business solutions for a sustainable world

EEB Laboratory Houston

Accelerating investment in Houston's energy-efficient buildings

Energy Efficiency in Buildings

wbcsd buildings

United States Business Council for Sustainable Development

WBCSD EEB 2.0 Project members active in EEB Laboratory Houston

Project leaders

United Technologies

Schneider Electric

AGC

LAFARGE

SIEMENS

EEB Laboratory Houston partners

HARC

nrg

Equilibrium Capital

PACE INTEXAS

Thompson & Knight Impact

Hines

SPEER

architend

Urban Land Houston Institute

Gensler

C40 CITIES

CITY ENERGY

RICE

KLEIN ISD

About the WBCSD

The World Business Council for Sustainable Development (WBCSD), a CEO-led organization of some 200 forward-thinking global companies, is committed to galvanizing the global business community to create a sustainable future for business, society and the environment. Together with its members, the council applies its respected thought leadership and effective advocacy to generate constructive solutions and take shared action. Leveraging its strong relationships with stakeholders as the leading advocate for business, the council helps drive debate and policy change in favor of sustainable development solutions.

The WBCSD provides a forum for its member companies - who represent all business sectors, all continents and a combined revenue of more than $8.5 trillion, 19 million employees - to share best practices on sustainable development issues and to develop innovative tools that change the status quo. The council also benefits from a network of 70 national and regional business councils and partner organizations, a majority of which are based in developing countries.
www.wbcsd.org

About the United States Business Council for Sustainable Development (US BCSD)

The US BCSD is an action oriented and member-led nonprofit business association that harnesses the power of collaborative projects, platforms and partnerships to develop, deploy and scale solutions to ecosystems, energy, materials and water challenges.

EEB 2.0 project members:

Lafarge (co-chair)
United Technologies (co-chair)
AGC
AkzoNobel
ARCADIS
ArcelorMittal
GDF SUEZ
Infosys
Schneider Electric
SGS
Siemens
Skanska

Contents

1 Executive Summary

Over three days during early October 2014, a private sector-led initiative brought together a diverse group of local stakeholders, thought leaders, and subject matter experts in the Houston market to define a set of ambitious, practical strategies for reducing building energy consumption by 30% or more.

The Energy Efficiency in Buildings Laboratory (EEB Lab) was convened by the World Business Council for Sustainable Development (WBCSD) and the United States Business Council for Sustainable Development (US BCSD) together with partners in the WBCSD's Energy Efficiency in Buildings market transformation initiative. The initiative addresses the challenge that globally, buildings are responsible for nearly one-third of final energy consumption (and over 40% of primary energy consumption) with a similar proportion of associated CO_2 emissions. The EEB Lab in Houston was the fourth such engagement by the WBCSD EEB 2.0 project, following San Francisco, Shanghai and Warsaw.

There is a powerful business case for more energy-efficient buildings. Houston's building energy consumption compared to that of transport and industry is 40% of final/primary energy consumption. A modest 25% energy efficiency improvement would save substantial sums for building owners and occupiers and contribute significantly to the spending power of consumers and businesses. The cost savings will free up cash for businesses to reinvest and consumers to spend on goods and services.

30% energy saving
20,000 new jobs

A vibrant market of more highly efficient buildings will bring jobs and other benefits for the city. A 30% energy saving in the commercial sector alone would translate into nearly 20,000 new jobs for regional energy efficiency contractors, the supply chain and the service sector over a five year period. The region would also be more competitive in attracting and retaining people because more sustainable cities with energy efficient and green buildings attract talented people and their families, especially the new generation of millennial workers.

51 million MWh

Houston has a strong economy and continues to expand, and energy efficiency is an effective solution to keep energy demand from exceeding current capacity. In 2013, Houston's main electricity generator, CenterPoint, delivered over 51 million MWh to its customers. The City of Houston permitted $7.3 billion in construction in 2013/14, a 39% increase over the previous year. Energy consumption is projected to grow significantly over the coming years, even if there may be a temporary impact from the drop in energy prices. An achievable increase in energy efficiency could avoid the need to invest in 10 mid-size power plants and free over half a billion dollars for other spending.

Houston has made progress on energy efficiency, particularly in Class A properties and through public initiatives. But the size and scale of the market means more is needed, with the involvement of the broader private sector. Houston follows some of the most progressive public policies and building energy codes for energy efficient buildings. It also leads through example by mandating LEED and Energy Star performance of its properties for public disclosure. Houston's residential building code is 15 percent above the minimum requirements of the International Energy Conservation Code (IECC). Further, its commercial energy code meets federal and state standards. Despite this foundation and the evidence for capturing value from energy efficiency, many Houston properties still waste energy and are not taking advantage of the multiple potential benefits.

$7.3 billion in construction

It will require a major effort to raise market awareness on energy efficiency, helped by the Mayor's commitment. It is clear that awareness of the potential benefits is a major barrier to greater energy efficiency. The EEB Lab occurred at an opportune moment, following the announcement by Houston's Mayor Annise Parker at the UN Summit on Climate Change in September 2014 that Houston would cut CO_2 emissions by 80 percent from 2005 levels by 2050.

Finance for energy efficiency and the essential practical knowledge and skills are in short supply. The general lack of energy efficiency capital means that upgrading buildings is difficult to finance. Several funding schemes are available but the level of funding is very low in comparison to the size of the market and may not be accessible for many properties. Operators are often unable to manage energy effectively and staffing is frequently inadequate. The result is that energy management is difficult for many Houston buildings to do.

Key Actions from the EEB Lab

During the EEB Lab, a team of experts representing the WBCSD member companies, regional stakeholders and global partners interviewed a cross section of Houston's real estate market. With Houston's developers, investors, designers, engineers, facility operators and tenants. They discussed with Houston's developers the business case for investment in energy efficiency of buildings for different stakeholder groups in the building value chain. These discussions confirmed four key areas for action to transform energy efficiency, which were the focus of the Lab sessions:

- Increasing awareness of market value to stakeholders through energy efficiency
- Investing and Financing
- Verifying value and return on investments
- Achieving appropriate policy and regulation

The Lab discussions elaborated concerns and barriers to energy efficiency in the Houston market, leading to recommendations for how to address them. Stakeholder groups are being formed to carry out the following actions. The WBCSD, US BCSD and the Houston Advanced Research Center (HARC) will manage a program in 2015 to create a stakeholder network to drive the activities in the Houston market around each of the four focus areas. Additional support will be built up to continue these initiatives beyond 2015.

ACTION 1

Raising awareness of the multiple benefits of EEB solutions

Create targeted marketing and messaging to motivate regional real estate professionals to take action on energy efficiency. In particular, focus on specific building owner classes that are less likely to invest in energy efficiency for their properties (Class B&C offices, retail sector, multi-family, etc.).

ACTION 2

Financing EEB solutions

Coordinate, foster development, and create greater access to energy efficiency financing options and tools, specifically targeting the class B-and below markets. All financial tools, such as utility on-bill financing, energy service agreements, and PACE financing options will be presented under an overall energy efficiency financing umbrella.

ACTION 3

Building capacity to deliver EEB solutions

Establish best practices around operations and strategic management, targeting the B-class (and lower) markets, including how to gain interest and reduce uncertainty in marketing energy efficiency investments within owner organizations. The goal will be to build credible capacity in the market to replicate and scale up the number of energy efficiency projects in Houston. This action will include evaluating how best to incorporate operator training, aiming to influence existing trainers, guiding them towards the market for lower class building owners and operators.

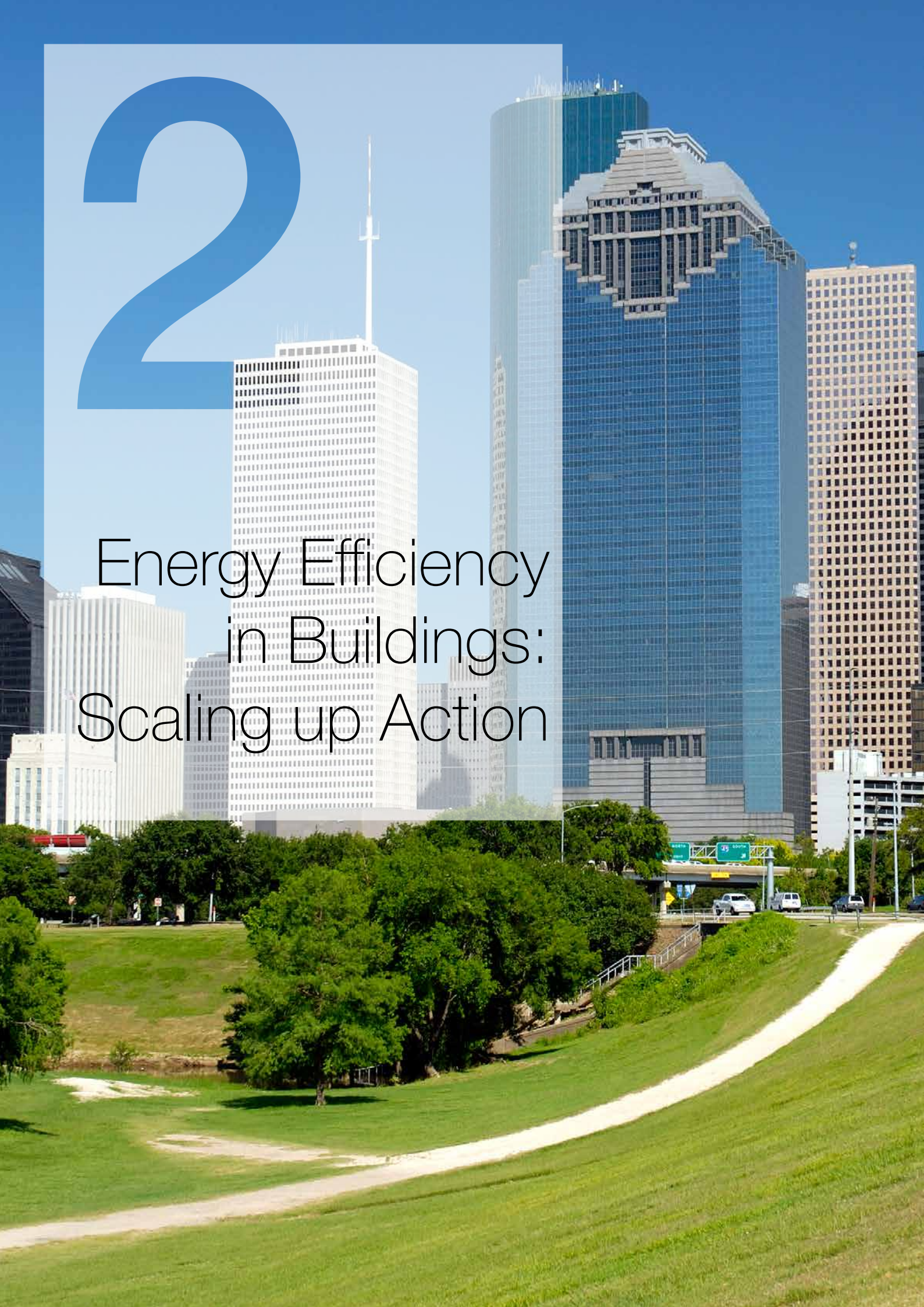
ACTION 4

Increasing Houston's real estate market competitiveness through innovative EEB policy solutions

Work with diverse regional stakeholders to develop public policy in tandem with the city and be a sounding board for proposed policy and regulatory action. The focus will be on creating business friendly policy and regulatory structures that will benefit the Houston market and increase the competitiveness of the regional real estate market. The aim is to attract and sustain private sector leadership with public sector support to reach Houston's goals, advocating how more effective policy/regulation makes good business sense.

