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Case 2: Chicago

Retrofit Chicago Energy Challenge

Abstract

The Retrofit Chicago Energy Challenge (“the Challenge”) encourages, supports and celebrates voluntary energy efficiency leadership among large commercial, institutional, and private buildings throughout the City of Chicago. In partnership with diverse public, nonprofit and private stakeholders, the Challenge motivates and guides voluntary action towards reducing energy consumption by 20% over five years. The Challenge provides direct support and peer networking to help participants achieve their energy goals. Additionally, it facilitates best practise sharing and showcasing of ambitious energy leadership and impact.

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1. Programme context

Citywide reduction target(s)

As mapped out in the Chicago Climate Action Plan (CCAP) created in 2008, the City of Chicago aims to reduce CO_2 emissions by 25% by 2020 and 80% by 2050, compared to 1990 levels.

Built environment context and programme background

In the 19th century Chicago gave birth to the modern skyscraper. In the 20th century, the city built a spectacular skyline that is a living monument to innovative architecture and design. Now, in the 21st century, Chicago is working to make that skyline one of the most energy efficient in the world. Residents and businesses in Chicago spend more than $3 billion each year on energy consumption, and building energy use accounts for 71% of citywide GHG emissions. Much of the building stock's energy expenditures are spent on Chicago's 3,246 heating degree days (C)[1] during cold months. This amount of required heating is the primary metric through which the U.S. Department of Energy defines the City of Chicago as having a "cold climate".

To advance Chicago's long-term climate and environmental goals through practical, near-term action, Chicago Mayor Rahm Emanuel led public and private stakeholders in creating the Sustainable Chicago Action Agenda (City of Chicago, 2012). This plan identified energy efficiency and the promotion of renewable energy as key components of citywide sustainability efforts. The Retrofit Chicago Energy Challenge (henceforth "the Challenge") emerged from this context. It represents an important piece of the City of Chicago's participation in the Better Buildings Challenge launched by President Obama and the U.S. Department of Energy in 2011. This national initiative mobilises local governments, businesses and partner institutions across the U.S. to bring cities to take measures to improve the energy efficiency of commercial, industrial, residential and public buildings by 20% over 10 years. Chicago's participation in the Better Buildings Challenge comprises of three related programmes (commercial, municipal, residential). The focus of this case study is on the segment of Retrofit Chicago targeting commercial, non-profit, institutional and other private sector buildings.

[1] The degree-day measurement is the difference in temperature between the average outdoor temperature over a 24-hour period and a given base temperature for a building space, typically 25°C. It represents the magnitude of heating requirements in a location. Examples of other cities are 2,420 in Seattle, 2,509 in New York City, and 2,967 in Philadelphia (source: http://www.c40.org/cities).

2. Programme overview

Overall goals and start year

Since its launch in 2012, the Challenge has sought to motivate large buildings to commit to the pursuit of a common energy reduction target. Participating buildings make a public commitment to improve energy efficiency by 20% within five years of joining the programme. Their participation involves sharing progress and serving as ambassadors to other buildings seeking to save energy and operating costs. The Challenge assists participating buildings in overcoming barriers to improving energy efficiency and delivering successful energy retrofit projects. It provides direct support to managers and owners, facilitates best practice sharing among buildings, and in parallel, seeks to foster voluntary energy efficiency leadership across the building industry.

Programme target and scope

The Challenge targets the owners, managers, operations teams and other stakeholders in existing, large commercial, institutional, multifamily residential and cultural facilities. There is presently no explicit size to qualify for joining the Challenge. Participants range in size from 30,000 to more than 4 million ft^2. The average Gross Floor Area (GFA) is approximately 700,000 ft^2.To date, 62 buildings are enrolled in the programme, spanning more than 43 million ft^2 of space. Initial participants were clustered in Chicago's central business district. Yet subsequent expansion has broadened participating building types and the geographical scope of the programme. Currently, 72% of participating buildings serve primarily as commercial offices. The remaining participants are comprised of hotels, universities, multifamily residences and cultural institutions. Specifically, these include iconic skyscrapers, historical landmarks, affordable and market-rate housing, worship facilities, mission driven organisations such as the Salvation Army headquarters and beloved Chicago attractions such as Navy Pier and the John G. Shedd Aquarium.

