

## summary report

February 2012



## Deep Energy Savings in Existing Buildings: Summit Summary

*In partnership with Preservation  
Green Lab of the National Trust for  
Historic Preservation*

**Preservation  
Green Lab**  
NATIONAL TRUST FOR  
HISTORIC PRESERVATION

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## *Participating Organizations*

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BC Hydro	NBBJ Architects
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# Introduction



Photo courtesy of Fitzmartin Consulting.

New Buildings Institute and the National Trust for Historic Preservation hosted a Deep Energy Savings in Existing Buildings Summit in Boulder, Colorado, September 14-16, 2011. The event convened 80 national experts in critical aspects of energy efficiency including implementation, design, ownership, management, research, policy, utility programs and real estate objectives.

The summit was a working meeting aimed at defining the framework and tools needed to support much more aggressive levels of efficiency in the existing commercial building marketplace. The group explored opportunities to move beyond building-by-building and widget-based approaches in a way that integrates profound energy savings into the urban fabric. The direct objectives were:

- Learn from the latest case studies and research
- Inform and refine efforts underway to develop multi-measure packages and tools for existing buildings, as well as market and regulatory approaches necessary to catalyze deep energy savings
- Connect companies, professionals and policymakers with experience in distinct disciplines of commercial real estate and energy efficiency
- Develop specific and replicable solutions that successfully address market barriers
- Identify strategies to accelerate deep energy savings in existing buildings throughout North America

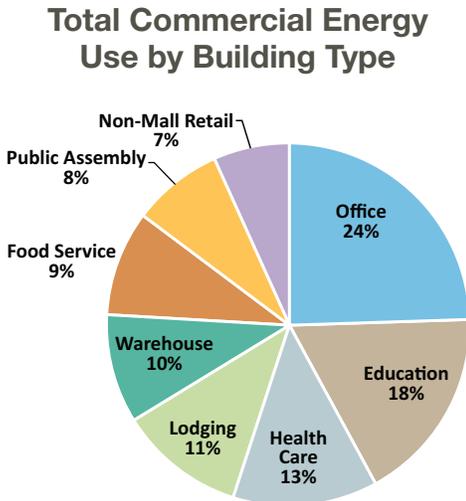
This report summarizes the key discussion areas and recommendations. Additional information is available at [www.newbuildings.org/summit](http://www.newbuildings.org/summit).

# Opportunity & Experience

A focus on new construction strategies can only address 1-2% of the building stock each year. Strategies for Deep Energy Retrofits (DER)<sup>1</sup> of existing buildings must be a dominant part of the critical path to meeting climate and energy policy goals as well as utility efficiency targets. The summit's working definition of 'deep' savings was moving existing buildings to a minimum of 30%, and a target of 50+%, energy reduction.

We know that capturing deep energy savings in existing buildings is achievable with today's technologies and practices, but to create new activity in this market we must first learn from the leaders. The opening sessions brought together knowledge, experience and current practices as a working foundation for all participants in three areas:

- 1. Case Studies** | At the opening dinner, participants shared over two dozen projects that have succeeded in achieving deep energy savings in existing buildings. These examples illustrate the potential for 30-60% savings in projects ranging widely in use (multi-floor tenant office improvement, renovated mixed-use historic building, school), size (5,000 to 300,000 square feet), age (10 to 100+ years old) and ownership (leased, public, owner occupied).
- 2. Replicable Approaches** | The group heard from leaders of organizations working to increase best practices and approaches for deep existing building efficiency in three areas: a) New Programs and Technical Efforts, b) Expansions to Current Programs and c) Marketplace Efforts. Examples included research on multi-tenant light commercial, corporate portfolio retrofits, Northwest and Northeast regional market and technical strategies, energy worksheets, financial studies, energy model tracking from leading design firms, and city- and community-led initiatives.
- 3. Market Characterization** | Work in progress by NBI and the Preservation Green Lab to establish sets of small and medium building typologies drew a lot of attention and interest. In addition to the standard building characterization work driven by use, age, size, location and energy consumption, this effort is establishing small building market segments according to physical characteristics coupled with use. Each typology is defined by a 'scorecard' that summarizes research in three categories – form (physical characteristics), footprint (energy consumption impact) and function (market factors). This work will facilitate new tool development for the selection and optimization of energy efficiency measures correlated to building typology.



