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Enercare

Zero Net Energy Building Controls

Greg Walker, CABA Research Director

Connect to what's next™

www.caba.org

Agenda

1) Overview of CABA
2) About the “Zero Net Energy Building Controls” Research
3) Background: Getting to Zero Net Energy Buildings
4) Research Results – Overview
5) Five Recommendations

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Overview of CABA

CABA (Continential Automated Buildings Association)

Vision

- CABA advances the connected home and intelligent buildings sectors.

Mission

- CABA enables organizations and individuals to make informed decisions about the integration of technology, ecosystems and connected lifestyles in homes and buildings.

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Connected Home Council

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Intelligent Buildings Council

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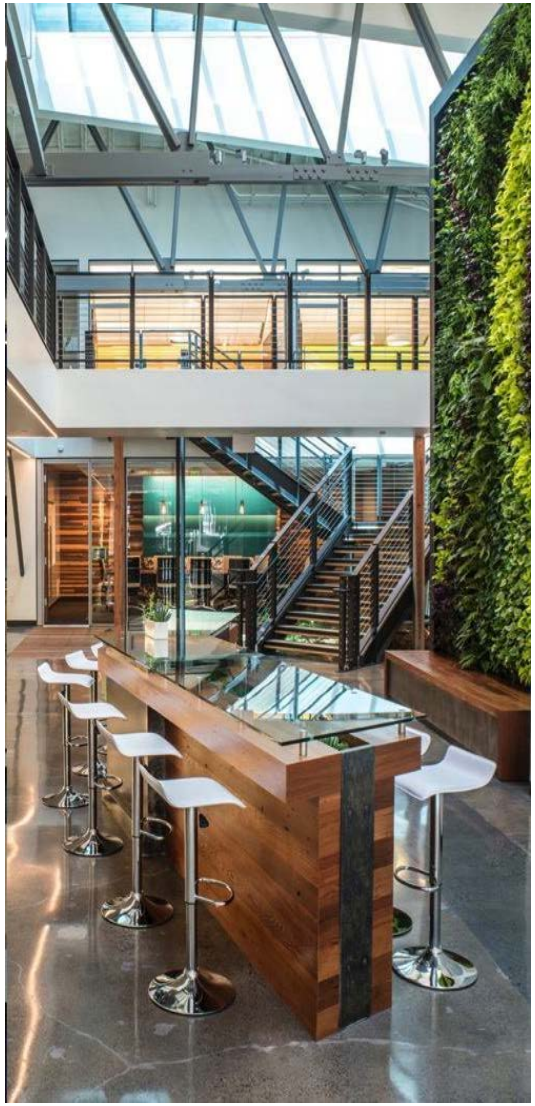
About the “Zero Net Energy Building Controls” Research



- CABA commissioned New Buildings Institute (NBI) to conduct this research with a collaborative framework that engaged funders from a cross-section of building technology solution providers.

- Research Objective: Characterize Controls Technology & Strategies in Zero Net Energy (ZNE) Buildings.

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Project Funders

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Research Design

Investigate Building Energy Monitoring & Controls Systems in Low-Energy and ZNE Buildings

Areas of inquiry and participants:

1. **The Selection and the System**. What did they choose and why.

   Design Firms

2. **The Energy Impact.**

   Savings assumptions in modeling and attribution in use.

   Design Firms and Operators

3. **The Use and User Experience.** How is it being used, what is effective and lacking.

   Operators and Occupants

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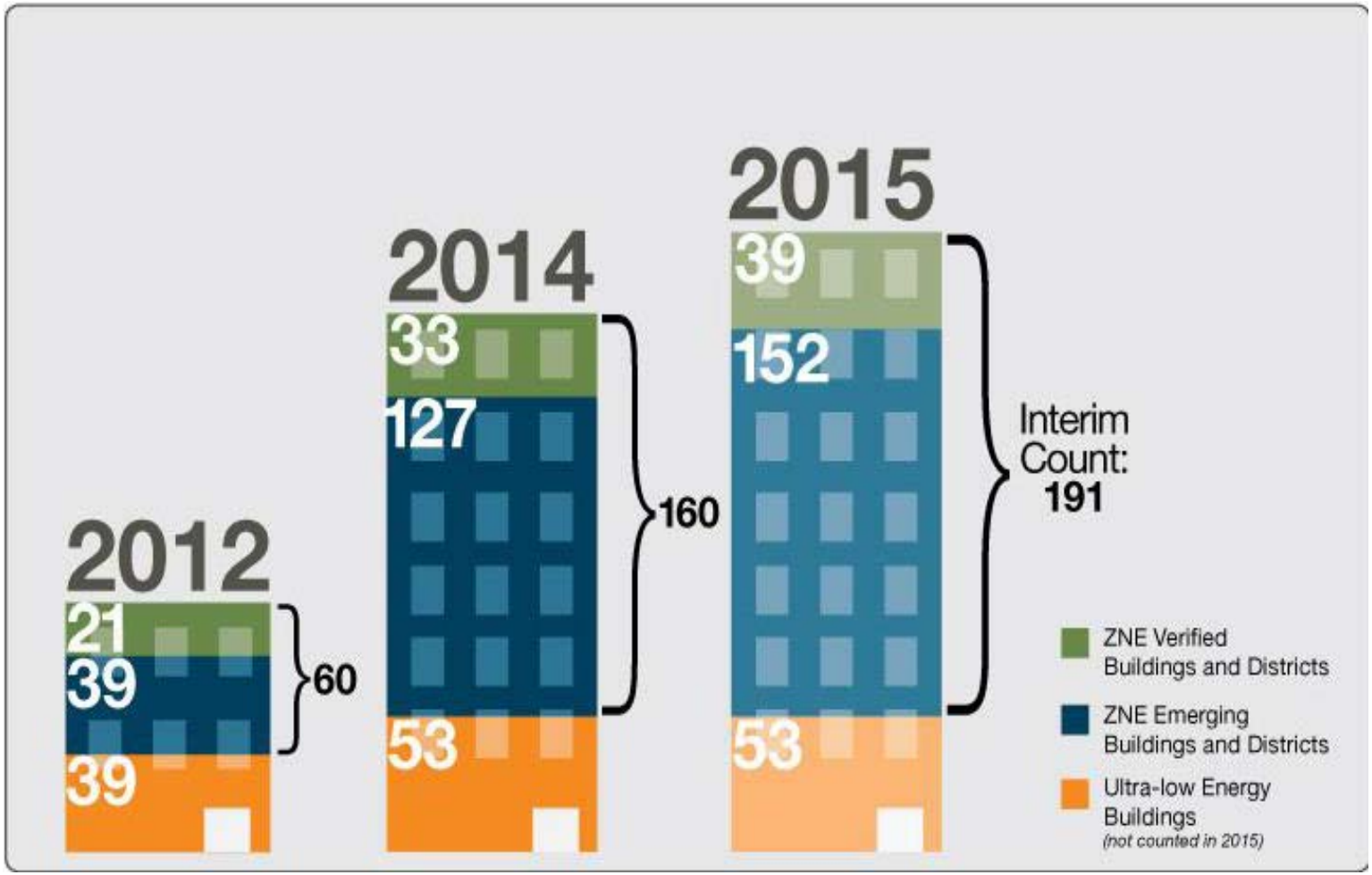
Sample Group