Programme structure and function

The Challenge is a collaboration between the City of Chicago and a host of public, nonprofit and private organisations. These include the C40 Cities Climate Leadership Group, Natural Resources Defense Council, City Energy Project, Institute for Market Transformation, Environmental Defense Fund, Alliance to Retrofit Chicago Higher Education, Rocky Mountain Institute and Midwest Energy Efficiency Alliance. Initial recruiting for the Challenge drew upon pre-existing relationships among city officials, public interest groups, building owners, management, design firms, utilities and energy service providers.

To join the Challenge, a senior representative of building ownership or management sends a letter to the Mayor's Office stating a commitment to the following goals:

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- Reduce energy usage in one or more buildings by at least 20% within five years
- Begin energy efficiency work within six months
- Track progress using the U.S. Environmental Protection Agency (EPA) ENERGY STAR Portfolio Manager (henceforth Portfolio Manager) and share best practices with the public
- Serve as ambassadors to other buildings interested in increasing energy efficiency

The commitment that participants make to reduce energy usage by 20% within five years is critical. Challenge partners selected the 20% energy reduction target—which applies to all energy use across the entire building, including electricity, natural gas, and district energy—to be specific, ambitious and impactful, yet achievable. The 20% reduction applies to a 12-month baseline period of up two calendar years prior to the commitment date. For example, if a build joins the programme in July of 2016, it can select January through December of 2014, 2015 or 2016 as its baseline. In this case, the target of reducing whole-building energy use by 20% must be reached by no later than the period running January to December in 2021. The stipulation that energy efficiency work begins within six

months of joining the programme can include energy audits or implementation of retrofit measures. Due to the urgency of reducing energy reduction opportunities, overall, participants have not struggled to meet this requirement. The qualitative commitments, such as best practice sharing to serve as ambassadors to other buildings across Chicago, are also very important, as capacity building is crucial to the programme.

To achieve a 20% improvement in energy efficiency within five years, Challenge participants are led to pursue the following five steps, seeking advice and support from programme partners along the way as necessary:

- Benchmark the building
- Conduct an energy assessment or review previously conducted assessments to identify savings opportunities
- Develop a business case for a building retrofit that considers utility incentives
- Plan and implement retrofit work
- Measure and track energy savings each six months via Portfolio Manager

To help progress towards greater energy efficiency and successful retrofitting, participants receive access to several crucial capacity building resources from the combined public, private and nonprofit resources of the various partners involved in implementing the programme. Support measures include access to consultations and expertise from city technical advisors and programme partners, also extending to invitations to participate in events for networking, knowledge sharing or celebrating outstanding practices and achievements.

As an example of building-specific technical support, Challenge participants in 2013 had the opportunity to consult with technicians and form an Energy Road Map. Also seeking to deepen relationships with key building and partner stakeholders, these roadmaps were made possible by a public-private collaboration and grant funding. They aimed to assist Challenge participants with various key tasks such as compiling energy use data, creating energy baselines, benchmarking performance against other same-type buildings through Portfolio Manager, quantifying actual and planned energy reduction measures to-date, identifying any gaps remaining to achieve the 20% goal, and finally, prioritising sequential actions and investments to meet (and exceed) the 20% reduction commitment. This latter estimate took into account expected capital costs, available utility funding incentives, projected return-on-investment and payback periods. A total of 19 participants took advantage of these road maps in 2013. Together, roadmaps identified $5 million in annual energy savings, with average building-level savings of $250,000 per year. Internal rates of return on efficiency investments ranged from 8% to 10%.

Additional programme activities include a workshop facilitated by the Natural Resources Defense Council on energy aligned leases. This helped familiarise building managers with leasing arrangements that allow landlords and tenants to overcome “split incentive” barriers by sharing the costs and benefits of energy efficiency upgrades. Furthermore, on a quarterly basis, the Challenge hosts engineer roundtables to showcase building operation practices that lead to large efficiency gains. Jointly organised by Retrofit Chicago, the Environmental Defense Fund and ComEd (Chicago’s publicly-traded electricity utility), these roundtables include tours of individual buildings, programme updates, briefings on utility incentive opportunities, peer-to-peer lesson sharing and networking.