Source: Data from Energy Information Administration Commercial Building End-Use Consumption Survey (CBECS) 2003.

<sup>1</sup> Commonly used in commercial real estate, the terms “retrofit,” “renovation” and “upgrade” were used throughout the summit. Of the three, “retrofit” was deemed the most broadly applicable and readily understood. “Renovation” typically refers to structural changes, and “upgrade” often denotes a single piece of equipment.

# Themes & Solutions

The summit was an outpouring of issues, inspirations and direction for action. A set of a dozen themes and solutions summarizes the high-level event discussions and outcomes.

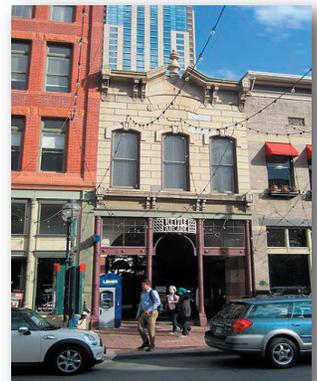
- 1. Deep savings are possible.** Deep savings are demonstrated and documented in existing commercial buildings of various types, sizes and ownerships. However, projects that achieve savings of 30% to more than 60% are rare and represent only a very small fraction of the existing building market. Both more comprehensive savings in individual existing buildings and wider market impact are critical to meeting targets and policies.
- 2. Smaller buildings matter.** Smaller buildings are a critical but largely underserved market for efficiency gains. Small and medium buildings (defined broadly as those less than 50,000 square feet) require simplified turnkey approaches that can deliver deep efficiency and finance solutions while requiring little time or expertise from owners. These buildings represent 95% of all buildings and half of the commercial floorspace.

## New solutions are needed for smaller, older buildings

73% of our existing commercial buildings are less than 10,000 square feet

95% of them are less than 50,000 square feet – representing half of all commercial floor space

*US Energy Information Administration, 2003*



Buildings in Denver's Historic District.  
Photo by Wally Gobetz

Source: Deep Energy Savings Summit Presentation by Liz Dunn, NTHP.

- 3. Develop sets of efficiency solutions and building typologies.** Solution sets to address the majority of energy savings opportunities in smaller buildings can be developed based on simplified and repeatable analysis tools and protocols. Grouping buildings by deeper typology including vintage, location, architectural features, size, configuration, glazing ratios, envelope type, equipment, etc. is foundational research to create such tools for the market. Combined with recognition of the customized or modeled needs for larger buildings and filters to determine the right mix for various smaller buildings, these tools can help streamline the delivery of DERs.

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4. **Aggregate buildings.** Aggregating or bundling sets of buildings creates the energy-saving and economic momentum to make DERs a stronger business model through reduced transaction costs and the ability to leverage services and solutions. This in turn makes them more attractive to large-scale financiers. Examples include single-owner portfolios, ‘fleets’ created by geographic proximity through eco-districts, utility-sponsored programs or community-led initiatives, third-party aggregation to leverage implementation, and financing in a performance contracting or power purchase agreement model.
  5. **Use urban strategies to mobilize large change.** Urban resources can be utilized to aggregate building upgrade strategies through policy and regulatory tools, political and cultural interest groups and advantages of density. Cities are developing district energy through eco-districts, increasing data on energy performance through disclosure requirements, aggregating buildings by neighborhood or district, using locally trusted sources for delivery of services, and reach or outcome-based codes.
  6. **Simplify delivery.** Simplify delivery of energy services, particularly to the small and medium building sector, by enhancing and expanding third-party provider models - contractors, energy service companies (ESCOs) and/or owner consortiums. The current ESCO focus is predominantly widget based and operating almost exclusively in the municipal, utility, schools and hospital (MUSH) market, with less than 7% of business revenue coming from private sector projects<sup>2</sup>. These projects also tend to focus on larger commercial buildings resulting from the economy of scale. Turnkey approaches for smaller buildings extended to large segments of the building marketplace would increase owner participation.
  7. **Facilitate financing.** Provide financing options at attractive rates and use off-balance-sheet options such as PACE, performance contracting, utility power purchase agreements or on-bill financing. Financing strategies and access, while not directly addressed at the summit, are primary components to successful DERs and gaining much needed attention through national and regional forums.
  8. **Align programs and policies.** Programs and policies must align to support and rapidly drive deep energy savings in existing buildings. While aggressive policies and energy efficiency targets are in place, there are substantial conflicting regulatory areas that constrain deep energy savings. These include cost-effectiveness tests applied per individual measure rather than packages of measures, defining ‘total’ resource cost to include customer contribution without crediting other customer benefits, short-

