical Progress by Component



T24 Controls Are Necessary……

- **Light switches** (or other control) in each room
- **Separate controls** for general, display, ornamental, and display case lighting
- **Occupant sensors** in offices 250 ft2 or smaller, multi-purpose rooms less than 1000 ft2, classrooms and conference rooms of any size
- **Partial ON/OFF occupant sensors** are required in aisle ways and open areas in warehouses, library book stack aisles, corridors, and stairwells
- **Multi-level control (dimming capability)** for lighting systems > 0.5 W/ft² in rooms > than 100 ft2.
- **Automatic daylighting controls** in daylit areas >100 ft2 except when the total installed general lighting is less than 120 watts or the glazing area is less than 24 ft2.
- **Demand responsive controls** in buildings larger than 10,000 ft2

What are the new approaches?

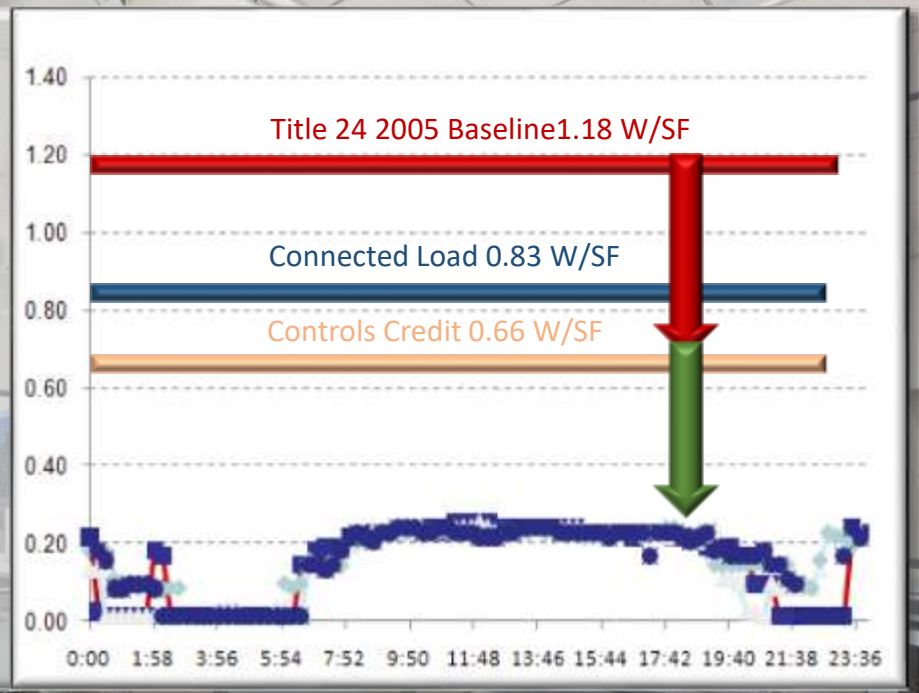


Measured Lighting Energy Use

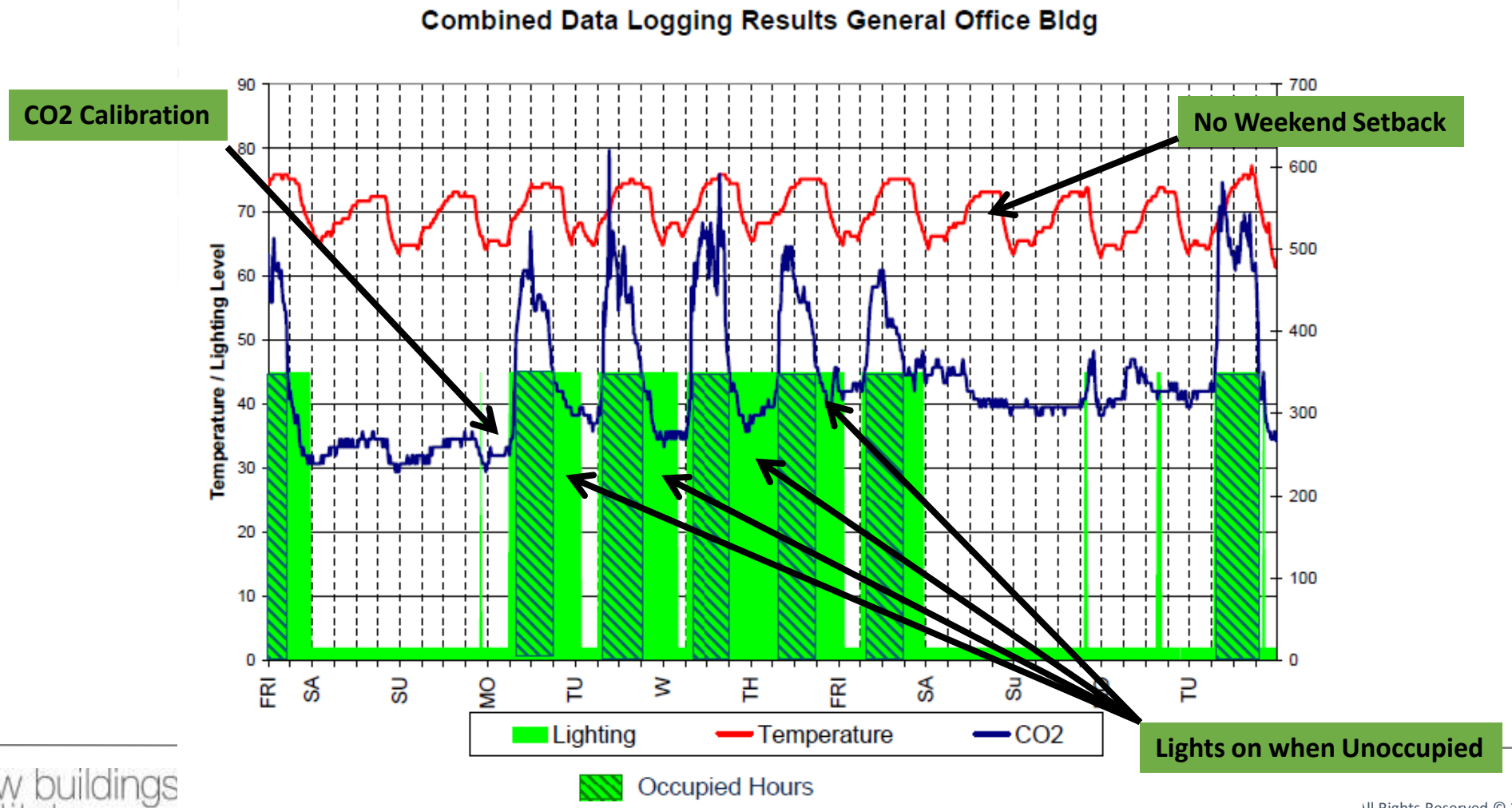
Single-Fixture Task-ambient (task light provides ambient)