Data collection and progress tracking

The principle data collection tool employed is Portfolio Manager. Weather-normalised source energy use—expressed as kBtu (thousand British thermal units)—is the chief metric used to measure participant progress toward the 20% reduction target. As highlighted above, reporting occurs twice per year. For certain building types such as offices, hotels and multifamily residential housing, Portfolio Manager also calculates adjusted energy use intensity (EUI). This metric controls not only for weather, but also for changes in building operations and space uses. Where possible, Portfolio Manager considers both adjusted and weather-normalised source EUI.

Participating buildings share read-only access to their Portfolio Manager accounts. This allows the Mayor’s Office and Challenge partners to assess ongoing energy performance. At the beginning of each calendar year, participants are asked to review and update their Portfolio Manager profiles to ensure up-to-date, accurate data. All data is self-reported and provided at the whole-building level. Although building-level progress tracking precludes assessment of the impacts of some specific retrofit projects or other interventions, many participants track these investments internally to measure return on investment or to fulfil utility incentive requirements. The Challenge regularly shares aggregate programme progress and impacts. This said, it does not share individually identifiable building energy data to the public or other participants without permission.

Innovative programme features

The specific goal of reducing energy usage by 20% within five years in each participating building is central to the Challenge’s success and credibility. It provides a clear, quantitative target for guiding voluntary efforts to improve the energy performance of individual buildings. It also motivates participants to continue taking action due to the commitment they have made publicly. At the same time, this individual building commitment fosters a shared sense of ambition, solidarity and responsibility among all participants as the Challenge tracks and shares collective energy savings.

Also innovative is the Challenge’s cross-sector collaborative implementation model. This unites public and private entities, including city officials, NGOs, private consultants and utilities. Operating in this way makes it possible to tap into the diverse and complementary resources of the partner network. These partners are made available to participating building owners and managers to provide varying forms of assistance. These include one-on-one technical expertise, access to utility incentive schemes, outreach to tenants, innovative

leasing structures to facilitate cost and benefit sharing of retrofits, sharing best practices and support with tracking progress.

Incentives and support mechanisms

Apart from receiving guidance on how to leverage utility incentives to accelerate and increase financial returns on energy efficiency investments, there is no direct financial assistance provided from the city for participation in the Challenge or financing retrofits. Rather, the primary incentive for participation stems from the above-described capacity building components of the programme.

As an additional strategy, mayoral recognition is used to publically promote the Challenge and encourage buildings to participate. Various platforms for showcasing participants include individual building profiles on the official website[2] and regular mayoral press releases to recognise new participants and progress. In addition, full page advertisements are run in both major Chicago daily newspapers. These commemorate both the launch of the programme and subsequent expansions as new participants join. Also, Chicago's Mayor Emanuel is publicly and visibly committed to the Challenge. He has personally participated in programme announcements, updates and building tours every year since the programme's launch. This top-level support from the city lends gravity and prestige to the programme, while also serving to underscore the importance of energy efficiency to the City of Chicago. In addition to these outlets, since 2014, participants are invited to take part in an annual award ceremony to recognize outstanding building achievements and overall Challenge progress. Over three years, this event has grown to include scores of participating building and partner representatives, senior city officials, real estate executives and environmental leaders. Awards are broken down into the following categories:

- **Mayor's Leadership Circle Award:** For participants who have reduced whole building energy use by 20% or more below their baseline, thereby reaching the main programme goal.
- **Most Valuable Engineer Award:** In recognition of an engineer who has gone above-and-beyond in identifying and achieving energy savings through efficient building operations at his or her facility.
- **Most Valuable Property Manager:** In recognition of a property manager or management team member who exemplifies how and why energy efficiency is critical to excellent property management.
- **Innovative Energy Efficiency Project or Partnership Award:** In recognition of a project, programme or partnership that has demonstrated innovative, impactful and replicable energy savings.

As a further incentive measure, participating buildings planning energy efficiency retrofits can receive expedited permitting assistance for energy related building

[2] www.RetrofitChicago.net

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upgrades. This is enabled by a cross-departmental collaboration between the Mayor's Office and the Chicago Department of Buildings.