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<sup>2</sup> Larsen, P. LBL, US Energy Service Companies Industry and Market Trends 2011

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“Contractors are stakeholders responsible for implementation of DER strategies, but the reality is that the trades have not caught up with technology. Therefore, one of the key items for contractors would be ‘up-training’ (a branch of ‘green jobs’) on current efficiency technologies.”

- ric cochrane, national trust for historic preservation

term program planning (e.g., annual kWh goals) and the absence of price signals on the value of deeper and monitored energy efficiency. At the rate level, there is a lack of effective price signals to reflect true costs of generation and delivery as well as the absence of carbon pricing.

- 9. Recognize trigger points in building life cycle and operational practices.** Opportunities for efficiency improvements will vary in part based on a building’s position in three broad categories: a) As-is – no planned capital improvements, b) Plan in Place – regular maintenance plan, equipment regularly assessed and upgraded, and c) Major Renovation – large-scale changes, often structural, with multiple system changes providing opportunities for deeper savings. The solution sets and timing of delivery must match the trigger points.
- 10. Partner for outreach and training.** Partnering through trusted organizations or local entities increases participation and reduces costs. The most crucial topics for education and messaging center on establishing the cost, energy and financial performance of retrofit buildings for owners and lenders, providing project examples relative to the decision maker, understanding motivations and growing the technical and sales capacity of contractors. Including messages of ‘future-proofing’ existing buildings by repositioning (renovating, change of use, etc.) follows the current strategy of some real estate leaders.
- 11. Target tenants.** Tenants drive energy use, and their impact has increased as design and construction practices improve. Plug load management and behavioral science are becoming a critical piece of the retrofit puzzle, along with equipment procurement, energy use feedback, individual controls and green leases. Tenant interest in green and energy efficient work space can drive owner decisions to do DERs. Attention here must be combined with ensuring the building is operated to provide the thermal, air quality and tenant control needs at optimum energy performance.
- 12. Learn from leaders.** Seek examples of individuals, firms and corporations that can tell stories of energy savings at the project level. This contributes to market confidence and can create a ‘pull’ as others aspire to keep pace. This same transfer of knowledge and experience can occur by identifying the leading utility program, neighborhood and municipality approaches, and nonprofit organizations. Creation of widely available profiles with credible data on these projects, owners and methods is important to moving the real estate and finance markets.

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# Tackling 5 Key Topics

Participants spent the majority of time engaged in working groups on five primary topics for discussion, identification of needs and barriers, and development of up to five key recommendations.

## 1. Programs & Policy

Programs through utility companies, green building organizations, and government programs and policies have the history and traction to help or hinder efforts in deep energy savings. The cost of energy has great potential to drive deep retrofits; there was active discussion regarding rate hikes and schedules, but the group recognized the market and political barriers. Programs and policies are currently weak when it comes to facilitating on-bill financing and other financing strategies that could work well for customers or in an aggregator model. Current building codes focus on new construction, miss major end-use categories, lack methods and enforcement for requirements affecting building operational phases, and do not in any way address existing building market cycles. Performance outcomes are not a part of most programs; the market signals are for installing widgets rather than achieving results. Utility incentives give higher priority to short payback strategies rather than emphasizing integrated solutions and longer-term investment in deep retrofit.