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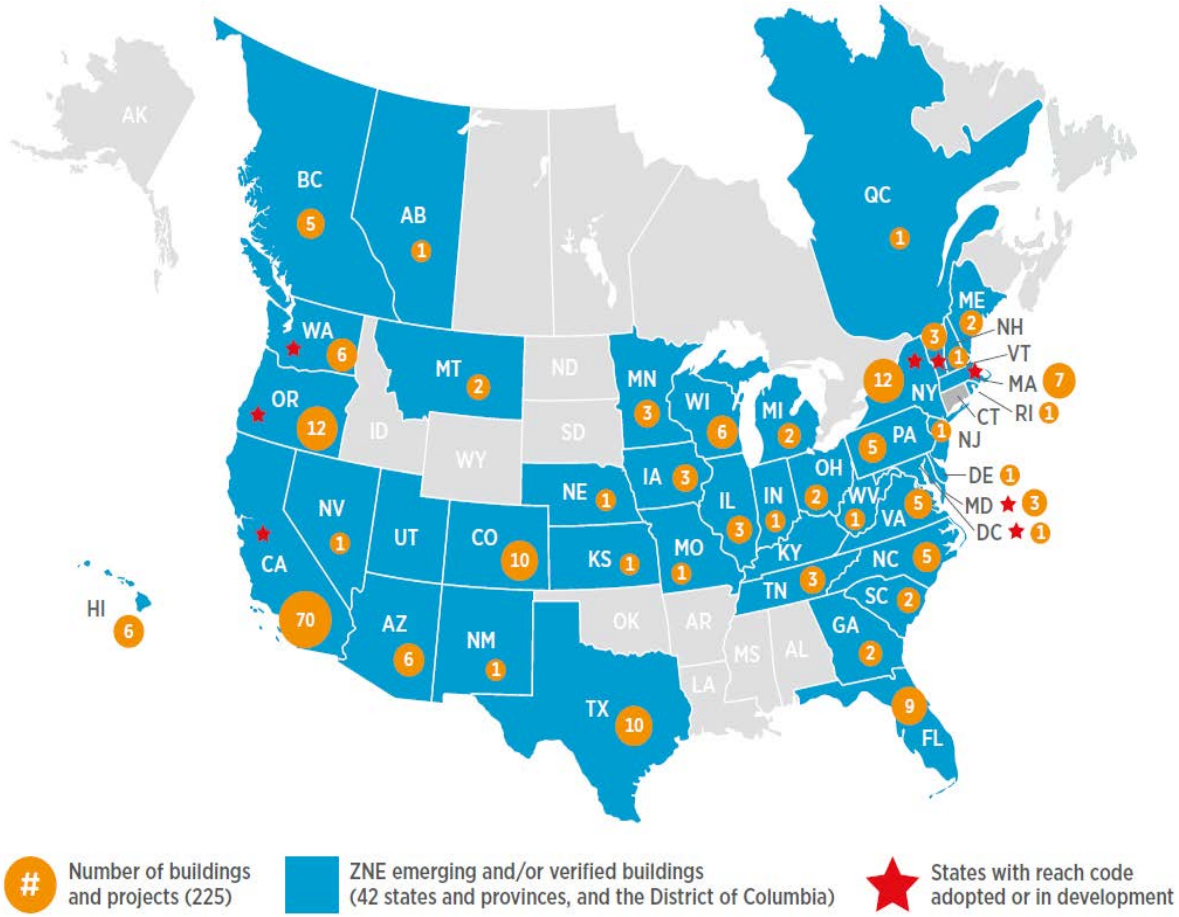
Sample Location



NBI's North America database

Mainly 10,000 – 100,000+ sqft

Mainly Offices & Higher Ed

- (Also: Courthouse, Lab, Library...)

Climate: CA has most ZNE buildings

- (Also: Canada, PNW, NE, CO)

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Background – Getting to Zero Net Energy Buildings

A Zero Net Energy (ZNE) building generates as much energy as it consumes annually. Also known as Net Zero Energy.

Zero = ‘nothing’

Net = On-site Energy Production (renewable) minus Energy Use, over 1 year

Energy = All energy (electric, gas, steam, liquid fuel etc.) consumed on site

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What does ZNE look like?

ZNE Buildings have very low energy loads such that the annual energy consumption is balanced by on-site renewable energy

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What does ZNE look like?

Germany's Solar Coated Building
by surPLUShome

The Wayne N. Aspinall Federal Building and U.S. Courthouse in Grand Junction, CO, which GSA is aiming to turn into a Net-Zero Energy usage historic building.
(Photo courtesy of GSA)

