

4.2 Case Studies

The ten case studies outlined in **Table 4.1** are presented in alphabetical order as follows:

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- 4.2.2 HOUSTON – *Houston Green Office Challenge (HGOCC)*
- 4.2.3 MELBOURNE – *1200 Buildings programme*
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in the Greener, Greater Buildings Plan*
- 4.2.5 PHILADELPHIA – *Building Energy Benchmarking Ordinance*
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4.2.1

HONG KONG – *Buildings Energy Efficiency Ordinance (BEEO)*

Abstract: The Buildings Energy Efficiency Ordinance of Hong Kong acts as an effective and legislative means to improve the energy efficiency of buildings. As a side benefit, it also helps to tackle the split-incentive problem in the market for building energy improvement works.

Citywide reduction target

Hong Kong supports the APEC's aspirational and yet ambitious target of reducing aggregate energy intensity by 45% by 2035 from 2005 levels.

Building-specific reduction target

Not specified.

I. Programme context

Key elements

The Buildings Energy Efficiency Ordinance (BEEO) covers new construction and major retrofits of existing commercial buildings. It seeks to drive energy efficiency through stringent codes of practice and energy audits. Registered Energy Assessors play an essential role in executing the ordinance by certifying compliance of building service design and conducting energy audits. The law was officially unveiled in December 2010 and fully implemented in September 2012 to enforce building energy efficiency as part of wider mitigation measures for climate change.

The BEEO consists of the following three central elements outlined below (see also **Figure 4.2.1**).

1. Building Energy Code (BEC): New construction and existing buildings undergoing major retrofits are required to comply with BEC minimum standards and requirements for four key building service installations: air-conditioning, electrical, lift and escalators and lighting (henceforth referred to as 'service installations').
2. Energy Audit Code (EAC): An energy audit must be conducted every ten years in accord with the EAC in regard to the above four key building service installations in commercial buildings and in commercial components of composite buildings such as shopping centres. Display of the energy audit report is then required for that building.
3. Registered Energy Assessors (REA): Certified REAs are required to process the BEC certification and energy audit works required under the ordinance. The Building Energy Efficiency Registered Energy Assessors Regulation (REA Regulation) specifies the detail of the registration and regulation of REA.

Enforcement

In cases of non-compliance, the Electrical and Mechanical Services Department (EMSD) will issue an improvement notice to the relevant building owner or person responsible. Details of non-compliant buildings are published on the webpage of the BEEO and are only removed following compliance. An offender is liable to fines ranging from HK\$ 2,000 to HK\$ 1 million, depending on the offence committed. If any person provides false information or obstructs enforcement, they are liable for a fine and imprisonment.

Programme target and scope

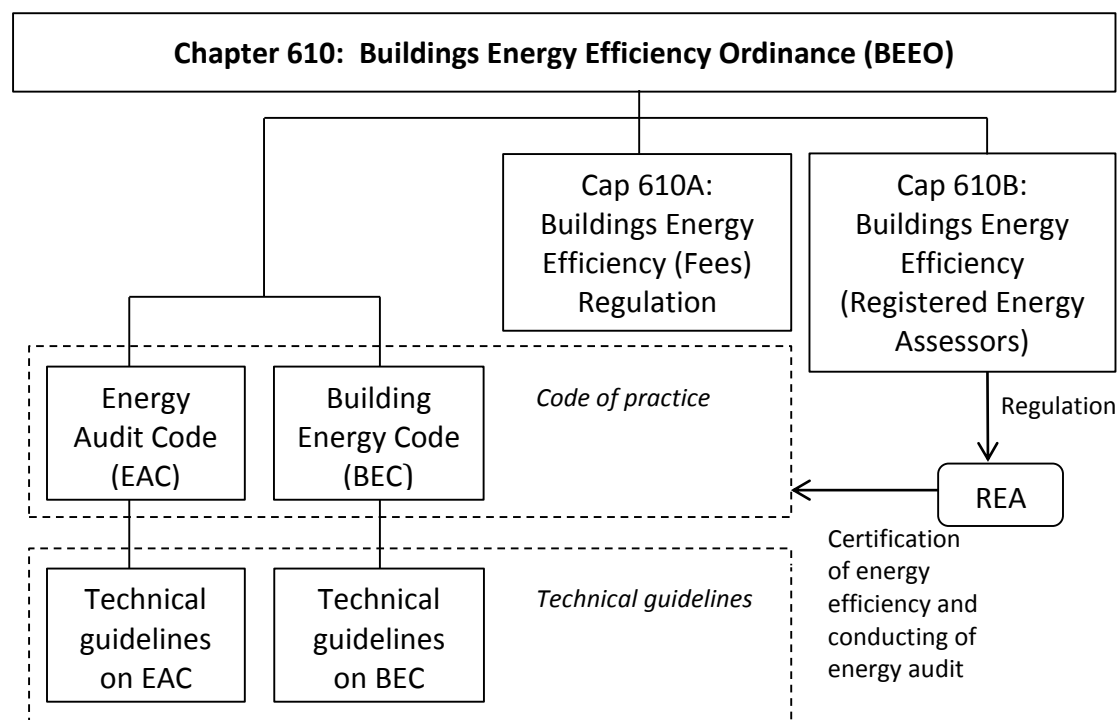
The BEC component of the BEEO covers most public and private commercial buildings in Hong Kong. In addition to offices, this includes, for example, hotels, government, municipality, educational and transport related buildings, in addition to commercial portions shared with industrial and residential buildings. The EAC component focuses on the four central service installations of commercial buildings and the commercial portion of composite buildings.

The BEEO covers both new and existing buildings. New buildings are those having obtained consent for the commencement of building works for superstructure construction from the Building Authority after 21 September 2012 (i.e. after commencement of the BEEO). Existing buildings are those whose permits were obtained prior to this.

The major retrofitting works covered by the BEC are those involving addition or replacement of a services installation covering a total floor area of 500 m² or more. The BEEO also targets the addition or replacement of a main component of a services installation. This may include addition or replacement of a complete electrical circuit at a rating of 400A or above; a unitary air-conditioner or air-conditioning chiller of a cooling or heating rating at or exceeding 350 kW; or the motor drive and mechanical drive of a lift, an escalator or passenger conveyor.

Small to medium sized buildings

The BEEO does not apply to smaller and historical buildings. More precisely, exempted historical buildings and smaller buildings refer to those with an electrical loading below 100A, less than three storeys, with a roofed-over area not more than 65.03 m², or a height inferior to 8.23 metres. Most of the small and medium sized buildings in Hong Kong are individual bungalow buildings between two and three storeys, with less than 70 m² per floor. Small



(Adapted from EMSD Symposium 2011)

Figure 4.2.1 The structure of Buildings Energy Efficiency Ordinance (BEEO)

buildings are not covered by the BEEO as their retrofitting is not justified in terms of cost efficiency. For these reasons, there are no present or planned initiatives for energy efficiency in such buildings.

Overall goals of the programme

The BEEO was enacted to enable the promotion of building energy efficiency under a regulatory framework. The requirement to carry out an energy audit was also designed to facilitate behaviour change in energy consumption. For the first decade of implementation it is estimated that the BEEO will lead to energy savings in the vicinity of 2.8 billion kWh for new buildings and a reduction of 1.96 million tonnes CO₂ emissions.

Links to other City policies or programmes

During official policy addresses in 2008-09 and 2009-10, the Chief Executive of the Government of the Hong Kong Special Administrative Region announced the intentions of the Hong Kong government to promote a low carbon economy. The BEEO was legislated as a major government measure for achieving this goal.

II. Inputs for the programme

Inputs during the design and implementation phases

Staff resources for developing the BEEO consisted of a team of five administrative officers and professional engineers from the Environment Bureau (ENB) and the EMSD. Development took approximately five years from detailed inception to full implementation. Before the drafting of the ordinance, an external consultant was engaged to study overseas building energy efficiency practices. In addition, a technical committee of representatives from some 30 professional institutions, trade associations, universities and government departments, as well as a trade taskforce with representatives from approximately ten trade bodies, was formed to provide input on the ordinance's drafting. A public consultation was also conducted to solicit views from the public and various stakeholders before legislation.

As the BEEO is a regulation, there is no overall budget allocated for its development or implementation.

III. Programme results

Compliance rate

With the BEEO still in the early stages of implementation, no compliance rate has yet been established. At the beginning of implementation, a six months grace period was given to building owners to encourage higher compliance levels. The main focus of the BEEO at this stage is the prosecution and investigation of any non-compliance.

Progress and evaluation

Data collected so far is insufficient for a significant assessment of progress by the BEEO towards national climate targets. This is principally because it only commenced in September 2012. Also, the collection of building energy performance data for benchmarking was not the purpose of the BEEO and there is no separate provision to mandate building owners to report such data. That said, data on energy consumption in the Hong Kong building sector is currently being accumulated from three various sources for future analysis, creation of baselines and possible utility for benchmarking.



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The first source is the energy audit report mandated by the EAC. This document requires detailed information on the four key services installations. A second source of energy data is design stage data from buildings adhering to the BEC. A third source of energy performance data comes from a comprehensive energy use survey called the Hong Kong Energy End-use Data (HKEEUD). Not officially part of the BEEO, this survey is managed by the EMSD and is sent to companies to study energy consumption from various sectors including the building sector. The survey result is open to the public and provides consumption data of the different energy fuel types and the specific purposes for which these fuels are consumed (e.g. space-conditioning, lighting and cooking etc). The data provides a better understanding of energy consumption and increases public awareness. The Hong Kong SAR Government also uses the information to formulate and evaluate its energy policies.

Regarding the accuracy and reliability of data acquired for the BEEO (design and energy audit data), this responsibility belongs to the REAs who are professionals and engineers. On the other hand, for the HKEEUD this relies on the quality of the information obtained in the survey. Meanwhile, there are provisions under the BEEO to regulate the qualification, knowledge, experience and other requirements for the registration of REAs.

Programme effects on retrofit market

The main purpose of the BEEO is to improve energy efficiency of buildings in Hong Kong. As such, it was not intended to drive market demand for retrofitting, although this has occurred indirectly to some extent. Two main impacts can be observed from the programme.

1. Overcoming split-incentives between building owners and tenants
The split-incentive problem between building owners and tenants has long existed in the real estate market of Hong Kong. It occurs where both the building owner and tenant are reluctant to make a large initial investment to improve building energy efficiency. This is because, on one hand, any outlay from the owner only results in long-term cost-savings on energy bills for the tenants. On the other hand, any investment from the tenant only results in improvements to a property they do not own. Before enactment of

the BEE0 legislation, this split-incentive dilemma was predicted to continue, with green leases and green premiums uncommon. The BEE0 has overcome this problem to a large degree by mandating building owners to improve their buildings, thus freeing tenants from the responsibility of sharing the cost of retrofit works.

2. Increasing community expectations towards building energy efficiency

The BEE0 sets minimum requirements for energy efficiency in four key building service installations. Initially, this is expected to foster the emergence of a new trend of increased energy efficiency in the building market. Then, with the regulatory nature of BEE0 turning this trend into a norm, it is expected that the market will then demand buildings satisfying a minimum standard of energy efficiency.

IV. Lessons learned for replication

IV-i Key drivers of success

Stakeholder engagement

During the design phase, the BEE0 team consulted with building stakeholders such as developers, owners, tenants, property management companies, institutions, professionals and trade associations on design aspects. This enabled them to obtain feedback concerning ordinance requirements before the law drafting process was finalised. The involvement of as many stakeholders as possible was of crucial importance as stakeholders felt that they were engaged and that their views would be adequately incorporated in the drafting of the final ordinance. The BEE0 team understood that this engagement process might not be sufficient to collect all viewpoints and interests of the community. Therefore, the BEE0 team has also met and obtained feedback from various stakeholders after the implementation of the ordinance. This was driven by their awareness that the only way to ensure effective implementation is to obtain the support of relevant stakeholders, given that the law requires action from the building industry.

Not all stakeholders have the expertise to understand the requirement details of the BEE0. Promotion and promulgation efforts are required to foster community understanding and compliance. The BEE0 team held more than 100 talks with the public and building industry representatives such as the Hong Kong Institution of Engineers and trade associations of various building services such as air-conditioning, electrical installation, and lift and escalator.

Concerted effort from the building trade

There are more than 40,000 existing buildings in Hong Kong, with this stock projected to increase by approximately 200 buildings every year. It therefore requires substantial manpower to reach out to these building owners, which is not always possible with the existing resources of the BEE0 enforcement team. The reliance on REAs to certify the energy efficiency of buildings and to conduct energy audits has been one of the solutions to deal with this shortfall. REAs are not necessarily third parties and may be direct staff of the developers, building owners or business tenants. Submissions from such REAs therefore function as a type of self-reporting mechanism. The BEE0 team has also collaborated with other government agencies for assistance in implementation. For information about building's owners and the occupation permit of buildings, they have worked closely with The Land Registry and the Buildings Department of the HKSAR Government.

It has proven relatively easy for the BEE0 enforcement team to reach out to new buildings by working with agencies managing various permits or licenses required previous to commencement of construction works. Conversely however, reaching out to existing

buildings and tracking their records of energy audits or major renovation activities is difficult. As submission of energy audits is required by law, tracking of this compliance is relatively easier than monitoring the reporting of major renovation activities—a process relying on the involvement of REAs. Whenever non-compliance is identified, officers are sent out for investigation.

IV-ii Main challenges

Community resistance due to split-incentive problem

As mentioned in the previous section, the split-incentive problem has long constituted a significant hurdle to the improvement of building energy efficiency in Hong Kong. While building owners are mandated to take concrete actions to improve building energy efficiency since the BEEO has come into force, this has not been without community resistance, particularly from building owners. This resistance has usually manifested in the form of non-compliance with BEEO requirements. It therefore appears that although the BEEO has been enforced to upgrade building energy efficiency at the time of a major retrofit, several cases of non-compliance are indicating that it has not completely resolved the zero-sum issue of the split-incentive dilemma between building owners and tenants.

One of the measures taken to deal with such resistance is the introduction of the Buildings Energy Efficiency Funding Scheme (BEEFS, from April 2009 to April 2012). Under the BEEFS, HK\$ 450 million was allocated to subsidise building owners to conduct energy-cum-carbon audits (ECAs) and to carry out energy efficiency improvement works. Consequently, the BEEFS has largely contributed to the enhancement of community awareness in building energy efficiency. It has also aided mobilisation of property owners and managers to take concrete actions to reduce carbon emissions and increase the energy performance of their properties.

Key outcomes include:

- Subsidisation of more than 6400 buildings (about 1/7 of total in Hong Kong);
- Stimulation of building retrofit market: from simple measures such as replacement of lightings to large-scale retrofits or replacement involving air-conditioners, lifts and escalators;
- Fostering of cross-sector cooperation between property managers and engineers through opportunities presented by a low-carbon economy;
- Over 20 training courses on energy and carbon audits have been offered for about 1,200 people by various training institutes and organisations;
- Estimated savings by the approved projects equating to around 180 million kWh/year or 126,000 tonnes of CO₂.

Publicity and human resource restraints

A key challenge remaining largely unsolved is the large amount of regulatory actions needed for effective enforcement of the BEEO. This barrier is even more significant when compounded with other challenges. These include the necessary publicity to facilitate compliance through education and outreach to various organisations and individuals, and existing manpower limitations for dealing with the large amount of building owners.