### Recommendations:

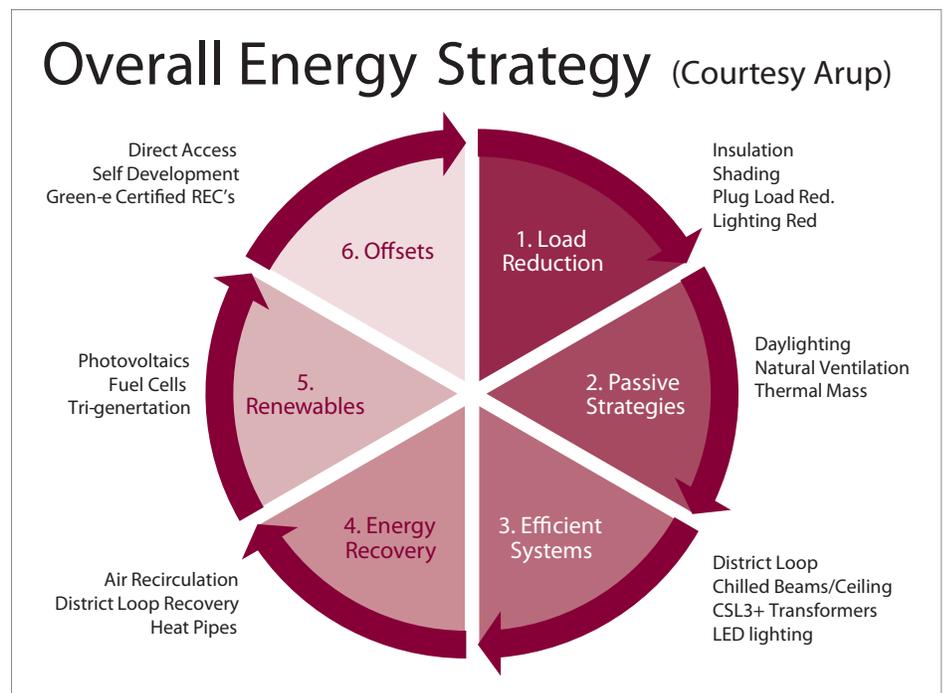
- **Establish State Long-term Energy Plans.** There is a need for good foundational energy policies at the state level through creation of long-term state energy plans.
- **Advance Existing Building and Outcome-based Energy Codes.** Create ways in which a minimum standard of energy efficiency can be set for all buildings and performance integrated.
- **Utilities and Regulators Must:** a) value deeper savings more, b) allow bundled measures to meet cost-effectiveness tests, c) establish multi-year program plans, d) assess resource cost within the utility only, e) provide on-bill financing and f) purchase proven and tracked efficiency as generation.
- **Review Tax Incentives.** Consider alternatives to tax treatment of capital improvements and depreciation cycles to favor efficiency investments.
- **Streamline Access.** Owners and contractors cite the process to participate in many utility and efficiency programs as a barrier. Programs should 'pave the road,' reducing bumps so the market can accelerate.

## 2. Technical Solutions

A significant number of strategies are applicable to a wide range of project types in a relatively predictable (repeatable) way. These represent an opportunity for a scalable prescriptive solution set for broad application, particularly to small and medium buildings. However, specific applicability depends on a range of factors or filters that must be used to guide decisions about how best to apply these strategies and in what order and combination. The filters must also identify those projects that should be using more detailed, individual analysis tools. A number of repeatable performance strategies focus not on physical building upgrades but on maintenance, operation and tenancy. These strategies must be an integral part of any performance upgrade; they also represent vast opportunities for more modest, low-cost performance upgrades across the building stock.

### Recommendations:

- **Generate Building Typologies.** Research and development of building typologies with characteristics that extend into a greater range of factors such as market, architectural and historic aspects can form the basis of streamlined solutions and program targeting.
- **Establish Widely Applicable Solution Sets.** Apply engineering analysis and design effort in advance across like buildings, particularly small and medium, to create sets of relevant measures that generate the majority of savings. Focus on bundling upgrade strategies rather than on individual measures. Include maintenance, operation and tenancy strategies, in addition to physical and technology-based building upgrades.