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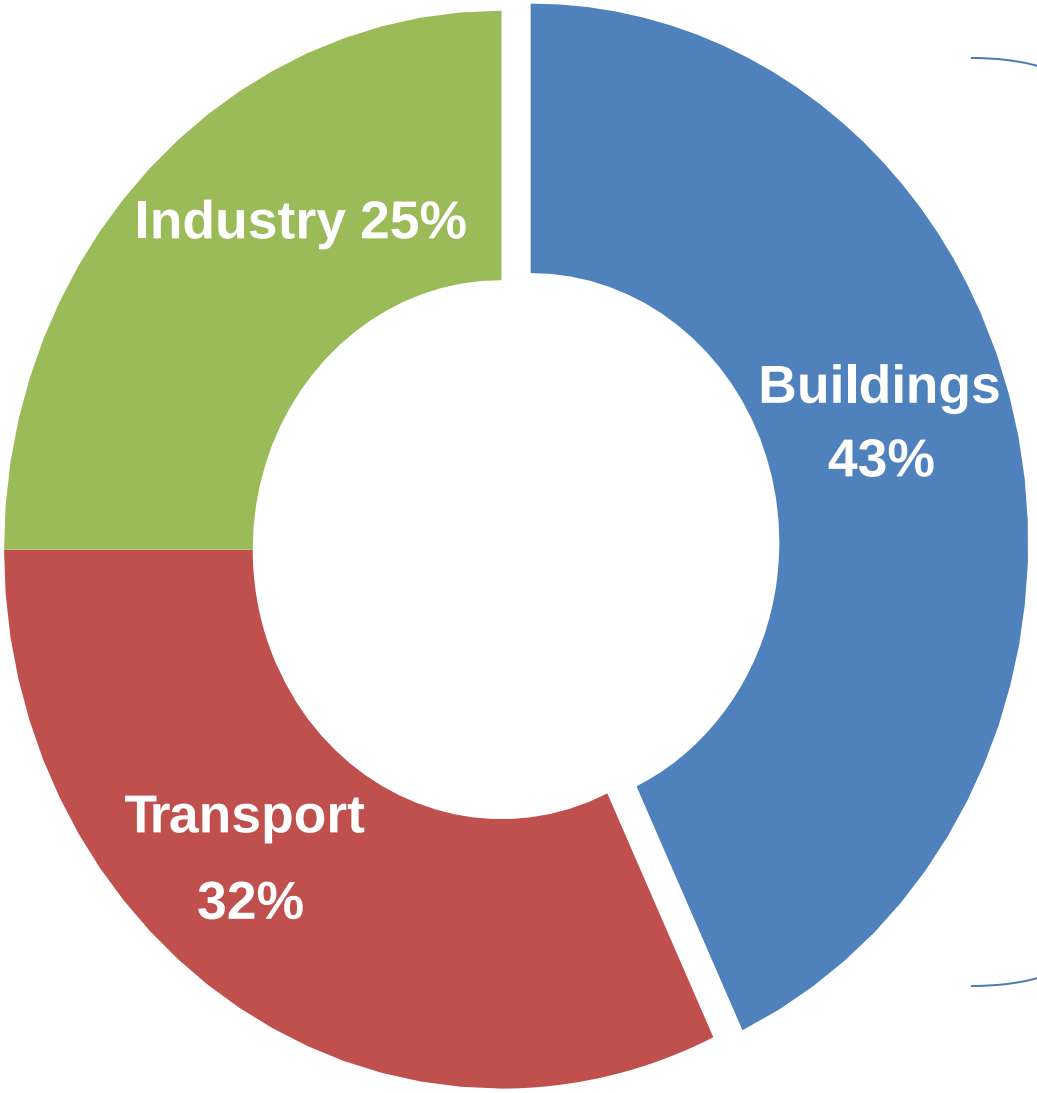
CO2 Emissions from Fossil Fuels by Sector



Industrial:	**5%**
Commercial:	**17%**
Residential:	**21%**
Buildings=	**43%**

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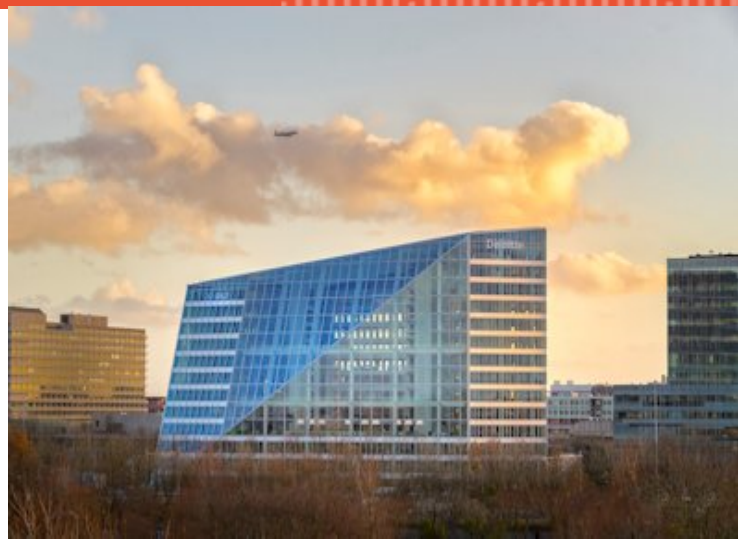
Data Source: Pew Center on Global Climate Change

NZE Facts

1-3% added initial cost of construction could save up to 60 percent of energy use in new buildings. (*2013 Cost Comparison of ZNE and LBC for the District of Columbia)*



Buildings are responsible for at least 40% of energy use in most countries. (The World Business Council for Sustainable Development)

California's Net Zero Energy Building Mandate To Reshape US Construction Industry

The first commercial-scale net-zero building was a center for environmental studies, completed at Oberlin College in Ohio in 2000. (Scientific America)

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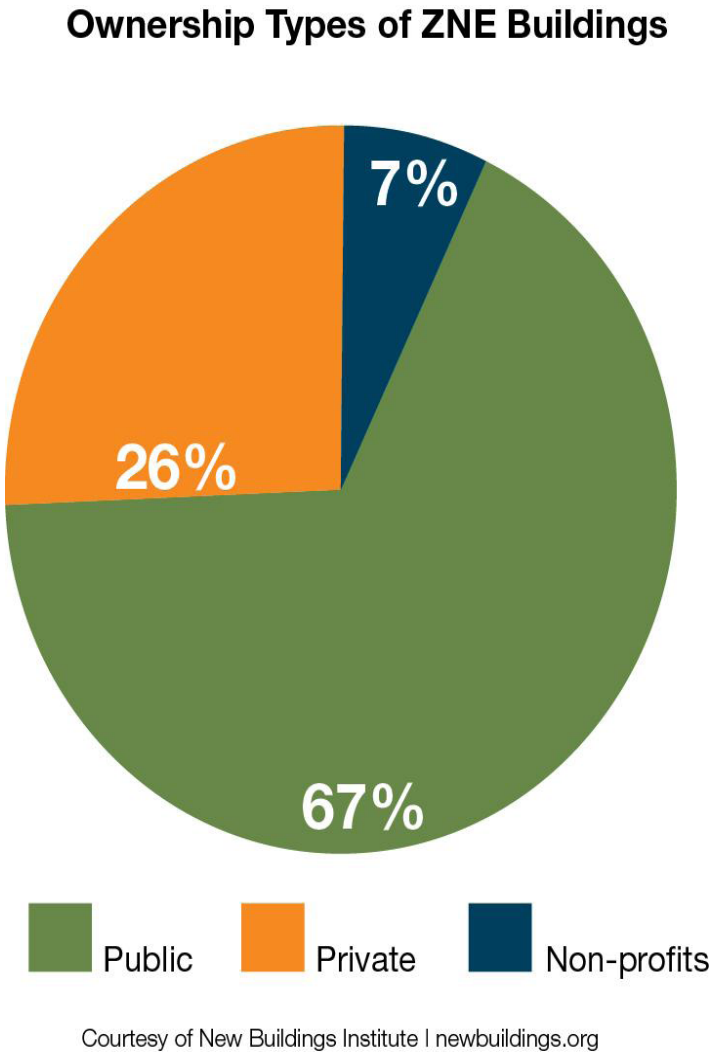
Who is going to Zero?