In addition, challenges encountered during enforcement of the ordinance include the prosecution and investigation of cases of non-compliance. This is because this ordinance is the first in Hong Kong directly regulating the energy efficiency of electrical and mechanical installations in buildings. Implementation of this legislation therefore represents a learning experience for both the community and the enforcement team.

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4.2.2

HOUSTON – *Houston Green Office Challenge (HGOC)*

Abstract: Instead of relying on the power of legislation, the voluntary Houston Green Office Challenge seeks to advance a holistic pursuit of office and building sustainability in energy and water consumption, as well as waste. It also addresses employee behaviour such as modes of transport and engagement to green office practices.

Citywide reduction target

Not specified.

Building-specific reduction target

The City is participating as a community partner in the US Department of Energy's Better Buildings Challenge. It has a goal of engaging the community to lower energy consumption in 30 million square feet (sq ft) of buildings (including 7 million of City-owned buildings) by a minimum of 20% by 2020, from 2008 levels. In addition, the City is aiming to attain the highest number of ENERGY STAR and LEED-certified buildings in the US.

I. Programme context

Overview

The Houston Green Office Challenge (HGOC) is an annual, voluntary challenge initiated in the Autumn of 2010, officially beginning in January 2011. It consisted of a partnership between the Mayor's Office of Sustainability in Houston, ICLEI-Local Governments for Sustainability and the Clinton Climate Initiative.

This initiative seeks to engage commercial property managers, building owners and office tenants in a friendly, voluntary competition that guides participants towards sustainability and greener building management whilst recognising outstanding achievement. The areas targeted by the programme are: energy and water consumption, waste outputs, transportation, building management/tenant engagement and employee outreach. At present, the programme has mobilised 375 buildings and tenants—representative of approximately 75 million sq ft—who disclose data and information to the City of Houston for appraisal. At the end of the first year, high achievements were acknowledged through awards, attracting high-levels of press and media attention and official mayoral recognition.

Key elements

This programme welcomes participation from both tenants and property managers/building owners, with differing tools and evaluation schemes employed for each. On one hand, property managers/building owners use the EPA's ENERGY STAR Portfolio Manager and ICLEI's Green Business Challenge reporting platform. Metrics evaluated by the combination of these two tools include energy and water consumption, waste, as well as tenant engagement. On the other hand, tenants are directed to monitor progress only through a specially developed Green Office Challenge Tenant Scorecard on ICLEI's Green Business Challenge platform. This facilitates the evaluation of green office strategies taken to influence employee behaviour in the areas of: energy use, waste, transportation choices and outreach. This scorecard creates a baseline score and suggests various measures that can be taken to improve this performance. Scores are organised into four tiers of achievement: Tier 1-Platinum (76-100 points), Tier 2-Gold (51-75 points), Tier 3-Silver (26-50 points) and Tier 4-

Bronze (15-25 points). With these areas of interest, the programme is equally focused on physical building performance and behavioural changes, as much as it is on workplace policies pertaining to employee work and lifestyles. From this perspective, the programme should be understood as being more about the holistic pursuit of sustainability rather than about mere energy efficiency.

Another key element of HGOC is a series of educational opportunities from the City to guide participants to improve their environmental performance in the above areas. These include the provision of free training and educational seminars, workshops and webinars for decreasing office energy and water consumption and fostering environmental behavioural changes in tenants and employees. Other support measures consist of easily implementable strategies for improving building and office sustainability, assistance in setting up Portfolio Manager accounts, referrals to free energy audits from HGOC sponsors, and lastly, financial incentives for energy efficiency retrofits from the City and local energy utilities.

Outstanding performance in the programme is recognised through an awards ceremony hosted by the Mayor and the City of Houston, in conjunction with coverage from the media.

Overall goal of the programme

The overall objective of HGOC is to engage the private sector to reduce energy and water usage and increase waste diversion by fostering leadership from commercial building managers and office tenants in regard to environmental performance and sustainability. Specific goals of the programme are to: (1) foster green building practices by providing sustainability knowledge and tools, educational opportunities and funding for building owners, property managers and tenants and (2) contribute to ambitions to attain the highest



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number of ENERGY STAR and LEED certified buildings in the nation. Through such objectives, the City is seeking to change its image from just an oil- and gas-centric economy to one where energy diversity is celebrated and renewables and efficiency are embraced.

Programme target and scope

HGOC targets building owners, property managers and tenants. All building tenants or property managers located within the city limits are eligible to participate. The focus on commercial buildings comes from the awareness that it is this sector making the most significant contribution to community-wide GHG emissions. For the upcoming 2014 Challenge year, considerations are being made to focus explicitly on Class A, with a special emphasis also on Class B and C commercial properties, for which there is no operative definition:

- Class A:
Large and centrally-located, premium office buildings. Usually with more than 500,000 m² of total flooring and a super hard finish on ground floor, which typically has a clear height of more than 30 feet.
- Class B:
Smaller buildings, typically around 10-15 years old. Usually located closer to the suburbs.
- Class C:
Lower market range of buildings, typically located in suburbs. Includes strip malls and light industrial buildings less than 50,000 m².

II. Inputs for the programme

Inputs for the design phase

Overall, design and development of the HGOC spanned from between three to six months and involved two to three FTEs. The programme received sponsorship to the amount of US\$ 210,000 from 12 companies and in-kind sponsorship amounting to approximately US \$35,000 from three others. Except for the allocation of staff hours, no funds from the City were contributed.

During development, Houston officials were able to draw upon the experiences of several other US cities previously incorporating an ICLEI model for a green office challenge. In particular, the City of Chicago proved a valuable point of reference. Outside of the US, Houston officials also gained valuable knowledge regarding case studies and potential bottlenecks from the City of London. A key lesson gained from these other cities was that top-down approaches with programmes designed single-handedly and without stakeholder engagement tend to prove less successful.

Inputs for the implementation phase

Resources allocated for the programme's implementation include one FTE and an additional \$5,000 for a marketing and communications budget. At the end of the first challenge year, two staff were involved with data analysis.

Engagement with stakeholders was central to the strategy of designing the programme in a way best reflecting participant needs and interest areas. This took place through several meetings aiming to gather feedback for the proposed challenge, gain support and encourage participation. Some of the various stakeholders involved include private sponsors such as the utility, Shell, Siemens and other corporations, NPOS, professional associations such as local chapter of the US Green Building Council and other government agencies.

Various forms of input were also procured from many of the financial sponsors and supporting partners for the programme. Contributions included assistance with outreach by local NPOs, the provision of free energy audits by Siemens, information sessions by CenterPoint Energy on incentive programmes available and the free collection and recycling of e-waste. In addition, a broad coalition of stakeholders from industry, government and civic societies also assisted with recruitment of participation on both the building and tenant level.

In May 2014, the City succeeded in winning a US \$20,000 award from ICLEI USA and its national programme sponsor Office Depot. The support is called the Green Business Challenge Implementation Pack valued at \$20,000, which includes in-kind contributions, software, and technical assistance and guidance. The funding also requires the City to facilitate three related events (e.g. a local programme launch, training sessions and an award ceremony) and an enhanced website for the programme.

Key metrics and reporting platform of energy data collection

Key metrics used in the data collection for property managers and building owners were electricity, natural gas and water consumption figures, and the amount of waste and recycling. This data was collected in ICLEI's Green Business Challenge platform and EPA's ENERGY STAR Portfolio Manager. In contrast, tenants are not required to directly report energy data. Instead, they provide information relating to a certain policy or initiative launched in their office during the reporting year. This information is also reported through ICLEI's Green Business Challenge platform.

III. Programme results

For the first Challenge year, the programme has mobilised a total of 375 participants, which together account for approximately 75 million sq ft of building flooring space. As for sustainability impacts, City officials have reported the following:

- Reductions in energy consumption by 28 million kilowatt hours;
- Reductions in water consumption by 280 million litres'
- 90% of participating tenants recycled in the office, achieving a 40% diversion from the landfill.

In addition, during the same period, well in excess of half the participants adopted various sustainability measures such as flextime and telecommuting policies, bicycle parking and policies to reduce paper consumption.

Programme effects on retrofit market

City officials report that the programme is playing a role in stimulating the retrofit market. This said, other factors must be considered as core drivers of the transformative activities taking place in the Houston building sector. For example, there has been a recent and dramatic increase in the amount of LEED certified existing buildings. As an indicator, over 8.5 million m² have been certified over the last two years. Currently, Houston has the fifth highest amount of LEED buildings in the US and is ranked tenth in terms of ENERGY STAR Buildings. One of the drivers of this market shift has been the realisation that non-LEED certified buildings are becoming less competitive in the market place. As part of this increase in LEED-certification for existing buildings, retrofitting activities have naturally expanded. In the context of this greater market transformation, HGOC has contributed to an increase in

LEED and ENERGY STAR certified buildings. This is largely by demonstrating that smaller Class B and C buildings can obtain LEED or Energy Star status.

Another key outcome of the programme is knowledge sharing amongst participants, who otherwise, may not have had the opportunity to share success stories with other building or business owners. The City believes that this information sharing is assisting the implementation of retrofitting activities and achievement of higher energy efficiency in the network. Also of note, not all success stories are from Class A buildings as many have come from smaller Class B or C types.

IV. Lessons learned for replication

IV-i Key drivers of success

Stakeholder engagement

The City demonstrated a strong willingness to listen to those segments of the building sector it wished to target, incorporate their concerns and desires, and ensure a large degree of flexibility for the design of the programme. Of importance was a strong engagement with building tenants, in addition to building owners and managers. This period of stakeholder consultation also allowed the identification of non-critical areas, which were later discarded from the focus of the programme.

This early stakeholder engagement meant that the City had achieved a strong network of advocates for the programme when it was launched. Officials also sought to capitalise on the Houston spirit of preferring market-based solutions as opposed to policy mandates.

Engagement of tenants in addition to building owners and managers

With half of programme participants being tenants, another key attribute and driver is the resolve to create opportunities for tenant involvement. Efforts to spur tenant engagement have included, for example, education sessions and networking events where participants share experiences on how green office practices were implemented. In the second year, an environmental behaviour change workshop was organised for HGOC participants. As an additional measure, the property managers and owners category also includes a section on tenant engagement, in addition to energy use, waste and water.

Holistic focus on sustainability as opposed to energy efficiency per se

A defining characteristic of the HGOC programme is a holistic pursuit of sustainability (inclusive of social and lifestyle dimensions) as opposed to a narrow focus on energy efficiency. This can be observed from its simultaneous targeting of building owners/managers and tenants, as well as the inclusion of indicators pertaining to transport policy, waste and recycling, outreach and employee behavioural changes. The design of this broader approach to building sustainability is also a result of the above stakeholder consultation process. Through such comprehensiveness, the programme has been able to maximise overall sustainability impacts in the commercial building sector by allowing a wider range of approaches to green office practices compared to a programme focused purely on energy efficiency.

Targeting diverse building types and expertise levels

As already mentioned, by targeting class A, B and C buildings, HGOC was designed to address a highly diverse array of building performance. Some segments of this population were already frontrunners and included examples of best practices resulting from owners' previous investments. Consultations with stakeholders during the design phase revealed

that a programme focused upon energy performance against a base year for the physical building alone would risk losing the participation of many building owners unable to make necessary investments for retrofitting. At the same time, it would also potentially lose the engagement of frontrunner buildings, the sharing of best practices, and the participation of building owners, managers and tenants who had already attained a high level of energy efficiency. To overcome these potential limitations, the programme was designed to target a broad range of sustainability areas, in addition to energy efficiency, that would be of relevance to a diverse array of building types and expertise levels.

The City Mayor as a 'marketing tool'

Another tactic employed was the use of the City Mayor as the official recogniser of excellence at the awards ceremony. Awards were handed out by the Mayor, who posed for photographs with the winners at the official ceremony. The prospect of being directly recognised by the City Mayor was in a sense used as a marketing tool and communicated to all participants during implementation. This demonstrated that the programme had top-level support from the City. The prospect of receiving formal recognition from the Mayor served as a major boost to competition and participation levels.

Communication and relationship building

Much of the success achieved by the programme has been attributed to relationship building and constant communication with participants via channels such as email, telephone and face-to-face meetings. Although this was challenging for the office when considering the limited staff available and the large participant base, stakeholder engagement in the early stages of programme design served to lay the foundations for the forging of strong relationships with various participants.

Recruiting of key staff

Success of the programme has also been attributed to the securing of staff whose competencies were aligned with the goals and activities of the programme. For example, strong communication skills and a background in green building practices by core staff members have proved critical in winning support and participation of stakeholders. Consequently, City officials have made efforts to employ knowledgeable staff with effective and outgoing communication skills to assist with engagement activities.

IV-ii Main challenges

Communication

While constant communication with the participants was cited as a key driver, there were several cases where the City was not able to build close relationships with participants due to staff and time restraints. This inability to devote more staff and resources for outreach proved a challenge during the latter stages of data reporting.

Data verification

A major limitation of HGOC is the incapacity of the City to clean or verify data submitted to the ENERGY STAR Portfolio Manager and ICLEI Green Business Challenge reporting platform. Only in those cases where data was found to be inaccurate (e.g. different energy units were chosen) were participants contacted and instructed to select the correct units by the two staff that were responsible for analysing participants' responses.

Financial incentives

In order to boost participation, the City initially attempted to establish an incentive scheme (also involving subsidised loans) through the Energy Efficiency Incentive Program, which

provided up to 20% of capital costs (labour and materials) for energy upgrades meeting certain criteria. However, this programme was met with limited success. This was principally due to the short-term availability of the funds and a highly complex and time-consuming application process, which utilised federal grant funding. In addition, the stipulation of strict conditions regarding retrofitting caused, in many cases, additional costs for the applicant and nullified the benefits of the programme (e.g. use of independent energy contractors and adherence to union wage conditions). Incidentally, the fixing of such rigid conditions came from the donor of the funding incentive.

Despite such complications, some building owners were able to successfully utilise the Energy Efficiency Incentive Program. However for the majority, the greatest incentive and driver of engagement was the prospect of receiving good publicity and being recognised as a top-performer by the Mayor and peers in the industry. This was particularly so for large and centrally located buildings (i.e. class A) competing for tenants in the market place.

Regarding potential lessons for future financial incentive programmes, an essential component would be the securing of a long-term funding base. As the case of Houston has shown, short-term funding incentives, which quickly expire, are not highly effective. Long-term funding would be particularly important in securing the participation of many public sector buildings and higher education institutions with long-term horizons and planning protocols. Another potential solution would be a revolving fund with firm stipulations regarding the time period for financing and a competitive interest rate. Projects would also need to involve a certified energy engineer and involve a simple repayment plan (i.e. once per year as opposed to once per month) in order to cut administrative costs for both parties. There would also have to be some sort of reserve for bad debt as repayments would potentially be affected by bankruptcies from some building owners.

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4.2.3

MELBOURNE – 1200 Buildings programme

Abstract: The 1200 Buildings programme aims to catalyse the retrofit of 1200 commercial buildings by helping owners assess current environmental performance, recommending improvements and providing innovative financing solutions to deliver results

Citywide reduction target

The City of Melbourne has a highly ambitious strategy, *Zero Net Emissions by 2020*, to attain climate neutrality by the year 2020, as articulated in a 2014 update.