Links to other policies and programmes

Initial experiences and data from Challenge participants informed the design of Chicago's Building Energy Use Benchmarking Ordinance, adopted in 2013. This ordinance mandates all buildings with more than 50,000 ft^2 of GFA to report annual energy usage data to the City of Chicago through Portfolio Manager. Results are then publically disclosed by the city. By virtue of their size and space uses, almost all buildings participating in the Challenge are also required to comply with the benchmarking ordinance. Early experiences in progress tracking for the Challenge illuminated common building challenges encountered by building owners and managers when collecting and reporting data. These included obtaining whole-building electricity and natural gas use data, and also using the Portfolio Manager reporting platform. Implementation of the Challenge thus provided valuable experience for city officials charged with administering the benchmarking ordinance, and vice-versa. Furthermore, partnerships formed with utilities, public interest groups, energy service providers, real estate

portfolios and other stakeholders in the Challenge also proved invaluable to ordinance development, outreach and provision of recommended actions to increase energy performance.

The mandatory benchmarking ordinance and voluntary Challenge thus both form an important and mutually re-enforcing relationship. The benchmarking scheme only mandates data reporting and no actual improvement in energy efficiency. On the other hand, the Challenge plays a vital role by providing covered buildings with a concrete opportunity to receive support and recognition for actually improving energy performance year to year.

3. Design and implementation

Design phase

Timeline

The Challenge was conceived during 2011 to early 2012 by senior city officials and environmental partners following Mayor Emanuel's election and mayoral transition.

Inputs

The Challenge was shaped through conversations between many key stakeholders including the Mayor's Office, local and regional electric and gas utilities, the Natural Resources Defense Council, C40 Cities Climate Leadership Group, the Joyce Foundation, private sector design and engineering services firms, and other mission-aligned non-profit organisations and foundations. Existing local and national voluntary energy efficiency initiatives at that time—as well as efforts to improve energy performance of Chicago's municipal buildings—provided a frame of reference and inspiration for the programme.

Implementation phase

Timeline

The programme launched in June of 2012 with a public announcement by Mayor Emanuel and U.S. Energy Secretary Steven Chu. The 14 founding participants represented 14 million ft^2 of commercial office and hotel space. The Challenge has since seen three major expansions, attracting 18 additional building participants in both 2013 and 2014 and 12 additional participants in 2016. This has brought total participation to 62 buildings and 43 million ft^2. However Mayor Emanuel has since announced the city's intention to continue expanding the number of participants in the programme to around 80 by mid-2017.

Inputs

As highlighted, the City of Chicago is not the exclusive co-ordinator of the Challenge. Instead, it operates as a collaboration that unites multiple partners and stakeholders from various sectors in the building and environmental community. From 2012 to 2016, coordination of the Challenge was carried out by the City of Chicago's Chief Sustainability Officer, the Chicago City Director of the C40 Cities Climate Leadership Group and a team of approximately ten part-time staff from the various core partners. As mentioned, these include Natural Resources Defense Council, City Energy Project, Institute for Market Transformation, Environmental Defense Fund, Alliance to Retrofit Chicago Higher Education, Rocky Mountain Institute and Midwest Energy Efficiency Alliance. In addition to this core partner network, the Challenge also draws on sponsorship and technical support from The Joyce Foundation, World Business Chicago, BOMA/Chicago, Sieben Energy Associates, AECOM and Seventhwave. As other contributions, a private engineering firm PositivEnergy Practice was behind the delivery of the 2013 Energy Road Maps. Also, programme participants have received several million dollars in energy utility incentive funding (through ComEd and Peoples Gas) to support efficiency improvements.

There is no public budget line item for the Challenge. Most costs are covered by pro-bono partner engagement and modest grant funding. Private partners—including local utilities and private companies—provide specific financial support for the annual awards.

To ensure reliable progress tracking, Challenge partners regularly review self-reported building energy use data, using a set of simple screening measures to flag potential data errors or inconsistencies. When periodic questions arise about specific building data, Challenge partners and buildings meet to review the data and address any issues. Although this process does not include third-party energy audits, this has proven to be an effective means of tracking progress and ensuring quantitative data quality.

Adjustments

Upon its launch, the Challenge targeted buildings with 200,000 ft^2 or more of GFA. These large buildings comprised mostly of offices. Based on partner and participant input, this threshold was later loosened in response to suggestions that additional buildings with large energy savings potential might be interested in participating alongside larger peers. Lowering the minimum size threshold thus allowed the programme to achieve a greater diversity in participants by including properties such as hotels, universities, multifamily housing, places of worship and cultural institutions.

