



Bringing Efficiency to LightSM

Energy Savings from Networked Lighting Control (NLC) Systems

October 6, 2017

Webinar Logistics

- All attendees on mute
- Ask questions as we go using Question feature of webinar
- If you experience any technical issues, use Chat feature to let us know
- Presentation and recorded webinar will be posted to the DLC website

Networked Lighting Controls



NLC QPL



Energy
Data
Report



Training
Curriculum



Savings
Calculator



Efficiency
Program
Incentives



Full Scale Adoption of Networked Lighting Controls

Activities

Reduce or eliminate market barriers

Equip EE Programs with tools to scale up

Enable at scale partnerships between industry and EE programs



Goal

Full-scale adoption of Networked Lighting Control technologies

Thanks to Data Contributors & Sponsors



Speakers



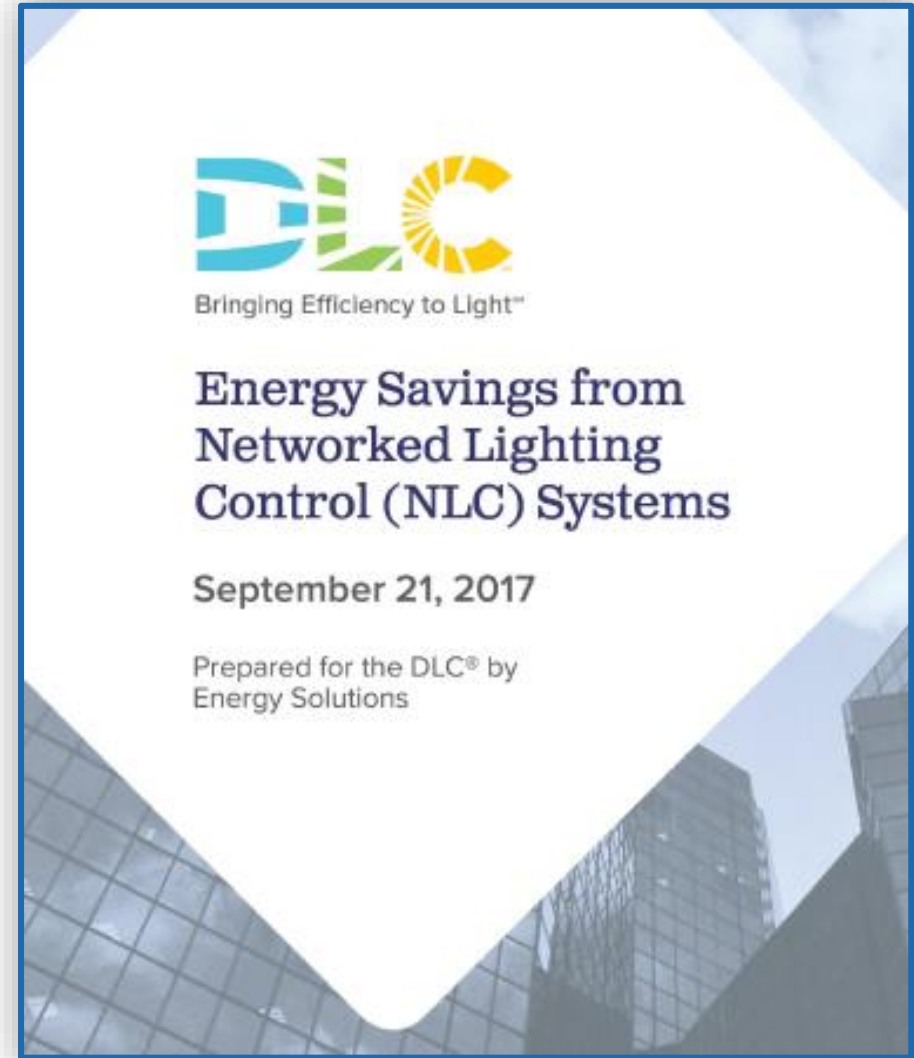
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DLC



Teddy Kisch, LC
Energy Solutions

Agenda

- Networked Lighting Controls Data Project
 - Introduction
 - Methods
 - Results
 - Recommendations
- Q&A



The DLC's Requirements for Networked Lighting Controls



- Networking of Luminaires and Devices
- Occupancy Sensing
- Daylight Harvesting
- High-End Trim
- Zoning
- Luminaire and Device Addressability
- Continuous Dimming



Photos: Digital Lumens, Enlighted, LinkedIn, Nedap, RAB



A long, long time ago...

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



the LED lighting industry was small, like the networked controls industry of today

2007

Product Specifications:

Limited

Utility Support:

Limited



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2017

DLC and ENERGY STAR

Over \$200 million annually from hundreds of programs across North America



pexels.com

What was needed for energy efficiency programs to help LED lighting scale up?

1. Information & demonstrations reduce performance risk



2. Industry standardization and transparent reporting

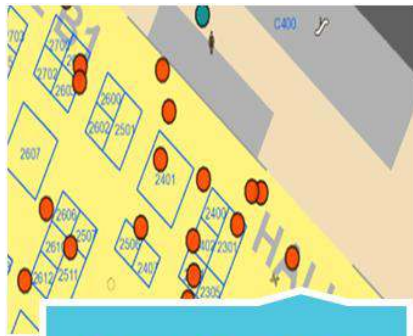


3. Financial incentives to reduce product first cost

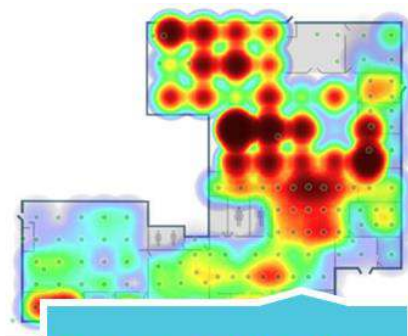


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Networked Lighting Controls bring new energy savings plus additional value



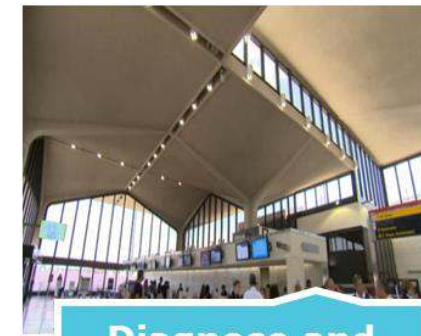
Asset Tracking



Space Utilization



Indoor Positioning



Diagnose and Report



Conference Room Scheduling



Security



Energy Tracking



Integrate with BMS/HVAC

What will help Networked Lighting Controls scale up?

1. Information & demonstrations reduce performance risk



2. Industry standardization and transparent reporting



3. Financial incentives to reduce product first cost



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**For Networked Lighting Controls,
all 3 strategies need energy performance data.**

Goals

- Better NLC energy savings estimates
- Database for energy performance data
- Data reporting guidelines for utilities and NLC manufacturers



Score!