Building-specific reduction target

The 1200 Buildings programme aims to increase the energy efficiency of 1200 existing commercial buildings by 38% by 2020. This equates to an estimated reduction of 383,000 tonnes of CO₂ per year. Also, the City has an interim target to achieve an average four-star National Australian Built Environmental Rating System (NABERS) rating of existing commercial buildings by 2015.

I. Programme context

Key elements and overview

The 1200 Buildings programme was launched in 2010 as a ten-year strategy to trigger dramatic improvements in energy and water consumption of 1200 commercial properties in Melbourne, as well as reduce waste to landfill. It is a core strategy to decarbonise the building sector. This voluntary programme was also conceived to hasten Melbourne's transition to a green economy by creating employment and business opportunities through driving demand for environmentally efficient buildings.

The programme contains a range of elements designed to:

- educate owners and managers on the benefits of energy efficient buildings;
- develop industry capacity to retrofit buildings and to monitor building environmental performance;
- provide attractive and easily accessible finance options;
- enable knowledge sharing and showcasing of best practices and new technologies.

The programme seeks to showcase leadership and catalyse behaviour change. Building owners are offered different opportunities to participate depending on their level of commitment, capacity and need for promotion. Research undertaken early in the programme's development identified two key ownership segments and influenced the development of two key engagement approaches:

1. Leadership group – institutional building owners

A number of corporate building owners participated in an earlier programme, the Building Improvement Partnership, and have since developed sophisticated approaches to retrofitting their assets. These owners have joined to take advantage of the opportunity to profile the superior performance of their building and display good corporate social responsibility. Leadership services are developed with these building owners and are available depending on the capacity of staff and resources available. Services include: precinct or energy grid projects, waste solutions, arts

commissions that catalyse behaviour change, climate adaptation, staff training, building campaigns, specialised finance projects (Environmental Upgrade Agreements – EUAs) and joint advocacy projects.

2. Under-performing buildings –the ‘mid-tier’

The programme focuses mostly on this group. The majority of buildings owned by the private segment have a moderate to extensive capacity to improve their energy efficiency performance. The owners of these buildings generally have low levels of awareness on the benefits of retrofitting and motivation to improve their buildings efficiency. Base services offered to these owners include: access to resources, facility management training, facilitating access to funding, tenant assessments, base building assessments, tools to assist interaction between building owners and tenants, precinct campaigns, awards, reporting, promotion and support through education partnerships.

Overall goals of the program

The specific target of the programme is to contribute to the City’s goal of climate neutrality by raising the energy efficiency of 1200 buildings by 38%. With the commercial sector currently responsible for emitting just over half of citywide GHG emissions, it is expected that a 38% increase in efficiency by 2020 for the commercial building sector will lead to an overall reduction of 383,000 tonnes of CO₂ per year.

Other related goals of the programme are to:

- Heavily reduce water consumption;
- Drive local economic development by increasing demand for green products and services;
- Achieve healthier buildings for both tenants and the city by decreasing heat and pollution inside and outside buildings.

Programme target and scope

The programme is principally aimed at engaging the owners and property/facilities managers of existing commercial buildings with office space. Yet other building types such as hotels, universities, light manufacturing and recreation facilities are also included. *Office buildings* are defined as containing 70-100% of floor space for office use. *Mixed use buildings* contain 1-69% office space and are characterised by a combination of office use and parking, retail and/or residential use.

The *Zero Net Emissions by 2020 – 2008 Update* strategy established that 1200 commercial buildings accounted for a total floor area of 5.6 million m². By fostering retrofits in 1200 properties, the programme is in effect targeting approximately two thirds of the commercial building stock containing office space in the city.

Whilst the 1200 Buildings Program itself is operated citywide, the incentives offered through the programme are targeted to certain ownership groups within a specific area of the city as a result of market research.

Private owners: ‘The mid-tier’

There are relatively few, large-scale office buildings and skyscrapers in Melbourne's central business district compared to megacities. A large portion of commercial buildings are ‘mid-tier’ defined as B, C or D by the Property Council of Australia. This grading system takes into consideration a diverse range of indicators such as building size, design, location,

environmental performance, security and building installations such as lifts, air-conditioning and other amenities. This means that the majority of the 1200 buildings targeted by the programme are smaller to medium size property owners. Such owners are very often individual investors, families or small businesses.

Innovative funding mechanisms

A key component of the 1200 Buildings programme involves financing packages designed to overcome the hurdle of owners lacking credit to finance retrofitting. The Environmental Upgrade Finance is a flagship product developed for the programme and administered by the Sustainable Melbourne Fund (a trust set up by the City to finance sustainability projects). This product consists of a tripartite agreement between the building owner, the City of Melbourne and a financial institution. Once a loan is negotiated, the lender transfers the funds to the owner for the financing of a retrofit. Loan repayments are then collected by the City of Melbourne through rates (i.e. municipal taxes) and passed back to the lender on behalf of the borrower. Special features of this loan system include competitive fixed interest rates and up to 15 year repayment periods. Importantly the charge is fixed to the building and can be passed onto next owner if the building is sold. As a further option, retrofitting costs (i.e. the loan) can be shared between the owner and the tenant as a way of overcoming the split-incentive dilemma, whereby the owner pays for an upgrade and the tenants gain the benefit of lower energy expenses.

Links to other City policies or programmes

Other initiatives conducted in parallel by the City to reduce emissions and increase sustainability performance in the building sector include Smart Blocks (targeting multi-unit residential buildings); City Switch (reducing emissions in commercial tenancies); Positive Charge (supporting both commercial and residential buildings to improve environmental performance) and the Solar Program (aiming to increase the uptake of renewable energy to 25% of the City's total electricity use by 2018).



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Links to other government policies

In 2011, the introduction of mandatory reporting of energy efficiency status by commercial buildings with over 2000 m² of net lettable area (Commercial Building Disclosure) has been leveraged by the City of Melbourne and industry partners to drive an increase in tenants demanding to work in better performing buildings. In some cases this has worked to incentivise building owners to take measures to improve building performance. However, because the legislation is only triggered at point of lease or sale (which in most cases occur only once every several years) the policy alone will not influence a significant number of owners to investigate their building's performance.

II. Inputs for the programme

Inputs during the design phase

AU\$ 750,000 was allocated by the City to establish the programme and Environmental Upgrade Agreements, as well as cover associated legal costs. Development of the program took place over two years, beginning in 2008. Three City officers were charged with this task, with additional support received from a director and external partners and consultants. In 2009, a steering committee of members of government, industry and academia representatives was set up to guide implementation efforts over the next decade.

Extensive research was commissioned by the City, utilising engineering and marketing consulting firms prior to the design of the programme. Although not published, these reports have been shared with industry and government stakeholders. One study analysed the Melbourne City building stock based on physical characteristics such as age, size and owner category as proxies to retrofitability. A major finding was that a relatively small number of properties (132 or 10%) in the CBD made up 42% of net lettable area (NLA). A key feature of this segment is that many buildings are owned by corporate or institutional investors, who are generally committed to retrofitting to improve building efficiency and obtaining higher NABERS Energy ratings. The study also identified another key segment: *private* (including owners or strata corporations). This group collectively owns 1078 buildings or the equivalent to 64% of total NLA. These owners are of key interest to the programme as such buildings tend to be older, with owners not typically engaged in improving building performance.

A second study analysed potential economic benefits from the programme. It concluded that a successful programme could drive around AU\$ 1.3 billion of additional retrofitting construction activities, create as much as from 5,800 to 11,800 in FTE employment, and decrease current energy expenditures in the City of Melbourne by up to 25% annually.

Inputs during the implementation phase

The programme was designed as a ten-year initiative, with implementation in three stages:

- 2011 – 2013
Efforts to understand the commercial building market and its drivers for change; awareness raising and capacity building for owners; securing of commitment from building owners; the provision of support to mid-tier owners to undertake retrofitting work; and setting targets.
- 2014 – 2017
Implementation of initiatives to increase retrofitting activity, with a particular focus on mid-tier owners, in addition to tracking emission reductions and driving local economic development.

- 2017 – 2020
Accelerated retrofitting action; transformative change.

Three officers were assigned to implementation of the programme, including a manager and director. In addition, two officers from the Sustainable Melbourne Fund were charged with the delivery of energy efficiency services.

A budget of AU\$ 250,000 was allocated, with a further AU\$ 250,000 for renewable energy projects for commercial buildings. In addition, the Sustainable Melbourne Fund (of which the City is the sole shareholder) has AU\$ 5 million available for low interest loans for commercial buildings. Private finance through Australian financial institutions is also available to building owners through the above-mentioned Environmental Upgrade Agreements.

III. Programme results

Effects on the retrofit market

Citywide progress in the retrofit market is monitored through the publication of the *1200 Buildings Retrofit Survey*. These surveys measure the volume and type of retrofitting activity and qualitative information on drivers and perceived obstacles to retrofitting the 2,256 buildings with portions of office space in Melbourne.

The latest report (2013) concluded that retrofitting activity in this sector is increasing. Key conclusions were:

- Since 2008, around 450 buildings (20% of the 2,256 buildings) have undertaken a retrofit.
- For the two five-year periods 2006-2011 (seen in the last biennial report) and 2008-2013, retrofitting activity accelerated, with more activity in the latter period.
- In 2013, 5% of the 589 buildings surveyed were currently retrofitting.
- 16% of buildings intended to retrofit within the next five years. 55% of respondents wanted to receive further information from the City regarding financial assistance and retrofitting advice.
- The majority of retrofitting was implemented by corporate owners.
- At the time the second survey was undertaken in 2013, the most common type of retrofitting activities were lighting upgrades (83%), followed by installation or upgrade to Building Mechanical Systems (59%), metering/sub-metering (57%) and chiller upgrades (54%). Other activities included boiler upgrades, installation of Variable-Speed Drives and other heating, ventilation and air conditioning (HVAC) improvements.
- Buildings undergoing retrofits were more commonly owned by the corporate segment (21%) and less commonly by private owners (4%). As the private segment own a much greater number of buildings, they accrued a greater total number of retrofits.

In addition, five buildings to date have signed an Environmental Upgrade Agreement (see *Innovative funding mechanisms* above) for financing retrofits.

In terms of other efforts to monitor citywide energy use reductions in buildings, this occurs through voluntary reporting and analysis of data from local energy maps and the Australian Government Commercial Building Disclosure programme.

IV. Lessons learned for replication

IV-i Key drivers of success

Time spent researching target audience

City officials attribute the allocation of sufficient time to the designing of the program as an important success factor. They highlight that during this period much effort was made to understand the nature and characteristics of the commercial building sector through stakeholder engagement and research. They focused on identifying key decision makers and understanding their motivations, capacity to finance retrofits and make decisions.

Different strategies for different building owners

Officials adopted different communication and incentive strategies for different sectors of commercial buildings. For example, corporate building owners typically have a large investment portfolio of buildings and a greater capacity to self-fund retrofits. They are motivated by the potential to gain publicity and showcase corporate social responsibility. Therefore, the City offered them a leadership programme to create opportunities for increased recognition.

By contrast, the mid-tier buildings owned by the private owner segment are not driven by corporate social responsibility and do not attract blue chip and government tenants choosing green buildings. They also lack the financial and human resources to take advantage of government grants and subsidies. The team therefore decided to play a major role in supporting this sector. Engagement with this segment includes the delivery of training and seminars, development of case studies and fact sheets, linking of owners with state and federal government subsidies, and provision of finance via Environmental Upgrade Agreements.

Drivers of retrofitting behaviour

The *1200 Buildings Retrofit Survey* (2013) shed some light on the key drivers behind owner decisions to retrofit buildings and equipment. The most common reason to retrofit was to replace a broken asset (39%) followed by a desire to minimise energy consumption (31%) and attract tenants (21%). The latter reason, in particular, indicates market demand for energy efficient buildings in central Melbourne, especially by government and blue chip tenants.

IV-ii Main challenges

Overcoming financing barriers

At the programme planning stage, lack of access to suitable financing was one of the most significant barriers preventing building owners from retrofitting. To overcome this, the City used its statutory power to establish Environmental Upgrade Finance to provide long-term financing to building owners. Despite the advantages that this option presents over conventional loans, it has been found that 81% of owners retrofitting at the time of the 2013 survey chose to fund their own projects. This may indicate that since recovery from the global financial crisis, access to finance is not proving a major barrier to retrofitting for Melbourne building owners. However, significant work is still required to engage with difficult to reach owners. As one strategy, the programme advocates ongoing and proactive building management as a low cost technique for improving environmental performance. For example, improved access to operational budgets for undertaking modest works to improve efficiency can be more attractive to owners not willing to borrow.

Engagement and marketing

Mid-tier owners are beginning to understand the opportunities represented by retrofitting

and improving the environmental performance of buildings. However it has taken more than three years to garner interest from these hard to reach owners. A new and ongoing challenge is the fact that a large number of building owners reside overseas, which limits the ability of City officials to contact or meet with them. It has also proved time consuming and challenging to secure the cooperation of building management services companies who are time poor and generally not committed to identifying opportunities for improving environmental performance. Officials devoted a large amount of time to understanding the market and creating tailor-made assistance packages for different segments and precincts. Officers are also collaborating with cultural associations, accountants, lawyers and consultants who advise building owners, and are experimenting with different messages. One approach is to utilise data obtained from recent heat waves and the social and economic impact of extreme temperatures. Other approaches include the provision of support and advice to building owners and managers with case studies, information kits, networking opportunities, seminars and training. Working with tenants through the City's CitySwitch program is proving effective to influence owners from the bottom-up.

Limitations of voluntary participation

The 1200 Buildings programme is a voluntary initiative seeking to trigger behavioural change. As such it is difficult to secure the participation of many building owners and managers in the absence of regulations. A secondary obstacle related to the absence of a legal framework is the acquisition of consistent information regarding energy and water consumption from both the entire building and individual tenants. City officials have attempted to overcome this by stipulating that tenants provide data to owners or managers as a condition of participation. Other channels are being pursued to facilitate data gathering, such as directly accessing data through utilities and using building owner reports. Officials are investigating the feasibility of proposing for legislative reform at the state government level, and are also seeking to learn from other cities in regard to the processes by which regulations are put in place and used to drive change in the building sector.

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4.2.4

NEW YORK CITY – *Mandatory benchmarking scheme in the Greener, Greater Buildings Plan*

Abstract: A benchmarking programme for energy and water consumption in large buildings, formed as one of four tenets in a comprehensive series of green building laws. After successfully achieving high compliance rates, the City is now focused on addressing data accuracy challenges.

Citywide reduction target

The PlaNYC sets a target of reducing citywide GHG emissions by 30% below 2005 levels by the year 2030.

Building-specific reduction target

The Greener, Greater Buildings Plan (GGBP) is expected to contribute 5% of the 30% target.

I. Programme context

Key elements

The Greener, Greater Buildings Plan (GGBP) is one of the most comprehensive building energy efficiency policies in the world. It consists of four Local Laws (LL) rendering mandatory the following: (1) adherence to strict energy local codes for both new construction and retrofitting, regardless of building size (LL85); (2) annual benchmarking of energy and water use with public disclosure (LL84); (3) audit and retro-commissioning every ten years (LL87); and (4) lighting upgrades and installation of electric sub-meters for large tenant spaces in commercial buildings to facilitate compliance with the current energy code (LL88). These four components are designed to complement each other. This case study focuses on the benchmarking programme.