McDonalds
Solterra Architects
Domus
Frito-Lay
Adobe
JC Johnson Co.
TNT Express
Bayer
Walgreens
PNC Bank
Melink Corp.
Kaiser Permanente
TD Bank
Honda
3C Company
Bubbly Dynamics
IBEW 595
Morphosis
Hines
Green Leaf Inn
DPR Construction
KB Homes
Hewlett Packard
Walt Disney

States : CA, CO, DC, DE, MA, MN, NY, NM, OR, RI, VT, WA
Cities: Seattle, Austin, Cambridge, Lancaster, Fort Collins Tucson/Pima County
All U.S. Federal Buildings, The European Union
British Columbia, Canada

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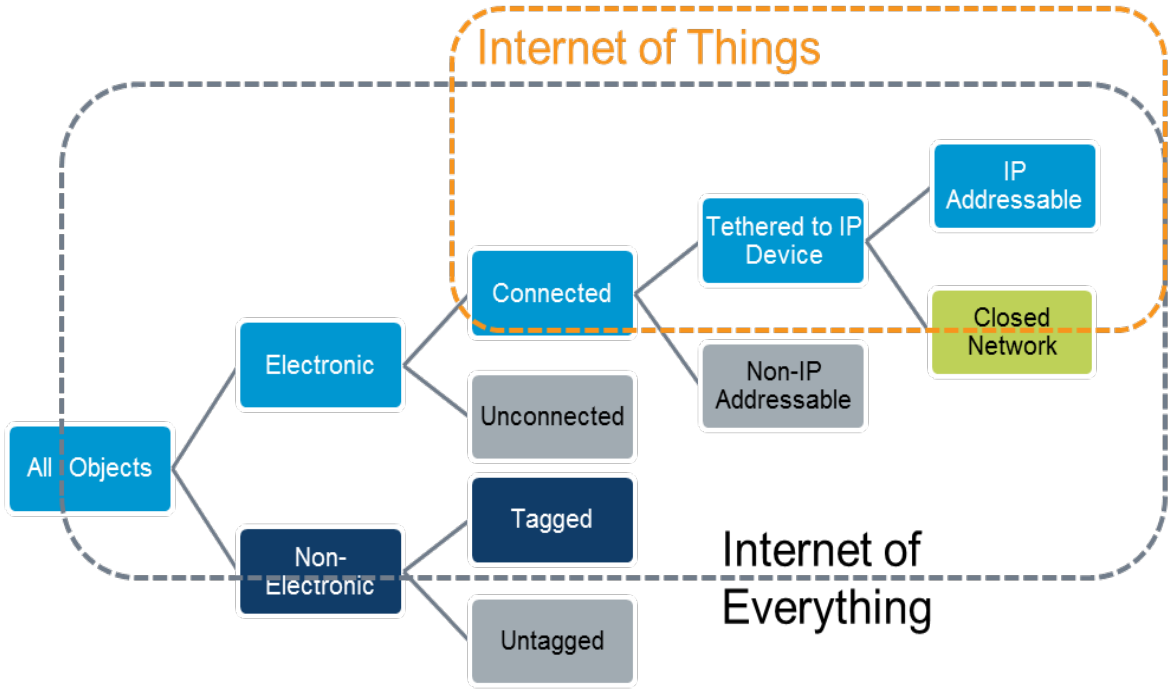
What is the Internet of Things (IoT)



- **Unconnected Objects:** Desk, chair, soda can, fire hydrant, animal collar, shipping pallet, buildings, etc.
- **Unconnected Electronic Devices:** Calculator, streetlight, vending machine, coffee maker, blood pressure monitor, etc.
- **Connected/Tethered Electronic Devices:** Audio headset, printer, computer monitor, DVD player, licensed mobile radio unit, etc.
- **IP-addressable Devices:** Tablet PC, smartphone, Infotainment head unit, smart meter, EV charging station, home health hub, etc.

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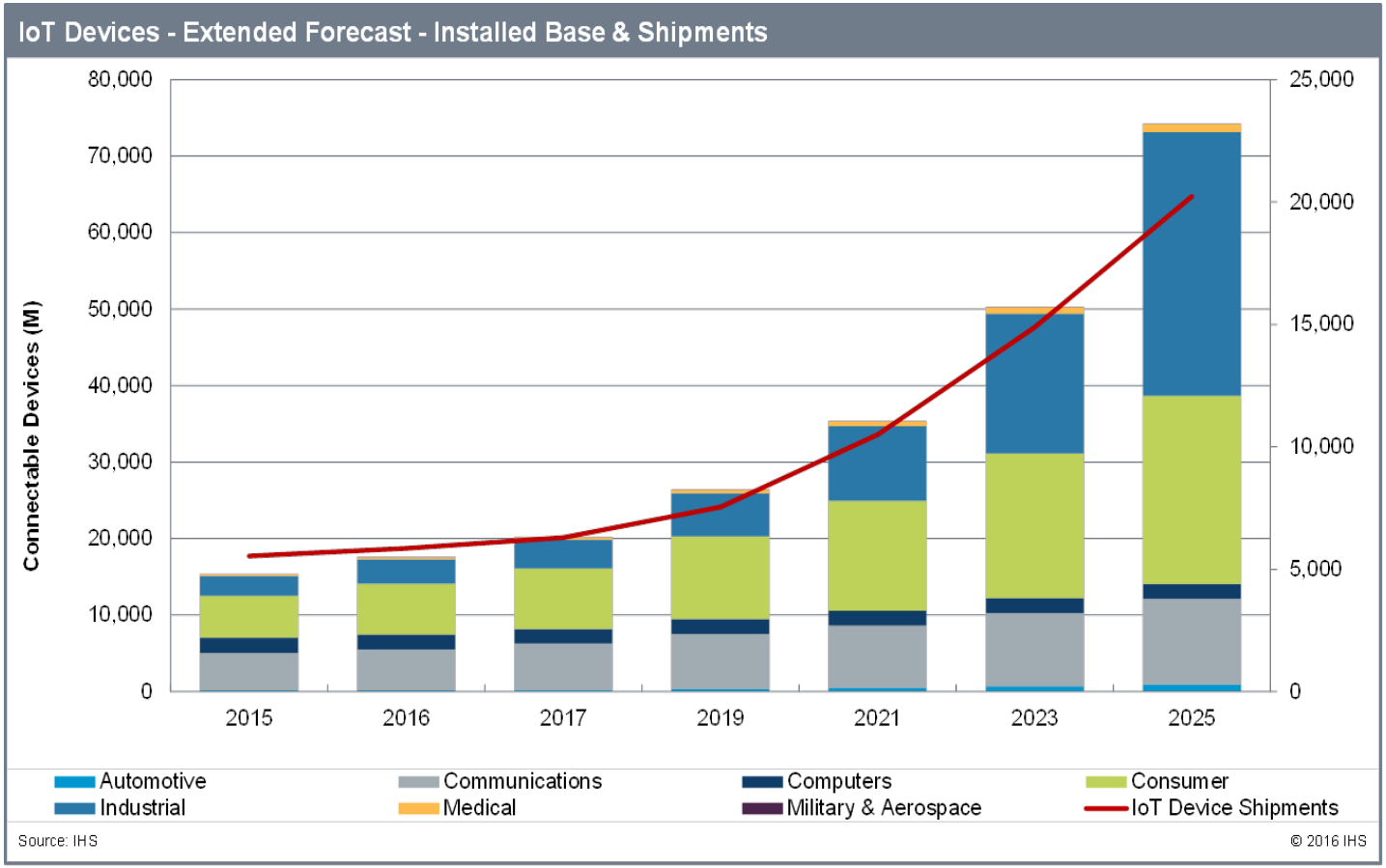
Internet of Things Evolution