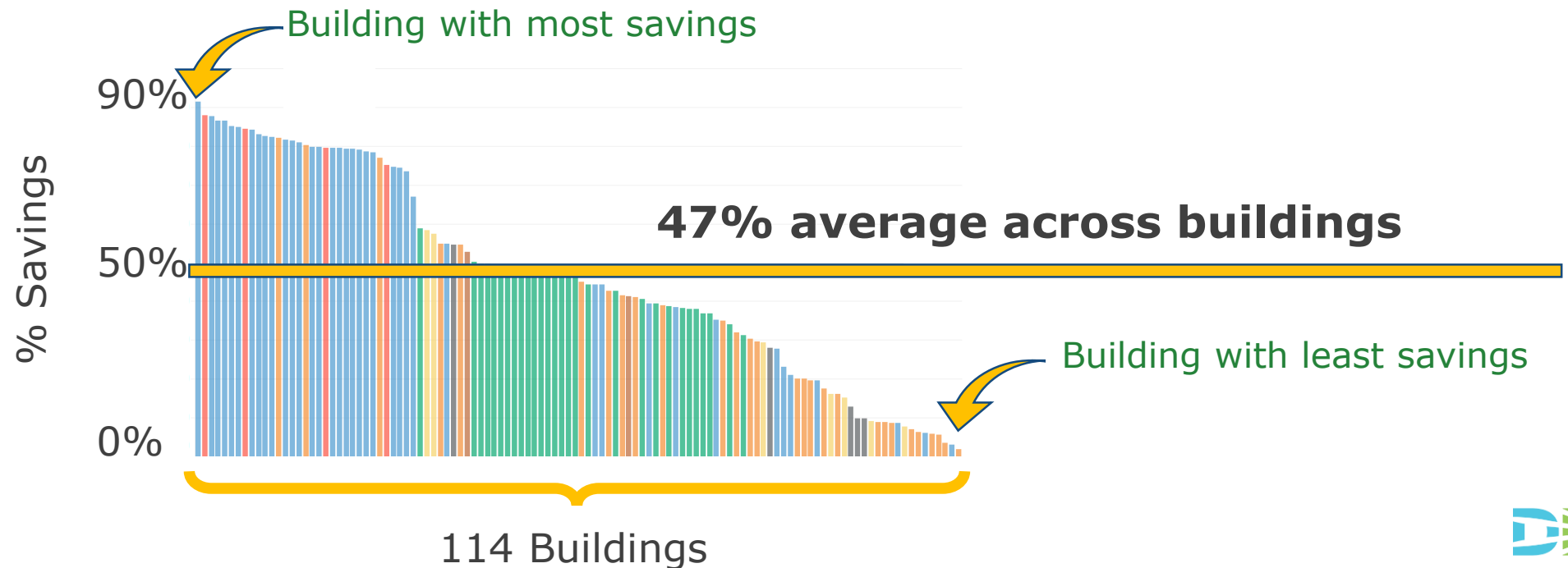
- 114 buildings, over 1,200 zones, 2 months of data



Highlights

NLCs Provide Significant Energy Savings

- Average savings in lighting energy from lighting controls: 47%
- Data from voluntary contributions
- Individual buildings: lighting control savings from 2% to 90%



Common Data Content and Format are Critical Issues to be Addressed

Appendix A of the report provides a starting point



Data Authorization is Essential

Appendix B of the Report provides a starting point

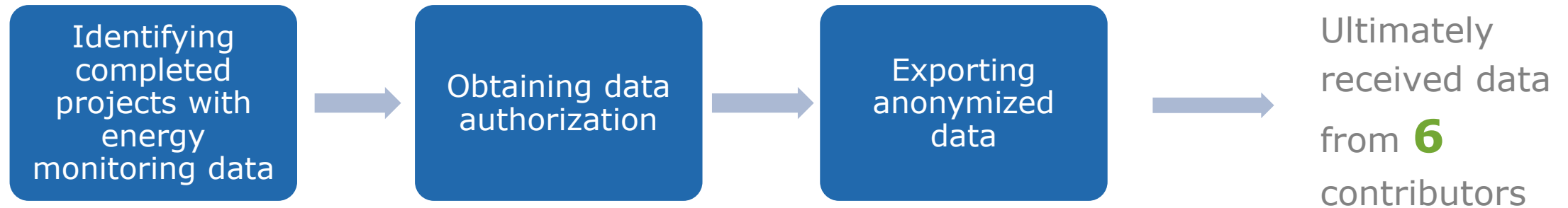


Methods:

Outreach & Data Collection

Outreach and Data Collection Process

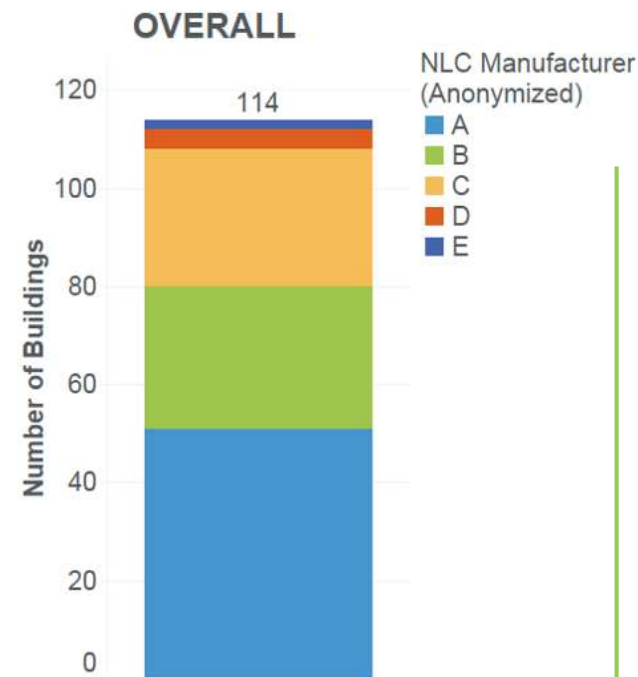
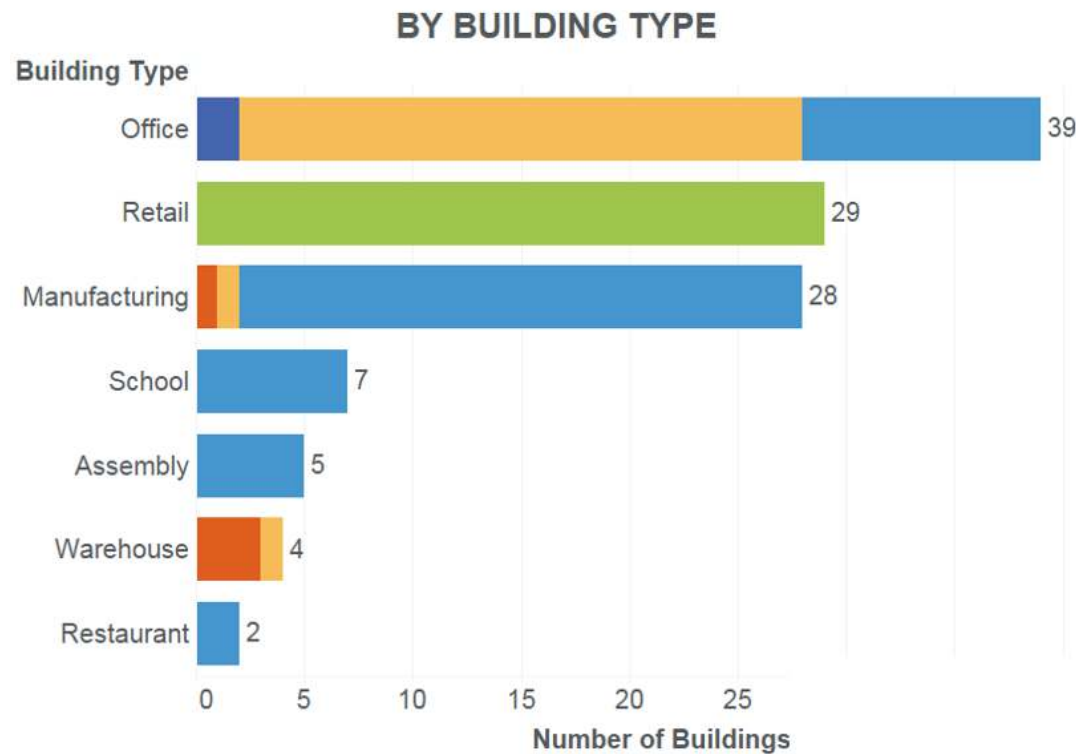
Conducted outreach to **30+** manufacturers, utilities, and national labs in three phases:



Greatest challenges were:

- logistical hurdles in obtaining customer authorization
- exporting the anonymized data

Summary of Dataset by Building Type and Manufacturer



114 buildings

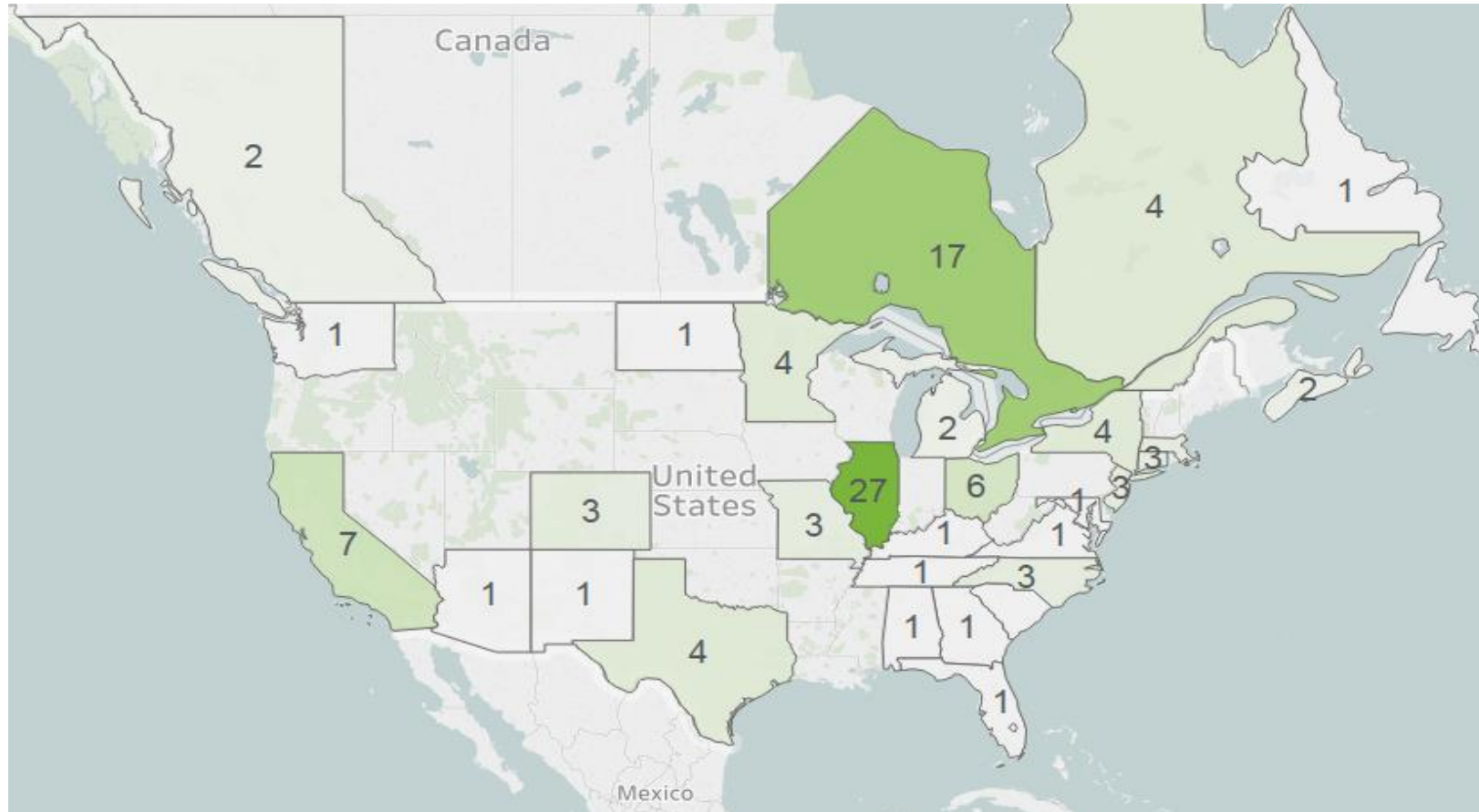
7 building types

5 NLC manufacturers

1,200 zones within buildings

60 days average monitoring duration (post-install)

