

DEEP ENERGY EFFICIENCY AND GETTING TO ZERO

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Executive Director

new buildings institute

- Non-profit, think tank on commercial building energy efficiency
- Formed in December 1997
- Funding
 - Sponsors: includes SCE, NEEA, NationalGrid, NYSERDA, CEC, SMUD
 - Contracts and Grants: EF, DDCF, Kresge, USGBC, CEC PIER, CPUC, etc.
- Staff in Vancouver, Seattle, and White Salmon, Washington



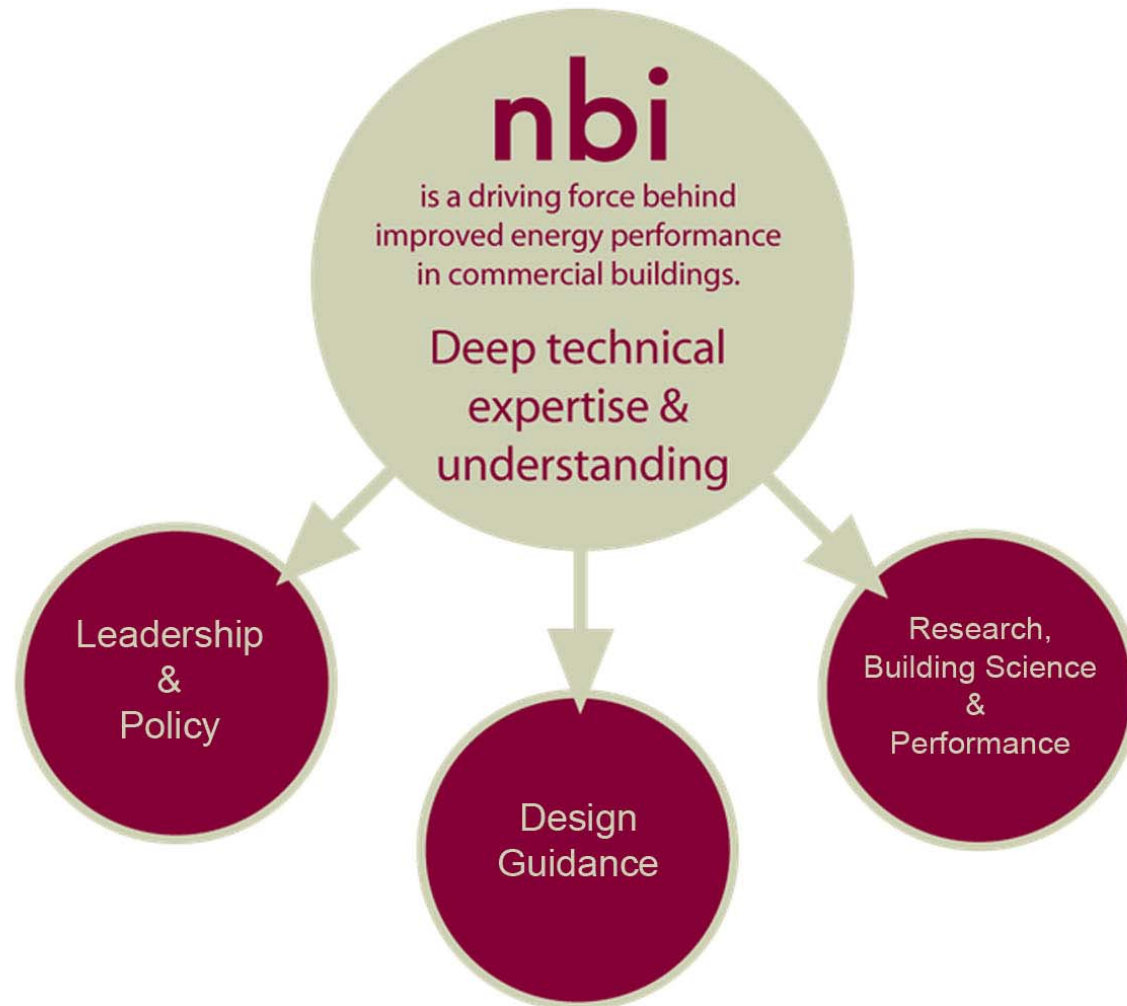
nature of our work

Intro

Research, Building
Science &
Performance

Design Guidance

Leadership &
Policy



key topics for today

- What do we know about the features and actual energy use of high performance buildings?
- What is possible in terms of energy performance in the near term?
- How we can structure programs, policies and market actions to support deep efficiency?
- New Tools