All building lighting on occupancy sensors

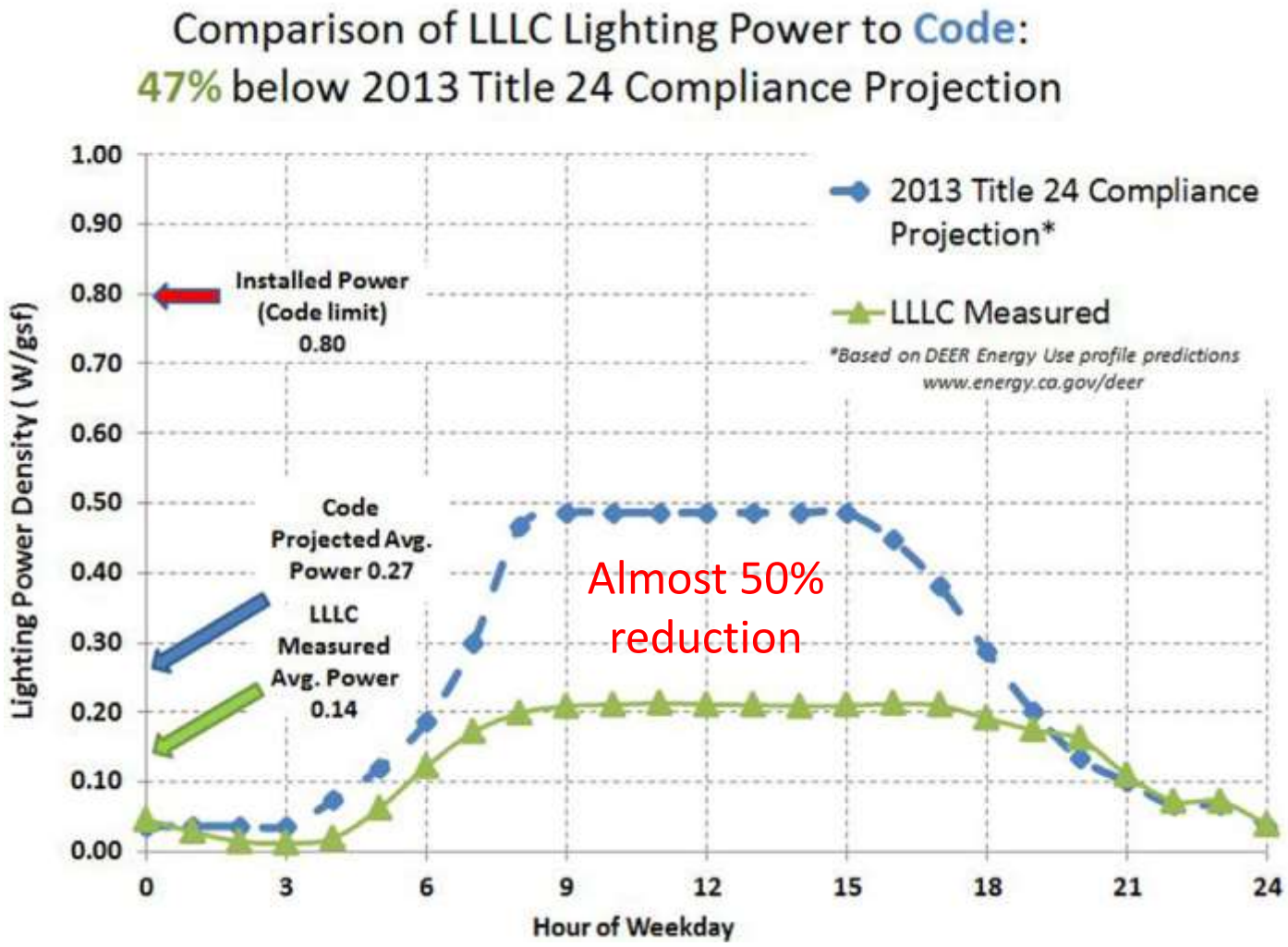
Private offices 50% auto-on with occupancy sensors, all lights auto-off



Actionable Data and Proxies



LLLC Compared to Code



nbi new buildings institute

NEW IN THE 2018 IECC

LUMINAIRE LIGHT LEVEL CONTROLS. A lighting system consisting of one or more luminaire(s) with embedded lighting control logic, occupancy and ambient light sensors, wireless networking capabilities, and local override switching capability, where required.

- **DLC Product Specifications for LLLC**

LIGHTING IN THE 2018 IECC

C405.2 Lighting controls (Mandatory). Lighting systems shall be provided with controls that comply with one of the following: ~~as specified in Sections C405.2.1, C405.2.2, C405.2.3, C405.2.4, and C405.2.5.~~

1. Lighting controls as specified in Sections C405.2.1, C405.2.2, C405.2.3, C405.2.4, and C405.2.5, or
2. *Luminaire light level controls* (LLLC) and lighting controls as specified in Sections C405.2.4, and C405.2.5. The LLLC luminaire shall be independently capable of:

    1. Monitoring occupant activity to brighten or dim its lighting when occupied or unoccupied respectively.
    2. Monitoring ambient light (both electric light and daylight) and brighten or dim artificial light to maintain desired light level.
    3. Configuration and re-configuration of performance parameters including; bright and dim set-points, time-outs, dimming fade rates, sensor sensitivity adjustments, and wireless zoning configurations, for each control strategy.

nbi new buildings institute

Pay for Performance (credit Julia Szinai; NRDC)

- P4P can leverage access to smart meters and improved analytics (M&V 2.0) to capture savings from a wider range of EE projects, especially complex, interactive, multi-measure, whole-building efficiency projects

- P4P can deliver efficiency as a verified energy or capacity resource

5 Ideal Utility Program Conditions*

1. Willingness for a **3rd party** Program Implementer (PI)
2. Structure for PI includes **pay for performance** + customer/contractor liaison
3. **Calculated** savings
4. Orient and Train in "**Sales**"
5. Customer **Co-Pay**

Greater savings per transaction = lower cost per transaction/kWh

** More in the Implementation Guide "10 Steps for Success"*

LUMENS AS A SERVICE

Rocky Mountain Institute, May 2017:

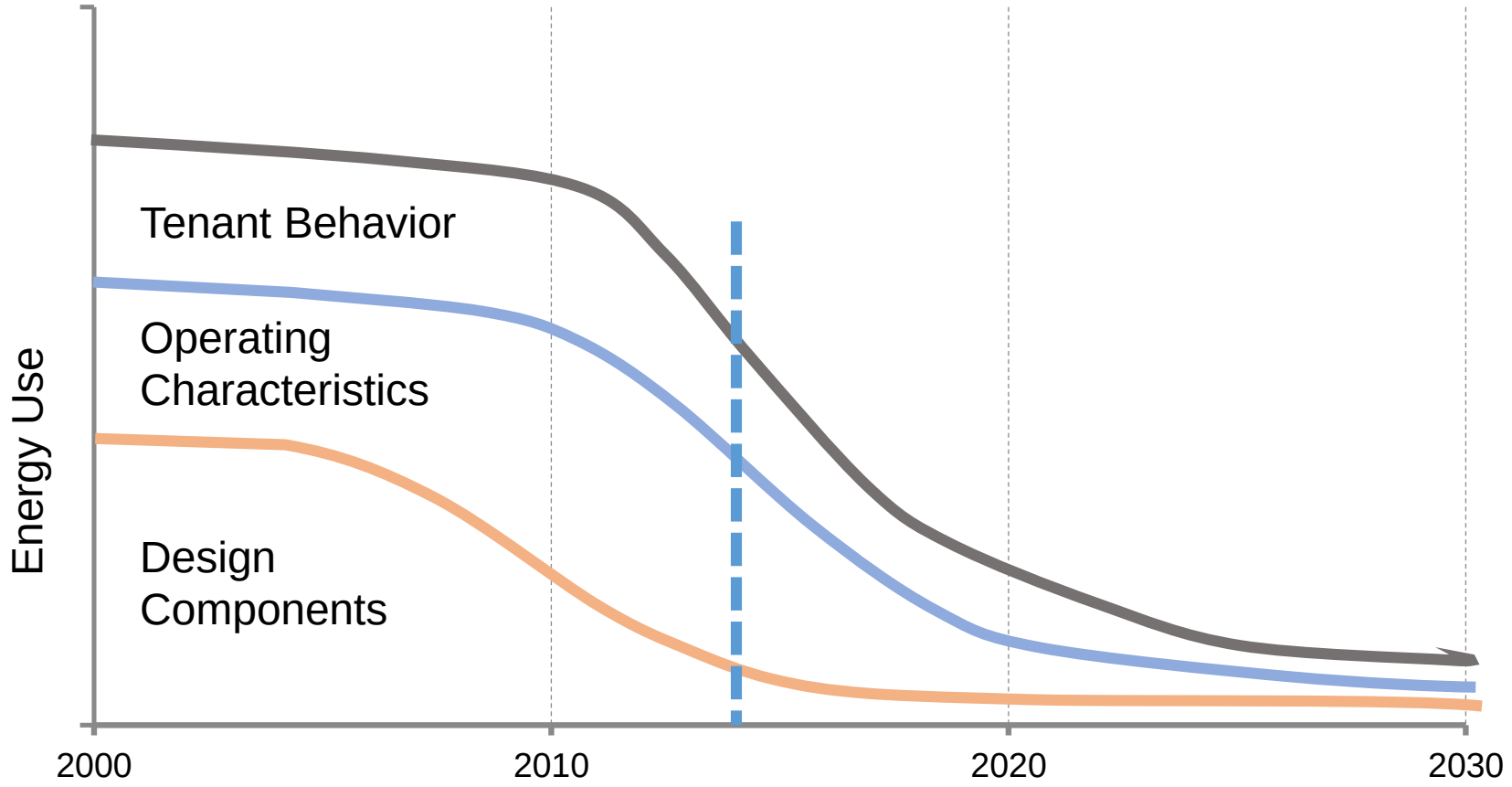
The convergence of technological advancements in and cost reductions of light-emitting diodes (LEDs) and smart lighting control technologies has created a major business opportunity in commercial buildings.