Geographic Distribution of Buildings in Project Dataset

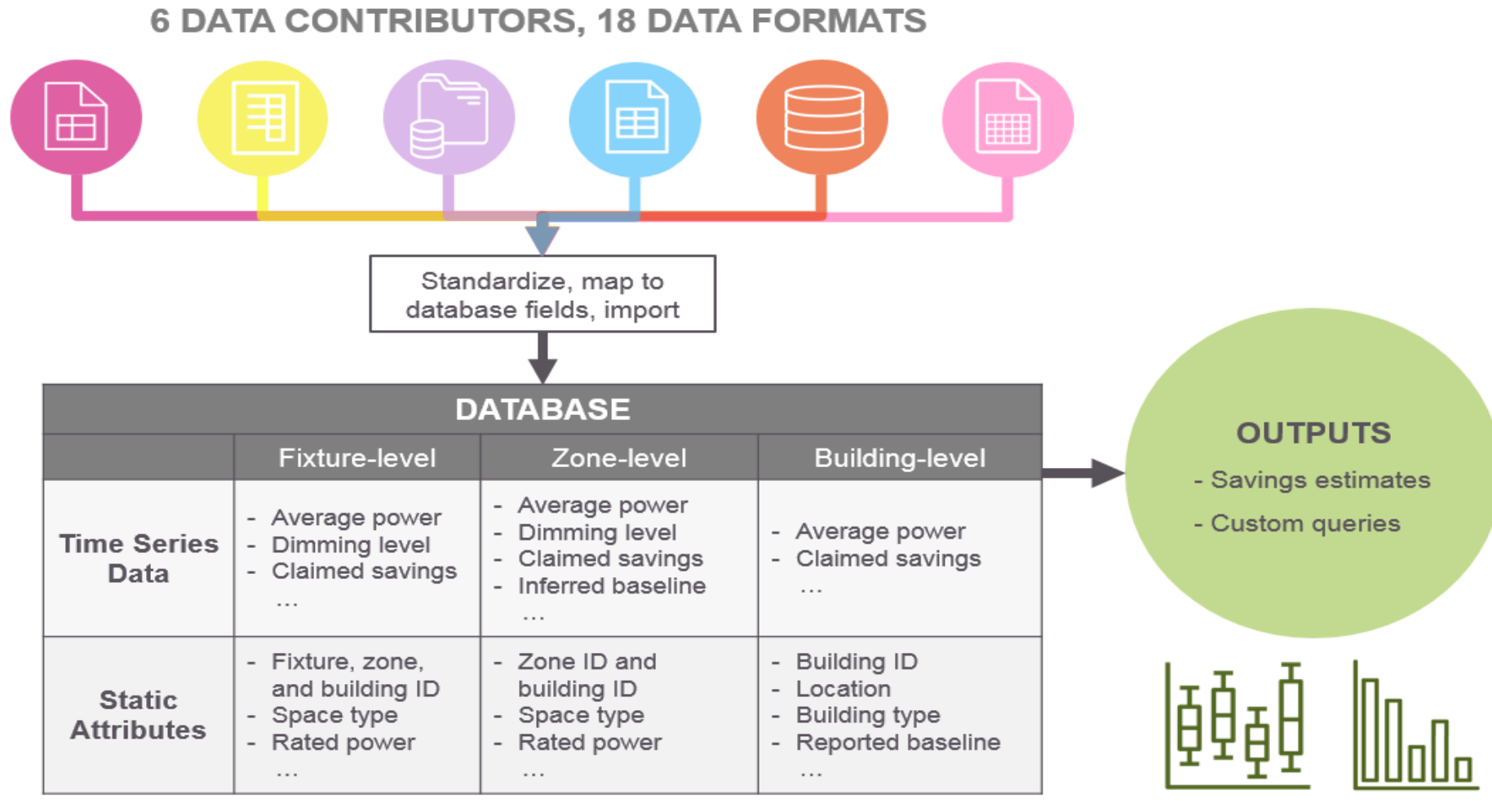


26 U.S. states

5 Canadian provinces

This only includes buildings with locational information (n=110)

Data Normalization and Database Architecture



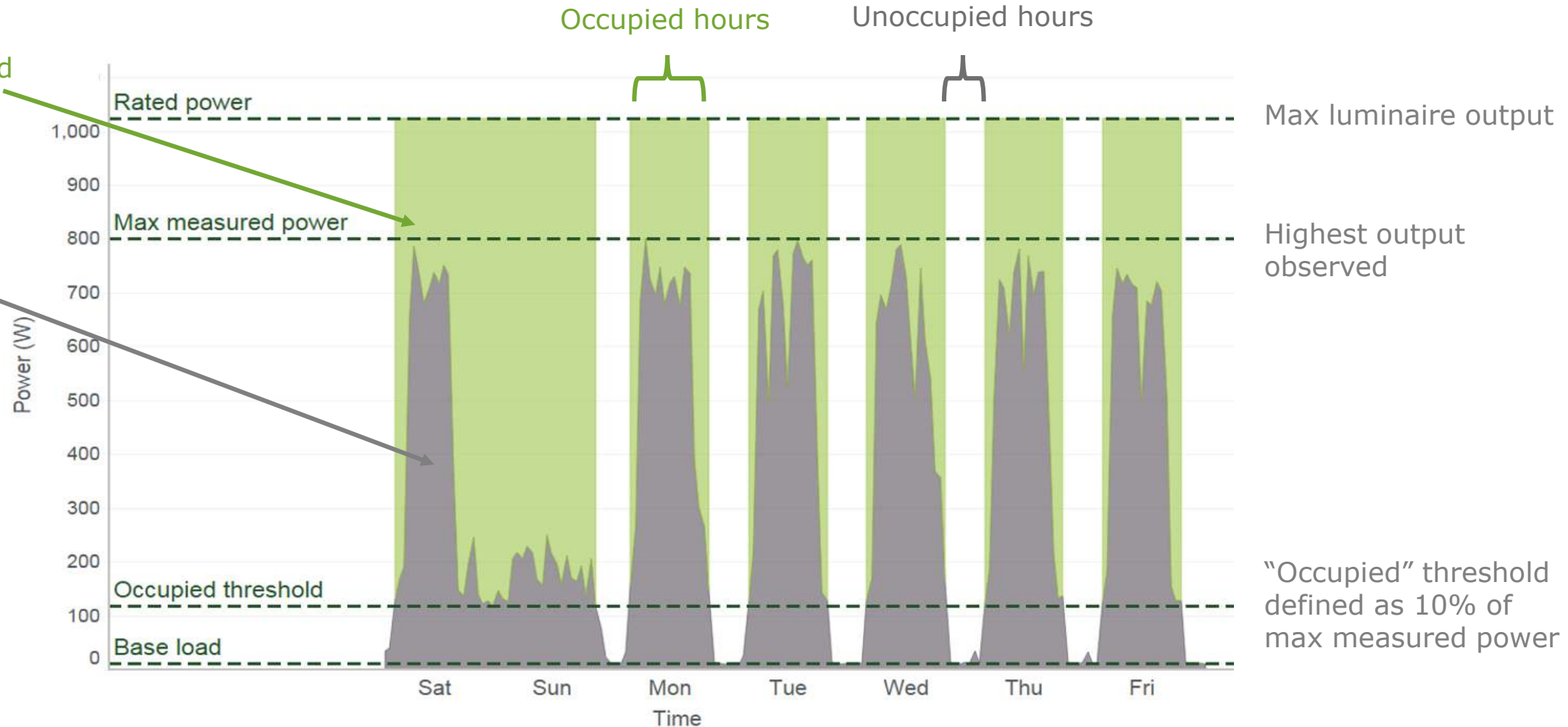
Methods:

Energy Savings Calculation

Baselining and Savings Calculation Methodology

Savings attributed to NLC system

Measured power



Methodology

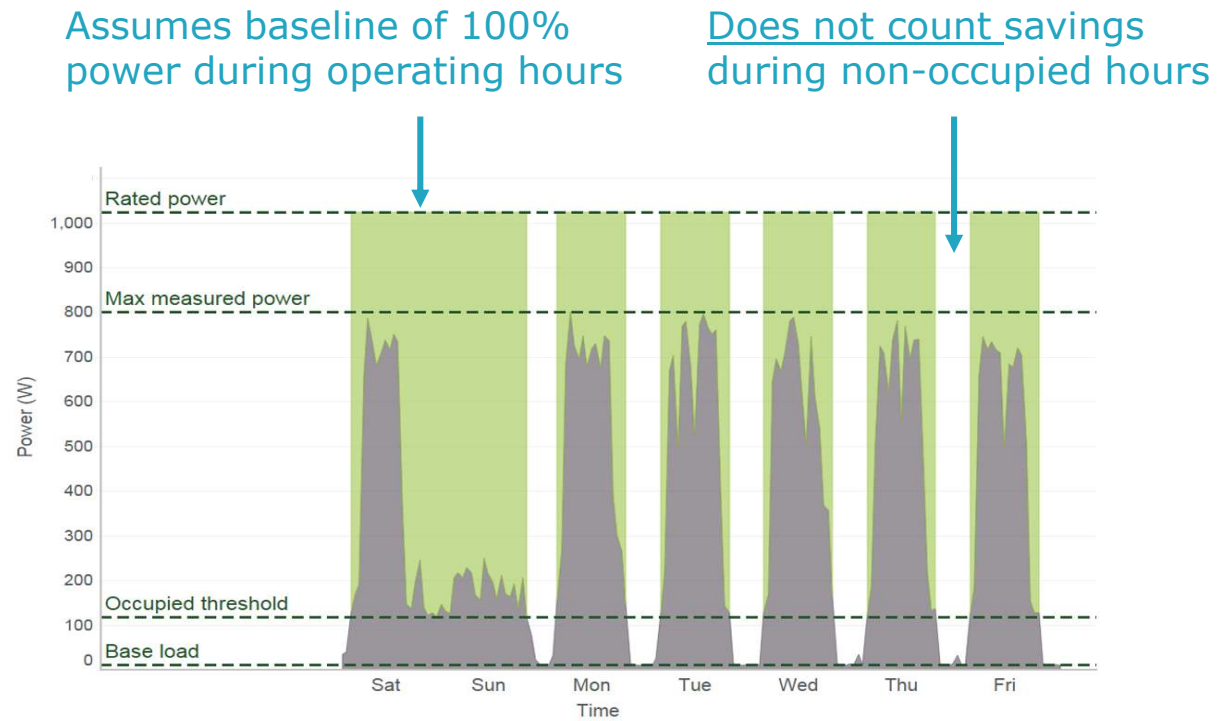
Rationale for selecting this approach:

- Unobtrusive and inexpensive
- Scalable and reproducible
- Project-specific and highly granular
- Reviewed and endorsed by NLC and EM&V experts

Caveats:

Savings values represent: *"% of lighting energy savings during occupied hours relative to maximum rated power"*

- Baseline assumes 100% power during operating hours (does not account for pre-existing control strategies)
- Does not count any energy savings during non-occupied hours (e.g. scheduling controls)

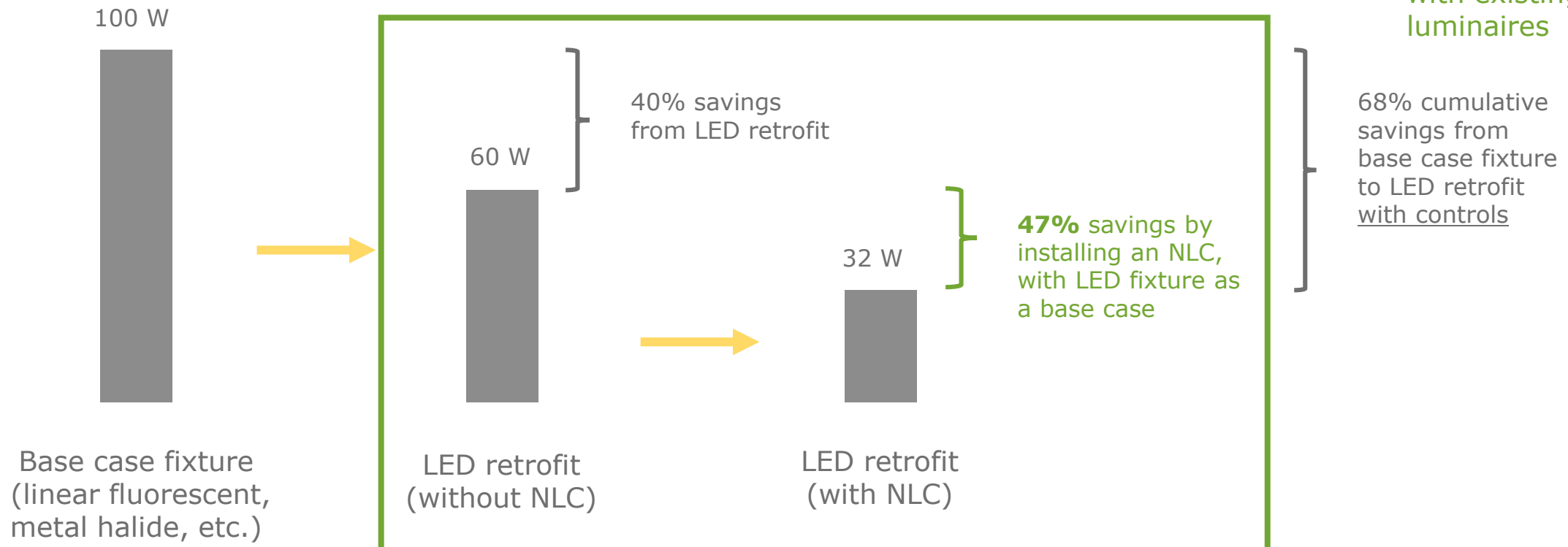


Findings

Average Lighting Energy Savings Attributed to Controls were **47%**

(Excludes Savings from Luminaire Retrofits)

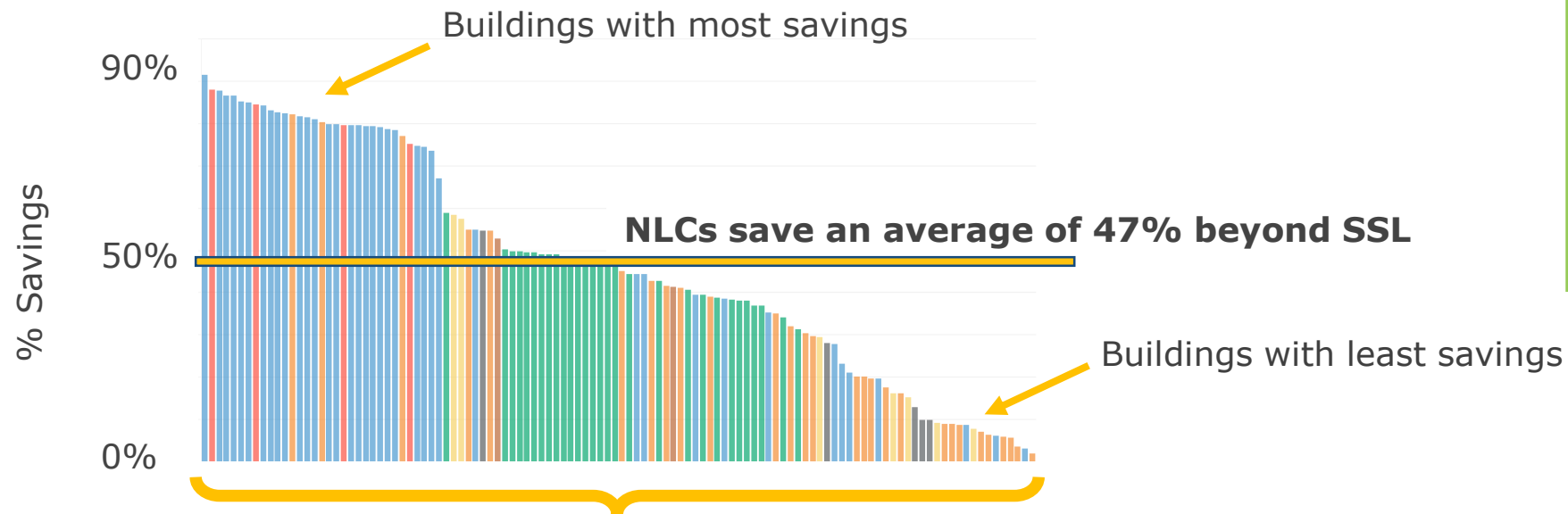
What does that number mean exactly? Here is a theoretical example:



The values in this report represent % savings of installing NLC system with existing LED luminaires

Average Lighting Energy Savings Attributed to Controls were **47%**

(Excludes Savings from Luminaire Retrofits)



Wide variation across buildings is likely due to differences in:

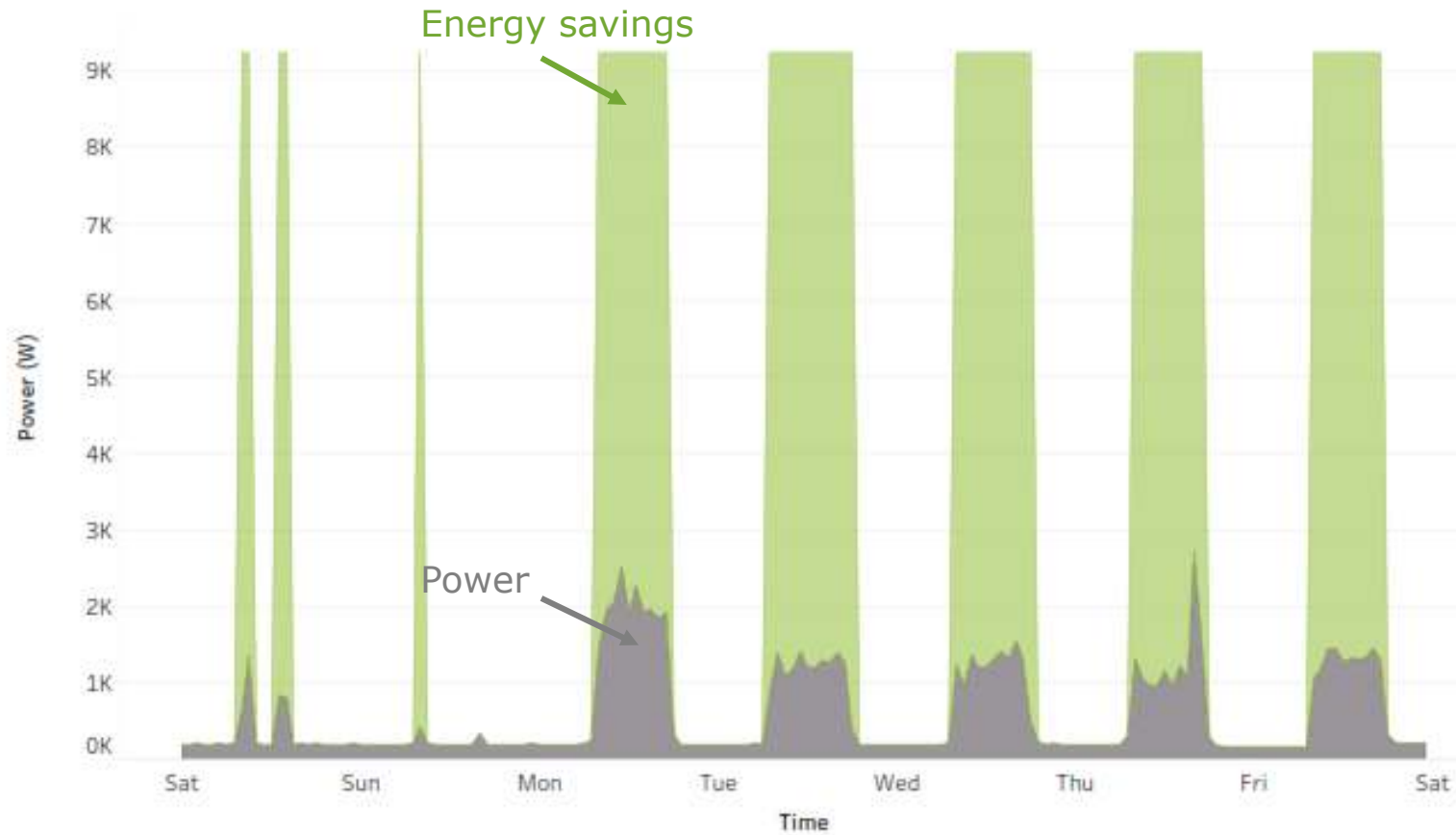
Control Strategies:

- High-end trim
- Occupancy controls
- Control settings

Site Characteristics:

- Occupancy patterns
- Presence of daylighting

What Site Characteristics Result in High NLC Savings?



Sample zone within a warehouse

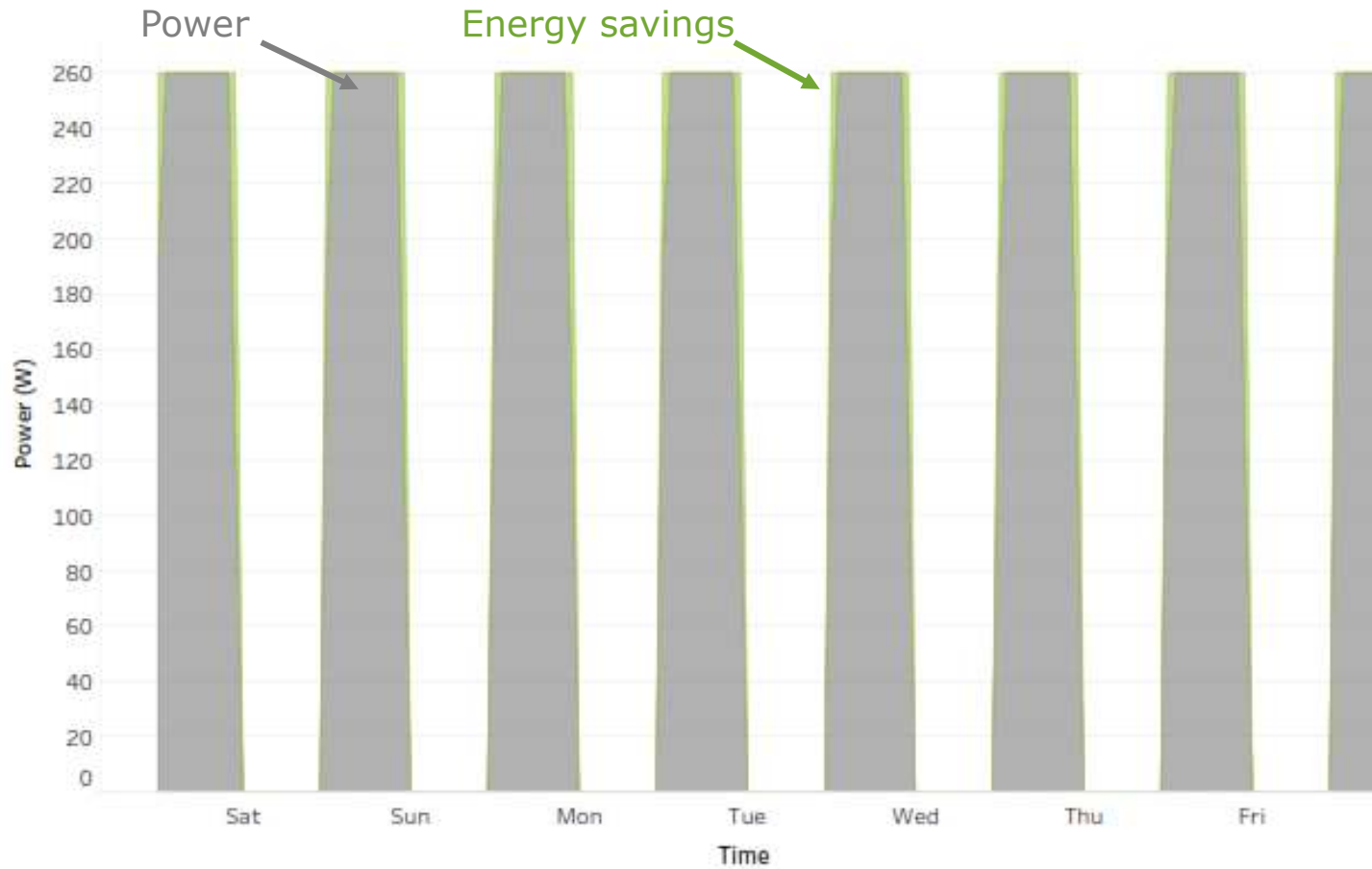
Major factors that enable high savings:

- Significant high-end trim (up to 60%)
- Aggressive occupancy controls

Other factors may include (but are more difficult to attribute savings to):

- Daylight harvesting
- High swings in occupancy
- Scheduling controls

What Site Characteristics Result in Low NLC Savings?

