Efficiency delivered.

NBI is responding to increasing urgency to reduce carbon emissions and increased demand for improved energy performance of new and existing buildings.

NBI’s Theory of Market Change:

Our Program Areas

(1) Building & Program Innovation
(2) Zero Energy Leadership & Market Development
(3) Advancing Codes & Policy

VanDusen Botanical Gardens Visitor Centre, Vancouver, BC
Source: Nic Lehoux
Today’s Agenda

• Zero Energy: Definitions and Data | Case Studies | Policies – Cathy Higgins, NBI
• Findings from the Johnson Controls 2018 Energy Efficiency Indicator Study – Clay Nesler, JCI
• Introduction to the new Getting to Zero Buildings Database – Alexi Miller, NBI
• Q&A

ZE Definitions and Data
What's in a name?

The Name Game

Zero Net Energy
Zero Energy Buildings
Zero Carbon Buildings
Zero Electric Buildings
Zero Energy Cost
Zero Net Ready Buildings

Emerging Buildings
Verified Buildings
Certified Buildings

Net Zero Energy
Nearly Zero Energy Buildings
Ultra-low Energy Buildings
High Performance Buildings
Living Building
Passive House
Today’s Terminology

- **A Zero Energy Building (ZEB)** is a highly energy efficiency building that meets 100% or more of its annual energy from renewables.
  - **Emerging**\(^1\) – targeting ZE
    - May be in planning, design, construction, occupied for less than a year, or yet to document ZEB performance
  - **Verified**\(^1\) – A year of more of documented performance by NBI
  - **Certified** – A year of more documented performance by a third-party program (ILFI, USGBC)

- **Energy Performance** - All energy (electric, gas, steam, liquid fuel etc.) consumed on site:
  - **EUI** - Energy Use Intensity in kBtu/sf/yr
    - The most common metric of energy performance

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\(^1\) Terms used by NBI for our Getting to Zero List

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NBI ZEB Watchlists and Status Report

North America ZEB Locations
ZEB Distribution by State and Region

Diversity of ZEB Size

© New Buildings Institute 2019
Diversity of ZEB Types

ASHRAE Energy Design Guides: Zero Energy K-12 Schools

Private/Public Distribution of ZEBs

© New Buildings Institute 2019
Energy Performance

- ZE Verified buildings on average use **60% less energy** than comparable existing U.S. commercial buildings and 46% less than new buildings under one of the most stringent U.S. base code (CA Title 24).

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ZEB Trends Summary

- **Location Distribution**
  - Every Climate Zone | 45 States | 4 Providences

- **Larger Buildings**
  - 25% of projects and 90% of floorspace are ≥ 50,000 sf

- **Diversity of Types**
  - 70 building types but 74% are education, office & multifamily

- **Private Sector Growth**
  - Private ownership is now 46% with 27% for-profit
Common Technologies to Get to Zero

- Heat Pumps
- Ventilation: Natural, Dedicated Outdoor Air Systems (DOAS), Demand Control Ventilation (DCV)
- Highly Efficient Thermal Envelope
- Building Orientation & Glazing ratio
- Solar Control - shading
- Daylighting Access and Controls
- Energy Management Systems
- Building Dashboards
- Radiant Heating/Cooling & Chilled Beams
- Plug load Reductions
- Energy Recovery Systems

Case Studies

© New Buildings Institute 2019
Hospital Portfolios Getting to Zero

Gunderson Health Systems, LaCrosse, WI

- 45 new and existing buildings
- 2.5 million square feet

Since 2008, the efficiency improvements and clean energy production adopted by Gunderson have positively contributed to air quality improvements in the region.

<table>
<thead>
<tr>
<th>Emissions (lbs)</th>
<th>2008</th>
<th>2015*</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO₂</td>
<td>241,011</td>
<td>15,027</td>
<td>94%</td>
</tr>
<tr>
<td>NOₓ</td>
<td>161,729</td>
<td>31,771</td>
<td>80%</td>
</tr>
<tr>
<td>CO₂</td>
<td>80,846,097</td>
<td>5,751,709</td>
<td>93%</td>
</tr>
<tr>
<td>Mercury</td>
<td>2.4</td>
<td>0.3</td>
<td>87%</td>
</tr>
<tr>
<td>Particulate Matter</td>
<td>434,928</td>
<td>39,542</td>
<td>91%</td>
</tr>
</tbody>
</table>

Medical / Tech Labs Getting to Zero

United Therapeutics
Unisphere Bldg. Silver Springs, MD - 135,000 sf

The Building Automation System (BAS) controls and monitors over 11,000 devices in 7 areas:
1. power monitoring
2. lighting control
3. data analytics
4. electrochromic glass control
5. geothermal HVAC optimization
6. interactive sustainability visualization
7. fire alarm system

United Therapeutics
Jax Lung Restoration Center
Mayo Clinic Jacksonville, FL
75,000 sf

Designed for Carbon and Energy Neutrality

Kaiser Permanente
Medical Office Building
87,480 sf

Saved $1 million in total budget through ZE design integration
Speculative Office Buildings Getting to Zero

Indio Way Building | Sharp Development

“...we wanted to prove that this type of sustainable renovation is not only cost-effective, but actually more profitable than the old way of doing things.”