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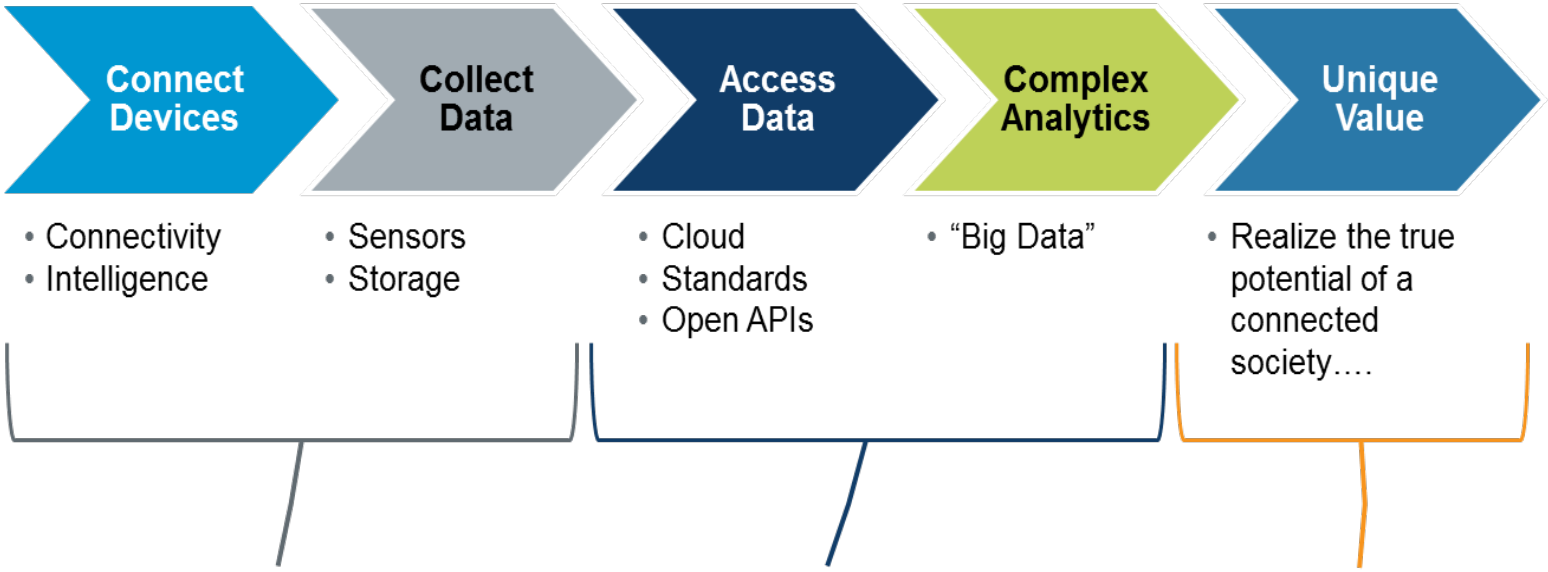
Internet of Things Evolution

Internet of Everything (IoE): represents the open access to data from one or more monitoring and control systems by third-party applications to provide unique, additional value to stakeholders.



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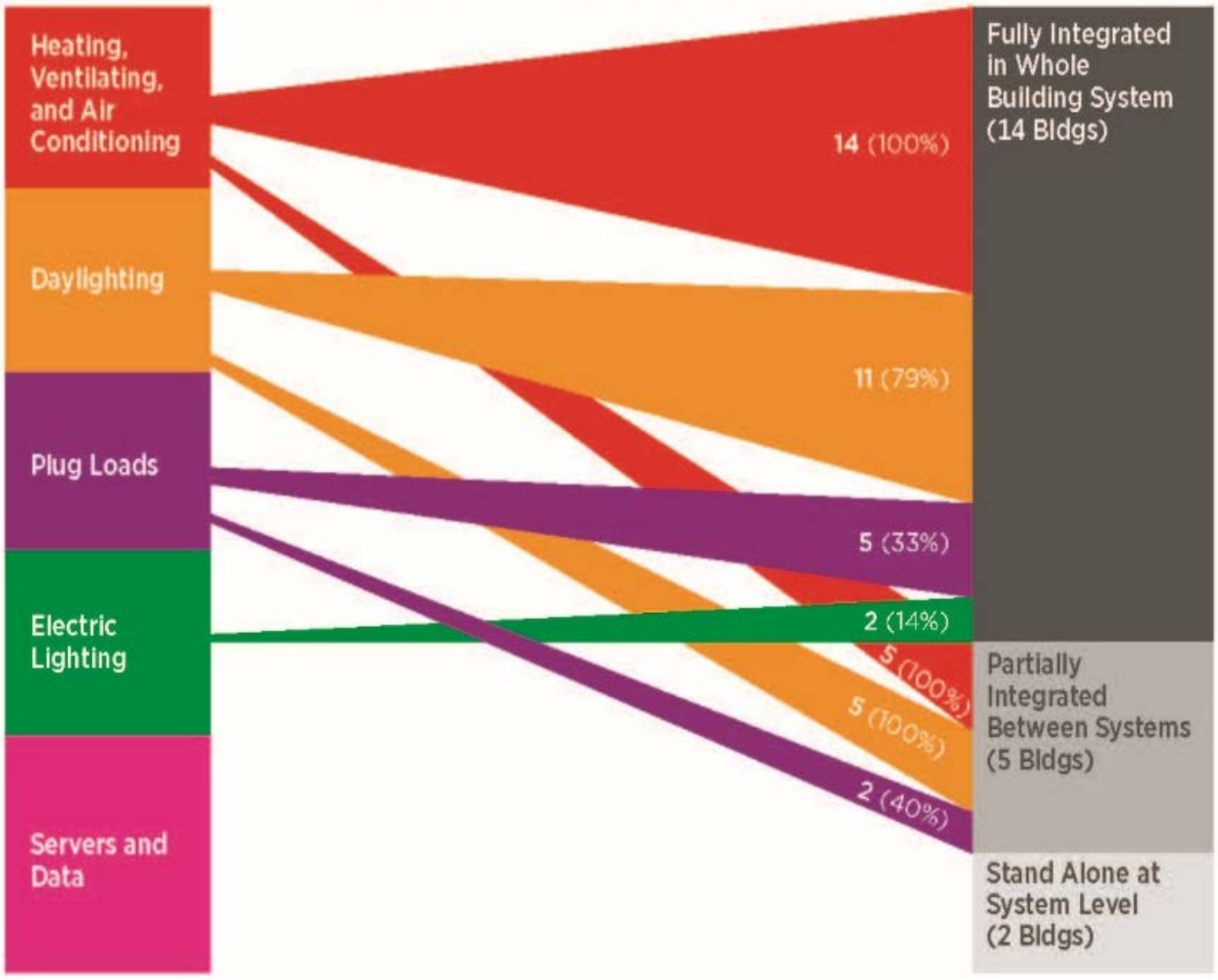
Controls System Integration by End-Use