2

Energy Efficiency in Buildings: Scaling up Action



Buildings are central to energy security and climate concerns

Buildings are the largest energy consumers in the world, accounting for more than one-third of all final energy use and approximately 30% of global carbon emissions. Energy-intensive sectors such as transport and heavy industry are more visible, but buildings have a major role to play in any corporate or national strategy to tackle climate change. This is why the WBCSD created the Energy Efficiency in Buildings (EEB) project – it is one of the key areas for action on energy security and man-made contributions to climate concerns.

Benefits of energy-efficient buildings

Energy efficiency saves money – American consumers and businesses could have more than $100 billion extra to spend on other goods and services from a relatively modest 25% energy efficiency improvement. Such savings would allow Houston's building owners and occupiers to spend more on local goods and services and reinvest in their businesses.

There are also many multiple benefits – the region's ability to attract new businesses and retain jobs will be enhanced, governments will have greater flexibility in their budgets, and utilities will save on generation and infrastructure costs. A 30% energy saving in the commercial sector alone could avoid the need to invest in 10 mid-size power plants, and contributing over half a billion dollars to the Houston economy. That saving could generate new jobs, in addition to the employment created by increased activity in energy efficiency retrofits and other energy services. A 30% energy efficiency investment could translate into nearly 20,000 new jobs over a five year period. And with 80% of the incoming millennial workforce wanting employment from companies and places that care about the environment, a more sustainable city would attract more young professionals.

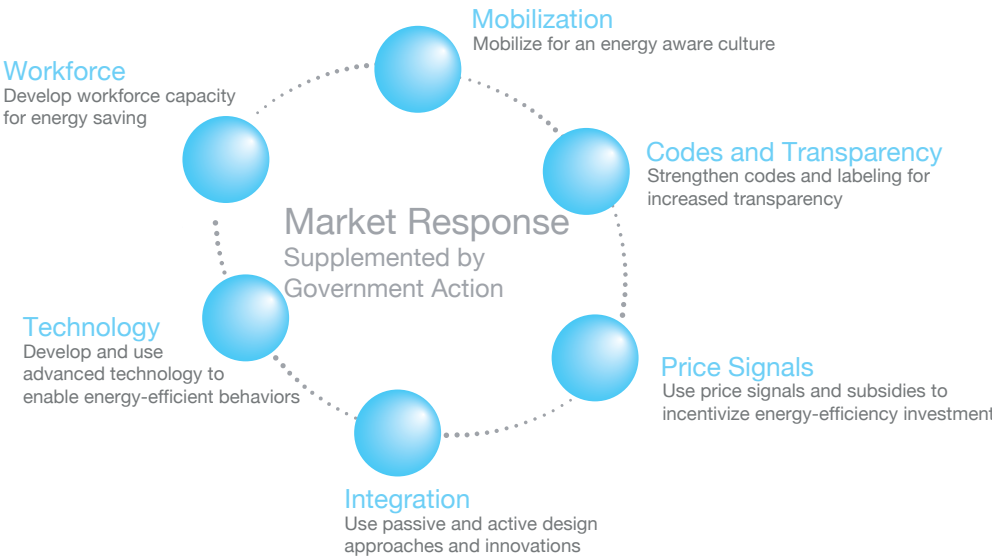
Overcoming barriers to transform the market

The first EEB project identified how to overcome barriers to energy efficiency in buildings, following a four-year research project. Transforming the Market made recommendations and created a roadmap to transform energy use in buildings. EEB showed that transformation requires action across the building industry, from developers and building owners to policy-makers.

From research to action in EEB 2.0

The second EEB project (EEB 2.0) began in 2013 to implement the recommendations and stimulate change. Its goal is to unlock financially viable energy-efficiency investments that are not being realized because of financial, regulatory, organizational and other non-technical barriers. EEB 2.0 is working with local and international stakeholders to develop the business case for energy efficiency in buildings with different groups of decision-makers and to provide recommendations for action.

Figure 1: **How to transform energy use in buildings**



Source: Transforming the Market, WBCSD, 2009

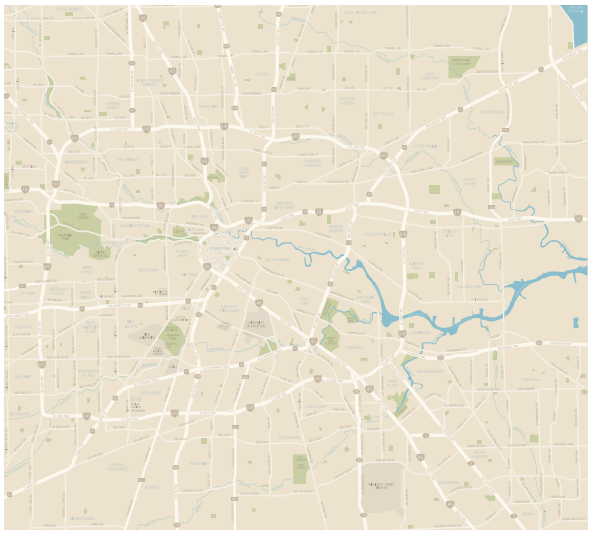
Engaging to activate the market through EEB Laboratories

EEB 2.0 has developed a structured, replicable stakeholder engagement process to diagnose and tackle key barriers to energy efficiency in cities and surrounding areas where commercial buildings are most concentrated. It is pioneering seven market engagements – in the US, China, India, Brazil, Poland, Benelux, and Indonesia/ Malaysia/Singapore. EEB 2.0 acts as a convener and facilitator, especially through the EEB Lab, which aims to:

- Build a clear understanding of the market, identifying local barriers and enablers that could drive change;
- Define actions to overcome barriers and catalyze enablers to assist in market transformation;
- Recruit key stakeholders to develop and implement an action plan for market-wide deployment.

The EEB Lab brings together local stakeholders and technical experts to pinpoint issues and priorities and create a coalition of actors who will drive transformation. This report presents the activities and outcomes of the EEB Lab in Houston on 8-10 October 2014, initiated by WBCSD together with its Global Network partner, the US Business Council for Sustainable Development (US BCSD).

3 The EEB Laboratory Houston



Cut CO_2 emissions by 80%

Why Houston?

The US BCSD and the WBCSD team used a comprehensive ranking of several key factors to select Houston. It was an excellent location for the EEB Lab because it has:

- a large, growing, and dynamic real estate market;
- a strong public sector intent on improving the market's perceptions of energy efficiency;
- regional private sector leadership in the area of energy efficient buildings;
- universities and research institutions providing expertise in energy and efficiency;
- a business presence of the project's WBCSD and US BCSD members and partners.

165,000 LED street light

A preliminary stakeholder meeting in May 2014 confirmed interest from the public and private sectors for Houston to be the focus of an EEB Lab.

Houston offers the challenge of a substantial physical footprint and a hot, humid climate. It has several high density commercial areas and a dispersed residential population, with high demand for space conditioning for much of the year.

The city's leadership has positioned the city as a leader in energy efficiency. Former Mayor Bill White aimed to transform Houston from "energy capital" of the world to "energy conservation capital" of the world. Current Mayor Annise Parker made a commitment at the UN Climate Change Summit in 2014 to cut CO_2 emissions by 80 percent from 2005 levels by 2050.

2.3 million smart meters

Already, emissions have fallen by 32% since 2007. The city has launched the largest (165,000) LED street light conversion in the country and more than 2.3 million smart meters have been installed. In 2013, the American Council for an Energy Efficient Economy ranked Houston 13th out of America's 34 largest cities. The city ranked 10th in the US for Energy Star certified buildings in 2014 and transactions of these properties were 50% higher than in the previous year.