1. Cost-effectively capture new value streams
2. Mass deployment of LED technologies and market demonstrations of “as a service”
3. Performance and financial returns are brought together.

Outcome-Based Code

- Prescriptive
- Performance (modeled)
- Outcome-Based

Components of energy outcomes



Outcome Project Examples

- Edith Green Wendell Wyatt Federal Building; Portland -SERA
- George Deukmejian Courthouse, Long Beach –AECOM/Clark
- Federal Center South; Seattle -ZGF

Outcome-based Pathway in the International Green Construction Code

Sets targets

- Table based on CBECS
- Ratio of actual performance to table reference

Compliance

- Issue Temporary Certificate of Occupancy or Post Occupancy Verification Permit
- Owner bears burden of reporting to resolve TCO/POVP
  - 12 months compliant data within 3 years
  - Certified by registered design professional
  - Could hinder financing, insurance, leasing, sale, permitting, etc.
- Penalties/resolution up to AHJ
- Requires links with other policies/departments

Jim Edelson
Director, NBI
jim@newbuildings.org

David and Lucille Packard Foundation Building
Courtesy: EHDD

‚Experience, Opportunities, challenges,

Networked lighting Controls

Lee Featherstone Schneider Electric

Life Is On Schneider Electric

Smart Lighting

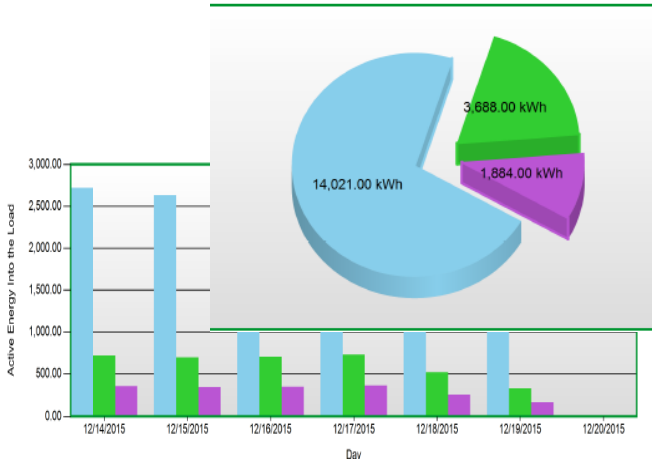
Experience, Opportunities and Challenges.

- M&V2017
- Opportunities with Smart lighting
- Potential challenges with Smart lighting
- Experience in projects
- Opportunity in Integration

M&V 2017

Experience from a Performance contracting business….