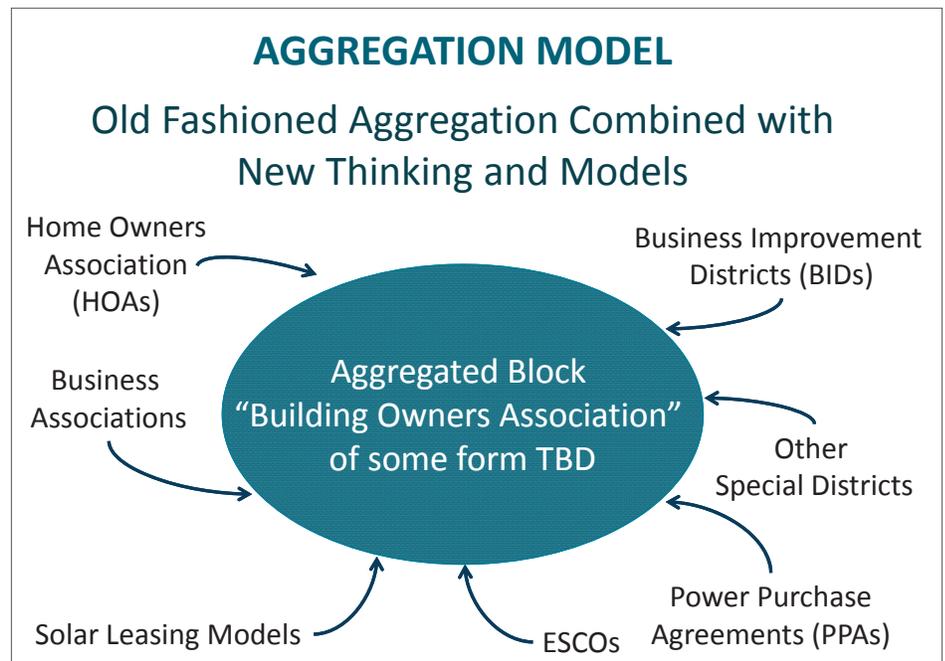


Source: Deep Energy Savings Summit Presentation by Clark Brockman, Sera Architects.

- **Create Tools and Guides.** Develop tools and guidelines for small commercial buildings that identify projects with predictable, repeatable improvement opportunities and provide key recommendations about these performance solutions. A large percentage of the market could be served by standardized tools.
- **Filter for Best Applications.** Include filters on the tools to guide decisions about how to apply these strategies, and in what order and combination. The filters must also identify those projects that should be using more detailed, individual analysis tools.

### 3. Delivery Approaches

Aggregation models and third-party delivery of full energy solutions and financing were discussed as priority ways to prime the market for deep energy retrofits in existing buildings, especially small and medium buildings. Benefits of aggregation and third-party delivery are numerous and include: a) reduced transaction cost, owner time and hassle, b) a more integrated package of solutions compared to a single measure-based contractor, c) provision of capital funding and business logic to decision makers and d) a repeatable model of delivery that makes smaller projects attractive. The gathering and delivering of deeper energy savings must become good business for the private sector through energy utility and regulatory programs and policies.



Source: Deep Energy Savings Summit Presentation by Llewellyn Wells, Living City Block.

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## Recommendations:

- **Support and Expand Third-Party Delivery.** Third-party delivery, direct install, aggregators and full-market ESCOs can deliver increased savings to a much greater range of existing buildings. The key benefits are reducing the overhead (and headaches) of the owner, lowering transaction costs, packaging solutions and financing, and providing a clear conduit for training, outreach and programs.
- **Pursue Portfolios.** Promote and facilitate the adoption of high performance (very low energy) buildings as a leasing, buying and renovation criteria to multi-site tenants and owners of multiple properties. Bank of America, Accenture, Goldman Sachs, IBM and Toyota provide strong corporate examples of entities making building efficiency and ‘green’ an important factor in their real estate and workplace decisions. The U.S. General Services Administration, the country’s largest tenant and a substantial owner of commercial real estate, sets efficiency criteria in all its lease agreements and is currently undertaking deep energy retrofits on several federal buildings.
- **Establish Utility Power Purchase Agreements.** Utilities should, with sufficient tracking and evaluation, allow energy efficiency power purchase agreements at rates on par with generation to encourage new delivery models from suppliers that would reduce the process and costs to building owners.
- **Support Design Firms as Energy Advocates.** Programs must support leading architect and engineering firms in the design-build field who can integrate deep efficiency into client renovations and upgrades and target others to follow this practice. Support can include recognition, tools to facilitate decisions on efficiency measures or cost/benefits, case studies and leveling the playing field with performance-based programs.
- **Pilot Delivery and Aggregation Models.** Alternative delivery models and aggregation are foundational to ramping up deep energy savings in existing buildings. New models need pilot programs that package a range of buildings into a single delivery effort with low-interest capital for financing. Comprehensive delivery programs to smaller buildings such as those in New Jersey, New York, Connecticut and northern California should be reviewed for transferability.