4. Outcomes and impacts

Environmental impacts

In July of 2016, Mayor Emanuel's office published a press release (City of Chicago, 2016) announcing the third expansion of the Challenge, together with key results. To date, participating buildings have achieved a total energy use reduction of 11.7% (weather normalised source energy) from baselines. This marks a significant improvement over the previously announced cumulative reduction of 7% in 2015. The latest results represent an annual savings of 90 million kilowatt-hours of electricity and 70,000 metric tonnes of avoided GHG emissions.

Social impacts

The Challenge has succeeded in fostering industry-wide awareness and a greater appreciation of the need to reduce energy use in commercial and private buildings. Many participating buildings are large downtown landmarks that are highly visible and influential components of the Chicago skyline. Since many of these landmark assets are looked to as leaders in the private sector real estate industry due to their size and history, their commitment to the pursuit of greater energy efficiency has important ripple effects on the rest of the citywide building stock. Typically, energy performance improvement at many buildings is frequently hidden from public view and competitor buildings. The Challenge, however, makes participants' accomplishments visible through recognition, best practice and case study sharing and networking events. In sharing the experiences and outcomes of the retrofitting journeys of frontrunners to other participants as well as the public, the Challenge is able to encourage other buildings to follow their lead. This is achieved by demonstrating empirically how investing in energy efficiency leads to important financial gains in the mid-term.

In addition, at the individual building level, the ability of management teams or owners to improve the energy performance of a building is enhanced through the capacity building measures of the Challenge. As well as providing knowledge from the experiences and best-practices of other Challenge participants, these include one-on-one technical consultations with city officials or Challenge partners. For example, the already described Energy Road Maps have been cited by many buildings as a critical enabler of energy reduction progress. Also significant, participation in the Challenge serves as an important opportunity for building owners and management teams to reach out to tenants for cooperation in reducing energy consumption, financing retrofitting, and sharing benefits. The Challenge offers extensive support in this area, thus contributing significantly to the improvement of tenant and owner/management relations around energy matters.

Market impacts

Meeting the 20% energy consumption reduction goal for the Challenge requires investment in retrofitting or other operational interventions such as

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retrocommissioning. This is explicitly outlined in the Challenge pledge, which requires that participants "start energy efficiency work within 6 months". Case studies on individual buildings show that, in addition to retrocommissioning to ensure that existing building systems run at high-efficiency, many buildings are carrying out retrofitting. Common installations include lighting (including occupancy sensors), boilers, chillers, fans, elevators and building automation systems for equipment scheduling and temperature setbacks. Also, the Challenge has assisted participants to leverage several millions of dollars in incentive funding from local energy utilities ComEd and Peoples Gas to support energy efficiency upgrades.

As well as increasing employment opportunities related to green construction, the above mentioned energy reductions are generating important savings in energy expenditures for participant buildings. Current financial savings from the above reported energy consumption reduction of 11.7% are estimated at around $6.4 million per year. Instead of flowing to energy utilities as monthly invoice payments, these savings (from both retrofitting and retrocommissioning) have been captured to finance retrofitting projects that also improve the market value and competitiveness of the building.

5. Lessons learned for replication

Strengths and drivers

Clear and meaningful, quantitative, mid-term goal

The goal of achieving a 20% reduction over five years drives the programme in two ways. First, it provides participants with a clear objective and time frame to pursue right from the beginning. Second, it encourages formation of mid- to long-term planning and meaningful investment strategies to meet the target, which would not be possible over a shorter time period.

Progress through capacity building

Sharing of best practices, both formally and informally, is a key driver of the programme. There is often a large knowledge gap associated when striving to make a building more energy efficient. Low awareness of the available low-risk and low-cost strategies for reducing energy consumption can prevent building owners and managers from pursuing improved performance. As experiences regarding successful measures or common pitfalls in improving energy efficiency have accumulated in the Challenge since 2012, this knowledge has become a common stock for all participants to draw upon. As mentioned, it is freely shared with other participants via means such as engineering roundtables, case studies, networking events and programme awards. This collective body of knowledge thus reduces uncertainty surrounding retrofitting whilst raising chances of success for late adopter buildings who can learn from the successes of frontrunner peers.