Annual benchmarking

The benchmarking programme requires owners of large buildings to report energy and water use data to the City by May 1 every year. The NYC Department of Finance (DOF) generates an annual list of buildings required to comply. A free benchmarking tool, ENERGY STAR Portfolio Manager provided by US Environmental Protection Agency (EPA), is used by building owners to submit the data to the NYC Mayor's Office of Long-Term Planning and Sustainability (OLTPS). As this energy usage data must cover the whole building, owners must collect this directly from tenants (in the case of commercial buildings), or by requesting aggregated data from utilities. The City strongly recommends the latter method to reduce unnecessary burdens on owners and tenants. As for water usage data, the mandate is applicable only to those buildings equipped with automatic meter readings provided by the Department of Environmental Protection (DEP) for the entire period of the previous year. Upon the building owner's request, this data is automatically uploaded to ENERGY STAR Portfolio Manager by DEP.

Enforcement

Currently fines are only applicable to cases of non-compliance. A US\$ 500 fine is imposed on those failing to submit benchmarking data by each of the four quarterly deadlines, in addition to the main deadline on May 1 each year, totalling to US\$ 2000 per year. Also, as benchmarking results are disclosed on the City website by DOF, owners failing to comply are

publically listed. Implementation of the legislation was phased in, with disclosure requirements required only for City buildings in the first year, commercial buildings for the second, and residential buildings in the third. As of September 2013, all reported data has been made publicly available.

Programme target and scope

The programme targets owners of the following large buildings (see **Table 4.2.4**)¹. Although it affects only approximately 2% of total buildings in NYC (roughly 24,000 private buildings and 2600 public buildings), it covers about half of the gross square footage, which is responsible for 45% of citywide energy consumption. In this way, the City has maximised its limited resources to impact a significant share of energy consumption in the building sector.

Table 4.2.4 Thresholds for targeted building sizes

City building (owned or operated)	Single building	Two or more buildings on the same tax lot	Two or more buildings with the same condominium ownership
More than 10,000 gross sq ft	More than 50,000 gross sq ft	More than 100,000 gross sq ft	More than 100,000 gross sq ft

With thresholds being the same for most GGBP programmes—namely Audits & Retro-commissioning (LL87), Lighting upgrades & Sub-metering (LL88) and Benchmarking (LL84) — this results in less confusion for owners.

Overall goals of the programme

Goals for the programme are organised into the following three levels.

1. Overall goal: Reduction of total energy consumption in buildings throughout New York City, contributing to a reduction in citywide GHG emissions.
2. Operational goal: High compliance rate and data accuracy.
3. Outcome goal: Market transformation, retrofit implementation, and information transparency by monitoring energy and water use data as a key metric for the real estate industry.

The City has evaluated and compiled the data into a series of annual benchmarking reports for the first three years. Each of these analyses compliance levels and data quality in addition to energy and water consumption trends and characteristics of covered (i.e. mandated to comply) buildings.

Linkages to other City policies or programmes

The New York City Energy Efficiency Corporation (NYCEEC) provides financial assistance to support compliance with GGBP. This body was originally set up by NYC to facilitate GGBP implementation and it provides varying assistance to building owners to obtain easily accessible financing for energy efficiency retrofits. Options include direct loans provided by NYCEEC, Energy Services Agreements (ESA) offered by ESA providers via contract, and a multifamily programme offered by a local utility, Consolidated Edison (Con Ed).

¹ In 'One City: Built to Last', the ten-year plan published in September 2014, New York City announced their intention to widen the target to mid-sized buildings by lowering the limit of eligible floor area from 50,000 sq ft to 25,000 sq ft.

II. Inputs for the programme

Inputs during the design phase

Preparations for GGBP took place over a total of approximately 15 months in a process consisting of extensive in-house research, stakeholder meetings and public consultation (elaborated in *4.1 Key drivers of success* below). Research into characteristics of the New York building stock, benchmarking measures in other cities and potential impacts was conducted with support of the PlaNYC Sustainability Advisory Board. Throughout this preparation phase, staff from the Mayor's Office of Long-Term Planning and Sustainability (OLTPS) led by coordinating both the overall conception and detailed design of the programme design. This role was supported by assistance from the Department of Finance (DOF), the Department of Buildings (DOB), the Department of Environmental Protection (DEP) and the Department of Citywide Administrative Services (DCAS). Technical support for the ENERGY STAR Portfolio Manager was also provided by the US Environmental Protection Agency (EPA). GGBP was officially enacted in December 2009.

Inputs during the implementation phase

Annual benchmarking for covered buildings has been mandatory since May 2011. The implementation phase is also coordinated by OLTPS, with technical and financial support from DOF, DOB, DEP and other City departments. Resources consist of three full-time staff in OLTPS (one dedicated full-time, with two others providing support) in addition to personnel engagement from other City departments such as DOF, DOB, DEP and DCAS. Outreach efforts from other parties are discussed in a later section (*Partner support*). Monitoring of programme implementation for the first three years is facilitated through publication of an annual benchmarking report. Regarding verification measures, currently no third-party is used. However academic partners do assist in data analysis. Also, basic internal verification is conducted for service providers that assist the majority of building owners with benchmarking (see *Feedback to service providers*). At present no specific budget is in place regarding funds required for marketing, communication, monitoring or verification. Many agents such as professional bodies, universities and utilities act as City partners to support the programme implementation (see *Lessons learned for replication*).

III. Programme results

Compliance rate

In September 2013, the City of New York published the second annual report for the benchmarking programme. According to the report, a 75% compliance rate on a property number basis was achieved in both 2010 and 2011, with the second year seeing a significantly faster reporting of results. In 2012, compliance rose to 84%. Benchmarking reports indicate that a combination of five factors have contributed to these relatively high compliance rates. Namely, enforcement, outreach and training, focus on large buildings, communications and technical support, and consultants.

Programme effects on retrofit market

The benchmarking scheme was enacted in late 2009 and implemented by the private sector in 2011 for data from the calendar year 2010. Being so recent, the City of New York has not yet taken formal measures to gauge progress towards energy efficiency and GHG reduction targets. As such, it is too early to assess the impact of the programme on the retrofit market or demand for energy efficient buildings. In terms of other market impacts, however, the Institute for Market Transformation (IMT) reports that a growing number of companies appear to be offering services related to benchmarking and auditing. For example, entrepreneurs such as service providers and ESCOs are launching businesses in the city, with

several coinciding with the inauguration of the benchmarking scheme. As the programme continues and building owners are further informed of their benchmarking results and energy saving opportunities, it is expected that the City will see significant progress towards GHG emissions reduction and higher energy efficiency of buildings in New York.

Overall improvements in ENERGY STAR scores

Other evidence of positive impacts for GHG emissions and energy efficiency across New York emerge when comparing benchmarking results from the first and second year. Compared to year one, median ENERGY STAR scores for year two have increased from 64 to 67, with 25% of submittals qualifying for an ENERGY STAR score compared to 20% in year one. This equates to an increase of 284 buildings for the second year. The accumulation of experience across the building sector and implementation of improvement measures and upgrades in response to the GGBP appear as likely contributors to this improvement.

IV. Lessons learned for replication

IV-i Key drivers of success

Stakeholder engagement

A core driver of success was a strong stakeholder engagement process. This involved key players such as the real estate community, large property owners and tenants, engineering and architecture firms, environmental organizations, non-profit groups, labour unions, and other industry experts. This process started as early as 2006, just after the creation of New York City Office of Long-Term Planning and Sustainability (OLTPS). Diverse stakeholders from civil society, industry and government were mobilised into the Sustainability Advisory Board (SAB) where they provided input for the design of GGBP concerning requirements for mandatory retrofits (later removed) and use of ENERGY STAR Portfolio Manager (ultimately approved). The process of stakeholder recruitment was facilitated by prior and solid connections from the City of New York. Interaction with stakeholders was particularly important when considering that compliance with the new laws of GGBP require a substantial amount of effort from building owners. Additionally, this allowed the sharing of viewpoints between the City and building owners, the identification of areas of concern or tension, and then a degree of compromise from both sides in order to make the programme feasible.

During implementation, it was particularly useful to build and maintain a list of stakeholder email addresses voluntarily submitted by individuals interested in receiving up to date information via email. This permitted the City to contact stakeholders directly through periodic email digests and maintain close contact to obtain feedback or support.

Additionally, green workforce development and training was significant in gaining support from stakeholders. A study conducted during the early stages indicated that numerous jobs would be created by GGBP. A knowledge centre for lighting efficiency, Green Light New York, was also established to help building owners comply with LL88, obtain training in lighting efficiency, and test out new lighting technology.

Partner support

Of the various stakeholders involved, a substantial number of organisations became strategic partners for the programme. The various roles assumed included assistance with outreach or training and the provision of expert knowledge and techniques for data cleaning and enhancing reliability (see 4.2 *Main challenges*). Energy utilities have also played a critical



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role in data collection. Further, the US Environmental Protection Agency (EPA) acts as a partner by providing technical assistance regarding Portfolio Manager.

The Urban Green Council—the New York Chapter of the US Green Building Council (USGBC)—has played a key role by disseminating green building practices in the region. They have published the *LL84 Compliance Checklist & User's Guide* to assist building owners submitting benchmarking data to the City and conducted GGBP presentations to the public. Also, they actively contributed to the City by making proposals for building related policies via the Green Codes Task Force and the Building Resiliency Task Force.

During the implementation phase, City University New York Building Performance Lab contributed through the establishment of a Benchmarking Help Centre to assist with data collection issues. Beginning as a call centre managed by graduate students, it continues via a call-back service for voicemail requests. OLTPS and DOB also assist the centre with financial support from IMT.

Competitive nature of the New York City real estate industry

From anecdotal observations, the competitive nature of the New York real estate industry seems to have had a positive impact on the success of the programme. Owners of large buildings in particular are acutely aware of competition in the real estate market and committed to maintaining the greenest and most efficient buildings possible. The disclosure of benchmarking data has therefore had the effect of stimulating competition.

Focus on large buildings

Another key driver was the decision to focus on large rather than small buildings. As a defining characteristic of the New York programme, buildings larger than 50,000 gross sq ft are targeted. This threshold is relatively larger than that of other similar benchmarking schemes. Consequently, the programme affects a small number of owners (about 13,000 properties) which together cover about half of total floor area in New York City. (That said, GGBP also requires benchmarking for about 2600 City government buildings over 10,000 sq ft). The reason behind this focus on larger buildings comes from the resolve to focus on properties that can potentially achieve the greatest impact with the smallest allocation of

public resources. Also, owners of large buildings tend to be more consolidated, have more capital for compliance, and possess a greater array of measures available to enhance the energy efficiency of their real estate.

Flexibility to ensure high compliance rate

The New York City benchmarking scheme allowed a degree of flexibility to assist building owners in compliance, especially during the first year of implementation. For example, the reporting deadline was extended twice in the first year, first from May 1 to August 31, then to December 31. This leniency was afforded mainly to give building owners of various sectors enough time to report. While many owners were unfamiliar with Portfolio Manager, some also lacked energy efficiency and benchmarking expertise, and were less likely than commercial building owners to employ building managers.

The City was also flexible regarding the disclosure of data in special circumstances. Some commercial tenants operate in energy-intensive ways and do not wish to publish their ENERGY STAR scores because these may not accurately portray energy use intensity across different sectors. While all building owners must disclose energy intensity data relative to floor area, the City provides an option to omit 0-100 ENERGY STAR scores for properties demonstrating that data centres, television studios and trading floors occupy more than 10 percent of the total gross floor area.

IV-ii Main challenges

Coordination between multiple agencies

Different City agencies are in charge of different aspect of the programme, which is complex to implement. It is therefore crucial that multiple agencies communicate frequently and fully understand each other's role to ensure efficient implementation and reduce risks of miscommunication. To briefly summarise the various departments and roles performed, the Department of Finance (DOF) creates the list of buildings required to comply. While benchmarking results are reported to the Mayor's Office of Long-Term Planning & Sustainability (OLTPS), they have previously been disclosed online via DOF (since 2013, OLTPS and DOF both disclose on respective websites). The Department of Buildings (DOB) is in charge of legal enforcement and the imposing of fines. OLTPS analyses energy usage results, with the Department of Environmental Protection (DEP) overseeing water use and providing automatic data uploads to ENERGY STAR Portfolio Manager on behalf of owners. OLTPS is the overall coordinator of GGBP and leads stakeholder outreach with the help of DOF, DOB, and DEP.

Building identification

Building identification is an on-going challenge for the City. This is because the programme requires the identification of a building in a particular lot. On one hand a 'lot' is identified by the DOF system of BBL ('Borough, Block, and Lot') which is used for taxation. On the other a 'building' is identified by the Department of City Planning (DCP) system of BIN ('Building Identification Number'), which is used by the DOB to check the compliance of each building. Since neither a BBL nor BIN is sufficient on its own to identify a certain building in a certain lot, both systems are presently necessary. To enable this, the City asks building owners to provide both numbers when they submit data via Portfolio Manager. However the presence and need for these two identification numbers is currently proving confusing and time consuming as reports often include only one or the other.

Verification and data cleaning

Although there is presently no third-party verification process, the City does conduct data

cleaning with cooperation of academic partners to improve data accuracy and suitability for analysis. New York University and University of Pennsylvania have separately developed individual data cleaning methods and successfully identified common errors such as under-reporting for gross square footage, in addition to omitting outliers (for more details see p.42 of the *2013 Benchmarking Report*).

Feedback to service providers

With around 80% of benchmarking reports submitted via 100 service providers (and as much as two thirds conducted by 30 firms) the data cleaning processes were able to identify the unique error tendencies of each service provider. Although mostly unintentional, these errors signalled potential flaws in reporting methodologies. With specific information on data accuracy levels for each firm, the City was able to contact the 35 largest service providers directly and provide them with feedback and individual 'report cards.' The City is confident that such efforts will continue to increase the reporting accuracy in the coming years.

Utility engagement and automatic uploading

Utility engagement is another key challenge facing the City, which has multiple utilities operating throughout its jurisdictions. Consolidated Edison (Con Ed) and National Grid provide electricity and gas, with PSEG Long Island in charge of electricity for Long Island, all of which are private firms. The City's Department of Environmental Protection (DEP) manages the citywide water supply. To comply with benchmarking requirements, building owners need aggregated, whole building data that includes tenant energy consumption information.

Prior to the launch of the benchmarking programme, private energy utilities did not offer aggregated whole building data. To obtain such data (which may include non-residential tenant energy consumption information) building owners were required to provide each tenant with a tenant energy request form, with limited means to ensure that this data would be provided. Fortunately, the law encouraged utilities to make aggregated whole building data available, making the form unnecessary. In 2014, the City notified building owners that due to the availability of aggregated data requests, forms were no longer required.

The City recognises that manual data entry is a short-term approach, with direct uploading being the end goal. Present limitations require manual data entry of aggregated data requested from utilities. This creates possibilities for errors and burdens building owners with the task of having to contact multiple entities. The City has taken efforts to automate reporting, and has seen success with water data, with DEP providing direct and automatic uploads since 2011. Additionally, the City is actively exploring partnerships with utilities and the federal government to make automatic energy data uploading feasible in the near future.