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## 4. Urban Strategies



Photo courtesy of Fitzmartin Consulting.

Cities are uniquely poised to pioneer public disclosure of building energy performance data; those that pilot this will have data no one else has. City-wide benchmarking data will allow cities to identify their worst performers as one kind of ‘portfolio’ they could tackle with targeted programs. City data may also start to provide benchmarks for the smaller buildings not addressed by ENERGY STAR. Because cities regulate building standards and land use, they can create incentives and mandates for deep savings fee-bates or density bonuses. Cities have the ability to build on existing mechanisms for district organizing and financing. This can include urban renewal districts to LIDS, BIDS, BIAs and Main Street programs that would attract ESCOs that can encourage crossing property lines with retrofits and financing. A city can create clusters to 1) see how adjacent buildings perform differently than stand-alone ones (e.g. Living City Block) and 2) determine their potential to share solutions or become energy farms. The challenges of city finance, depleted bonding capacity and multi-party decision processes can fatigue these efforts; however, encouraging examples exist and can be replicated.

### Recommendations:

- **Adopt Benchmarking and Disclosure Ordinances.** Adopt benchmarking and disclosure ordinances, standardize data between cities, and apply data to policy and programs.
- **Advance Codes.** Use the carrots and sticks of building and zoning codes to advance existing building energy efficiency through reach and outcome-based energy codes, fee-bates, density bonuses and other regulatory mechanisms.
- **Incorporate Energy into Infrastructure and Planning.** Cities should identify opportunities that will align with and facilitate efficiency objectives (e.g. local generation sites like gas stations, shared piping, water energy and more) and incorporate these into long-term infrastructure planning.
- **Leverage Community Mechanisms for Aggregation and Financing.** Community-based mechanisms may already exist for district organizing and financing. Use planning and mapping tools to identify geographic clusters and districts that ease the overhead of aggregating buildings into ‘fleets’ of saving opportunities.
- **Facilitate District Energy.** Break down short-term policy barriers to crossing property boundaries with energy solutions. Remove barriers to establishing small local utilities for sharing electrical and thermal energy. Infrastructure projects should identify opportunities to plan and incorporate district energy opportunities.

## 5. Outreach, Education and Information Flow



Source: BECC 2010 Presentation by Cathy Higgins, NBI (based on IMT slide).

Two working groups had a great deal of overlap in the areas of education and information flow, so their discussion highlights and recommendations are merged in this section.

**Outreach and Messaging.** Numerous materials are produced on the topic of energy efficiency, but the majority either lack the market message and/or are not delivered at the right time to the right parties. Conflicting or incomplete messages are given to the market, such as driving demand for LEED in Class A office space but not associating that with specific energy saving goals. We need to do a better job of communicating who benefits (not just the owner) from deeper savings and why. Priority outreach should be to owners and developers who have high leverage for enabling deep retrofits, as well as utilities/regulators and tenants.

**Training and Education.** Training must be appropriately tailored based on scale and typology. Certain typologies, such as Main Street, may provide distinct opportunities that can be capitalized upon. An owner-occupied building requires a unique education approach. Small building owners definitely need a turnkey approach. Education is no exception. Look for existing opportunities. Ask “Where do owners/managers currently go for their education?”

**Data and Information Flow.** There is a difference between the data required for any kind of statistical characterization of the building stock and the information needed by the project team working on an individual building. Confusing the two can lead to an inefficient and resource-intensive effort to gather building stock data or guidance for an individual building that inadequately serves the needs of the project team. Information can be grossly divided between aggregate and individual data. Aggregate data is crucial to assessing current and potential trends and range of building performance. Increasing the volume, consistency and format protocols for building data is essential. This will create confidence for the finance industry, inform performance policies and establish market asset values. A greater set of individual building project data and information, on both what succeeded and where the challenges were, is needed for programs and design firms to use with decision makers.