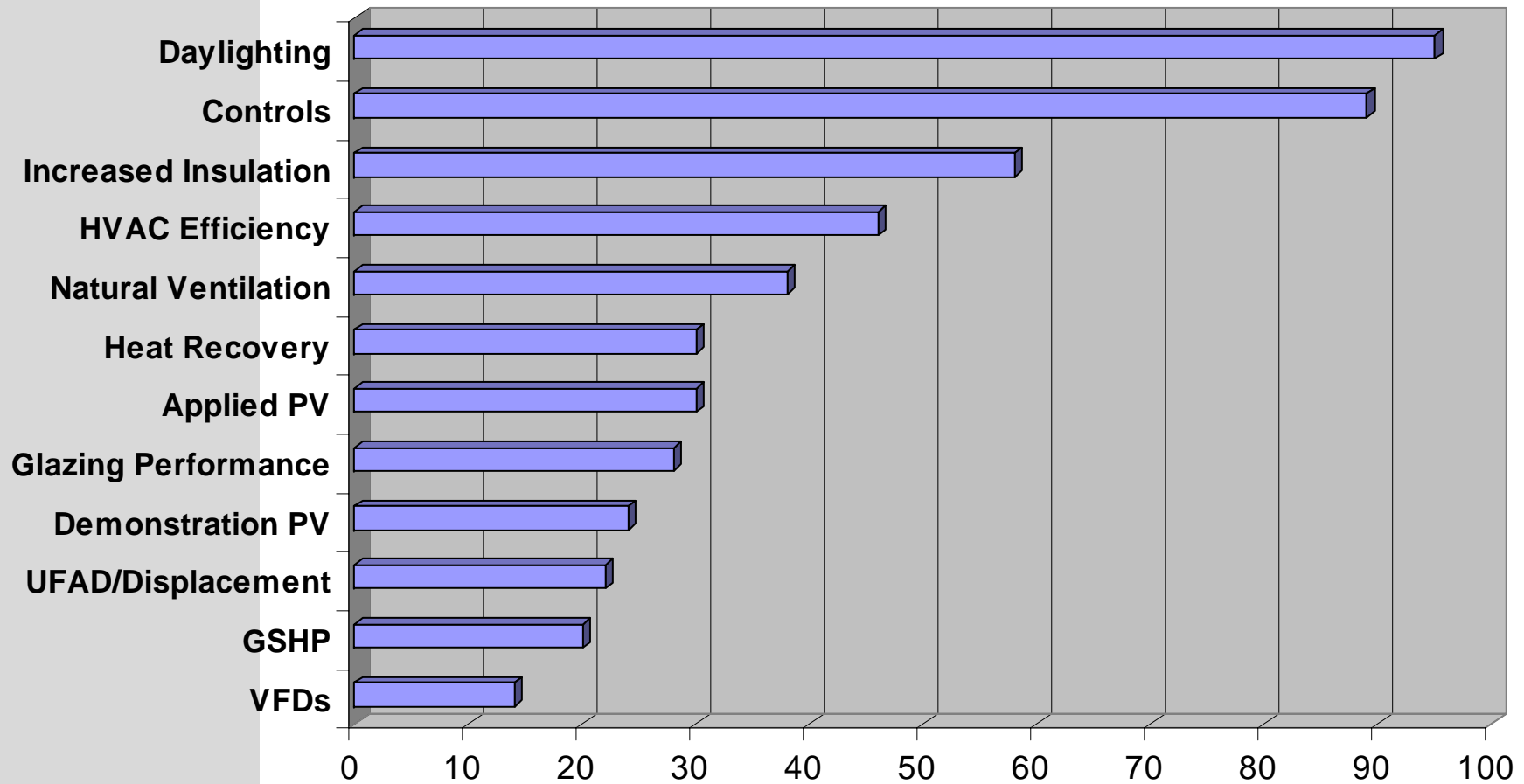
first, getting to fifty - new

- NBI identified about 100 buildings around the country that had energy performance (at least estimated to be) 50% better than typical.
- Reviewed feature sets, and created a database of projects.
- Sponsored a two day planning event in Atlanta to determine how to get more 50% buildings constructed.

findings from GT50 buildings

- Fewer than 1 in 1,000 new buildings reach this level of efficiency
- It is possible across multiple building types, multiple climate zones, multiple design teams
- Largely driven by the owner, with support from public and/or utilities.
- How do we spread the motivation, skills and support to get buildings at this performance level? (IECC 2012?)