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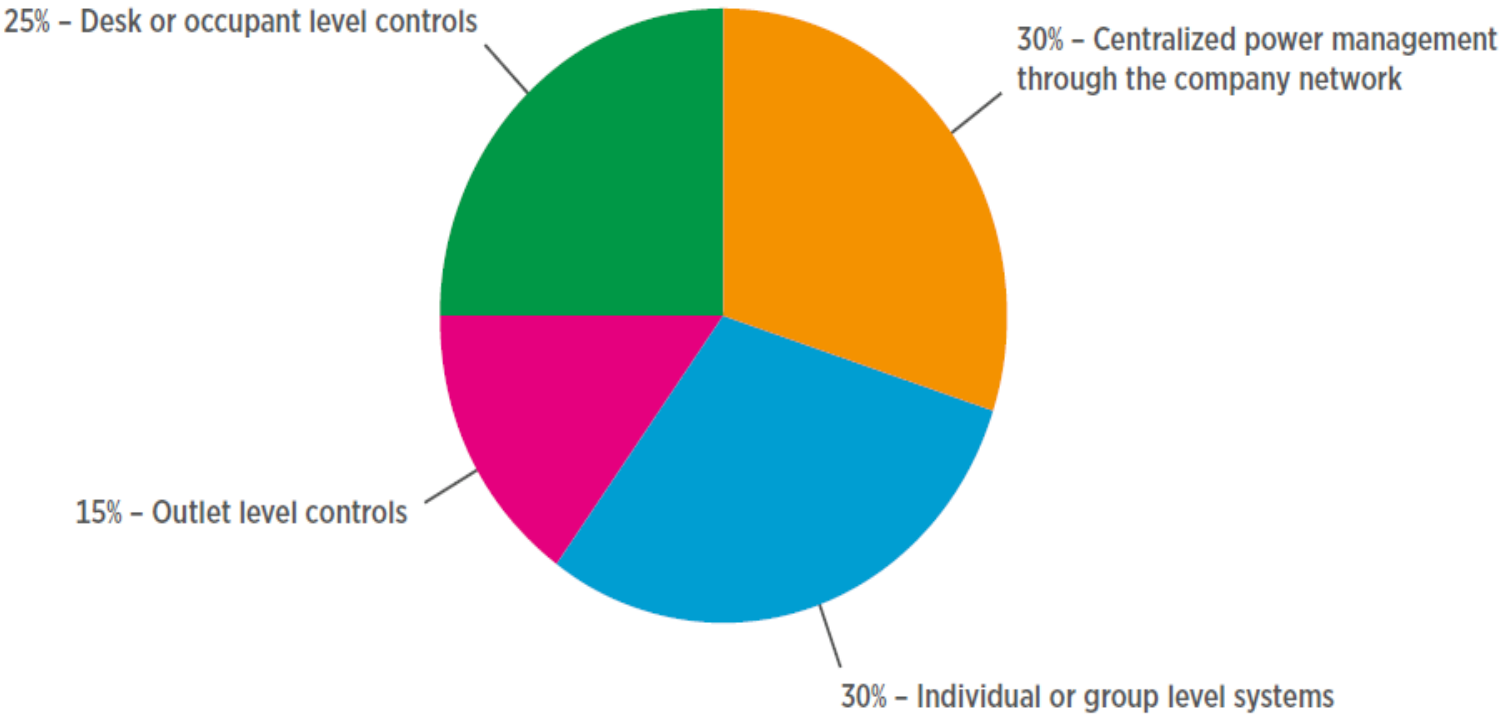
Types of Controls: Plug Loads



- More devices and occupant-driven misc loads coming online
- Regulated loads (Lights, HVAC, Water Heat…) becoming more efficient
- Most (64%) buildings surveyed use plug load controls or monitoring

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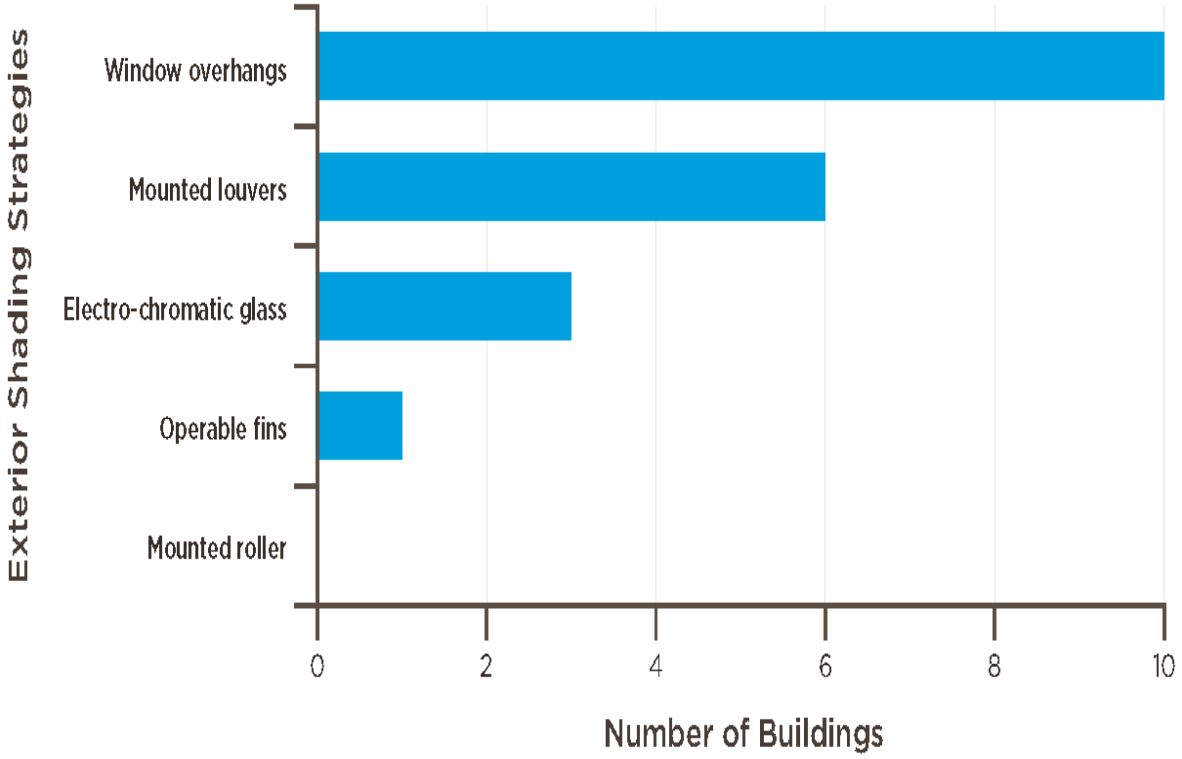
Types of Controls: Shading & Daylighting