### Recommendations:

- **Time and Target Information.** Establish specific materials and tools delivered at key intervention opportunities or events in the building life cycle. Examples include change of use, major renovations, equipment life cycles, fiscal constraints, regulatory changes like codes and disclosure rules, and market repositioning.
- **Drive Building Performance Data and Value.** Increase availability of energy performance data and case studies, promote labels and ratings, investigate tenant feedback methods and enhance information on the workspace quality aspects of energy efficiency retrofits. Incorporate business cases into training. Consistency and protocols for data are critical.

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“All of the players in this business need to become more conversant in presenting the business case to skeptical building owners.”

- duane jonlin, nbbj

- **Focus Messaging on Business Performance.** Prioritize the business case regarding performance such as: a) financial benefits of reduced operating/maintenance costs, b) market appeal and labeling and ratings available to high performance buildings that can impact asset value and lease/occupancy rates, and c) improved tenant work environment and role/interest in ‘green’ spaces.
- **Increase and Standardize Cost, Market and Finance Information.** Leverage existing data on costs and invest in increased information and standardization of data on retrofit costs, financial performance data and market-wide assessments. This can establish energy efficiency performance as a standard part of finance and appraisal analysis forms and will help drive lender appreciation of value from deep energy retrofits and reduce perceived risks.
- **Provide Green Leasing and Tenant Energy Guidelines.** Many good examples have been developed in recent years, but they remain an exception in the leasing and occupancy of commercial buildings. The lease structure should allow energy price signals to pass through to parties responsible for building energy use and set a baseline for the efficiency of the space provided. Make these the new leasing standard.
- **Target groups.** Tailor training and set targets based on key groups such as: a) community-based organizations to create energy champions at a local level, b) utilities, regulators and lenders on benefits, risks and right timing of deep energy savings, c) owners and operators on building asset value and ratings based on efficiency improvements and d) tenants and lease agents about green leasing and easy-to-implement principles for creating collaborative environments that make deep savings possible
- **Work through Trusted Sources.** Training and education can be most effective if it follows three pathways: 1) work with a trusted source (peer to peer and at a local level) that building owners and decision makers already rely on, 2) develop champions – train trainers from within trusted organizations, 3) implement market-oriented projects like the NEEA/BOMA Kilowatt Crackdown that showcase buildings achieving significant reduction in energy use.

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## Next Steps

All the working group recommendations warrant attention through various audiences and mechanisms. Many of the individuals, efficiency-related organizations and companies who attended the summit are diligently working on some of the identified areas.

The steps listed below represent the specific actions prioritized at the summit which NBI, with its partners, committed to moving forward in 2012 as part of a national **Deep Energy Savings in Existing Buildings Initiative**.

- 1. Develop Small and Medium Building Market Characterization.** Develop sets of building typologies to support identification of repeatable efficiency solutions and market priorities for small and medium buildings in the U.S.
- 2. Create New Technical Tools for Performance Review and Solution Strategies.** Develop and pilot new tools that provide initial direction on current performance and energy solutions to building owners, operators or contractors.
- 3. Partner with Urban Entities and Third Parties for Delivery and Aggregation.** Explore and support alternative and expanded delivery models through urban and regional entities, ESCOs and other third parties. These partners can be the pilot implementers of new tools and approaches and a forum for feedback to move greater portions of the marketplace.
- 4. Build the Business Case.** Work nationally with like organizations to increase business information, consistent performance and cost data, and project stories that represent a wide range of applications and are widely available and accessed by owners, design firms, operators, tenants, lenders and policy developers.
- 5. Explore New Regulatory Strategies.** A topic that deserves additional focus is modifying building code development or other regulatory mechanisms to more specifically impact existing buildings and capture additional savings.
- 6. Set Subsequent Summits and Establish a Networking Group.** The value of merging top thinkers for isolated periods of focus is immeasurable. Having impact from these efforts depends on representing and acting on the recommendations and continuing the dialog and network. NBI will create and host an e-forum network on existing buildings to coordinate approaches and a subsequent summit based on input from that group.

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Links to related work are located at [www.newbuildings.org/summit](http://www.newbuildings.org/summit), and NBI welcomes additional references.