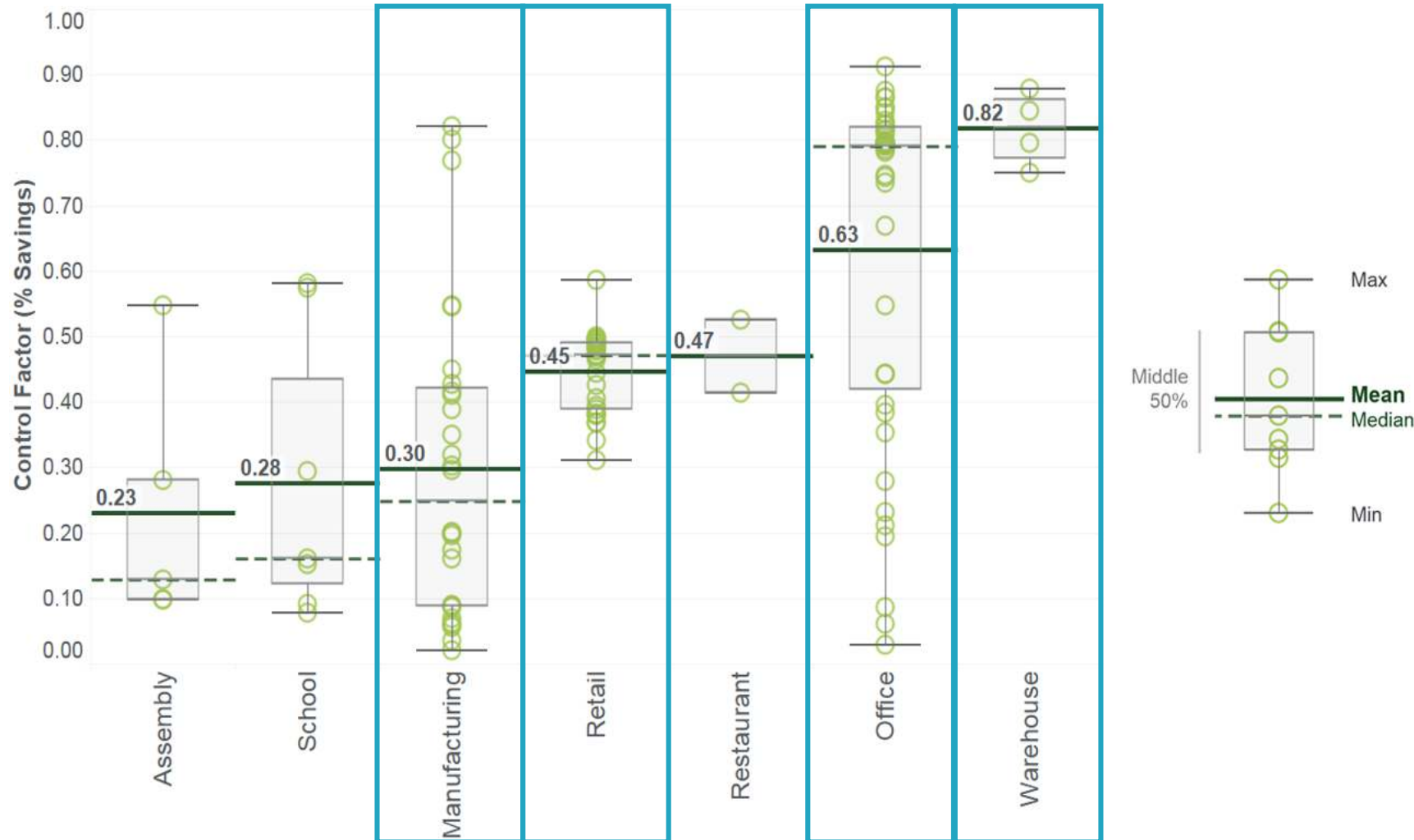


Sample zone within a manufacturing facility

NLC system used primarily as a scheduling control:

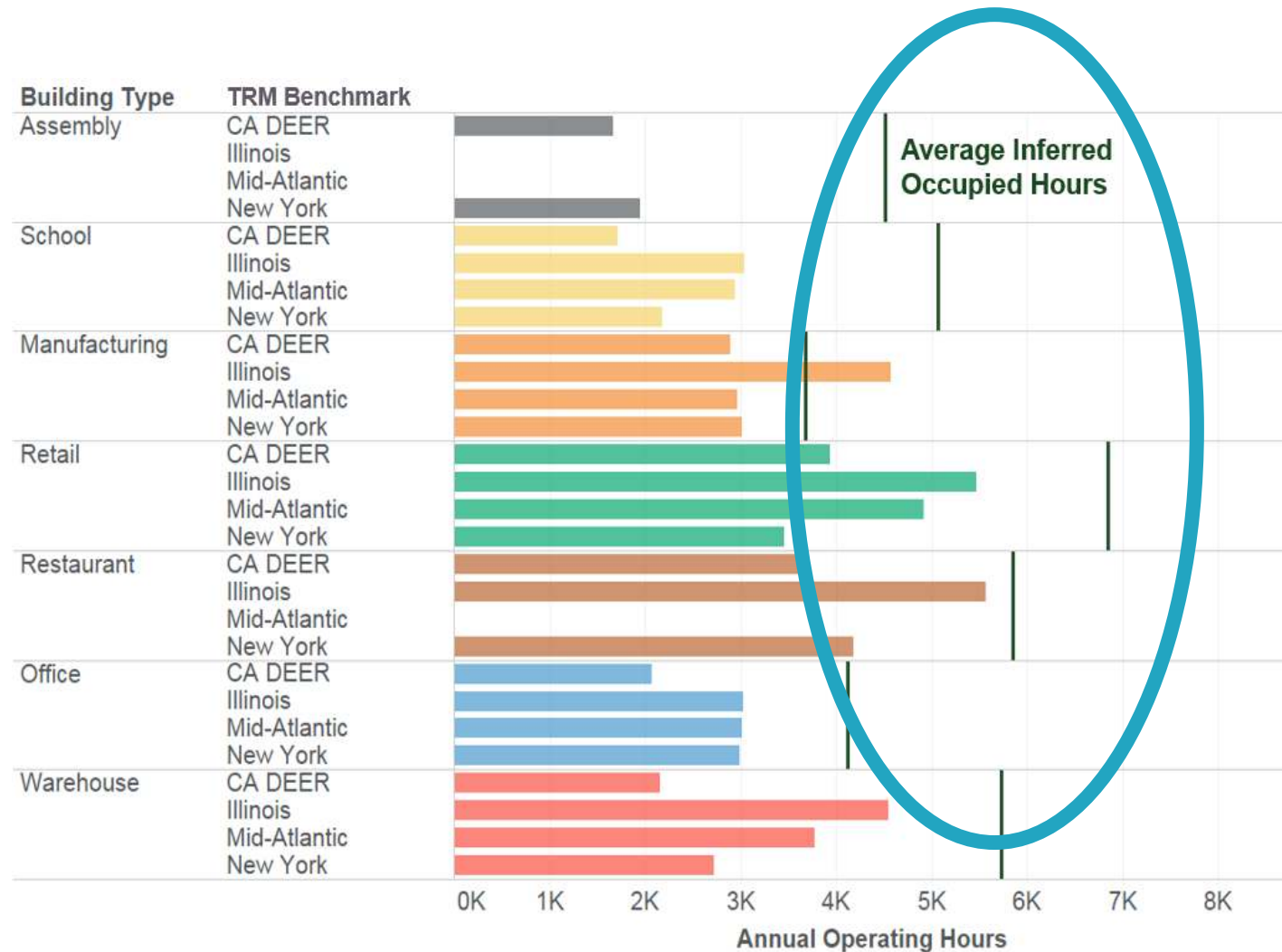
- No high end trim
- Lights appear to be at 100% full-time
- Occupancy controls not enabled or building does not have occupancy shifts