10th in the US for Energy Star certified buildings

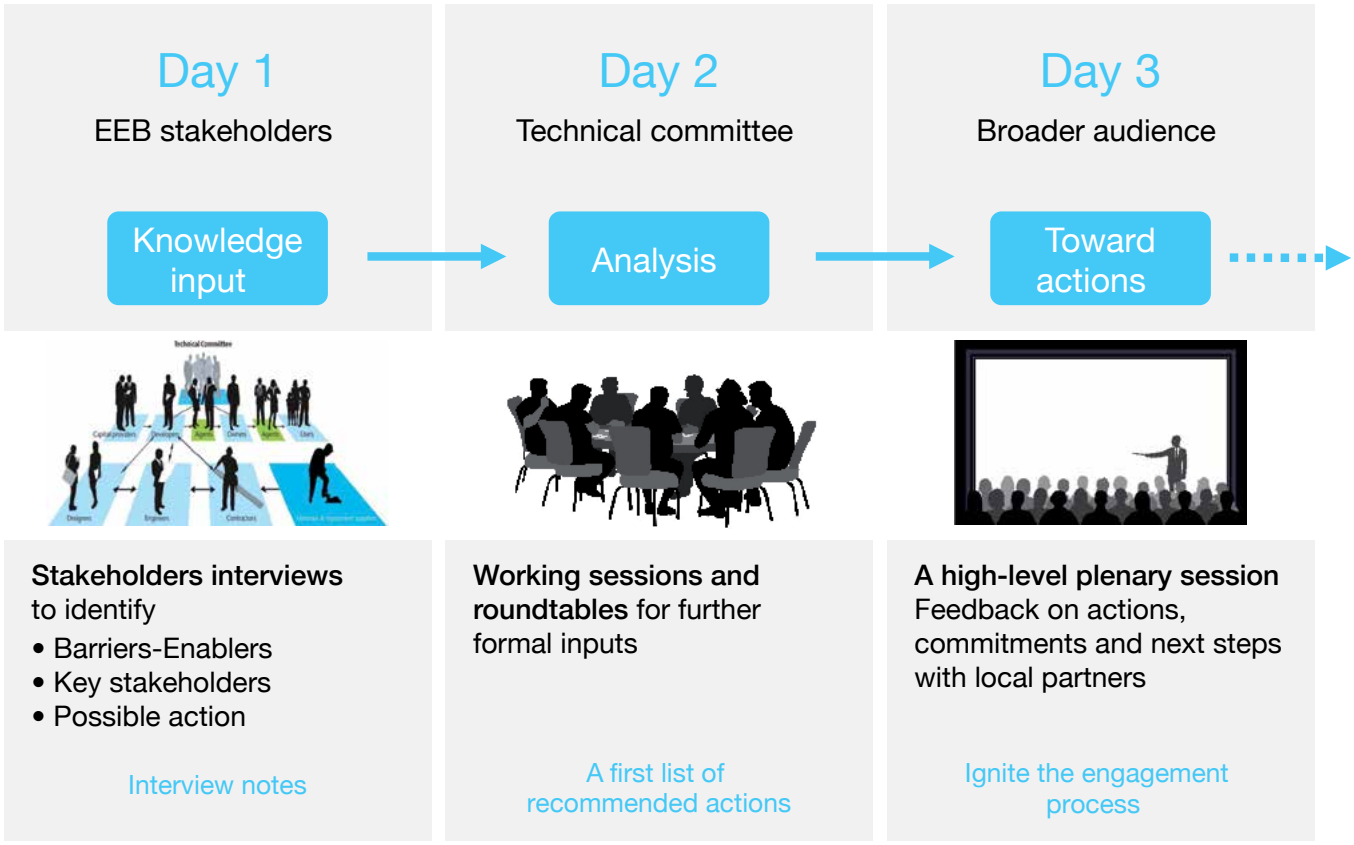
Houston in numbers

- 2.1 million population
- Area of 600 square miles with population density of 3,553 people/square mile
- Average daily temperatures range from a high of 85°F (29°C) in August to a low of 45°F (7°C) in January
- Gross Metropolitan Product on a par with the GDPs of Austria or Poland
- 23 Fortune 500 firms headquartered here
- $7 billion in permitted construction in 2013/14, a 39% increase over the previous year

The EEB Lab Process

The EEB Lab benefited from extensive preparation and the involvement of national and local partner organizations. It operated over three days. The Technical Committee interviewed 46 stakeholders and analyzed their contributions to identify common themes. This work fed into Roundtable discussions on day two. The final day brought together all participants and other invited guests in a high-level plenary session to discuss conclusions and seek commitment from participants to take action on the opportunities for improvement identified during the Lab.

Figure 2: The EEB Lab concept



Preparation

Several months ahead of the EEB Lab, a Steering Committee was formed to identify relevant stakeholders, recruit experts and thought leaders to support the Lab's Technical Committee, and plan the event. The Steering Committee consisted of Lilibeth Andre, Rice University; Steve Block, Thompson &Knight LLP; Gavin Dillingham, HARC; Caroline Keicher, Institute for Market Transformation; Ann Taylor, Urban Land Institute-Houston; and members from the US BCSD and WBCSD teams. A Houston Market Review was also commissioned to the Shell Center for Sustainability at Rice University to understand the current state of energy efficiency in the Houston real estate market.

A Technical Committee is central to an EEB Lab as it brings together national and international experts who help to define the specific Lab objectives, carry out interviews with local stakeholders, and consolidate findings into meaningful recommendations for commitments and action. The Technical Committee in Houston consisted of experts from approximately 30 organizations (see Table 1).

Table 1: Organizations represented on the EEB Lab Technical Committee

WBCSD Members	Laboratory partners
AGC	Architend
Lafarge	Equilibrium Capital (Cal)
Schneider Electric	Gensler
Shell	Hines
Siemens	Houston Advanced Research Center (HARC)
United Technologies – Research, Automated Logic and Carrier	Houston – Mayor's Office of Sustainability
	Keeping PACE
	Klein ISD
	NRG
	Rice University – Shell Center for Sustainability
	SPEER
	T&K
	Urban Land Institute
	USGBC – Gulf Coast Chapter
	Natural Resources Defense Council and Institute for Market Transformation as part of the City Energy Project
	C40 Cities
	WBCSD and US BCSD

Objectives

In preparation for the EEB Lab, the Steering Committee met to discuss the market situation, to identify key stakeholders, and to set the agenda and the participants. It agreed the following objectives:

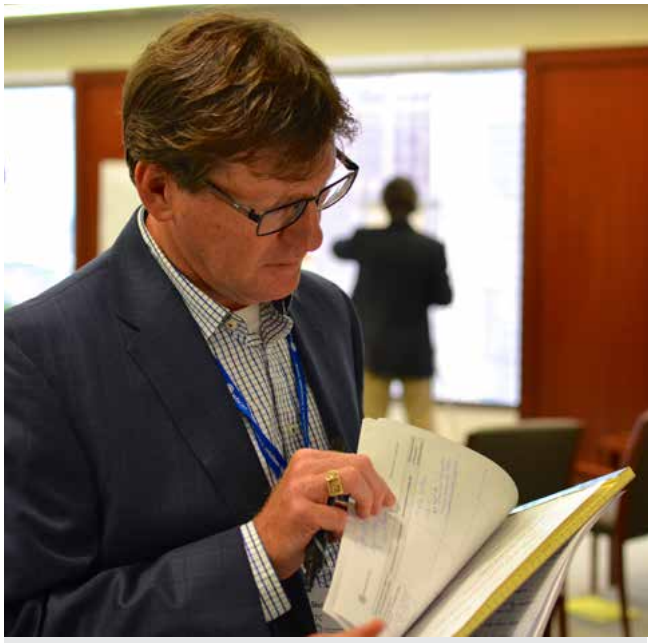
- Demonstrate the benefits of energy-efficient buildings to convince and commit stakeholders to invest in energy efficiency;
- Deliver a tangible energy efficiency in buildings action plan for Houston;
- Launch a self-sustaining stakeholder network with knowledgeable and skilled people who can connect with governmental organizations and drive a progressive agenda for energy efficiency in buildings.

Inputs

The *Market Review* produced by the Shell Center for Sustainability summarized available information to support the Lab process, providing background information for the interviews and the Roundtable discussions. The Market Review can be downloaded from http://www.wbcsd.org/buildings.aspx.

Interview candidates were provided with a short synopsis of the EEB Lab and the areas that would be covered in the interviews.

All Roundtable participants received a copy of a recent International Energy Agency (IEA) publication: "Capturing the Multiple Benefits of Energy Efficiency". It provides a comprehensive review of the co-benefits of energy efficient buildings, covering macroeconomic development, public budgets, health and well-being, productivity, and energy delivery. An IEA representative presented this document in a conference call.



Day 1 – **Interviews** hosted by Thompson & Knight ATTORNEYS AND COUNSELORS Impact

Technical Committee members (assisted by students from Rice University) held 46 one-hour interviews with stakeholders from across the building value chain. These interviews are a key element of every Lab, providing vital insights into barriers, enablers and actions relevant to the city.

Table 2: Organizations interviewed

Architects, design consulting	**Developers**	**Real estate advisors**	**Construction, Material/ components providers**	**NGOs**
Archi+Designers	Kensinger Donnelly	Avison Young		USGBC
Gensler	New Hope Housing	ERM	**providers**	HARC
Way Holding	Hines	Baker Katz		
Engineering	Trammell Crow	Moody -Rambin	Tellepsen	
Ascentergy	Metro National		Construction Services	**Academia**
Consultants	Cousins Properties		Schneider Electric	
Levinson Alcosar	Buckhead Investment	**Banks, capital and**	HTS Engineering	Rice
Associates	Partners	**finance providers**		
TEAM Solutions	McCord Development		**Facility managers**	
STG Design	Nexos Resource	Cadence Bank		**Owner Occupiers**
	Partners	Pecan Street	Houston Independent	
		Energy Corridor	School District	Shell
		Management District	Crimson Services	City of Houston
			CBRE	

Day 2 – Analysis and discussion

The Technical Committee consolidated the interview results. Cross-sector Roundtable dialogues then considered key barriers holding back green building investments. The Roundtables discussed central themes developed by the EEB 2.0 project to analyze the perceived and known barriers to energy efficiency investment. Each Roundtable had a group of experts and a facilitator. Technical Committee members spent time in each Roundtable to experience the diverse discussions.

The general objective for the Roundtables was to:

- Identify high level goals (3 maximum) that can be implemented within a reasonable timeframe;
- Propose corresponding action plans to achieve each goal and eliminate or reduce Houston's market barriers;
- Estimate the benefit of achieving each goal for the region's primary stakeholders.

These broad goals were translated into the following specific objectives for each Roundtable:

Roundtable 1: **Raising awareness of the multiple benefits of energy efficiency**

Chaired by Nathan Bailey, USGBC/Automated Logic Corporation

- Understand and articulate a comprehensive value proposition in the Houston market that defines and captures the full spectrum of "co-benefits" from EEB investments (e.g., occupant productivity, job creation, and reduced utility peak demand)
- Identify key actions needed to steer the market towards these considerations.