- Kevin Bates, President of Sharp Development

OVERVIEW

Location: Sunnyvale, CA
Project Size: 31,799 SF
Construction Type: New
Completion Date: 2013
Occupied: May 2014
Building Type: Office
Climate Zone: 4
Total Building Cost: $5,136,015
Cost per SF: $162
Hard costs: $4,042,458

Applied an innovative façade PV integration

Creating a tenant utility solar lease resulted in 8.3% cash on cash return

Indio Building Net Cash Flow

| Net Cash Flow after Debt Service | $123,080 | $2,967 |

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Corporate Portfolios Getting to Zero

North Face and VF Outdoor Campus

“These are brands that have a deep passion for the outdoors – not only to play in it, but to preserve it - and we wanted this campus to really speak to that.”

- Steve Reeda, Vice President, VF Corporation

OVERVIEW

Location: Almeda, CA
Project Size: 160,000 SF
Completion Date: 2012
Building Type: Office
Climate Zone: 3
Total Campus Cost: $40,000,000
Cost/SF: $200

Measures:

- Advanced Lighting & Daylighting
- High performance envelope and glazing
- IDEC for HVAC
- Plug Load Management
- Monitoring and Controls
- Occupant Engagement and Training
- Wind turbines and building/ site PVs

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Policy Trends

Key Policies to Support ZEB

- Net Energy Metering
- Achieve ZE in energy codes by a date-certain (CA, WA…)
- Achieve interim goals to ZE (OR, NY,….)
- Enable utility programs to fully incent ZE
- Create Climate and/or Energy Roadmaps for State/City Agencies
- Regulate energy performance after Certificate of Occupancy (NYC, Boulder)
- Requirements for new and existing public buildings - lead by example
- Financial and Tax Incentives

‘Electrification’ and ‘Decarbonization’ are increasing as terms, topics and policies
States Getting to Zero

**Washington**  ZE or ZE Capable in New Construction: Executive Order 18-01

**Oregon**  Solar Ready and Carbon Neutrality: Executive Order 17-20

**California**  ZE by 2025 and 2030: Executive Order B-18-12

**Minnesota**  ZE by 2030: Sustainable Building 2030 & Executive Order 17-12

**New York**  Voluntary Stretch Code: NYStretch

**Delaware**  ZE capable homes by 2025, ZE capable commercial by ZE: Senate Bill 59

**Vermont**  ZE for all new residential & commercial by 2030

**Virginia**  ZE Schools - HB 2192 requires use of the ASHRAE AEDG K-12 Zero Energy School Guide

Cities and Counties Getting to Zero

**Carbon Neutral Polices** – 37 cities targeting carbon neutral

**Zero Energy Buildings** – 11 cities with zero ordinances and propositions

- New York City, NY
- Pima County, AZ
- Austin, TX
- Lancaster, CA
- Palo Alto, CA
- Hayward, CA
- Washington DC
- Santa Monica, CA
- Cambridge, MA
- Boulder, CO
- Park City, UT

**100% Renewables** – > 90 cities, ten counties and two states have goals for energy to be supplied by 100% renewable energy but this is gaining traction as more cities look to adopt similar goals.

- Six cities in the U.S. - Aspen, Burlington, Georgetown, Greensburg, Rock port, and Kodiak Island - have already hit their targets and now generate 100% of the energy used community-wide from clean, non-polluting and renewable sources.

Source: https://www.sierraclub.org/ready-for-100/commitments
The 2018 Energy Efficiency Indicator Study surveyed 1,901 energy and facility management executives from twenty countries.

- Argentina
- Brazil
- Canada
- Chile
- China
- Colombia
- France
- Germany
- India
- Ireland
- Italy
- Japan
- Mexico
- Netherlands
- South Africa
- South Korea
- Spain
- Switzerland
- United Kingdom
- United States
Investment in energy efficiency, renewable energy, and smart building technology is expected to increase globally

Organizations increasing investment in energy efficiency, renewable energy or smart building technology over the next 12 months

Greenhouse gas footprint reduction is the greatest driver of energy efficiency investments in the U.S., while globally it is energy cost savings

Organizations rating as very or extremely significant

- Greenhouse gas footprint reduction: 90%
- Energy cost savings: 80%
- Increasing energy security: 76%
- Enhanced brand or reputation: 70%
- Investor reporting demands: 70%
- Customer attraction/retention: 69%
- Attracting/retaining employees: 69%
- Existing government policy: 68%
- Increase building resilience: 67%

Global

United States
Uncertainty regarding savings was rated as the top barrier to energy efficiency investments in the U.S., while globally, it is lack of technical expertise.

Building controls improvements are expected to have the greatest rate of investment over the coming year.