Energy Savings Vary Significantly within each Building Type



- Warehouses had the largest savings opportunity
- Offices and manufacturing had the widest variation in savings
- Savings in retail varied even though it was a single customer for all 29 buildings

Operating Hours are Longer than Expected

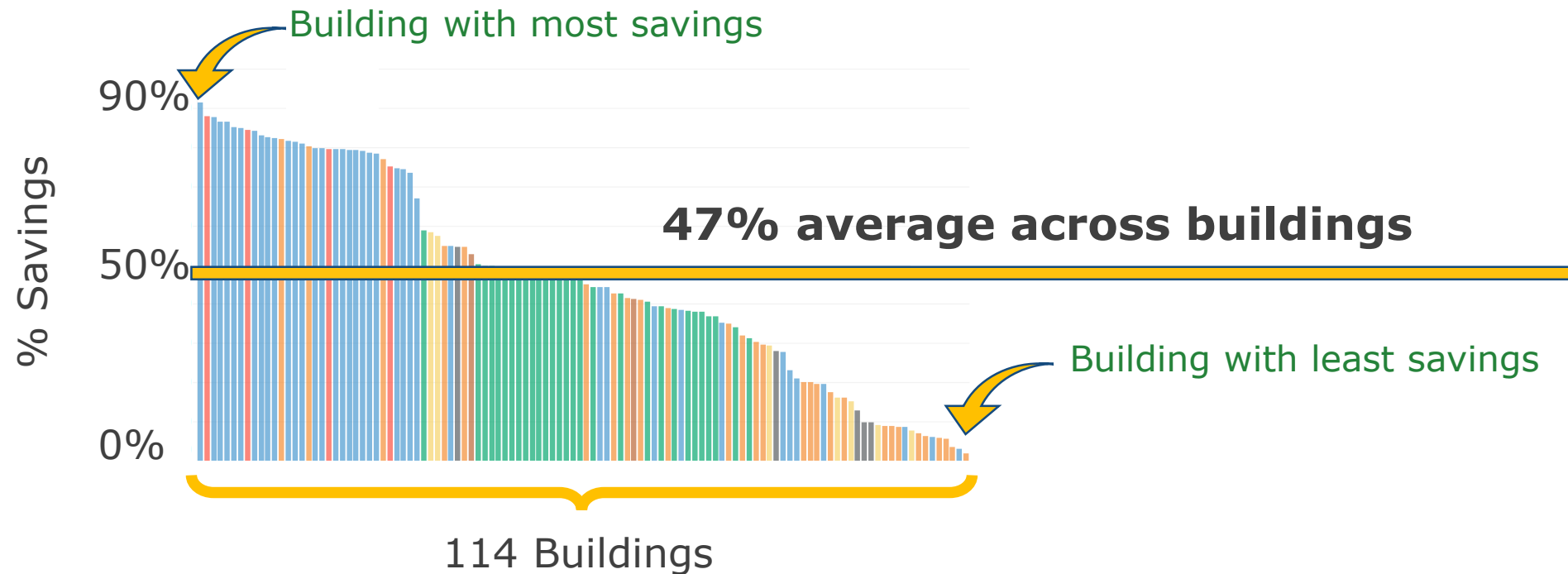


Recommendations

Recommendation: Apply Best Practices to a Portfolio of Buildings



Higher average savings as more
buildings adopt best practices!



Recommendation: A Common Data Reporting Format



Guidelines in Appendix A can facilitate:

- Incentives and rebates
- Research on best practices (for higher savings and higher rebates)
- Interoperability

Appendix A (excerpt)

Data Element	Definition	Required (R)/ Preferred (P) ^a	Data Type	Unit	Minimum Requirements
Site	The building in which the NLC system is installed. An NLC installation may not cover the entire building and a building may have multiple NLC installations due to specific needs of a lighting design of different ownership/tenancy.				
NLC System Manufacturer	The manufacturer of the NLC system	R	Alphanumeric		
NLC System Product Name / Model	The name of model number of the NLC system	R	Alphanumeric		
Site ID	Unique identifier for a particular NLC system installation.	P	Alphanumeric		
Building / Business Type	The main business function pertaining to the portion of the building where the NLC system is installed	R	Alphabetic	List: Select from the <u>Building Types</u>	ASHRAE 90.1-2016 Table 9.5.1 (preferred)
ZIP Code	A system of 5-digit codes that identifies the individual Post Office or metropolitan area delivery station associated with an address.	P	Numeric		
Gross Floor Area	Total floor area of the NLC installation site with no deductions.	P	Numeric	Square Feet	
Nominal Business Hours	Number of hours a year the site is open for business	P	Numeric	Hours/Year	
Nominal Cleaning Crew Hours	Number of hours a year the cleaning crew works on the site	P	Numeric	Hours/Year	
Space	An enclosed area, not necessarily enclosed by physical walls, within a building that is designated to a specific function and usage.				
Space Type	The main usage of an enclosed area, not necessarily by physical walls, within a building.	P	Alphabetic	List: Select from the <u>Space Type</u>	ASHRAE 90.1-2016 Table 9.5.1 (preferred)

Recommendation: Data Authorization is Essential



- Address up front, for fewer headaches for all parties
- Clarify who provides data to support utility incentives
- Guidelines in Appendix B



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Recommendations



ADOPT A BUILDING PORTFOLIO APPROACH

NLC energy savings vary by site, but across the portfolio of all buildings they were 47%



ADOPT A STANDARDIZED FORMAT

Utility NLC programs and manufacturers should adopt a standardized reporting format



IMPLEMENT DATA SHARING AGREEMENTS

Utility NLC programs and manufacturers should support anonymized data sharing



Where Do We Go From Here?

It's up to you!



- Report on modern NLC controlling LED lights in over 1200 zones across 114 buildings
- Consistent reporting of energy performance data
- 3rd party reference for saving claims

Download the Report

Click the button at www.designlights.org homepage



Or find the report here:

<https://www.designlights.org/lighting-controls/reports-tools-resources/nlc-energy-savings-report/>

Thank You For Attending

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