Other measures to tackle data inaccuracy

Additional measures are being investigated by the City to address data quality issues. One option includes the hiring of specialist staff to verify data accuracy, investigate outliers and inform building owners of quality issues. The City is also exploring the possibility of imposing a penalty for inaccurate data entries, in addition to existing fines for non-compliance.

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4.2.5

PHILADELPHIA – *Building Energy Benchmarking Ordinance*

Abstract: This case study focuses on a benchmarking and disclosure programme from Philadelphia, supporting its goal to become “the greenest city in America” by 2015.

Citywide reduction target

The City of Philadelphia aims to reduce GHG emissions by 20% from 1990 levels, and municipal energy use by 30% from 2008 levels, both by 2015.

Building-specific reduction target

The City is aiming to reduce citywide building energy use by 10% by 2015 from 2006 levels.

I. Programme context

Key elements

The origins of the Building Energy Benchmarking Program lie in *Greenworks Philadelphia*, a comprehensive and ambitious sustainability plan announced by the Mayor of Philadelphia in 2009 to make Philadelphia “the greenest city in America” by 2015. *Greenworks*, as it is known, is comprised of 15 measurable targets and 164 initiatives encompassing five specific areas: energy, environment, equity, economy and engagement. Tackling commercial buildings was among the highest priorities, as approximately 62% of all GHG emissions in Philadelphia come from the building sector, with 60% of building energy used by commercial properties.

In June of 2012, the City Council unanimously passed the Building Energy Benchmarking Ordinance to amend Chapter 9-3400 of the Philadelphia Code. The new ordinance, which amends the Energy Conservation Code, mandates benchmarking, reporting and public disclosure of energy and water efficiency for non-residential buildings. Owners of covered buildings are required to submit data through EPA ENERGY STAR Portfolio Manager by June 30 each year. Data is required for energy and water consumption for the previous calendar year. Owners must disclose the recent benchmarking data to prospective purchasers or tenants upon request. The ordinance also includes provisions to safeguard privacy regarding the sharing of utility data. Starting with the second round of reporting in 2014, the information reported by building owners to the City will be publicly disclosed.

Programme target and scope

As stated in the Building Energy Benchmarking Ordinance, a qualifying building can be either of the following:

- Any commercial building with indoor floor space of 50,000 sq ft or more.
- All commercial portions of any mixed-use building where a total of 50,000 sq ft or more of indoor floor space is devoted to any commercial use.

Results from the first year of benchmarking show that the buildings targeted by the ordinance represent approximately 20% of citywide energy use in the building sector.

The responsibility of compliance falls on building owners, who must obtain energy and water consumption data even when tenants are separately metered by a utility supplier. Once

requested by the building owner, a tenant is required by the ordinance to provide information so that the owner can fulfil the benchmarking requirement. Because the majority of the covered buildings are served by 'master' energy and water meters, obtaining tenant data has not been a major barrier to compliance.

Overall goals of the programme

The programme aims to increase transparency in the commercial marketplace with regard to energy efficiency, advance energy efficiency building practices and reduce energy related expenditures for owners and tenants alike.

Enforcement

In cases of non-compliance, the building owner can be fined US\$ 300 for the first 30 days, and US\$ 100 each day thereafter. Based on a compliance rate of 86% in year one, the Mayor's Office of Sustainability (MOS) did not pursue fines for non-compliant buildings. With year two reporting now substantially complete, MOS has observed slightly higher compliance rates in the second year. However the final 10-12% of covered buildings are proving virtually impossible to reach.

II. Inputs for the programme

Manpower

The planning and design of the Building Energy Benchmarking Ordinance was undertaken by one full-time equivalent (FTE) from the Mayor's Office of Sustainability (MOS) who also managed other responsibilities. Staff support increased to 1.5 FTE going into implementation.

Input from diverse resources

There is no specific City budget for implementation and monitoring of the ordinance. However, inputs have been secured from diverse external sources to decrease reliance on internal resources. For example, the design of the benchmarking programme received technical assistance from academic partners in the Energy Efficient Buildings Hub, a regional innovation cluster funded by the Department of Energy. These partners also assisted by sharing costs or donating funds, in addition to other activities such as developing the programme website in the first year. The City also used approximately US\$ 50,000 of a grant funds to support advertising and public outreach activities.

A further US\$ 75,000 was spent on outreach programmes, mailing building owners and website development in efforts to boost compliance rates. In 2014 the City received funds for outreach activities from the City Energy Project, a US national initiative led by the Natural Resource Defense Council (NRDC) and the Institute for Market Transformation (IMT) that supports ten cities in their commercial energy efficiency efforts.

Learning from other cities

Philadelphia is the sixth city in the US to legislate a benchmarking law after New York, Washington, Seattle, San Francisco and Austin. Experiences from these cities, particularly with

regard to programme design and potential implementation issues, served as important points of reference for officials in Philadelphia. Knowledge was also gained about these cities from IMT. In particular, benchmarking experiences from New York have also proved highly insightful. For example, officials learnt that in New York most large buildings are owned by real estate corporations, who may own dozens of buildings. In Philadelphia, by contrast, many buildings are owned by individuals with single or small portfolios. Such market

characteristics encouraged building management companies with large portfolios to voluntarily hire consultants to facilitate compliance in New York, but much less so in Philadelphia.

Energy data collection

The EPA Portfolio Manager tool serves as the standard reporting and data entry platform in all nine US cities implementing energy benchmarking programmes. Key metrics collected through Portfolio Manager are the ENERGY STAR score, source energy use intensity (EUI), site EUI, GHG, and water use. Philadelphia's benchmarking programme relies on self-reporting by building owners and does not require appointment of registered professionals to verify data. A data quality checker is used by the City to assist in the identification of any data problems which, once located, must be corrected by building owners. In contrast to other cities where many buildings in publicly disclosed benchmarking datasets lack EUI information, submissions to the City of Philadelphia missing such essential data are considered as incomplete.

III. Programme results

Compliance rate

Reporting for the first compliance period for the calendar year 2012 officially closed on 15 November, 2013. This initial deadline was pushed back from June to accommodate the major upgrades that the EPA introduced to the Portfolio Manager in the summer of 2013. In May 2014, the City released aggregate programme results for this first year of the programme (i.e. the calendar year 2012). Public disclosure of individual building-level results is scheduled for summer 2014.

Results from 2012 indicate that 1,762 buildings submitted benchmarking data, representing 253 million sq ft. On a square footage basis, this equated to a compliance rate of 86.6%; 79.0% by number of properties and 85.4% by number of buildings. City officials are satisfied with this compliance rate, which has been affected by a number of vacant or soon to be demolished buildings that will be exempted from the ordinance anyway. Taking such building owners into account, compliance rate for the first year could reach nearly 90%.

GHG reductions

According to the *Greenworks 2012 Progress Report*, the City saw an overall GHG emissions reduction of 3.7% from 2006 to 2010. This is largely due to fuel switching in power generation away from coal to natural gas. It is still too early to assess the contribution of the Building Energy Benchmarking Program. The reasons are that firstly the programme did not take effect until 2013 and secondly that citywide GHG inventories are conducted on two year cycles on at least a 12 month delay. There still remains a large gap between the City's initial target of a 20% reduction by 2015. Despite increased adoption of energy efficiency practices in building construction and retrofits of existing buildings, citywide building energy consumption increased between 2006 and 2012. To some extent this can be attributed to new development, extreme weather, a slow economy and historically low energy prices during the period. Notwithstanding this setback, the benchmarking programme is still regarded as a key tool in the City's numerous strategies to slash GHG emissions.

Programme effects on retrofit market

One anecdotal indicator of the benchmarking legislation's success is a growing awareness in organisations such as the Building Owners and Managers Association (BOMA) on the role that retrofitting can play in boosting building energy efficiency and cutting energy

expenditures for building owners. City officials predict that for the second compliance year—and especially after public disclosure of results in the summer of 2014—many consultants will start offering services to building owners with low energy performance. Conversely, it is also expected that owners of poorly performing buildings will start seeking technical assistance from service providers.

Programme effects on other initiatives for small and medium buildings

The Building Energy Benchmarking programme exempts buildings smaller than 50,000 sq ft. However, the City recognises the importance of driving improvements in energy efficiency in this sector. Separate programmes have been designed and implemented for these buildings such as the EnergyWorks and Greenworks Rebate programmes. Such initiatives usually come in the form of energy audits, low-interest financing, grants, and technical consultations at low or no cost. In addition, advertisements on radio and public transportation are used to reach out to small and medium building owners.

Future plans

Although the current programme focuses on commercial buildings, there is a plan to extend the coverage to residential buildings in response to a recent announcement made by the EPA that residential buildings are now eligible for ENERGY STAR ratings. The City also intends to develop methods for tracking activities in the private retrofit market and to encourage the sharing of experiences between active service providers in the private sector.

IV. Lessons learned for replication

IV-i Key drivers of success

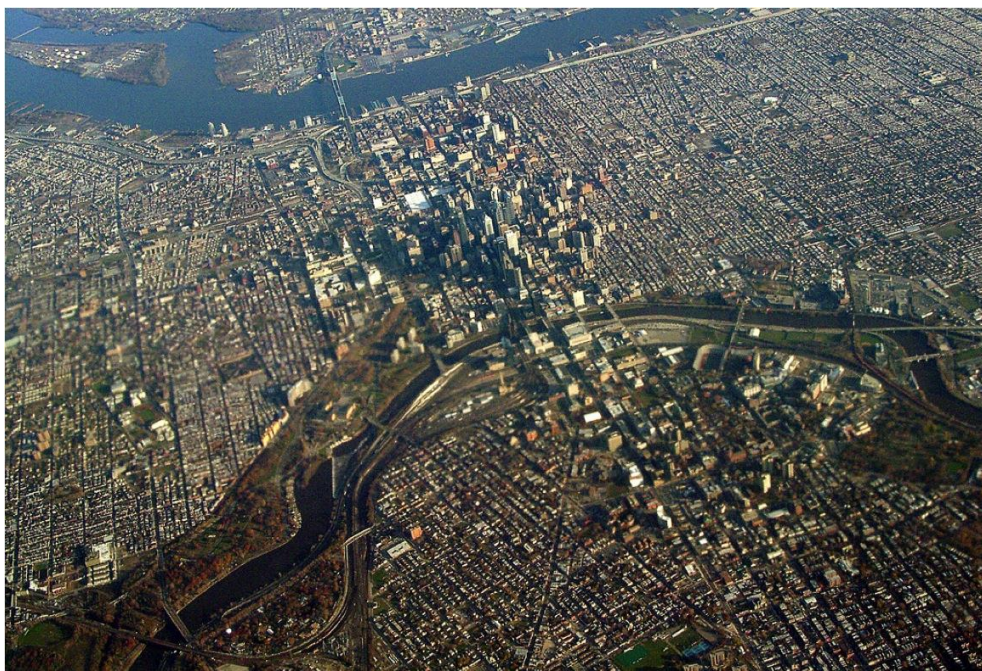
Stakeholder engagement

In 2011, the Mayor's Office of Sustainability (MOS) started meeting various stakeholders to gauge opinions about the benchmarking and disclosure programme. These stakeholders included building owners, organisations such as the BOMA, utilities, city council members and other City agencies and departments. This process proved an important means of gaining the support of such groups by incorporating their feedback into the programme design as much as possible.

Another highly effective means of fostering stakeholder engagement and support for the legislation came through the Coalition for an Energy Efficient Philadelphia (CEEP). The CEEP is a broad coalition of businesses, institutions, citizens, and organisations working together to increase energy efficiency in Philadelphia's buildings to stimulate economic growth and employment, cut energy expenditures for residents and businesses, and increase neighbourhood sustainability. City officials received assistance in building stakeholder support from the founding members of CEEP several months before the introduction of the ordinance. CEEP asked their fellow members to sign a pledge recognising the environmental and economic benefits of building energy efficiency, the 10% citywide energy reduction goal and new energy benchmarking requirements.

Cooperation from professional bodies

Relations with various professional bodies and organisations such as BOMA (Building Owners and Managers Association) were important drivers. BOMA had anticipated the enactment of this legislation, with both the international and local chapter supportive of benchmarking, yet opposed to public disclosure. Despite this, the City succeeded in building a good relationship with the BOMA local office and gained their cooperation in reaching out to key stakeholders, once the legislation was passed.



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Cooperation and automated data transfer from utilities

In Philadelphia, the water and gas utilities (Philadelphia Water Department and Philadelphia Gas Works) are municipally controlled, whereas the electricity and steam utilities are privately owned (PECO and Veolia Energy, respectively). All four of these providers are regulated through a Public Utility Commissions (PUC), as elsewhere in the US. The City gained the cooperation of the utilities by working closely with this regulator, which was receptive to using benchmarking to make utility data more transparent to customers. The utilities agreed to participate in public consultations concerning the technical aspects of the Building Energy Benchmarking Ordinance. More recently, the two privately-owned utilities for electricity and steam have begun automatic transfer of data to EPA Portfolio Manager. At present, automation of data reporting to ENERGY STAR Portfolio Manager is playing a great role in reducing the burden on building owners. This also extends to the City itself, which owns several hundred municipal buildings captured by the legislation.

Partnership with other agencies

The City has delegated the responsibility of administering the ordinance to MOS. Duties include convening stakeholder meetings, development of a plan for distributing benchmarking information online and the implementation of regulations to address privacy issues. The ability of the MOS to perform these tasks is greatly influenced by various constraints on manpower and financial resources. Consequently, the MOS has sought cooperation with other governmental agencies. For example, the Department of Licenses and Inspections is a well-known body in the City that monitors any violation of regulations. As such, they have enhanced enforcement efforts by sending non-compliance notices. The Office of Property Assessment has also assisted by providing data to determine the coverage and scope of policy targets during the programme design.

IV-ii Main challenges

Ensuring data quality

The assurance of data accuracy is one of the largest challenges in Philadelphia. Data submission relies on self-reporting and third-party data verification is not required before

submission. Although Portfolio Manager contains an inbuilt checker which automatically highlights outliers and common errors before data is submitted to the City, this alone is insufficient for assuring data reliability. Staff at MOS therefore verify each submission for errors.

Expertise gap among building managers

Expertise levels and responsibilities of building or energy managers appointed by large building owners vary greatly. Such managers range from planning and energy management professionals to administrative staff responsible for paying energy bills, often with little understanding of building energy efficiency. Although the latter group commonly experiences difficulties in compliance and often needs assistance, it nevertheless represents a large potential opportunity to reduce emissions.

As a means of assisting inexperienced building owners and managers, MOS officers have adopted measures such as providing a helpline, free information sessions and walkthrough assistance, as well as fixing specific time slots for receiving visits from building owners with enquiries. Instead of using third parties, the City of Philadelphia has chosen to provide in-house help beyond that required solely for benchmarking purposes as a way of creating maximum opportunities to advance energy efficiency in buildings, and sustainability more broadly.