Exterior Shading



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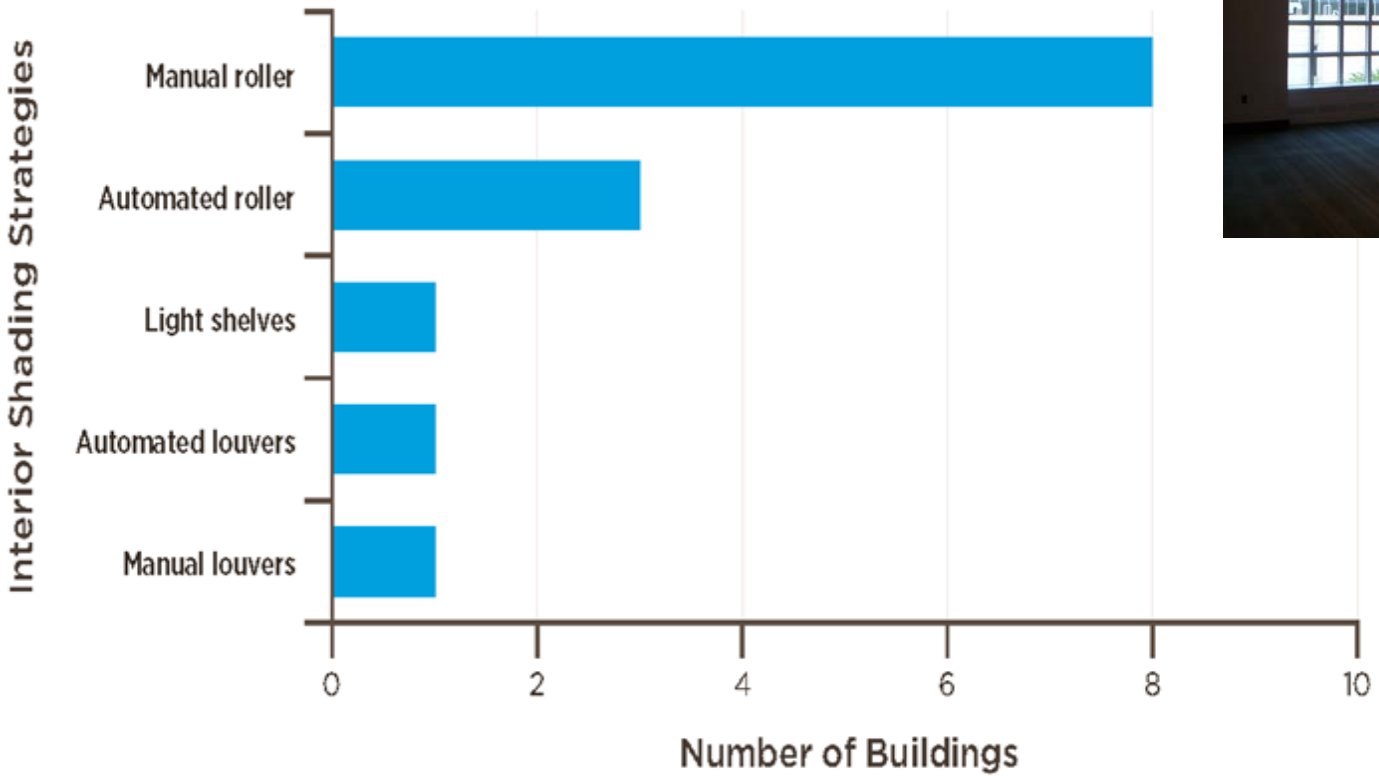
Types of Controls: Shading & Daylighting

Interior Shading



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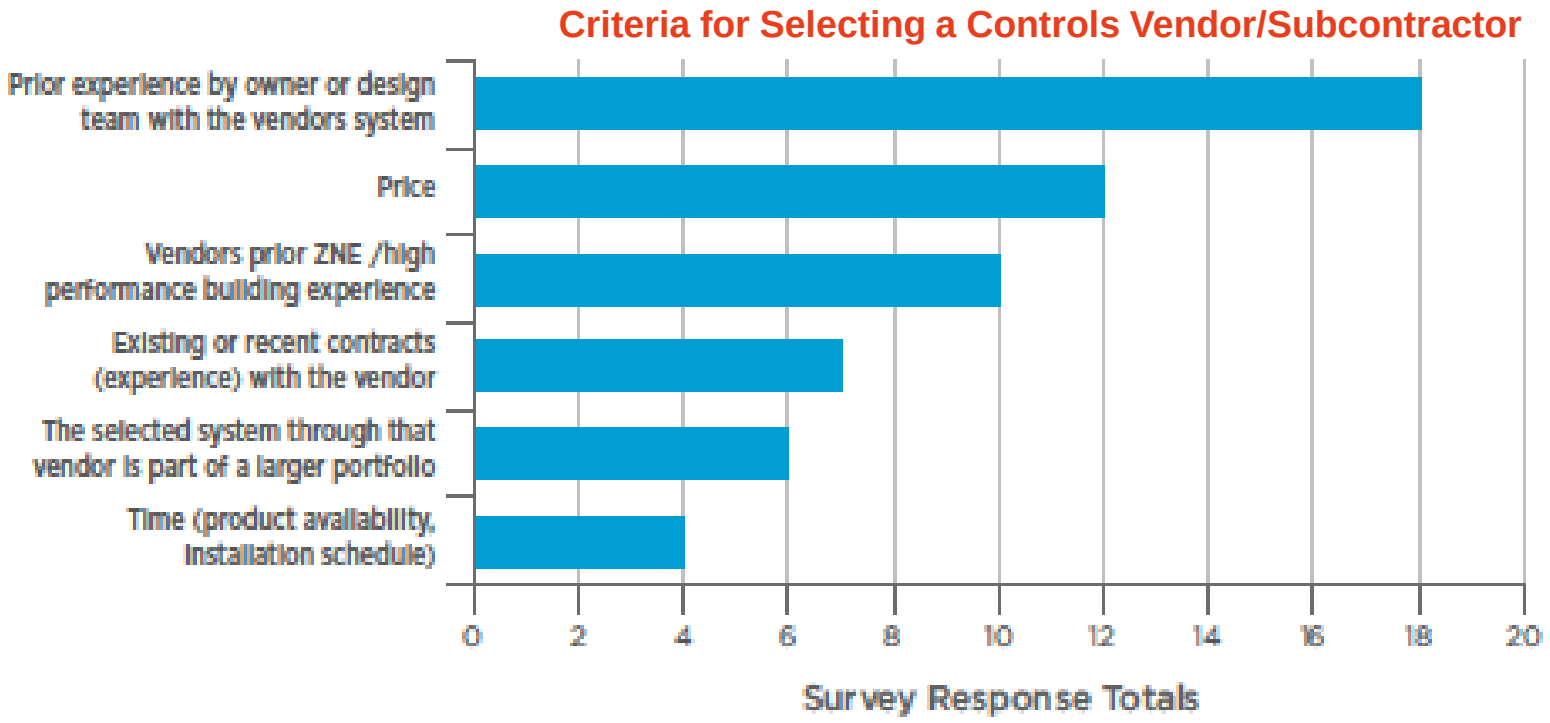
Controls Design Selection Process: Selection Criteria