technologies in GT50 buildings



recent buildings: U.S./Northwest and German demos

Building Type	U.S./ NW Average New Bldgs.	U.S./ NW LEED Buildings	German Demos	
Offices	88/ 93 kBTU	62/ 60 kBTU	27.5 kBTU	
Schools	81/ 65 kBTU	62/ 33 kBTU	19.4 kBTU	

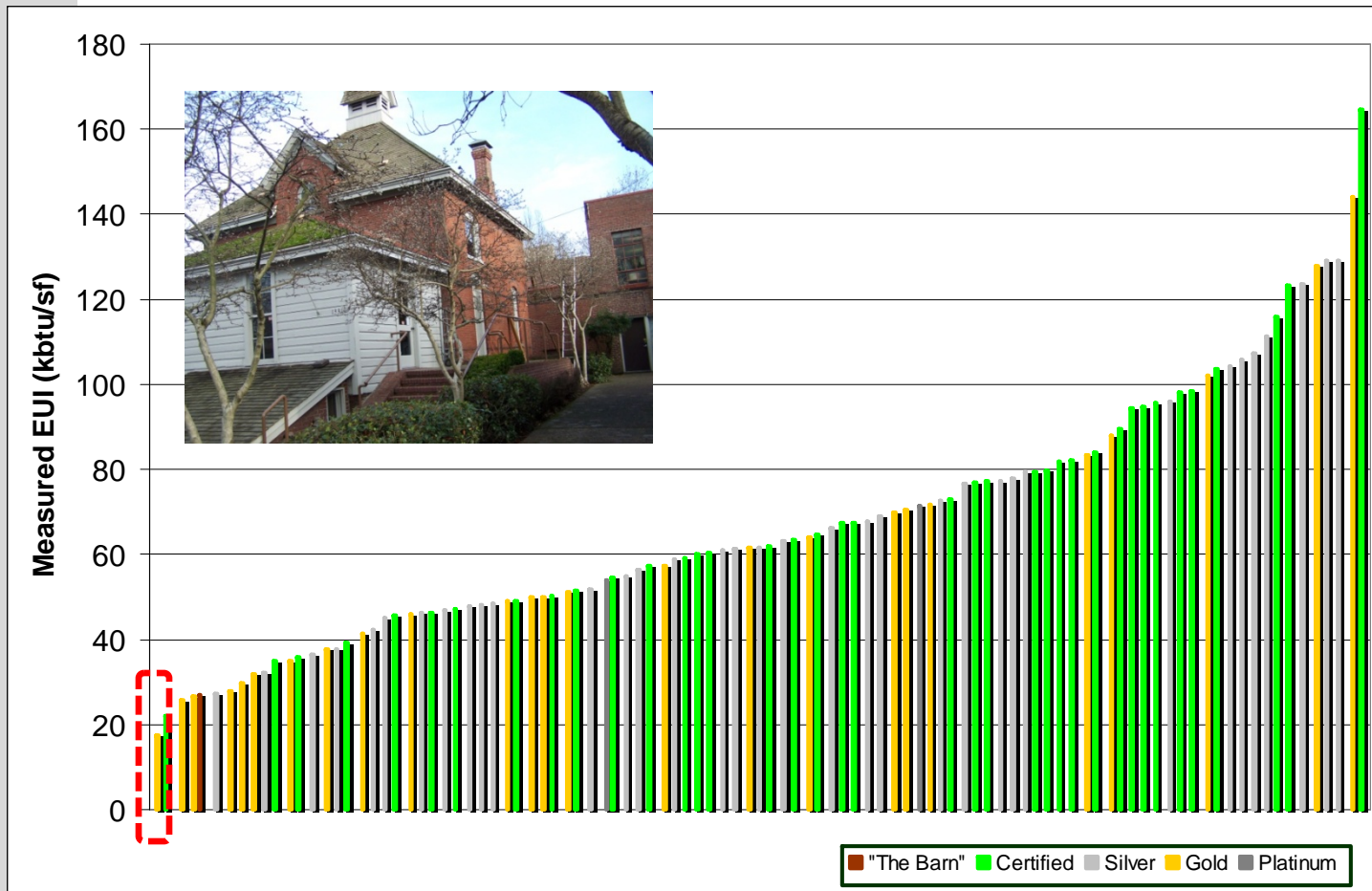
digging into buildings and data

- Detailed look at 50+ HP buildings
- Best of Best – advanced mechanical, daylighting, advanced controls, natural ventilation plus pay attention
- Worst of Best – usually no clue that building not performing, mostly operational issues, occasionally design or construction; simultaneous heating and cooling, Cx post occupancy should fix most

what about zero-net energy buildings?