Outreach to non-BOMA buildings

BOMA possesses sophisticated expertise in energy use issues as most of its members have been using Portfolio Manager prior to the launch of the benchmarking programme. Yet building owners belonging to the BOMA represent only a small number of targeted properties in the City; although these include some of the largest. It has so far proven relatively easy to reach out to this audience through the BOMA organisation. The real challenge remains how to reach out and provide various forms of assistance to non-BOMA individual buildings when MOS staff and funding resources are limited.

Moving from compliance to understanding

Many building owners are complying with the Building Energy Benchmarking programme simply because they are mandated to do so by law. Many do not realise or appreciate the importance of monitoring or improving energy performance other than to avoid non-compliance and fines. A key challenge for the second year of benchmarking legislation is therefore to communicate, educate and raise awareness about the importance of building energy efficiency. Towards this end, the benchmarking report for the first compliance year will provide information regarding the significance of energy efficiency improvement measures in buildings and will illustrate their potential benefits to the environment and economy.

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4.2.6

SAN FRANCISCO – *Existing Commercial Buildings Energy Performance Ordinance*

Abstract: A comprehensive policy initiative aimed at existing commercial buildings. Consists of benchmarking, auditing and measures to foster retro-commissioning and retrofitting by complimenting other finance and incentive programmes from the City.

Citywide reduction target

The City and County of San Francisco has set a goal of reducing GHG emissions to 40% below 1990 levels by 2025.

Building-specific reduction target

The Existing Commercial Buildings Task Force and San Francisco's 2013 Climate Action Strategy Update recognised the goal of reducing by 2.5% per year the total energy consumption in commercial and non-residential buildings. This will result in a total reduction of 50% by 2030 below 1990 levels.

I. Programme context

Key elements

The Existing Commercial Buildings Energy Performance Ordinance (ECB ordinance)—or the Environment Code Chapter 20—came in to force in 2011, targeting all non-residential buildings with more than 10,000 sq ft of conditioned space (i.e. heated and/or air-conditioned). The ordinance was adopted in response to a set of recommendations proposed by the Mayor's Task Force on Existing Commercial Buildings.

Targeted buildings must abide by the following requirements: (1) annual submission of a limited set of statistical information, also involving public disclosure of total energy consumption and 1-100 ENERGY STAR score for each affected building, and (2) conducting of either an energy audit or retro-commissioning of the entire building (including both tenant and common areas) at least every five years. The aim of these requirements is to ensure that decision makers such as owners, managers, tenants and investors etc. are able to (1) determine the energy performance of the building concerned, both over time and in comparison to similar buildings across the City and (2) have clear and actionable reports from qualified auditors identifying cost effective opportunities for enhancing building energy efficiency.

Benchmarking

Building owners or managers are required to annually submit a brief report of key benchmarking results to the San Francisco Department of Environment (SF Environment) by April 1. This is called an 'Annual Energy Benchmark Summary' and consists of the following points:

- Contact information and square footage
- Energy intensity (the amount of energy used per square foot)
- 1-100 ENERGY STAR score from Portfolio Manager (where applicable)
- GHG emissions from energy usage

This report is based on data from the previous calendar year. The local electricity and natural gas provider Pacific Gas & Electric Company (PG&E) provides automated data upload of energy data into ENERGY STAR Portfolio Manager for free. Owners or managers are required to submit the Annual Energy Benchmark Summary to tenants upon request. In addition, the City will disclose each Annual Energy Benchmark Summary publically through 'DataSF' the City's open data portal, which is scheduled to begin in October 2014. It should be noted that the reports for the first reporting year are being held confidential. In addition, data obtained is shared with the US Department of Energy Building Performance Database.

Audit and retro-commissioning

As mentioned above, requirements for the auditing procedure vary in accord with building size. For buildings greater than 50,000 sq ft, stricter requirements apply. An audit must at least satisfy Level 2 from ASHRAE and consist of an 'intermediate' survey and energy analysis. This will involve a detailed building survey and energy analysis, in addition to the recommendation of capital-intensive energy saving opportunities in alignment with owner constraints and economic capacity. Buildings between 10,000 and 49,999 sq ft require a less strict ASHRAE Level 1 'basic energy analysis'. This will involve a brief walk through visit and inspection of energy bills to identify low cost/no cost energy saving measures. In both cases, qualified auditors are then required to submit a Confirmation of Energy Audit to the City.

A noteworthy aspect of this requirement is that owners can select retro-commissioning as an alternative to energy auditing. The ordinance defines *retro-commissioning* as "non-capital work" such as repairs, maintenance and adjustment to optimise energy performance. This is opposed to *retrofit measures* involving "capital alterations" on the building such as the installation of new, energy efficient technology. This flexibility regarding either auditing or retro-commissioning is based on the implicit assumption that building owners would alternate between these two options as recommendations from energy audits were implemented to improve energy efficiency for every second fifth year. Note that the difference between an energy audit and retro-commissioning is a matter of emphasis; it is common practice for an engineer to document operational savings opportunities in the course of an energy audit, and to identify items entailing capital investment in the course of retro-commissioning.

Support system

The City offers free in-person presentations and webinars on the benefits of complying with the benchmarking ordinance, and provides a helpdesk reachable via email, phone, and troubleshooting via screen-sharing. The utility PG&E also provides free classes on benchmarking and how results can be used to generate cost and energy savings. Those who attend these PG&E sponsored classes are also eligible for free technical support with benchmarking.

Overall goals of the programme

The ECB ordinance aims to enable market decision-makers to compare the energy performance of their building to others, and gain actionable insight into cost-effective strategies for enhancing the energy efficiency of their property. Its wider goal is to reduce energy costs in the City of San Francisco, support the economy, reduce GHG emissions and enhance the competitiveness of the building stock. Specific targets of the programme are to reduce total energy consumption in non-residential buildings by 2.5% per year, achieving a total reduction of 50% by 2030 below 1990 levels. This target has come from the Existing Commercial Buildings Task Force set up by the City and San Francisco's 2013 Climate Action

Strategy Update. It was also formed in response to the State of California's goal of achieving zero net energy in 50% of existing commercial buildings by 2030.

Enforcement

In comparison to other cities, San Francisco has taken a relatively lenient stance to compliance thus far. The Department of Environment is required to: 1) issue a written notice of violation, 2) publicly post those buildings not complying after 30 days from the deadline, and 3) has the authority to levy fines 45 days after the written notice. With fines yet to be issued, the stance of the City is to encourage compliance by communicating the benefits of complying with the ordinance, assist those in need of technical assistance such as acquiring the necessary data, and to provide incentives and financing resources to those that comply. For the time being, the financial penalty for inaction is the opportunity cost of foregone energy cost savings.

Programme target and scope

The ECB ordinance targets all existing commercial buildings larger than 10,000 sq ft. As a result, approximately 19,000 private sector buildings and 450 public buildings are affected by the ordinance. This equates to a total of approximately 151 million sq ft of private sector buildings (around 80% of conditioned commercial floor area in the city) and approximately 38 million sq ft of municipal buildings and schools. This focus on commercial buildings has come from the realisation that buildings account for 53% of citywide carbon emissions, with commercial buildings making up 31.8% of emissions for this sector.

In regards to exempted buildings, ECB differs from policies of other cities by only targeting non-residential buildings with conditioned space. Consequently, any unconditioned building such as a warehouse, for instance, is exempted from the ordinance. In addition, other types of buildings are outside the focus of the ordinance. An Annual Energy Benchmark Summary is not required for new buildings less than two years old. Unoccupied buildings are also exempt. As for the auditing requirement, buildings are exempt when any of the following apply: an energy audit has been conducted within the past five years, an ENERGY STAR certification has been obtained for three of the last five years or LEED for Existing Buildings operational certification in the past five years. Other exempted buildings are those less than five years old, unoccupied, or under financial distress.

The ordinance does not target residential buildings. This is because it was shaped largely by a series of consultations with commercial real estate stakeholders (i.e. the Mayor's Task Force on Existing Commercial Buildings) and thus the focus was on commercial buildings rather than residential. The principle reason for focusing on commercial buildings was that in California, cities lack the authority to directly regulate energy usage data, and residential buildings tend to have very large numbers of individually metered tenants. As a result, residential energy benchmarking in San Francisco would require the consent of each individual tenant. Given the large number of residences in an apartment building, the inclusion of the residential sector for benchmarking and auditing would prove impractical at this point in time. In commercial buildings, the same issue applies. However it is less common for tenants to purchase energy directly for individual portions of the building, with the total number of tenants also tending to be much less. Although the programme has proved more feasible to implement on the commercial sector, significant friction remains. As this is a recurring problem across the country, at the invitation of the Obama Administration and US Department of Energy, the City and utility have entered into an agreement (the White House Data Accelerator) to find a better solution to the tenant data sharing problem within two years, beginning in December 2013.

Interestingly, the Mayor's taskforce initially recommended targeting buildings from 5,000 sq ft in order to ensure that the broadest spectrum of stakeholders possible were involved and provided with data on energy performance. However this was raised to 10,000 sq ft to make the policy easier to administer. As a result, it has been estimated that there are at present approximately 11,000 commercial buildings under 10,000 sq ft falling outside of the law. However this tranche of buildings comprises only 17% of aggregate commercial floor area in the City.

Linkage to the other city policies and programmes

The City of San Francisco has implemented various other measures to improve energy efficiency in buildings. These including policy for existing and new buildings, incentives, and financing:

Policy

A strict State energy code (CA Title 24 2013 Energy Standards) applies to all new construction and alterations to existing buildings. In addition, San Francisco requires LEED Gold for all new commercial construction larger than 25,000 sq ft. By targeting existing buildings, the ECB ordinance hence compliments this code.

Incentive programmes

The ECB ordinance also complements San Francisco Energy Watch (SFEW). Launched in 2006, this programme targets hard-to-reach small businesses, medium sized commercial buildings and multifamily buildings by providing free audits and project management of retrofit projects, whilst also supporting retro-commissioning. Rebates and quality assurance assistance help motivate building owners to implement energy efficiency measures recommended through the mandatory audits.

Financing

The City also offers the GreenFinanceSF Property Assessed Clean Energy (PACE) finance programme, which finances energy efficiency, renewable energy, water efficiency, and seismic retrofit projects. Capital is provided by investors selected by the property owner and repaid through an increase to annual property tax assessments, with terms up to 20 years.

California State benchmarking programme

The ECB ordinance also compliments the Commercial Building Energy Use Disclosure Programme (AB 1103) by the State of California, effective from January 2014. This requires disclosure of a detailed set of energy efficiency data to the two parties involved in a major real estate transaction (i.e. sale, lease or refinance), in addition to the state regulating body. In contrast, the City of San Francisco requires public, annual disclosure of a very limited set of data. The view in San Francisco is that annual disclosure is a mechanism to encourage current occupants to improve energy efficiency in operation. On the other hand, transactional disclosure helps the buyer, future tenant or investor gauge opportunities for further improvement.



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II. Inputs for the programme

Inputs for the design and implementation phase

Whereas initial administration of the ordinance is funded by a combination of the city and foundation support, related programmes are funded separately. SFEW currently receives approximately US\$ 7 million per year from contracts with utilities to provide efficiency and outreach services to commercial and multifamily customers in need. This funding is in turn derived from nearly US\$ 1 billion in energy efficiency funds paid by California ratepayers under the auspices of the California Public Utilities Commission.

The ordinance was designed in 2009 by the Mayor's Task Force on Existing Commercial Buildings, with stakeholder engagement and drafting of the legislation stretching out over approximately 18 months. Implementation of the ordinance was designed to be phased in as follows:

- April 2011: Ordinance becomes effective
- October 2011: First benchmark reporting deadline for large buildings (50,000 sq ft or more)
- January 2013: First submission deadline for energy audits or retro-commissioning reports for large buildings
- April 2013: First benchmark reporting deadline for small buildings (10,000 to 25,000 sq ft)
- End of 2014: 95% of audits for smaller buildings expected to be complete

For staffing resources, the City supplies approximately 1.5 FTE, and various support roles are provided by the private sector. In addition, extra staff are mobilised before and after reporting deadlines.

Stakeholder engagement during the design phase

Stakeholder engagement and consultation took place through the above mentioned Mayor's Existing Commercial Buildings Task Force. This consisted of approximately 20 stakeholders with diverse experience and expertise in commercial real estate (ownership, management,

operations, engineering, construction, law and finance), engineering firms, the local energy utility PG&E, the State Energy Commission and the US Environmental Protection Agency (EPA). This task force was originally convened by the Mayor to identify the policies, partnerships and measures for maximising energy efficiency in commercial buildings, reducing GHG emissions and improving the competitiveness of commercial buildings in the city. As mentioned already, one of the main driving forces behind the emergence of ECB ordinance was the formal recommendation (in the form of a report) for a benchmarking system. Stakeholder consultation then continued after drafting of the ordinance, itself based on recommendations of the task force.

A preliminary version of the ordinance was then formed, also based on research from the City Department of Environment, City data and literature reviews. The draft was presented to no less than 50 trade groups and commissions (many from the task force) as well as community members. It was revised based upon feedback from these groups. Once adopted in February 2011, outreach about the new requirements of the ordinance commenced. This took place through presentations to trade groups, utility-sponsored training, media coverage and letters of notification to affected property owners.

Partnerships with other cities

Officials in San Francisco Department of the Environment are part of the Local Government Sustainable Energy Coalition (LGSEC). This group of 26 local governments engages in knowledge sharing around issues such as energy data access, improvement to state policy and regulations, and how cities can team with utilities to promote energy efficiency. San Francisco also shares best practices and policy models with the US DOE. At the same time, the City is participating alongside other US cities implementing energy benchmarking programmes to contribute to the development of the Standard Energy Efficiency Data (SEED) platform. This is intended as a common database to standardise management of similar energy efficiency programs, among other uses. The open source software platform is in beta testing, with release expected in the latter half of 2014.

III. Programme results

Impacts

The 2013 update to the Climate Action Strategy reports that as of Spring in the same year more than US\$ 6 million in annual energy savings opportunities and US\$ 10.7 million in energy efficiency investments have been identified in the first 195 audits submitted. It is also reaffirmed that full compliance with the ECB ordinance will lead to a 2.5% annual improvement in efficiency for the commercial building sector, with projected annual GHG reductions being 176,638 metric tonnes per year.

Compliance

Benchmarking compliance has been established at currently 80% for the two year period of 2011-2012. Compliance rates are significantly higher for large buildings, with smaller buildings between 25,000 and 50,000 sq ft presently attaining only around 50-60%. This sector therefore represents the main area of focus for City efforts to boost compliance. For small buildings between 10,000-25,000 sq ft, compliance only just became compulsory last year, and at present, compliance rates are extremely low. Yet this can mainly be attributed to technical problems related to the upgrade of the EPA ENERGY STAR website which caused technical issues with data uploading from the energy utility. Audit compliance for 2013 was 78%.

Programme effects on retrofit market

City officials are confident that the law is helping drive the retrofit market. To cite some anecdotal evidence, the City-run SFEW programme is observing that a high proportion (around 40-70%) of small commercial and multi-family building customers are implementing the energy saving opportunities identified in free audits provided by SFEW. So while audits do not entail mandatory upgrades, the retrofit market is regarded as robust. Moreover, the State of California's ambitious Title 24 Energy Standards apply to all commercial and residential additions and alterations. In addition, San Francisco has instituted various amendments to these standards such as time-of-sale mandatory upgrades for residential properties, and greater performance standards for fluorescent lighting. Therefore, it is important to bear in mind that the benchmarking system has only been in operation for three years whereas 'low hanging fruit' such as energy efficiency codes and incentive packages have been in existence for much longer.