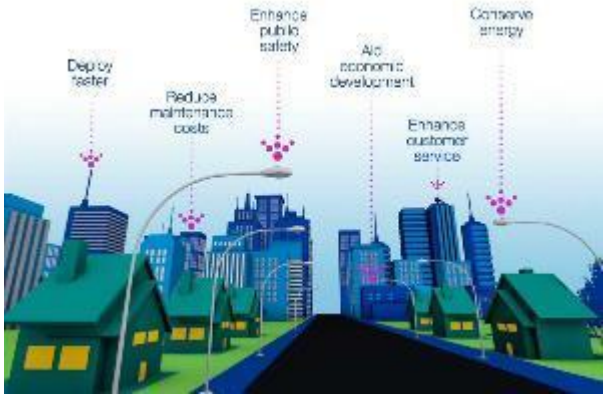
- A few meters to understand Energy Usage…..
  - Sometimes read manually,
  - Connected to the BMS and logged periodically
  - Some form of Reporting depending on requirements



Too often we only meet minimums….and miss out on many opportunities…..

Opportunities with Smart lighting….

- Control and data to a fixture
  - Automation based on Occupancy, light harvesting, Demand response
- Capability to understand and drive behavior
  - Usage data
  - Control for security /safety
  - Reduce Maintenance costs
- Combining communications for other required sensors
  - Environmental
  - Video /sound



Potential Challenges with Smart Lighting

- Information handling
  - Many more devices and data points
  - Having the tools and personnel to analyze the data
  - Implementing processes and behavioral changes
- Power Quality Issues
  - Harmonics, load balancing, Power Factor
- Adding another system in most Buildings

Privacy and security…….

Experience with Networked Lighting

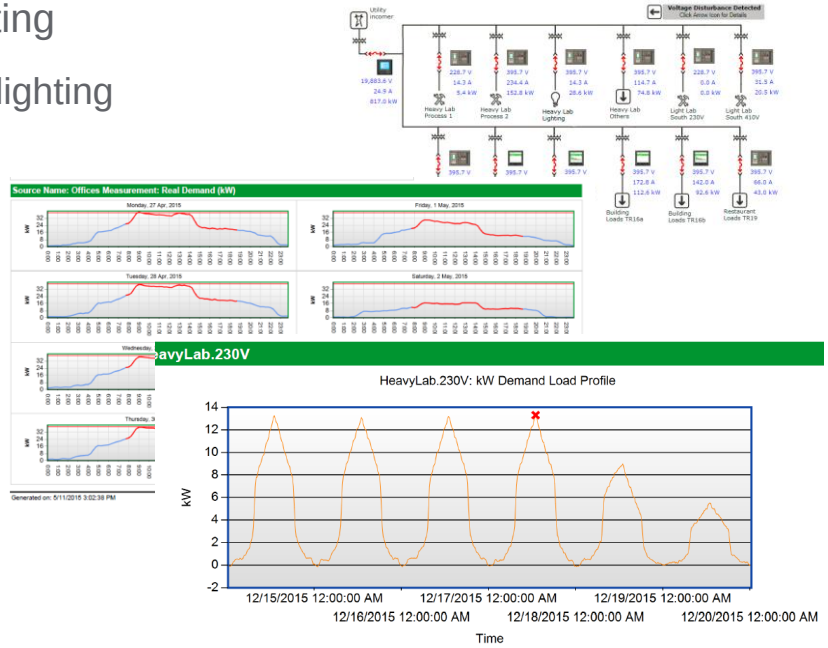
From a Performance Contracting team…

Implementing lighting control, LED and NLC

- Average of ~30% with standard lighting control
- Savings between 15-60% of Energy Costs with LED lighting
  - Current state of the Building
  - Implemented technologies
  - “LED technology saves so much compared to old technology that the Controls part is hard to justify except where required by code”
- Performance Contracting is usually just based on Energy Savings, it does not include maintenance labor savings or other factors.

Opportunities for Integration and additional Energy and Cost Saving

- Integrated Systems Building, Power, security, lighting
  - Smart Building, Smart Power Infrastructure, Smart lighting
    - Energy Optics include more data
    - Occupancy can apply to more systems
    - Enhanced Security
    - Shared data networks
    - Smart Electrical Infrastructure
  - Much more data from the Building
    - Analytic tools to point out issues in Energy
    - Drive changes in Energy savings
  - Standardization can help drive the Integration



Life Is On Schneider Electric

Life Is On | Schneider Electric