Roundtable 2: **Financing EEB solutions**

Chaired by Charlene Heydinger, Keeping PACE in Texas

Explore available financing options and discuss how to promote, pilot and scale their use with all building owners in the Houston area. In particular:

- PACE financing, which is expected to be implemented in Houston
- Ratepayer funded energy efficiency incentive programs
- Other mechanisms that may be able to break through the barriers commonly encountered in energy efficiency finance.

Roundtable 3: **Building capacity to deliver EEB solutions**

Chaired by Jonathan Wilson, Schneider Electric Corp.

Discuss how to verify that EEB investments deliver real returns which contribute to broader aspects of market and shared value, so that developers, owners, investors, and others will more readily implement energy efficiency in new construction and retrofits to existing buildings.

Roundtable 4: **Increasing Houston's real estate market competitiveness through innovative EEB policy solutions**

Chaired by Gavin Dillingham, Houston Advanced Research Center

Consider the existing policy and regulatory environment for energy efficiency in buildings in Houston and identify additional approaches appropriate for the region's market to address fundamental market failures while maintaining a competitive business climate.

Day 3 – **Plenary** hosted by

The Lab culminated in a high-level closing plenary, discussing the significant opportunities in the market, key findings from the Lab and a call to action for Houston to take forward the momentum developed during the Lab to move the market. Approximately 100 Houston-area business leaders, government representatives, and academic experts took part.

Table 3: The Houston EEB lab Plenary agenda and distinguished speakers

Plenary Opening
Speakers: Andy Mangan, US BCSD; Roland Hunziker, WBCSD; John Anderson, Rice University, Laura Spanjian, City of Houston

The Business Case for Energy Efficiency
Gerald Hines, Chairman and CEO, Hines; Andy Kitchens, Hines (as interviewer)

Key Findings from the Houston EEB Laboratory
Bill Sisson, United Technologies (UTC); Harvey Dunham, Schneider Electric; Nathan Bailey, USGBC/Automated Logic (UTC); Charlene Heydinger, Keeping Pace in Texas; Jonathan Wilson, Schneider Electric; Gavin Dillingham, Houston Advanced Research Center (HARC)

Private Sector Call to Action
Speakers: Doug Schuler, Rice University (moderator); Chuck Wemple, Houston-Galveston Area Council; Walter Ulrich, Houston Technology Center; Nisha Desai, NRG;

Wrap Up & Next Steps
Speakers: Andy Mangan; Roland Hunziker

Gerald D. Hines, founder and chairman of Hines, gave a keynote talk focused on the business case for energy efficiency. Mr. Hines' vision, innovative spirit, and enduring advocacy for energy efficiency has helped Hines become a global real estate leader and role model for others.

Mr. Hines emphasized the importance of considering the total energy needed to produce and operate a building. He also stressed the need to take technical risks to achieve energy efficiency, and how open channels of communication between designers and building operators help encourage a cycle of constant improvement.

On cap rate, Mr. Hines noted that, ***"when we [Hines] decide to sell a building, we get the best cap rate because we have good efficiency in the way the building operates, and people know that it's at least one of the top rated buildings, which means a lot to financial institutions."***

In the broader landscape of energy efficiency in buildings, Class B&C building owners will be a key target market to engage. Mr. Hines recommended that to communicate the value of energy efficiency to B&C building owners, the major value premise is demonstrating that energy efficiency improvements will positively impact the liquidation of the building when it comes time to sell.

Media interest

Raising awareness and increasing market knowledge on energy efficiency in buildings is fundamental to extend market participation and support the EEB Lab's objectives. The Lab organizers retained a marketing firm, Androvett Legal Media and Marketing, to help raise market awareness for the Lab and increase interest in participation.
As a result, the Houston Chronicle ran stories on the first day of the Lab and a report in the Real Estate section following the concluding Plenary.

"Classy old buildings strive for modern energy efficiencies", October 7, 2014

"Energy Efficiency 'Makes Business Sense', October 10, 2014

Table 4: A plenary conversation

The plenary included a conversation between Nisha Desai of NRG, Walter Ulrich from the Houston Technology Center, and Chuck Wemple of the Houston-Galveston Area Council, including these extracts:

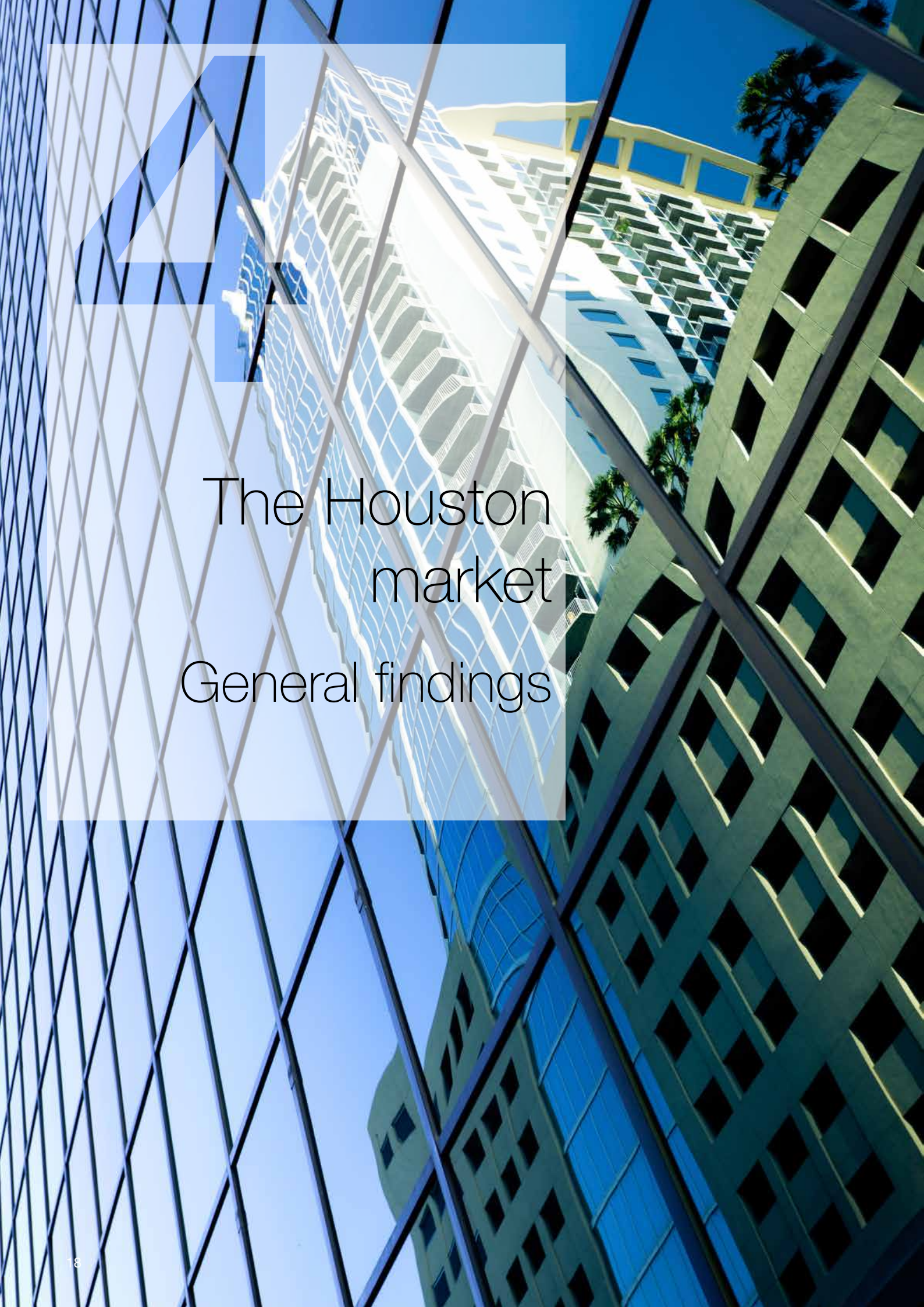
Walter Ulrich: Energy efficiency has to make economic sense, and economic incentives have to work.

Nisha Desai: Value to stakeholders is important. It'd be great if doing the right thing actually generates large savings too. Being able to get the value proposition right for all the stakeholders is key…. The business case for B and C class buildings really revolves around the ability to charge lower rents and attract tenants.

Chuck Wemple: You need to pitch this to B and C properties that want to be competitive and improve their grade.

Walter Ulrich: You need to find every possible way to tell the story, and engage local partners to share the story.

Nisha Desai: A fundamental challenge is connecting good behavior to the tenant. You need innovative programs to involve the building occupants. It's important to differentiate between energy efficiency and energy conservation. Conservation implies sacrifice of comfort or output. Efficiency is keeping output the same, but reducing what needs to go in via efficiency improvement. It's an important distinction.



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The Houston market

General findings

Houston differs in several respects from other large cities in the US, including its strong industrial base due to its status as a major port and the high concentration of petrochemical facilities. The city has a solid foundation of energy efficiency work on which to build in its residential, commercial, government, and educational buildings. City government, corporate headquarters occupants, and many Class A office owner/operators have led by example. Building energy codes in the city are strong and home builders have widely adopted green building certification standards. More than 2.3 million smart meters have been installed in the city but there is still a challenge in motivating customers to access and use the data to capture energy savings.

The existing building stock, however, particularly in the low to moderate income residential and Class B and C commercial sectors, needs greater attention. Some B-class owners are taking action and this can be a demonstration to others that there is value in energy efficiency in this part of the market. See press articles from Houston Business Journal:

"How to make your Class B commercial property look Class A", Dec 3, 2014
"Older downtown building ups the ante on green features to stay competitive", Dec 2, 2014

Finance

The general lack of energy efficiency capital means that upgrading buildings is difficult to finance. A commercial Property Assessed Clean Energy (PACE) program under development for Houston may enable greater penetration of energy efficiency improvements in existing buildings.

Houston used a $23 million federal grant in 2009 for the Residential Energy Efficiency Program (REEP) for home weatherization, aimed at low to moderate income families. The city continues funding for home weatherization through a partnership with CenterPoint Energy's Agency in Action program. CenterPoint, the city's transmission and distribution utility, offers 11 programs for residential building energy efficiency, the most popular being the Energy STAR homes MTP, used mostly by commercial home builders.