IV. Lessons learned for replication

IV-i Key drivers of success

Support from both elected officials and local stakeholders

As local stakeholders were involved in the design period, implementation of the ordinance has been fuelled by support from various stakeholder communities who felt that their interests had been adequately incorporated. Conversely, there was no substantial resistance from owners, who comprised a large part of the Mayor's task force. In the legislative process, the local Building Owners and Managers Association (BOMA), the Chamber of Commerce, and the Small Business Commission were strong supporters. Support from these bodies is representative of a large range of building sizes and uses. The critical mass of the above described support granted the City some freedom to learn through trial and error when implementing the new act.

Differing messages for different audiences

City officials have made efforts to adjust the message and medium used to communicate about the ordinance depending on the market segment targeted. This also appears to be a key factor in fostering stakeholder support or understanding for the audience. In the case of written communications to building owners, the amount of content is kept brief, with the main focus being on financial savings rather than climate change mitigation. In verbal communications, references are made to the Mayor's task force and political support, again with the emphasis on potential financial savings and opportunities for competitive advantage. Climate change risks and mitigation is positioned as a secondary driver. In web communications or presentations, key messages focus on cross-referencing benchmarking initiatives in other cities, financial benefits and the importance of reducing GHG emissions for the real estate industry.

Compatibility with existing efficiency measures

When designing the ordinance, substantial efforts have been made to ensure compatibility with other City and State incentives for energy efficiency. The policy was designed so that once data required for compliance was assembled, owners would be well positioned to take advantage of other programmes and financial incentives to implement upgrade measures and capitalise on savings opportunities identified in audits. As other measures to ensure compatibility with other programmes, workshops provided by the City on data reporting and energy efficiency were designed to contain additional information to that already available through existing educational initiatives such as energy efficiency training programmes from PG&E.

Securing of high quality data

The City has observed that data reported so far is on the whole of high quality, with no evidence of systematic falsification of data. A key driver for this appears to be the awareness that data falsification could potentially jeopardise a building's future transaction (i.e. sale etc.). This is because State law requires benchmarking reports to be disclosed to concerned parties at the time of a real estate transaction. To ensure data quality, the City recommends the validation of benchmarking information by professional engineering services.

IV-ii Main challenges

Balancing priority and resources

The City's legislative body, the Board of Supervisors, being motivated by concerns about climate change, sought a more aggressive approach. As a result, the originally envisioned time period allocated for conducting the first round of audits was shortened from five to three years. The need to strike a balance between calls for an aggressive timeline, programme efficiency and feasibility, in addition to data quality challenges (explained below), have all contributed to the relatively lenient enforcement approach taken to date.

Lack of quality data for the local built environment

In designing and implementing the ordinance, a major obstacle has been a lack of quality data describing the local built environment. There were multiple existing datasets in the City with some relevance to the ordinance, in particular those by the tax assessors and local building inspection department. However, this data was organised according to the different functions of each agency and was not entirely suitable for the implementation of the ordinance. Much effort was therefore required to clean and re-organise the data, including cross-referencing with data from Co-Star (a comprehensive database of commercial real estate data). Now that data quality has improved substantially, the City is poised to utilise the US DOE's SEED platform, which was mentioned above. It is envisioned that this tool will generate significant cost savings for the City for data management whilst standardising this process across other cities.

Owner access to whole-building energy use data

While it is a straightforward matter for owner-occupied buildings and single-tenant buildings to track energy use, this is proving much more challenging for owners of buildings with numerous separately metered tenants. In the other eight US cities where energy benchmarking is required, utilities solve this problem by providing whole-building monthly total energy consumption upon request. By automating data access, the utility PG&E has reduced but not yet solved this problem. Tenants must still consent to share data with building owners, with this procedure being facilitated through a free online process on the PG&E website.

Institutional complications for data management

Two state agencies regulate energy consumption data in the state: the California Public Utilities Commission and the California Energy Commission. Lack of a single regulatory authority complicates the City of San Francisco's efforts to streamline the data procurement and management process. In order to overcome this barrier, the City is currently involved with the US DOE and PG&E in the White House Data Accelerator project mentioned above.

Communicating the value of benchmarking data

Communication and education remain as key future challenges for the City. A core task and eventual metric of success for the programme is to ensure that the wider public is aware of the value of benchmarking information, which it is hoped, will trigger a shift in market trends.

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4.2.7

SEATTLE – *The Seattle Building Energy Benchmarking and Reporting Program*

Abstract: Although Seattle’s programme is achieving a high compliance rate, maintaining outreach efforts to educate stakeholders on the value of benchmarking data is an ongoing challenge.

Citywide reduction target:

The City of Seattle aims to attain carbon neutrality by the year 2050.

Building-specific reduction target:

The City has set a 2030 goal to reduce energy use in commercial buildings and residential buildings by 10% and 20% respectively..

I. Programme context

Key elements

The Seattle Building Energy Benchmarking and Reporting Program requires all residential and commercial buildings of 20,000 sq ft or larger to track energy performance annually, report to the City and disclose upon request this information to current and prospective tenants, buyers or lenders. This regulation has been developed in support of the Climate Action Plan (CAP), updated in 2013, as a step toward the City’s 2050 carbon neutrality goal.

The benchmarking programme was adopted in January 2010 as Ordinance 123226 (updated in 2012 as Ordinance 123993). Implementation of the law included a phase-in period beginning with large commercial buildings greater than 50,000 sq ft, which were first required to report by April 2012. Multifamily buildings were first required to report by October 2012. For buildings greater than 20,000 sq ft (and less than 50,000 sq ft) reporting was first required in April 2013. The programme is now in full implementation, covering approximately 3250 properties (totalling more than 280 million sq ft).

Annual benchmarking structure

The benchmarking programme requires building owners to collect building use details and actual energy use data for each building and report to the City by April 1 each year. Reporting is carried out through the ENERGY STAR Portfolio Manager from the US Environmental Protection Agency (EPA).

While submitted data is not currently verified by a third party, the City provides a free help desk to support owners with reporting performance data via telephone and email, in addition to weekly drop-in sessions and workshops. The City also uses third-party technical assistance to identify outlier data and contact building owners to correct inaccuracies.

Enforcement

Programme outreach includes annual mailing of a notification letter informing or reminding building owners of the April 1 reporting requirement. In cases of non-compliance, the City notifies owners with a warning letter. After the provision of grace periods and assistance in creating the data (if required), a Notice of Violation with penalties is eventually sent to those failing to submit within 90 days of the deadline. For buildings greater than 50,000 sq ft, a

fine of US\$ 1,000 applies per quarter of non-compliance, with this amount being US\$ 500 for those between 20,000 and 49,999 sq ft. Last year, approximately 2% of 3250 buildings were issued a fine. Fines continue to accrue every ninety days if a building owner fails to correct the violation and bring the building into compliance.

Programme target and scope

The programme targets all residential and commercial buildings 20,000 sq ft or larger, with requirements directed toward building owners and managers. The logic behind this focus on large buildings was the resolve to capture the majority of flooring surface area in Seattle. Another decisive factor was that this class of buildings is more likely than smaller buildings to employ a facility manager or building management firm and, therefore, to have greater capacity to conduct energy benchmarking and act upon the results.

The initial ordinance was targeted at commercial buildings above 10,000 sq ft and multi-family buildings of five units or more. This was revised when it became clear that this would affect 9000 buildings, many of which were small buildings whose owners lacked knowledge of benchmarking systems and the resources to report energy consumption. This led to a reform of the ordinance to target larger buildings of 20,000 sq ft or more in the commercial and residential sector.

Overall goals of the programme

The ultimate goal is to help building owners lower energy consumption and costs and thus contribute to the Climate Action Plan goals for reducing carbon emissions in Seattle's existing buildings. The City has also placed a great deal of emphasis on the programme's educational aspects. It hopes that by educating tenants and owners in energy efficiency performance and benchmarking, the programme will contribute to an informed market which considers energy efficiency when making financial decisions. In addition, annual reports of building energy performance are also planned to help guide the City's future policies and incentive programmes. As an operational goal, the City aims to attain close to 100% compliance annually.



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II. Inputs for the programme

Inputs during the design phase

The design phase took place over two years. From 2008 to 2009 a Mayor's Green Building Task Force (elaborated below) was convened and charged with the mission of providing guidance on suitable policy mechanisms for reducing energy consumption in existing buildings by 20%. A benchmarking policy was one of the energy efficiency policies recommended during this stakeholder engagement process. Policy legislation was designed and proposed during 2009, and eventually passed in 2010. Starting with the design process, personnel has ranged from portions of existing staff, growing to 2.75 FTE in 2013 during the implementation period. In addition, staff for technical assistance began at 0.5 FTE, then expanded to 3 FTE in the second year of phased implementation. Now that all buildings are reporting for their second and third year, the technical assistance staffing level has been reduced to 1.75 FTE.

In terms of overall budget, the policy proposal phase (2007-08) relied on part-time contributions from several existing staff members in other departments. After the policy was recommended by the Green Building Task Force in 2009, 0.25 FTE staff was committed to its design. Federal grant resources were also used to create infrastructure for the programme, such as for instance database development.

Stakeholder consultation took place around a year before the passing of the ordinance. This was mainly assured through the above-mentioned Mayor's Green Building Task Force consisting of 50 individuals from the private sector, energy utilities, government authorities and the civic sector. This task force was eventually divided into two groups—one focusing on new buildings and the other on existing buildings—and met monthly during the period of June 2008 to January 2009. In addition, approximately 18 months later a series of community discussions were held to inform about implementation requirements of the ordinance. These consisted of both informal and formal meetings with the Building Owners and Managers Association (BOMA), rental housing associations and other public stakeholders. Feedback from these meetings was used to refine the adopted ordinance's rule mailing guidance known as the 'Director's Rule'. After adoption, stakeholder consultations continued. These involved working with training providers to educate building owners on the uploading of data to ENERGY STAR Portfolio Manager, as well as outreach efforts to the building sector to inform them about the new reporting requirement. Additionally, officials launched a multifamily pilot programme in the early implementation stages to verify the effectiveness of educational materials and support compliance of multifamily building owners.

Inputs during the implementation phase

Although shifting over time, the overall budget composition for the implementation phase roughly consisted of 75% in grant funds, 15% in city funding and 10% in penalty revenue. In regard to staffing resources, the programme currently has 2.75 FTEs. This includes 1.0 for programme management and planning, 1.0 for outreach, education and data management, and 0.75 for compliance and enforcement.

The latest marketing and communication budget was approximately US\$ 20,000. This was to cover costs associated with producing notification letters, educational materials, and warning letters. The latest budget for Information Technology upgrades to maintain the web services for the reporting process was approximately US\$ 15,000.

The City has also continually invested in the stakeholder engagement process. This has encompassed measures such as free educational workshops to facilitate compliance, media outreach through monthly e-newsletters and contributions to industry publications, and also by sharing lessons learned from data analysis.

III. Programme results

In January 2014, the first comprehensive analysis report of data submitted in 2011 and 2012 was released. This provided the first ever means for building owners and managers to gauge their building's energy efficiency against similar buildings in the city. So far, the programme has achieved a remarkably high compliance rate (elaborated below). In addition, it is also seeking to spur green building practices by referring owners and managers to other utility incentive programmes regarding energy efficiency and so on.

High compliance rate

According to the report, the programme has achieved a 93% compliance rate on average (89% for non-residential and 97% for multifamily buildings). This rate is one of the highest recorded of US cities implementing similar benchmarking programmes.

Programme effects on retrofit market

With energy savings usually requiring a number of years to manifest, it is hard to assess the impact of the programme at this early stage of implementation. However, there is anecdotal evidence of several buildings undertaking energy efficiency upgrades in response to the ordinance. As a further measure to drive retrofitting, the City is partnering with the publicly-owned electric utility Seattle City Light. This utility is currently comparing benchmarking results with internal data and using findings to improve and inform existing and future efficiency rebate programmes.

Another source of anecdotal evidence comes from the Seattle 2030 District. This coalition of private downtown buildings is seeking to, amongst other sustainability goals, attain carbon neutrality for new buildings and a 50% reduction in energy usage for existing buildings by the year 2030. The City's benchmarking initiative has been credited by the Executive Director of the Seattle 2030 District as being one of the key drivers behind the self-initiated formation of this alliance.

IV. Lessons learned for replication

IV-i Key drivers of success

Political and stakeholder support

A key driver of success has been political support from the City's Mayor, Council members, and department directors. Buy-in from the Mayor and other representatives, due to existing City commitments to implement new measures to meet climate targets, proved particularly important in forming the programme.

Stakeholder support was also key in driving the formation of the programme. The main group involved was the above-described Mayor's Green Building Task Force, which recommended the creation of a benchmarking programme in their findings. Working collaboratively with stakeholder groups (such as BOMA), the ordinance was created with a unique disclosure provision aimed at entities engaged with a building, rather than allowing broad public access. Annually reported metrics were also limited to basic building energy performance and not operational characteristics. This responsive policy proposal enabled

the City to overcome the bottleneck of building industry concern regarding the disclosure of building level energy data. In addition, support came from the Institute for Market Transformation (IMT), EPA and the US Department of Energy (DOE).

Funding

Another core driver was the securing of funding from the Federal Government, local energy efficiency organisations and private foundations.

Existing knowledge base

The existence of a knowledge base on the residential and commercial stock in the City helped the identification of the most suitable buildings to target. This consisted of a City-created database utilising data from the local tax assessor's office.

Drivers of high compliance

Officials attribute Seattle's remarkably high compliance rate to outreach and stakeholder engagement efforts involving free information and training sessions and establishment of a help-desk, now in operation for over two and a half years. Other important factors include the revision of the ordinance to focus on the type of buildings that would most benefit from benchmarking. The City relaxed some of the initial reporting deadlines deemed as too ambitious for many building owners, and modified some of the rules and details in the ordinance during the design phase. The City also spends time following up dubious reports or helping resolve errors in the reporting process. Another reason behind high compliance levels appears to be the commitment to enforcement, when necessary.

Closer examination of compliance rates reveals that the residential sector (97%) outperforms the non-residential sector (89%). Commercial and residential buildings each make up roughly 50% of the 3250 properties required to benchmark. Contrary to expectations, interest and compliance from the smaller commercial building market is lowest, with, in contrast, small multi-family property owners proving much more receptive and easier to reach out to. One of the key drivers for the higher compliance rate in this category appears to be that residential owners were easier to contact, with many being members of local housing rental associations and users of property managers.

Citywide energy reduction targets

The success of the programme has also been driven by the wider City resolve since 2005 to decrease carbon emissions. Officials cite the presence of the Climate Action Plan (CAP) as being helpful when reaching out to stakeholder groups who may otherwise have felt that the new ordinance was an unnecessary and additional burden. This is because the CAP illustrates that simultaneous efforts are being made to tackle sectors such as transport, in addition to buildings. The CAP also shows stakeholders that the City of Seattle is itself subject to benchmarking and carbon reduction requirements.