Prior Experience is the #1 selection criteria

- Indicator of the importance of getting key players involved early in the design process
- Demonstrates the important role controls play in achieving a ZNE goal

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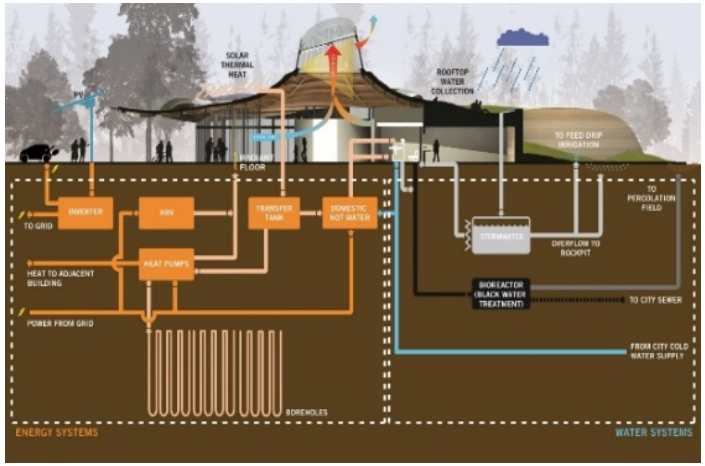
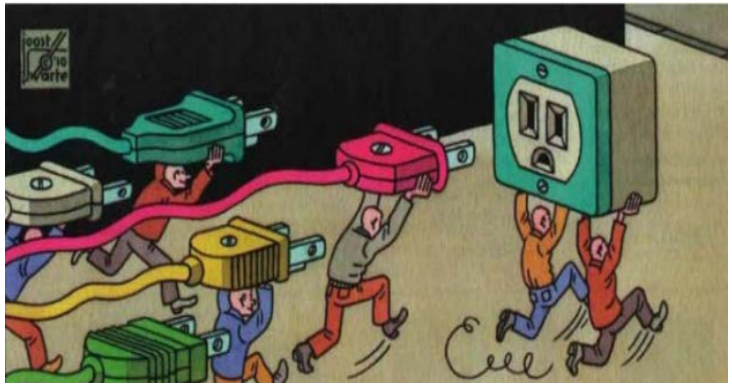
General Finding and Trends

ZNE is driven by good design, High Performance Systems and Shading



New Roles & Old Relationships

Controls are at the Nexus of Energy Performance



Occupants are a new Operator

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Five Recommendations

1. **Prioritize Passive Strategies**
   - then layer in controls to optimize the whole building outcomes

2. **Integrate the Controls Contractor**
   - controls contractor needs to be a primary team member from design through occupancy

3. **Increase Operator Training and Support**
   - bring controls training and improved hand-off documentation to operators and ongoing access to the design team and controls contractor

4. **Provide Occupants Control but Backup with Default Settings**
   - occupants want some engagement and control access but a ‘hybrid’ system that returns controls to default settings and “Off” is necessary

5. **Build Industry Awareness and Knowledge of Emerging Trends**
   a) integrated, wireless and adaptive controls
   b) feedback and dashboards
   c) DC systems and renewable integration
   d) utility load management, price and program issues
   e) ZNE policy drivers

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Current CABA RESEARCH PROJECTS

Intelligent Buildings and the Impact of the Internet of Things (IoT)

The Continental Automated Buildings Association is conducting a Landmark Research project called **“Intelligent Buildings and the Impact of the Internet of Things”.**

This CABA research project will examine the impact of IoT related to intelligent buildings. This research will provide actionable data relevant to all segments of the intelligent building value chain, including, but not limited to: building owners, technology manufacturers, builders and developers, integrators and installers, service providers, insurance companies, industry

CABA MEMBERS ARE COLLABORATING & FUNDING THIS RESEARCH:

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infoComm INTERNATIONAL · intel · JLL · John Hancock Real Estate · Johnson Controls · KMC CONTROLS

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For more information and pricing contact Sashien Godakandae, CABA’s Business Development Coordinator, at 613.686.1814 X 229 or godakandae@caba.org.

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Current CABA RESEARCH PROJECTS
Connected Multi-Dwelling Units and the Internet of Things

The Continental Automated Buildings Association is conducting a Landmark Research project called **“Connected Multi-Dwelling Units and the Internet of Things”.**

The goal of this research project is to provide a comprehensive examination of all the major aspects of IoT related to MDUs, including: state of the market, MDU IoT trends, business opportunities, technical barriers and opportunities, future market direction, issues, case studies and industry recommendations.

CABA MEMBERS ARE COLLABORATING & FUNDING THIS RESEARCH:

For more information and pricing contact Sashien Godakandae, CABA’s Business Development Coordinator, at 613.686.1814 X 229 or godakandae@caba.org.

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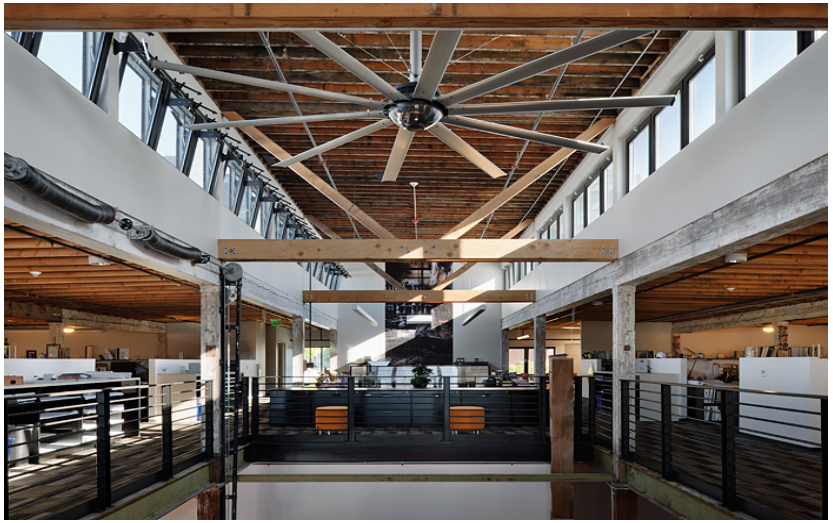
CONTACT CABA



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