Several utility-administered building energy efficiency programs exist but the amount of funding is very low in comparison to the size of the market. City incentives such as LEED tax abatements are focused on larger buildings and therefore not accessible to much of the market. CenterPoint offers six programs for building energy efficiency in the commercial sector but at about $14M this barely scratches the surface of the potential market. Houston only offers capital finance support in the commercial sector for very large projects and banks do not offer any special package. The City supports the LEED Tax Abatement Program for projects costing a minimum $1 million and offers a rebate of permitting for LEED certification.

Building class definitions

Class A
Most prestigious buildings competing for premier office users with rents above average for the area. Buildings have high quality standard finishes, state of the art systems, exceptional accessibility and a definite market presence.

Class B
Buildings competing for a wide range of users with rents in the average range for the area. Building finishes are fair to good for the area and systems are adequate, but the building does not compete with Class A at the same price.

Class C
Buildings competing for tenants requiring functional space at rents below the average for the area.

Building codes

Energy efficiency is governed by Federal, State and City codes.

Federal

Current goals in accordance with the International Energy Conservation Code (IECC) 2006 and 2009 and the ANSI/ASHRAE/IESNA Standard 90.1-2004 and 90.1-2007:

- 50% energy savings over the 2006 IECC for residential buildings and Standard 90.1—2004 for commercial buildings;

- Adoption of the 2009 IECC for residential buildings and Standard 90.1—2007 for commercial buildings by 70% of U.S. states and territories by 2015;

- A 90% compliance rate with the 2009 IECC for residential buildings and Standard 90.1—2007 for commercial buildings – by 2017.

The U.S. General Services Administration (GSA) is responsible for the federal government's buildings portfolio. In 2010, GSA adopted the LEED Gold certification standard as the minimum in all new federal building construction and substantial renovation projects (Beatty 2010).

State of Texas

The codes currently in place are:

- 2009 International Residential Code (IRC) - Effective since January 1, 2012, for all residential construction, one and two family residences of three stories or less above ground;

- 2009 IECC - Effective since April 1, 2011 for commercial, industrial and residential buildings over three stories.

ASHRAE/IESNA 90.1-2010 - Effective since September 1, 2011 for State-funded new construction or major renovation costing $2M or more

City of Houston

The City has adopted the USGBC's LEED 2 certification standards for new or replacement facilities and major renovations for city-owned property with more than 10,000 square feet of occupied space.

In 2014, the city increased the Houston Residential Energy Conservation Code to 15 percent above the minimum energy efficiency level mandated by the IECC 2009. This is for one and two-family homes, townhouses and apartments up to three stories.

The Houston Commercial Energy Conservation Code, enacted in 2011 is based on ANSI/ ASHRAE/IESNA Standard 90.1–2007 or 2009 IECC and covers new commercial construction only. There is a Cool Roof requirement attached, with requirements for new commercial buildings and multifamily structures over 3 stories or roof replacements for the same types of structures.

building sectors

Residential
The City had more than 900,000 housing units of which 770,000 were occupied, split 45% owner occupied and 55% rented, and including a relatively high percentage (50%) of single family detached housing. They are typically relatively modern, with a median construction year of 1976. The stock is expanding rapidly – in 2013, Houston led the country in single family home starts with 28,339 units, a 20% increase on 2012.

Five multifamily residential units (three of which belong to Rice University) were LEED certified in 2014 and a further 13 were seeking certification. The Greater Houston Builders Association has a green homes certification program called Green Built Gulf Coast which follows the ANSI-approved National Green Building Standard International Code Council. Since 2010, 11,000 homes have been certified.

Commercial
The city has up to 700 million square feet of commercial space. This included 265 million square feet of rentable area in 2013 and 1 million square feet of construction planned. It was fourth in a ranking of cities adopting green building standards. A total of 182 LEED certified projects accounted for 81,604,331 square feet of commercial space at the end of 2013 and an additional 222 projects were awaiting LEED certification. There were also 320 ENERGY STAR certified commercial buildings at the end of 2013.

Government buildings
All new City buildings and major renovations are required to be LEED certified and there were 23 LEED certifications out of 340 city-owned buildings in 2014. The City has benchmarked all of its buildings in EPA Portfolio Manager, and in November it disclosed the energy use intensity (kBtu / square foot) for all of its properties larger than 25,000 square feet, approximately 5 million square feet.

Houston has purchased more than 140 MW of Green E-Certified Renewable Energy Credits (RECs) for 2013 to 2015, making it the largest municipal purchaser of green energy in the country and supplying approximately half of its energy needs.

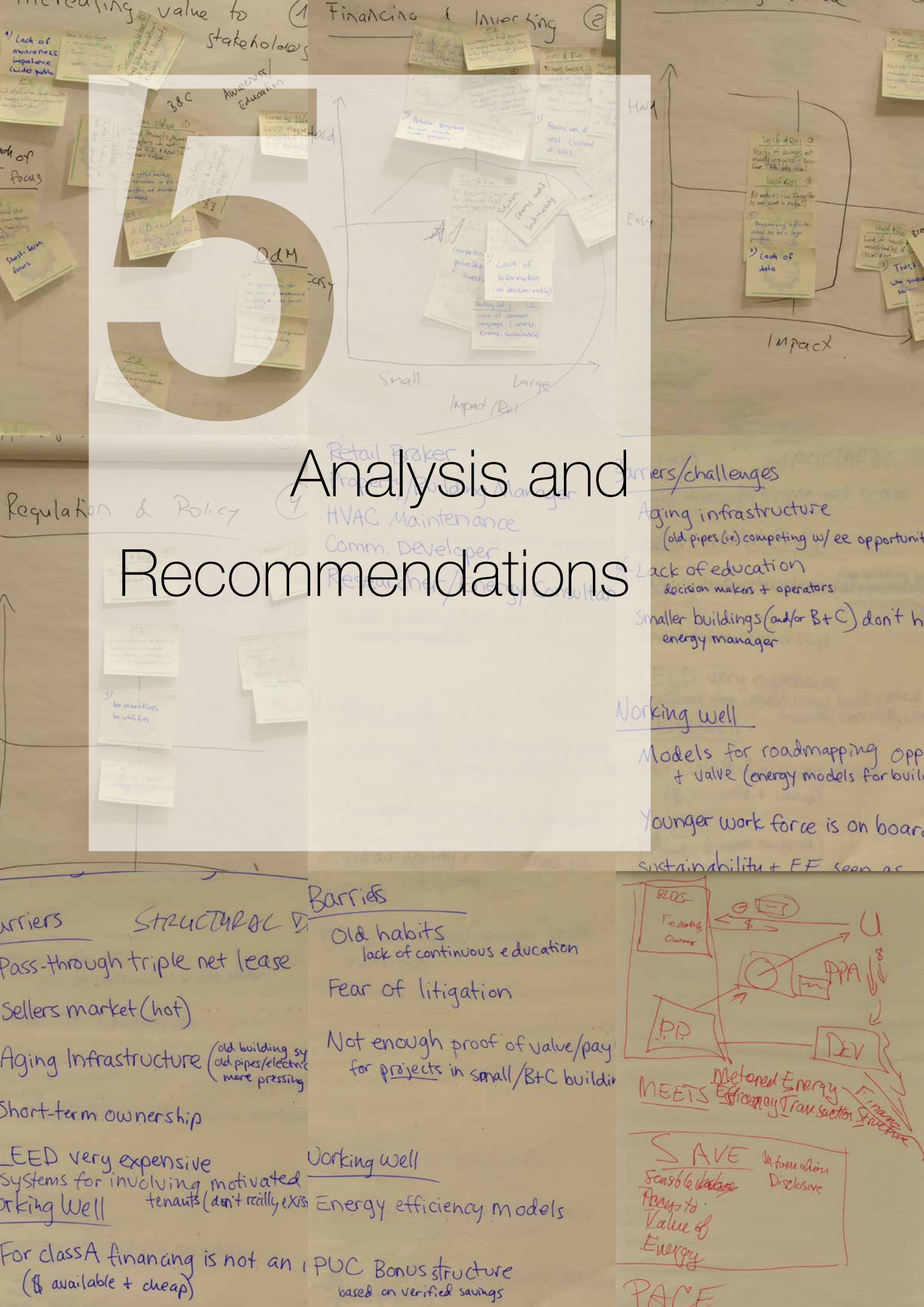
Houston has used the low-interest federal Qualified Energy Conservation Bonds for Energy to finance energy efficiency capital expenditures in libraries and other public buildings. The City has an energy performance contracting project which is upgrading operations in 262 facilities with 7.1 million square feet of space. Since 2009 the City has saved more than $9 million and 56,000 MWh. The savings pay the debt service and finance further energy management and investment.

Education Institutions
The education sector has made progress on energy efficiency, as shown in these examples:

- The Houston Independent School District (HISD) is responsible for 276 schools, 25 of which were LEED certified or pending certification in 2014. HISD has benchmarked all its facilities, undergone energy master planning and implemented a behavioral change program.

- Rice University has approximately 84 buildings with a gross size of 5,930,533 square feet, 11 of which are LEED certified. It gets more than a quarter of its electricity needs from a cogeneration plant on campus fueled by natural gas, which uses waste heat for heating and cooling.

- The University of Houston has a roof-mounted solar panel system with 88 large photovoltaic panels producing approximately 23,600 kilowatt hours (kWh) annually. It has audited 19 campus buildings, representing over 2 million square feet and has achieved energy savings of almost $500,000. The university is implementing a phased installation of approximately 170 electric, chilled water, domestic water and steam meters.


5
Analysis and Recommendations
Financing & Investing
Regulation & Policy
Barriers/challenges
Aging infrastructure
Lack of education
decision makers + operators
Working well
Barriers
Old habits
lack of continuous education
Fear of litigation
Working well
Energy efficiency models
PUC Bonus structure
based on verified savings
Impact
Small
Large
Easy
PPA
PACE

During the EEB Lab, the Technical Committee analyzed the information gathered in the interviews to identify barriers and successes in relation to each of the four roundtable topics. To identify priorities, they rated the timescale for implementing a solution to a key barrier and the corresponding impact. Actions that would have high impact in the short to medium term are the highest priorities for the post-Lab task force.