- About 15-20 built in U.S.
- (Identified about 50 net zero capable – i.e. less than 30 kBTUs site)
- Except for NREL, mostly small
- All the basics plus very efficient HVAC, daylighting, natural ventilation, heat recovery
- 50+ projects under design/ construction, e.g. Living Building Challenge, Saving by Design, ETO

the barn – built in 1887



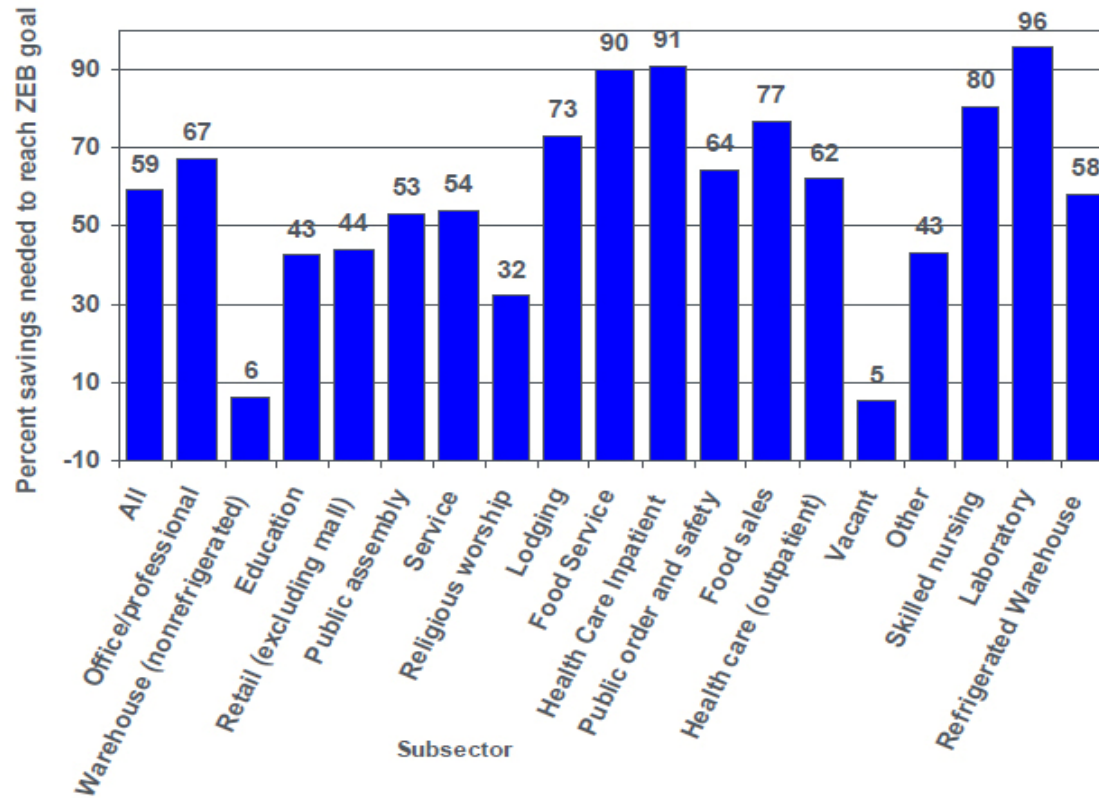
NBI Study of the measured performance of 100 LEED buildings.

existing buildings

- California Plan includes 50% of existing buildings to net zero
- NBI and National Trust for Historic Preservation identified 50 existing buildings with documented savings in the 30% to 80% range.
- Taking a deeper look now, but requires changes to at least two buildings systems

getting to zero in existing buildings

need 60% to 70% decrease in energy consumption of commercial buildings to get to Zero Energy Buildings