Commitment to controlled, continuous expansion

Since its initial implementation in 2012, the Challenge has adopted a snowballing strategy of recruiting new participants to expand the participant pool. As mentioned, it has quintupled in size—from an initial cohort of 14 large, office buildings—to a diverse community of 62 properties including hotels, universities, multifamily residences, a house of worship and cultural institutions. This cohort of buildings is one of the largest in the U.S. for a voluntary programme of this kind. This rapid expansion of the initial pool of participants has been achieved through word-of-mouth, ongoing outreach and public recognition of building accomplishments. Top-level and visible support for the programme from Chicago's Mayor is another key driving force. With each expansion of the participant base, a unique new set of building profiles, capacities to improve energy efficiency and expertise are integrated into the Challenge, expanding the shared pool of knowledge.

Challenges, limitations and countermeasures

Turnover in the real estate industry

A significant challenge encountered stems from instances where buildings are bought and sold during the Challenge participation period. Since the Challenge works directly with upper level building management and owners, a transition of ownership or management when buildings changes hands can result in continuity issues. Furthermore, a shift in ownership may also result in staffing changes in the building concerned. This can disrupt relationships and momentum towards investments and strategies for implementing energy efficiency improvements since energy efficiency or participation in the Challenge may not be prioritised by new owners or managers. So far, the programme has been able to overcome such obstacles by directly engaging with new ownership or management to inform them of the previous commitments and of any progress made so far. This however involves constant market monitoring and building re-engagement from Challenge coordinators and partners.

Representing Chicago's building stock

Although initial participation consisted mainly of Class A office spaces in the central business district, programme coordinators and partners have learned that it is a fallacy that energy efficiency opportunities apply only to a city's most visible and well-funded buildings. For this reason, recruitment efforts have since expanded to integrate a richer diversity of building types, sizes and sectors. This is to demonstrate that all nature of buildings can benefit from improved energy performance. This is evidenced by the most recent addition of 12 participants, which includes a church and a large, mission-driven organisation. However, achieving inclusivity is difficult, as differing types of buildings are characterised by differing levels of financial, organisational and technical limitations.

Limited resources

Although the Challenge does its best to leverage utility incentives that make retrofitting measures more affordable, cost nevertheless remains a significant barrier to many potential retrofitting opportunities. To date, the key approach to dealing with this problem has been to help participants understand the business case for taking energy efficiency action. The aforementioned Energy Road Maps, which highlight projected upfront costs, payback periods and returns on investment, are an excellent example of this. Additionally, the Challenge currently lacks a full-time team of coordinating and engineering staff and a dedicated budget. As such, it must rely heavily on pro-bono technical, financial and manpower support and donations from its various partners, as well as external grant funding. It follows therefore that additional resources (such as full-time, dedicated staff and funding) would allow for expanded technical support to guide building efforts and to recruit additional participants. This would also permit enhanced relationship and capacity building for participating buildings and also facilitate more engaged public communication through social, Internet and press media.

List of references

City of Chicago. Retrofit Chicago Energy Challenge. Official website. http://www.retrofitchicago.net Accessed 10 December 2016.

City of Chicago. 2012. Sustainable Chicago Action Agenda. Office of the Mayor. http://www.cityofchicago.org/content/dam/city/progs/env/SustainableChicago2015.pdf Accessed 25 January 2016.

City of Chicago. 2016. Mayor Emanuel Announces Third Expansion of the Retrofit Chicago Energy Challenge (press release). Office of the Mayor. http://www.cityofchicago.org/city/en/depts/mayor/press_room/press_releases/2016/july/Retrofit-Chicago-Energy-Challenge.html Accessed 25 July 2016.

Natural Resources Defense Council. 2015. Retrofit Chicago Commercial Buildings Initiative Recognizes Energy Efficiency Leaders Across the City (press release). http://www.nrdc.org/media/2015/151021a.asp Accessed 25 January 2016.

Retrofit Chicago Commercial Buildings Initiative. 2014. Best Practices Report. http://www.retrofitchicago.net/our-media/entry/initiatives-best-practices-report-now-available Accessed 25 January 2016.

U.S. Department of Energy (DOE). 2010. Guide to Determining Climate Regions by County. http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/ba_climateguide_7_1.pdf Accessed 25 January 2016.

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