The key outcomes around the four roundtable topics as well as the recommendations for action are detailed below. The latter include a detailed plan created by a sub-group of the Technical Committee after the EEB lab. They aggregated the individual recommendations to create high-level actions for each roundtable topic – articulated around four Focus areas. These consolidated actions are designed to build on the strong position that Houston has already established and create significant additional benefit for Houston's economy and the region.

Proposals for specific sectors have also been developed (see p 27).

The interviews: **Top 10 issues**

Awareness of the multiple benefits of EEB solutions

1 Class A office buildings compete on certification and benchmarking and LEED has effectively become the base standard of the Houston Class-A real estate market;
2 Lower tier owners and occupiers are less aware of the role and importance of building energy efficiency and do not have the scale or structure to pursue energy efficiency investments;
3 Replacing broken equipment tends to be piecemeal and decision makers don't have the awareness and/or finances to look at holistic efficiency strategies;

Financing EEB solutions

4 Incentives do not go far enough for smaller commercial building owners and operators;
5 Innovative financing approaches are limited and PACE financing regulations in Texas were unfamiliar to many of those interviewed;
6 Risk aversion inhibits recommending or investing in energy efficiency technologies unfamiliar to the market;
7 Lease structures inhibit energy efficiency investments because of the split incentive between landlord and tenant and the structure of payments.

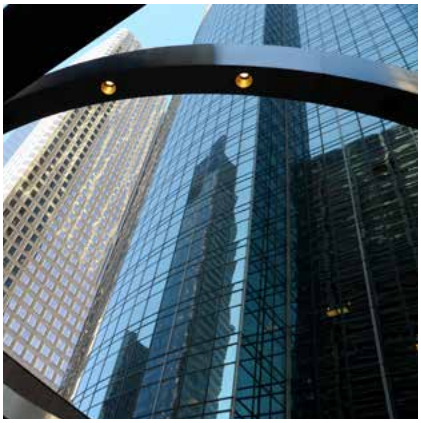
Building capacity to deliver EEB solutions

8 Limited operator and contractor capacity, knowledge and training is an impediment to reaching or maintaining high energy performance and can compromise the potential of an investment;

EEB policy solutions

9 Energy information and access to the data is difficult;
10 Houston has provided model examples and resources to raise awareness of energy efficiency in buildings and has some of the most progressive building codes but reach and enforcement have been limited;

See Appendix 1 for a fuller summary of interview responses, arranged according to stakeholder group.



Sector-specific recommendations

Market sectors face different challenges which call for specific solutions that address each sector's unique characteristics. The following recommendations address four key market segments.

Commercial Office

- Reinvigorate the Class A office market
- Increase energy efficiency investments among Class B and C markets
- Create "cooperatives" for smaller scale owners/operators to leverage purchasing power under aggregated efficiency programs
- Use district models and Green Bonds to create financial capacity and scale improvements with favorable financing
- Create competitions within sub-sectors
- Run marketing campaigns around properties that will attract a new class of tenants, business interests, and business models
- Promote energy efficiency for Class B/C through chambers of commerce and at owner/manager trade functions which attract small businesses

Multifamily Residential

- Develop lease structures that favor efficiency investments
- Extend tenant metering and controls
- Increase disclosure for property comparisons
- Promote the attractiveness of energy efficient residential spaces
- Promote the new ENERGY STAR program for multifamily as a marketing advantage

Retail

- Promote the superiority of retail centers with ENERGY STAR performance
- Increase market awareness and demand for retailers who integrate sustainability
- Demonstrate the lower operating costs from energy efficiency and the effect on increased margins
- Promote the multiple benefits of low-energy display controls (e.g. colorized LED systems)
- Highlight lower HVAC and refrigeration costs associated with lower lighting loads
- Show how sales can be improved by having an energy smart building.

Education

- Highlight the potential for energy cost savings to contribute to teacher salaries and capital programs
- Educate teachers and students on the benefits of energy savings, possibly integrated in the curriculum.
- Create a tool that links maintenance budgets with operating budgets to encourage co-operation and trade-offs
- Establish the link between more efficient and better-conditioned buildings and increased student performance, less illness and reduced absenteeism.
- Benchmark schools against each other
- Ensure that custodian staff are educated on energy efficiency
- Create district pilots and centers of excellence to showcase the direct and co-benefits from energy efficiency programs.
- Use Energy Service Companies to work with school districts under multiple contracts, aggregating the benefits from individual schools.

Focus area 1 Raising awareness of the multiple benefits of EEB solutions

Key outcomes

- **Stakeholders have varying perceptions of the value of energy efficiency.**
    - **Developers, managers and occupants of Class A office space** in Houston have accepted sustainability and energy efficiency as a requirement for a property to command higher market rates and attract employees;
    - **Significant differences exist among building owners** regarding their understanding of the total value of energy efficiency, including not only the economic benefit, but also the co-benefits such as increased worker productivity, reduced absenteeism and higher rental rates. Some knowledge of these benefits is seen in the Class A building owners, but to a lesser degree with Class B and C;
    - **Tenants,** in particular, need to be educated in the benefits of greater efficiency so they begin to demand it in their buildings. They need to understand that energy efficiency can provide a bundle of benefits - cost savings, greater comfort, and a more satisfied and productive work force.
- **Communicating market value to the B and C segments is a critical factor.** The focus should therefore be on these harder-to-reach and harder-to-convince segments of the market, such as Class B and C office buildings.

Recommendations

- **Increase awareness for all stakeholders** and especially for building owner classes that are currently less likely to invest in energy efficiency (Class B&C offices, retail sector, multi-family).
- **Education and capacity building** for building owners, operators, tenants and service providers is key to moving the market forward. A comprehensive set of educational material and tools that are easily accessible and applicable should be developed to foster market development. Further, the material must be organized in a way that allows the entire energy efficiency ecosystem to be understood as an interrelated system of choices and activities that influence all actors in the market. A comprehensive understanding of the entire energy efficiency ecosystem will allow all actors within the system to better develop and implement cost effective projects that take into account the entire life-cycle of a project from design, procurement, installation and operations. This would include:
    - ✓ Identify, develop and publicize best practices and energy efficiency information for business case development and access to services for specific building subsectors.
    - ✓ Develop road maps for different commercial building sectors and energy efficiency actors.
    - ✓ Develop and implement a communication plan so that the right messages will be broadcast through the right media channels to reach the right property owners.
    - ✓ Foster a collaborative approach with property owner associations to share and disseminate information via speeches, workshops and seminars.
    - ✓ Develop a dynamic repository of case studies and information material that can be used by all actors in the energy efficiency value chain to develop cost-effective, sustainable energy efficiency programs.

As many sources are already available with useful information and best practice data, the group can use this information along with other resources and expertise to develop powerful and meaningful messages for property owners and occupiers interested in energy efficiency investments. In this way, the group will catalyze a “movement” to drive the energy efficiency campaign across a broader cross-section of property types in the Houston regional marketplace.

The group carrying forward these recommendations will consist of key educators, communications and media professionals, real estate professionals and service providers from the Houston market.

Focus area 2 Financing EEB solutions

Key outcomes

- The main barriers to energy efficiency investment are the long payback period, competing investment priorities, balance sheet restrictions, and split incentives;
- Risk aversion to investing in measures and lack of financing/ incentives are relevant, especially for the B and C market;
- Class B and C properties may not fully realize the financing opportunities that exist, and if they do, may not be certain of how to access these markets. For some, this may include a lack of understanding of how to develop an appropriate business case to take the bank or financial institution that would allow the lender to fully appreciate the benefit and risk of such a project.
- Simpler ways are needed to turn disaggregated value flow into long-term aggregated cash flow to overcome balance-sheet limitations.

The roundtable discussed in detail two promising models for financing investments in energy efficiency for buildings:

- Property Assessed Clean Energy (PACE) - The State of Texas has passed legislation enabling municipalities to implement PACE and Houston is developing its own program. (See http://www.keepingpaceintexas.org/)
- Metered energy efficiency transaction structure (MEETS) – a method of bringing together a utility, investor and building owner or occupant to ensure the investor receives the returns from energy savings (See http://www.meetscoalition.org/how-meets-works)

Recommendations

- Coordinate, foster development and create greater access to energy efficiency financing options and tools, specifically targeting the class B-and lower markets. All financial tools, such as utility on-bill financing, energy service agreements, and PACE financing options will be presented under an overall energy efficiency financing umbrella.
- Explore financing options and innovations including broader utility structured financing, incentives, and other means. The PACE financing model addresses the main barriers identified and its implementation in Houston should be accelerated but other financing models should also be explored.
- Compile, assess and recommend financing tools to support financing due diligence and business case development that will support investment decisions.
- Compile, assess and recommend compelling business case templates that can be used by an owner to take to the bank or financing institution. The intent is to also ensure bankers understand the importance, risks and benefits of energy efficiency financing.
- Develop workshops bringing together Energy Efficiency Solution Providers and financiers to highlight the information financiers need from solution providers to maximize the chances that an energy efficiency project will get financing. This information will also be made available to Focus Area 1 for raising awareness and coordinated communications. We expect businesses that serve the audit and financing market will participate in or organize workshops which will develop informed clients and create new sales channels.
- Publish classification and audit program information and tools to support financing due diligence and business case development that will support investment decisions.

The group acting on Focus Area 2 plans to engage with experts such as the Investor Confidence Project (ICP) (http://www.eeperformance.org) to benefit from their experience and guidance, as ICP has worked on Keeping Pace in Texas and similar projects nationally to unlock private sector financing.

Focus area 3 Building capacity to deliver EEB solutions

Key outcomes

- Operators are often pulled in different directions in reaction to tenant complaints, and staffing is frequently inadequate. The result is that many buildings in Houston are not properly managed. In the long run, operating the building at maximum efficiency should replace the reactionary mode and lead to better workplaces overall.
- Rather than view maintenance issues and equipment replacements in terms of simple payback, operators should be able to see the value proposition in terms of life-cycle costs.
- To optimize building operations, better access to and trust in data is necessary, including improved and lower-cost data collection methodologies;

Recommendations

- Establish best practices around operations and strategic management, targeting the B-class (and lower) markets, including how to gain interest and reduce uncertainty in marketing energy efficiency investments within owner organizations. The goal will be to build credible capacity in the market to replicate and scale up the number of energy efficiency projects in Houston.
- Develop specific case studies and guide books for building operators (separate from the material for building owners under focus area 1) to optimize building operation and maintenance practices.
- Identify, assess and recommend best practices in energy data management to strengthen building operators' ability to read and evaluate data.
- Identify and/or develop business case development tool for building operators to convince building owners of the benefits of an energy efficiency project.
- Identify, assess and recommend training organizations to provide training for the building operators class. Training should include understanding the nature of energy efficiency investments, approaches for achieving maximum value and how to realize and sustain energy savings. Night classes and the services of chambers of commerce will be considered to address the time constraints of smaller business owners.
- Support the energy awareness program: *Houston Green Office Challenge* of the city of Houston by engaging the private sector.