Source: U.S. Department of Energy

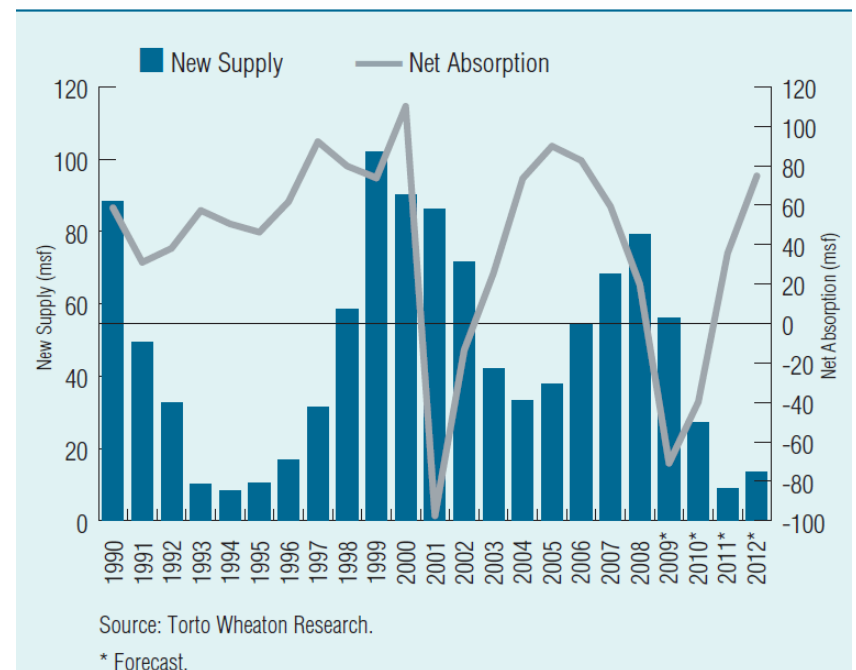
how to move existing buildings

- Create and support innovative technical solution sets that build on the strengths of existing buildings.
- Critical need for new financial tools that can support deep savings (40% to 60%)
- Move from widget based efforts to integrated system based efforts with enhanced controls.

emerging trends; existing buildings

- Replacement costs won't justify new projects
- Large companies look to reduce costs by using existing space more efficiently
- “Developers regroup to focus on reuse strategies”

EXHIBIT 4-17
U.S. Office New Supply and Net Absorption



five strategies for moving the market

1. Performance Goal Driven

- Focused on achievement of an absolute number – for most buildings 25 to 40 kBTU/sq.ft. site: Measured
- Brings in operations and plug loads

2. Strong utility and public program support

- Big, Bold in CA (Path to Zero)
- ETO has similar program element
- TRC is an issue

five strategies for moving the market

3. Need to focus on Collaborative Learning
 - Review high-performance buildings
 - Track Key Performance Indicators
4. Reduce performance risks and cost of changing practice
 - Move from **Case Studies** to **Lessons Learned** to **Design Guidance**

five strategies for moving the market

5. Understand the motivations of and work with key decision makers (owners, developers, finance, design community)
 - Neither net zero nor deep energy in existing will be driven by utility incentives.
 - What are the business motivations?

three issues for programs

- Customer Centric
 - Recognize that commercial buildings market is very diverse;
 - Commercial real estate – can't handle additional debt
 - MUSH Market
 - Owner occupied retail and food service – need to stay fresh

three issues for programs

- Widgets are in the Way.
 - Technical approach for deep savings needs to move to best practice in systems.
 - Start with comprehensive treatment of lighting and plug loads;
 - Then shell if practical – but frequently it is not (critical for going really deep)
 - HVAC, best practice not component replacement.

three issues for programs

- Regulatory Revisions Required
 - Need support from regulators to start moving in more productive directions.
 - Multiyear goals, depth of savings, market leverage – less consideration of attribution and net to gross
 - TRC rules need to reflect that customers want choices if we are leveraging their money.

Design Guidance Projects

- Advanced Buildings
 - Core Performance
 - Developing a 50% package
- Advanced Lighting Guidelines
 - Web-based tool connected to CLS
- Office of the Future
 - Tenant Improvement; lights and plugs
 - 50% solution beginning research




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Advanced Lighting Guidelines

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Welcome to Advanced Lighting Guidelines

Welcome copy, 75 words max: Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat

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Intro

Research, Building
Science &
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Design Guidance

Daylighting Pattern Book

- Visual guidance based on real examples
- Series of variations
- Also an Office Interiors guide



Photo by Gary Hall Photography

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Office of the Future Consortium

- Integrated technical solutions in existing office TIs
- Lighting, plug loads, HVAC performance, metering
- Initial pilots show robust savings

Deep Efficiency in Existing Buildings

- Best examples
- Developing new tools
 - First view, operational diagnostics
 - Multi Measure Tool; Pre-modeled solution sets for common buildings
- Summit meeting in Boulder CO
- June 28-30

Thank you

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