US organizations investing in the next 12 months:

- Building controls improvements: 68%
- Heating, ventilation, air conditioning (HVAC) improvement: 65%
- Energy focused behavior or educational programs: 64%
- Integration of fire/life safety with other building technology systems: 61%
- Centralized building operations center: 60%
- Integration of security systems with other building technology systems: 59%
- Fire/ life safety system improvements: 58%
- Onsite renewable energy: 57%
The trend towards integration will continue with strong investment planned in the next year

US organizations investing in the next 12 months

- Fire & Life Safety integration: 61%
- Security system integration: 59%
- Building Management systems integration: 43%
- Lighting systems integration: 39%
- Smart Building equipment integration: 38%

Interest in achieving green building certification and leasing space in green buildings is high in the U.S.

- 72% of respondents have achieved or plan to achieve voluntary green building certification
- 44% of respondents are willing to pay a premium for space in a certified green building

Global

- 57% of respondents plan to achieve or already have achieved voluntary green building certification
- 51% of respondents are willing to pay a premium for space in a certified green building
Net zero and resilience are important drivers in future building infrastructure investments

61%

Net Zero Energy / Carbon
US respondents that are very or extremely likely to have one or more facilities that are nearly zero, net zero or positive energy or carbon status in the next ten years

54%

Going off the grid
US respondents that are very or extremely likely to have one or more facilities able to operate off the grid in the next ten years

Global
Canada, Italy, Switzerland and Germany are the only countries with higher likelihoods of having one or more net zero energy/carbon buildings in the next ten years

Smart building measures show the greatest increase between planned and previous year investments in the U.S.

Copyright 2018 – Johnson Controls
### Smart building measures show the greatest increase between planned and previous year investments in the U.S.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Forecast Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building systems integration</td>
<td>20%</td>
</tr>
<tr>
<td>Energy management process (e.g. ISO 50001)</td>
<td>15%</td>
</tr>
<tr>
<td>Non-renewable distributed energy generation</td>
<td>10%</td>
</tr>
<tr>
<td>Security system improvements</td>
<td>5%</td>
</tr>
<tr>
<td>Integration of lighting systems with other building technology systems</td>
<td>0%</td>
</tr>
<tr>
<td>Electric energy storage</td>
<td>-5%</td>
</tr>
<tr>
<td>Fire/life safety system improvements</td>
<td>-10%</td>
</tr>
<tr>
<td>Centralized building operations center</td>
<td>-15%</td>
</tr>
<tr>
<td>Cogeneration renewable energy</td>
<td>-20%</td>
</tr>
<tr>
<td>Demand response / demand management</td>
<td>-25%</td>
</tr>
<tr>
<td>Integration of fire/life safety with other building technology systems</td>
<td></td>
</tr>
<tr>
<td>Integration of smart building equipment with other building technology systems</td>
<td></td>
</tr>
<tr>
<td>Integration of building management systems with other building technology systems</td>
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<td>Integration of security systems with other building technology systems</td>
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Copyright 2018 – Johnson Controls
Smart building measures show the greatest increase between planned and previous year investments in the U.S.
Energy Efficiency Indicator

Clay Nesler
VP, Global Sustainability and Regulatory Affairs
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@ClayNesler

The New Getting to Zero Buildings Database
Live and Interactive List, Maps, and Analytics
For more information:
NBI’s Case Studies present some of the best examples of ultra-low and zero energy buildings in North America. Additional case studies are also available on the Getting to Zero website.

Do you know about a low or zero energy building not listed here? Submit the building to our registry.

Learn more about the residential ZE market in the Net Zero Energy Coalition 2015 Zero Energy Inventory.

If you have questions or additional information for us, please let us know by email.
GETTING TO ZERO BUILDINGS DATABASE

NBI works to identify, research, analyze, and promote commercial and multifamily buildings that are leaders in low and zero energy, the maintain the most comprehensive list of zero energy (ZE) commercial and multifamily buildings across North America. This interactive tool puts NBI’s getting to zero buildings database at your fingertips and allows you to generate custom maps, lists, and charts.

There are two tabs:
1. Map and List: The map plots ZE projects across the US. The table (below the map) lists each project and its key characteristics. Use the check boxes on the left to filter by ZE status, location, and building type.
2. Analysis: Interactive charts display key data about the ZE building stock. Use the check boxes to customize the charts by ZE status, location, building type, ownership, and size.

NBI Getting to Zero Buildings Database

Use the filter on the left to filter projects in the map and table. ZE projects in the map filter the table below. Click on the Analysis tab above to see the big picture and create customized charts.
Please do **Use and Share** NBI GTZ Database graphics in reports, presentations, etc. in your work to help more projects Get to Zero!

Be sure to credit graphics properly when you use GTZ content:

*Source: New Buildings Institute, May 2019*
What’s your number?
Submit your zero energy project information and have your numbers shared!
newbuildings.org/project-registry/

Resources and Events
NBI ZE and Energy Efficiency Resources

JOIN US!

Join us at the premier global event dedicated to creating a zero energy, zero carbon future for the built environment.

GETTING TO ZERO FORUM 2019

October 9-11
Oakland Marriott
Oakland, CA
gettingtozeroforum.org
Questions?