Proven tools such as Energy Star (http://www.energystar.gov/buildings/tools-and-resources/energy-program-assessment-matrix-excel) will be considered to avoid re-inventing the wheel in driving these recommendations.

Focus area 4 Increasing Houston's real estate market competitiveness through innovative EEB policy solutions

Key outcomes

- There is little or no transparency on energy use in the Houston market, particularly for multi-tenant building owners. Better data is necessary:
  - to help with benchmarking, which is currently difficult, particularly in the small and mid-sized commercial sectors;
  - to understand the cost of building ownership when buying buildings;
  - to identify and prioritize potential energy efficiency projects;
  - to build a business case for energy efficiency projects.

Leading By Example with Energy Data Transparency

The City is helping to build capacity by disclosing data and providing training. It also demonstrates the benefits from benchmarking and disclosure and shows how competition between departments is cutting energy waste. Voluntary programs such as the Houston Green Office Challenge (HGOC) and Lights Out Houston are good models and HGOC does provide for private disclosure, although this is limited.

- The City of Houston has some of the most advanced and progressive building energy codes in the state. The more advanced building energy codes and their continuing improvement due to competition among cities is positive. However, this competition-driven evolution makes it difficult for project developers, builders and equipment vendors to keep up with standards due to the fairly frequent changes.

- State buildings – including universities, health care, state offices – are required to follow the state code and not the more stringent city code, which results in buildings potentially not being as efficient as their non-governmental counterparts.

- The voluntary certification scheme (LEED) is complex and expensive for B- and C-Class operators.

- Energy Efficiency Resource Standard (EERS) goals are low, limiting the availability of funds. EERS, which shapes the energy efficiency incentive program (EEIP) for utilities, was the first in the country when it was passed in 1999. But the goals are not ambitious enough and the funding available is not enough to transform the market. Incentives are quickly oversubscribed because the cap on EEIP limits the amount of funding that is available for energy efficiency.

Recommendations

- The group taking forward these recommendations will help bring together the stakeholders, provide guidance to the city, and be a sounding board for encouraging market transformation through proposed policy and regulatory action.

  The focus will be on creating business-friendly policy and regulatory structures that will benefit the Houston market and increase the competitiveness of the regional real estate market. The aim is to attract and sustain private sector leadership with public sector support, typical of public-private co-operation in Houston and Texas. This is about advocating how more effective policy/regulation makes good business sense.

Benchmarking and Transparency

- Develop policies promoting and transparency of building performance. This could be done by a coalition of city leaders, developers, owners, and others. This coalition could learn from and follow the example of cities such as Chicago and Austin which can now demonstrate the value of transparency.

Energy Codes and Certification

- Allow greater involvement of the private sector in the development of code changes to instill greater private sector commitment and compliance.

- Provide more training opportunities for designers, vendors and installers, and ensure training prepares building operators and facility managers to keep up with the continual advances in building technology.

- Require state facilities built in Houston to meet the more stringent energy requirement of the state and local codes.

- Encourage the use of free tools such as Energy Star to help smaller organizations which are discouraged by the cost and complexity of LEED.

Energy Efficiency Resource Standard (EERS)

- Work with the legislature and the Public Utility Commission of Texas to increase the goals of EERS and the funding available.

Actions to transform energy efficiency

01

Focus area 1 - **Raising awareness of the multiple benefits of EEB solutions**

The group in this focus area will consist of key educators, communications and media professionals, real estate professionals and service providers from the Houston market.

Commitments from Focus area 1

1 Identify, develop and publicize best practices and energy efficiency information for business case development and access to services for specific building subsectors.

2. Develop road maps for different commercial building sectors and energy efficiency actors.

3. Develop and implement a communication plan so that the right messages will be broadcast through the right media channels to reach the right property owners.

4. Foster a collaborative approach with property owner associations to share and disseminate information via speeches, workshops and seminars.

5. Develop a dynamic repository of case studies and information material that can be used by all actors in the energy efficiency value chain to develop cost-effective, sustainable energy efficiency programs.

02

Focus area 2 - **Financing EEB solutions**

The group in this focus area will engage with experts such as the Investor Confidence Project (ICP) (http://www.eeperformance.org) to benefit from their experience and guidance, as ICP has worked on Keeping Pace in Texas and similar projects nationally to unlock private sector financing.

Commitments from Focus area 2

6 Coordinate, foster development and create greater access to energy efficiency financing options and tools, specifically targeting the class B - and lower markets.

7 Explore financing options and innovations including broader utility structured financing, incentives, and other means and broader private sector financing options such as the PACE and MEETS[1] financing models.

8 Compile, assess and recommend financing tools to support financing due diligence and business case development that will support investment decisions.

9 Compile, assess and recommend compelling business case development tools and templates that can be used to support investment decisions by an owner when taken to the bank or financing institution.

10 Develop workshops bringing together Energy Efficiency Solution Providers and financiers to highlight the information financiers need from solution providers to maximize the chances that an energy efficiency project will get financing.

[1] Metered Energy Efficiency Transaction Structure

03

Focus area 3: **Building capacity to deliver EEB solutions**

Commitments from Focus area 3

11 Establish best practices around operations and strategic management, targeting the B-class (and lower) markets, including how to gain interest and reduce uncertainty in marketing energy efficiency investments within owner organizations.

12 Develop case studies and guide books for building operators to be used to optimize building operation and maintenance practices.

13 Identify, assess and recommend best practices in energy data management to strengthen building operators' ability to read and evaluate data.

14 Identify and/or develop business case development tool for building operators to be used to convince building owners of the benefits of an energy efficiency project.

15 Identify, assess and recommend training organizations to provide training for building operators class.

16 Support the energy awareness program: *Houston Green Office Challenge* of the city of Houston by engaging the private sector.

04

Focus area 4: **Increasing Houston's real estate market competitiveness through innovative EEB policy solutions**

Commitments from Focus area 4

Benchmarking and Transparency

17 Develop policies promoting benchmarking and transparency of building performance. This will be done by a coalition of city leaders, developers, owners, building operators and other stakeholders. This coalition could learn from and follow the example of cities such as Chicago and Austin which can now demonstrate the value of transparency.

Energy Codes and Certification

18 Allow greater involvement of the private sector in the development of code changes to instill greater private sector commitment and compliance.

19 Provide more training opportunities for designers, vendors and installers, and ensure training prepares building operators and facility managers to keep up with the continual advances in building technology.

20 Require state facilities built in Houston to meet the more stringent energy requirement of the state and local codes.

21 Encourage the use of free tools such as Energy Star to help smaller organizations which are discouraged by the cost and complexity of LEED.

Energy Efficiency Resource Standard (EERS)

22 Work with the legislature and the Public Utility Commission of Texas to increase the goals of EERS and the funding available.

Next steps

A new energy efficiency platform, Energy Efficiency in Buildings – Houston, will be the base from which four groups will work to move Houston forward as it increases energy efficiency investment opportunities across the region. The WBCSD, US BCSD and the Houston Advanced Research Center (HARC) are managing this program in 2015 to drive the activities in the Houston market around each of the four focus areas and to build additional support to continue these initiatives beyond 2015.

A committee has been formed for each focus area, with a chairperson to lead the development of guides and plans. Each working group comprises a diversity of energy efficiency market participants representing the building owners, building operators, equipment vendors, building tenants, the public sector and energy efficiency consultants.

Energy Efficiency in Buildings – Houston is the overarching body coordinating these focus area committees to help them stay on task and move the process forward. HARC will be the lead organization for this effort. The scope of work will include:

- Leading the development of a committee for each focus area with a chairperson for each;
- Developing the scope for committee leads to follow as they develop action plans;
- Coordinating and leading regular meetings to keep committees on task and up to date on program status;
- Providing resources and data to committees to facilitate development of action plans and guidebooks
- Developing and leading a plenary or workshop for the CATEE (Clean Air Through Energy Efficiency) Conference in Galveston, TX in December 2015, to report on action plans and guides.

Appendices

Appendix 1. Summary of Interviews by Stakeholder Group

Architecture and Engineering

Barriers

- Reluctance to recommend EEB investments due to the risk firms face from losing business to competitors who promote low-cost approaches
- Energy recovery options (cogen) generally not recognized or implemented
- Lack of attention to post-installation evaluation of energy efficiency measures, so the performance is unknown
- No requirements for tenant renovations to incorporate energy efficiency, such as a “green” code
- Customer interest in glass facades makes it difficult to design for meeting energy targets
- LEED widely recognized for adding value, yet it does not always produce more energy efficient buildings. Main focus is on new rather than existing buildings.
- Class A building market has widely adopted sustainable buildings, but the market for Class B and lower has not. Retail not as interested.
- Focus on short term costs, short payback threshold
- Hot and humid climate produces unique challenges to implementation of energy efficiency
- Many incentives are time consuming and complicated
- Lack of alignment in supply chain
- Economic times are good, so the need to save on energy costs is not important to many. Building owners want features that will drive their business forward; EE not generally near the top of the list.
- Credibility of energy savings estimated by equipment suppliers and engineers is often lacking. For those familiar with Star Trek, the technical community (Dr. Spock) does not see eye-to-eye with the owners (Captain Kirk)
- Operators see more work and little incentive to implement EE, plus risk if something goes wrong, so not motivated to change
- Decision makers are hard to reach, and often do not understand energy
- Information on the energy performance of other comparable buildings is difficult to obtain
- Split incentives: owners pass through energy and other operating costs to the tenant
- Short time frame of some developers significantly reduces any incentive to do EE upgrades.

Opportunities

- Offer recognition to leaders in energy efficiency
- Green energy task force to help promote greening of codes and standards
- Encourage greater use of Energy Star (mandate, incentives, etc.)
- Promote energy efficiency in Class B-F commercial buildings through Chamber of Commerce; do the same for residential through homeowner associations.
- Develop “operating coops” of like owners (dentists, doctors, etc)
- Aim utility programs towards the smaller client base
- Education of tenants, staff, brokers
- Use energy efficiency and sustainability as a tool to help recruit new staff
- Implement mandatory benchmarking
- Create zones in the city where incentives are offered to help revitalize an area; e.g., a mid-town tax abatement district

Developers

Barriers

- Technology moving fast so adopting new innovations seen as risky

- Some do not view LEED as a driving force; Energy Star is a better measure
- Many contractors lack qualified trade workers to construct energy efficient buildings
- Owners/managers do not promote EE to tenants
- Demand for lots of glass. Some tenants insist on floor-to-ceiling glass
- Split incentives
- Class A space must be LEED certified; this does not extend to lower class buildings. Focus on LEED rather than EE. Retail has very little focus on energy.
- Lack of data on other projects and energy efficiency performance.
- Buyers and investors are highly varied in their understanding of EE.
- Cost of electricity is below the national average. Commercial natural gas prices are also slightly below.
- Three to 5 year leases the norm – hard to justify. Leases standardized.

Opportunities

- Employees are attracted to energy efficient buildings. More data on relationship to comfort, positive employee attitudes, health, and productivity would help. As companies compete for talent, they will drive toward better buildings (mainly relevant to high tech, energy, knowledge workers)
- Broker education
- Put ratings on front door; e.g., disclose benchmarking results
- Increase metering – master meter with submetering (but can be too complicated and expensive for some)
- Education of smaller retail tenants
- Disclosure, competition, and gamification
- PACE financing
- Bundle EEB with water reduction projects

Financiers/Banks

Barriers

- No time-of-use pricing to drive behavior (this is load shifting)

Opportunities

Construction and Equipment Providers

Barriers

- MEP firms are the problem because they are dragging behind
- Lack of stakeholder alignment
- Owner lack of knowledge
- High market activity in Houston means that unsophisticated buyer won't be served well – scarcity in tradesmen due to opportunities in oil and gas
- Better than 18 month payback required on oil company EEB projects

Opportunities

- High quality EEBs attract millennial work force (not as important to baby boomers), which is important to many companies in Houston. Educate Gen Y and new employees to be strong EE advocates
- Make efficiency a key performance indicator (KPI)
- To get a Class A tenant, you need to be able to operate building at max efficiency
- Provide better incentives for existing buildings
- Get oil companies to exert more local influence in towns where they build new HQs
- Enable best-practice sharing; form B and C co-ops for building portfolios (has been done in Washington DC)
- Operator training

Residential (multi-family)

Barriers

- Developers of new residential properties generally build only what is mandated by the energy code.
- LEED is sometimes a marketing tool but not used as an energy saving mechanism.

Opportunities

- Greater availability of incentives could be beneficial to the market.

Education

Barriers

- Energy not school's core business; other concerns more important.
- Focus on capital – saving 5% on capital is valued much more than a 5% annual savings on operating expenses. Short payback.
- Custodians and other workers lack of awareness of energy efficiency
- Public school principals have ultimate control, and may value other things over energy efficiency – can't risk hurting students learning with lower AC or lighting – react to complaints
- Lack of funding

Opportunities

- Benchmarking other schools
- Educate on how energy compares pre-AC, compare to other cultures
- Encourage owners to have a sustainability manager on staff
- Measure and report avoided energy costs
- Engage with on-site staff and seek feedback
- Retro-commissioning

Facility management, equipment providers

Barriers

- Some people think buildings can just go on autopilot
- Skepticism of savings
- Maintenance budget and capital budget are disconnected

Opportunities

- Need certified operator program
- Better education and utilization of utility EE programs to lower first cost
- Accelerated depreciation and tax benefit

The WBCSD's EEB 2.0 project

In response to climate and development challenges of the building sector, the World Business Council for Sustainable Development (WBCSD) initiated the cross-industry Energy Efficiency in Buildings (EEB) project. In the first phase, from 2006 to 2010, the EEB project sought to create an understanding of both the challenges and the opportunities within the global building sector.

The project's first achievement was the publication of the Facts & Trends summary report, which combines the findings from research existing at the time of the project and stakeholder dialogues during hearings, workshops and forums with a breakthrough market research study that measures the stakeholder perceptions of sustainable buildings around the world.

The project's second milestone was the publication of its second report, Energy Efficiency in Buildings: Transforming the Market, launched in 2009. The report is based on a unique simulation model that analyzes the energy use of thousands of building types and millions of existing and new buildings, both commercial and residential. This model shows how energy use in buildings can be cut by 60% by 2050, which is essential to meeting global climate change targets. But this will require immediate action to transform the building sector.

Finally, the EEB project also developed a roadmap setting out the key actions in the short and medium term for the seven groups that can contribute to meeting this challenge, ranging from investors to government authorities. The roadmap is an addendum to the main report, Transforming the Market.

See: http://www.wbcsd.org/work-program/sector-projects/buildings/eeb-first-phase.aspx

WBCSD's Vision 2050 sees "9 billion people living well, within the resource limits of the planet by 2050."

As this 2050 timeline is too distant for businesses to plan against, the WBCSD launched a stepping stone initiative, Action 2020, which has identified priority areas for business action that are based on scientific facts and social trends. A societal "Must-Have" has been set for each priority area that business solutions should work towards achieving by 2020.

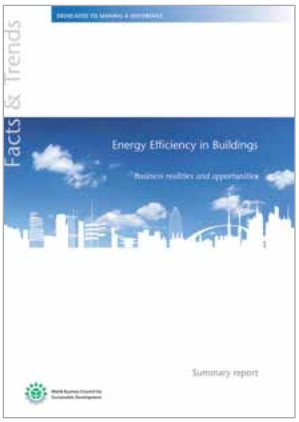
The Energy Efficiency in Building 2.0 project will contribute to the climate change "Must-Have" by working with member companies to dramatically reduce the energy consumption of new and existing buildings.

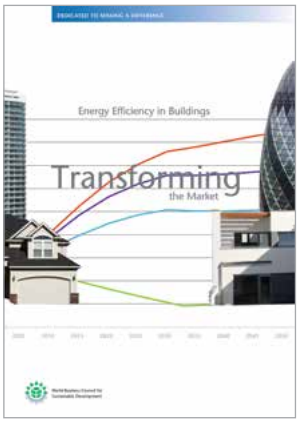
Climate Change "Must-Have"

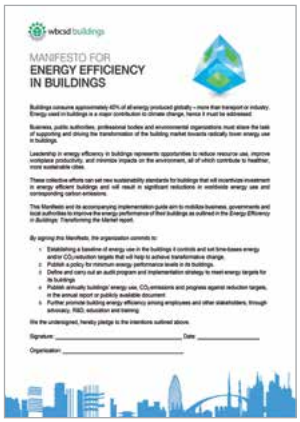
With the goal of limiting global temperature rise to 2°C above pre-industrial levels, by 2020 the world must have energy, industry, agriculture and forestry systems that simultaneously:

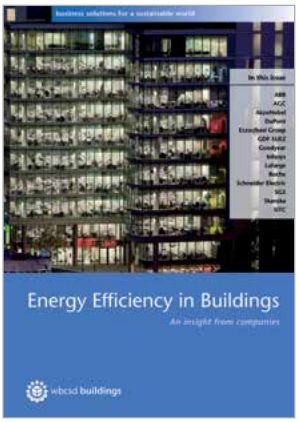
- Meet societal development needs;
- Are undergoing the necessary structural transformation to ensure that cumulative net emissions do not exceed one trillion tonnes of carbon;+ peaking global emissions by 2020 keeps this goal in a feasible range;
- Are becoming resilient to expected changes in climate.

+ Anthropogenic CO_2 emissions from pre-industrial levels as outlined in the IPCC Working Group I Fifth Assessment Report. One trillion tonnes carbon = 3.67 trillion tonnes CO_2.









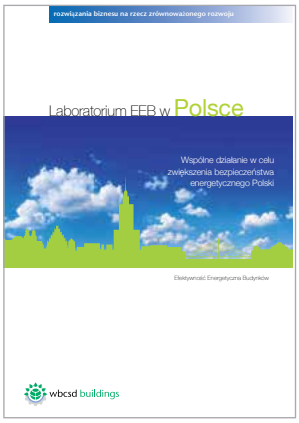
As part of the EEB project, the WBCSD decided to bring a *Manifesto for Energy Efficiency in Buildings* to all its members, calling on them to take voluntary action. By signing the Manifesto, companies "walk the talk" and send a strong message to the market, stakeholders and employees. The *Manifesto* and its accompanying Implementation Guide outline five actions for companies:

1 Create a baseline for the company's commercial buildings and set time-based energy and/or CO_2 reduction targets in line with transformative change;
2 Publish a company policy for minimum energy performance levels in the company's commercial buildings;
3 Define and carry out the company's audit program and implementation strategy to meet energy targets for its commercial buildings;
4 Publish buildings' energy use, CO_2 emissions and progress against reduction targets annually in the company's corporate social responsibility or other report;
5 Further promote energy efficiency in buildings among suppliers, employees and other stakeholders through advocacy, marketing activity, R&D, education and training.

140+ member companies, non-member companies and regional network partners had signed the Manifesto. For more information on the WBCSD Manifesto for Energy Efficiency in Buildings, please see: http://www.wbcsd.org/work-program/sector-projects/buildings/eeb-manifesto.aspx.

In 2014, WBCSD issued two magazines which describe the successes and challenges of companies implementing the EEB Manifesto

An insight from companies, April 2014
A call to action, September 2014



Acknowledgements

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Disclaimer

This publication is released in the name of the WBCSD and its partners in the EEB Laboratory Houston. Like other WBCSD publications, it is the result of a collaborative effort by members of the secretariat and senior executives from several member companies and partner organizations. A wide range of members and partners reviewed drafts, thereby ensuring that the document broadly represents the majority view of the WBCSD membership and the partners. It does not mean, however, that every member company and every partner organization agrees with every word.

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