Inter-city exchanges

Sharing of best practices and mutual testing of various approaches with other municipalities pursuing similar policies was highly valuable. Such cities include New York City, San Francisco and Washington DC. Officials in Seattle were able to draw upon this outside experience and research which demonstrated the importance of benchmarking in driving energy efficiency and carbon reduction. Some of the meetings with these cities were realised with funding from external sources such as US Sustainability Directors Network and the Bloomberg Foundation.

Utility support

Support from utilities in regard to data exchange has also been a significant contributor to the success of the programme. In Seattle, access to energy data requires the cooperation of three utilities: Seattle City Light (electricity, publicly-owned), Puget Sound Energy (LNG, privately-owned) and Seattle Steam (privately-owned). Each of these utilities has specially set up data access and reporting infrastructures. Direct access to utility data allows building owners to attain aggregate building level consumption data inclusive of all tenant energy use, whilst retaining tenant anonymity. Furthermore, utilities also offer automatic data upload to ENERGY STAR Portfolio Manager on behalf of customers as a data exchange service. The combination of these measures facilitates the reporting process by saving the manual task of, for example, referring to individual power bills for each tenant in a building. The establishment of access mechanisms between the utility and individual buildings was time consuming and cumbersome. Yet, once set up, it eased the task of continued reporting and reduced errors in data arising from manually input.

IV-ii Main challenges

Software and data management issues

City officials found that the software used for reporting (ENERGY STAR Portfolio Manager) was not user friendly as it was originally designed for energy efficiency engineers. This system has since been redesigned and made more user friendly, which appears to have helped building owners.

Creating the database and information technology system for data exchange was also challenging. This has required ongoing technical oversight to address problems and maintain compatibility. Utilities have been faced with the need to individually create an automated data processing programme for data exchange. Customer resistance and lack of technical expertise are large barriers that the City has continually needed to address through technical assistance.

In terms of measures to ensure data accuracy, the City mainly relies on self-reporting, although they have audited a sample. They have also separated results into building type, allowing the verification of data accuracy for cases falling outside category mean ranges. This verification of outliers has generated opportunities for property managers to consider increasing energy efficiency after being informed that their energy consumption falls well above the mean range. All data is managed in house, although the City attained assistance and verification support from the Department of Energy through the Buildings Performance Database and contracting with a private consultant to conduct data analysis.

Another strategy to boost data accuracy is to encourage building owners to obtain the EPA ENERGY STAR certifications, as such energy efficiency ratings can be used to promote the market appeal of their building. As the awarding of an ENERGY STAR certification requires verification of reported energy consumption via an engineer-led inspection of past energy bills, this strategy of promoting certification serves to enhance data accuracy of the self-reported benchmarking results. It also helps eliminate the perverse incentive of falsely reporting lower energy consumption figures to the City. At present, however, the Seattle Building Energy Benchmarking Analysis Report shows that only 69 out of 309 buildings eligible for certification have actually obtained certification.

Outreach efforts required to educate on the value of benchmarking data

Precise data on the number of buildings receiving requests for disclosure from their tenants,

buyers and lenders is currently not collected. Anecdotal evidence suggests that disclosure is requested for real estate transactions involving large downtown office buildings. Now that benchmarking data is available, the City wishes to encourage the real estate sector to understand the importance of this data and how it can be used. It aims to move beyond mere compliance towards action on improving energy efficiency. It believes continued education of stakeholders is required for future efforts.

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4.2.8

SINGAPORE – *Existing Buildings Legislation*

Abstract: The landmark legislation for the greening of existing buildings was enacted to accelerate progress in meeting the stretched national target of ‘greening’ at least 80% of Singapore’s building stock by 2030.

Citywide reduction target

There are two aspects to climate reduction targets for the city-state Singapore. The first pledge is to reduce national GHG emissions by 16% by 2020 from business-as-usual (BAU) levels, on the condition that there is a legally binding global agreement in place, in which all countries implement their commitments in good faith. In line with the above, Singapore has embarked on implementing policies and measures in the hope of reducing emissions between 7% and 11% from BAU levels by 2020.

Building-specific reduction target

Not specified.

I. Programme context

Overview

The legislation to green existing buildings (EB legislation) was passed in September 2012 as part of a strategy by the Building and Construction Authority (BCA) under the 2nd Green Building Master Plan (GBMP) to achieve the national target of greening at least 80% of the building stock by 2030. The implementation of this legislation signals a shift in focus from new to existing buildings. This was driven by the realisation that targeting the latter is the key to reducing emissions in the greater portion of the building stock in Singapore.

Background - Building Control Act and BCA Green Building Master Plan

Two major green building policies were enacted under the Building Control Act to mandate minimum environmental sustainability standards for all new and existing buildings in Singapore (see Figure 4.2.8). The first was the Building Control (Environmental Sustainability) Regulations implemented in 2008, a legislation aligned to the focus on improving the energy efficiency of new buildings under the 1st GBMP. The second legislation and focus of this case study—i.e. Building Control (Amendment) Act 2012—emerged in response to the existing building focus of the 2nd GBMP. The 3rd GBMP launched in September 2014 focuses on engaging building occupants and tenants as a holistic approach in reducing the energy consumption of buildings.

Key elements

The EB legislation instituted three key elements:

1. **Minimum Green Mark Certified standard:** Building owners are required to meet a minimum environmental sustainability standard at the time of an installation or replacement of any water-cooled/air-cooled chiller or unitary system. This aims to spur building owners to install energy efficient centralised air-conditioning systems to reap energy saving benefits over the typical lifespan of 15 to 20 years.

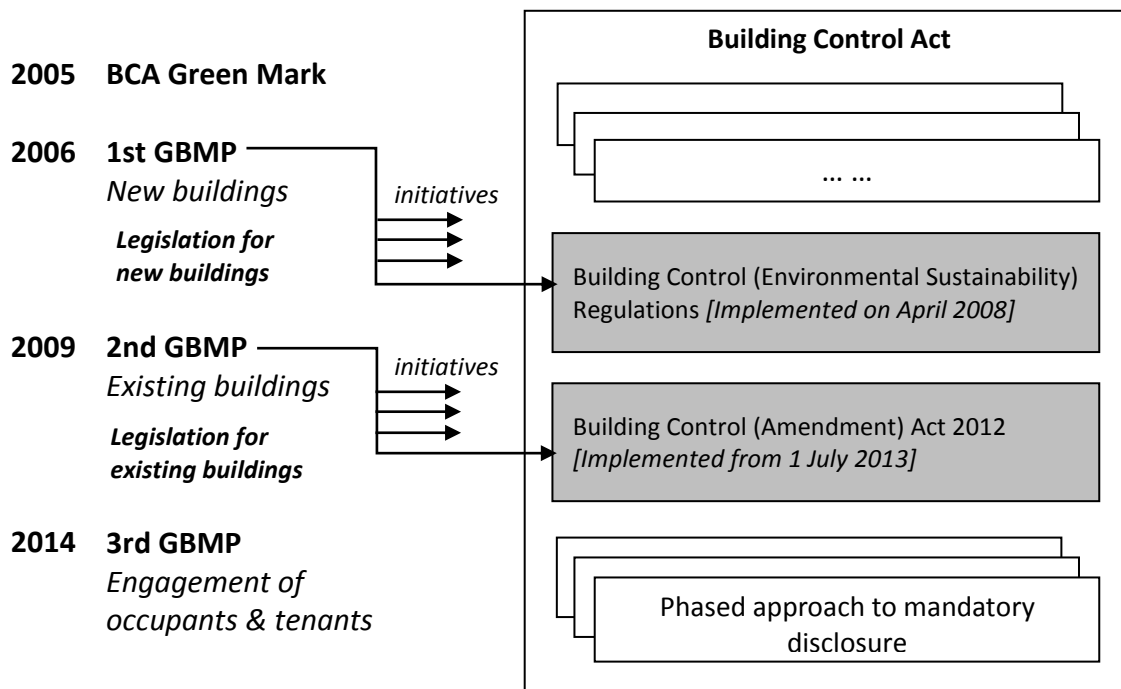


Figure 4.2.8 Legislative components under the Green Building Master Plans in Singapore

2. **Three-yearly energy audit on building cooling system:** Notified building owners must engage a Professional Mechanical Engineer or an Energy Auditor registered with BCA to carry out an energy audit on their chiller system in accordance with the prescribed Code and submit the necessary documents to BCA. This is to ensure that a building cooling system continues to operate efficiently and comply with minimum standards throughout its lifetime.
3. **Annual mandatory submission of building information and energy consumption data:** Building owners are to submit building information and energy consumption data annually through an online submission portal. The submitted data will form the basis of national building energy benchmarks, which will be shared with building owners to encourage them to pro-actively improve the energy performance of their buildings.

Target and scope

The EB legislation initially focuses on commercial buildings namely offices, hotels, retail and mixed developments. The minimum Green Mark certified standards and three-yearly energy audit for building cooling system are applicable to commercial buildings with gross floor area of at least 15,000 m², while the annual mandatory submission is applicable to all commercial buildings regardless of building size. The responsibility to comply with all three legislative requirements is on building owners. On the other hand, the legislation for new buildings is applicable to all new buildings and any extension, renovation or retrofitting works to existing buildings that involve a gross floor area of 2000 m² or more. Jointly, the two legislations mandate and improve the energy efficiency of the buildings in Singapore.

Overall goals of the programme

The EB legislation was introduced to ensure progress to green at least 80% of buildings by 2030 and promote energy efficiency in buildings. It was also designed to enable the collection of data to form the basis of a national energy benchmark for the building sector. This energy benchmark will encourage building owners to take a proactive approach to

improving performance by allowing comparisons of current performance with other buildings. The establishment of minimum efficiency standards also aims to allow owners to increase energy performance whilst enjoying rewards such as reduced energy expenditures.

Submission and requirements of benchmarking and building data

Under the EB legislation, all notified commercial building owners are required to submit building information and energy consumption data starting from 1 July 2013. To initialise the submission cycle, an online submission portal, Building Energy Submission System (BESS), was developed to facilitate seamless data collection. Downloadable self-help tools such as a user submission manual, technical guide, and training and demonstration videos have been built in to assist building owners in familiarising with the submission requirements and procedures. For the first year, building owners are required to collate and submit the following building information:

1. Ownership and activity type (ownership, occupancy type, building activity type);
2. Building data (gross floor area, air-conditioning floor area, renovation/retrofitting works);
3. Service information (lifts, ACMV, lighting and hot water systems);
4. Energy consumption (electricity, diesel, gas etc.).

To overcome difficulties in aggregating energy consumption data from monthly energy bills of landlords and tenants, the BESS submission process is streamlined by drawing electricity data directly from utilities. For the subsequent years, building owners are only required to update any changes to the building information and view the energy consumption data prior to completing the submission.

At the close of the submission period, data collected through BESS are checked for any inconsistencies or data entry errors and, where necessary, building owners are contacted for verification before data are used for analytics and benchmarking. Furthermore, building information submitted by Green Mark buildings are cross-checked against their Green Mark submissions to ensure consistency of data submitted to BCA.

Verified data are analysed to establish national energy benchmarks for commercial buildings. Findings and benchmarks are shared with building owners via two platforms, namely the BESS and the inaugural BCA Building Energy Benchmarking Report (BEBR) 2014 which was released in September 2014. With the annual mandatory submission currently in its second cycle (as of 2014), a review of data requirements and reporting procedures will be conducted as part of future policy planning such as a phased approach to mandatory energy disclosure.

Enforcement

In cases of non-compliance, a deadline extension and grace period with multiple reminders are given to the relevant building owners. For non-complying building owners, enforcement actions would be taken after repeated reminders. If convicted, an offender is liable to a fine of up to S\$ 10,000.

II. Inputs for the programme

Inputs during design stage

The legislation took about three years from design to implementation. During the design phase, stakeholders' feedback was gathered by BCA officials through industry consultation sessions with representatives from developers, Energy Services Company (ESCOs),

Management Corporation Strata Titles (MCSTs), Mechanical and Electrical (M&E) consultants, building managers and government agencies. This was then used to fine-tune the proposed legislation. Separately, the annual mandatory submission through BESS was pilot tested with industry before the commencement of the legislation.

The design team also learned from New York City's experiences, and particularly the initial challenges faced by building owners in collecting aggregated building energy consumption data from tenants or utility suppliers. BCA mandated utility suppliers to provide energy consumption data directly to the Authority. This has served to minimise the burden on building owners to gather and aggregate past energy bills and also ensure greater data accuracy.

Prior to the introduction of the EB legislation, several incentive and financing schemes had been rolled out to encourage developers and building owners to carry out energy efficient retrofitting works for existing buildings. These have come solely from the Singapore government with no funding from non-profits or sponsors. A Green Mark Incentive Scheme for Existing Buildings (GMIS-EB) for S\$ 100 million was established in 2009 to fund the replacement of chiller plant and other retrofitting works. This targets existing private commercial buildings with a minimum gross floor area of 2,000 m² and central chilled water air-conditioning plants, or plans to upgrade to such plants. GMIS-EB expired on 28 April 2014 and the cash incentive has been fully committed.

In 2011, a pilot Building Retrofit Energy Efficiency Financing (BREEF) Scheme was introduced to provide financial assistance to small and medium building owners for energy efficiency retrofits. Under the BREEF Scheme, BCA co-share 50% of the risk of any loan default to encourage private financial institutes to provide credit to small and medium building owners. In its initial phase, five projects were financed with over S\$ 6 million. Under the second pilot phase of BREEF from 1 April 2014, the co-share credit risk has been increased to 60%, with credit facilities extended to residential buildings.



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Inputs during implementation stage

Implementation of the annual mandatory submission and associated duties such as communications, outreach, enforcement, analysis and monitoring etc. are currently assumed by a team of three BCA officers. This comprises of two part-time Executive Managers and one part-time Senior Manager (i.e. with other job responsibilities). All three officers provide direct assistance to building owners and building submission representatives such as MCSTs, managing agents and facilities managers through channels such as telephone hotlines, emails, onsite visits and one-to-one consultations.

Professional associations such as Singapore Institute of Architects, Institution of Engineers Singapore, Real Estate Developers Association Singapore and International Facility Management Association were engaged to disseminate circulars of the legislation to members. In addition, as a key outreach platform for diffusing latest news and information to industry stakeholders, BCA leverages on the Construction and Real Estate Network (CORENET), an online submission and information portal for planning approval, building and structural plans approvals and other official documents.

III. Programme results

Compliance and benchmarking results

In 2014, the annual mandatory submission entered its second year of implementation. The BCA BEBR 2014 covering the analysis of data collected in the first year, i.e. calendar year 2013, was released during the International Green Building Conference (IGBC) 2014 from 1 to 3 September 2014. The overall compliance achieved for the first year of data collection is 99%, as at 30 June 2014.

Growth of green buildings achieved

Although it is still too early to assess the unique impacts of the EB legislation on green building practices, various other policies and incentives established by BCA have contributed to a distinct growth in the number of Green Mark rated building projects in Singapore. These Green Mark buildings have grown by 17 in 2005 to about 2,200 in September 2014, now representing about 63 million m² or equivalent to more than 26% of Singapore's total gross floor area.

Programme effects on retrofit market

A growth in demand for several businesses and services related to building energy efficiency has been observed. This includes an increase in the number of Green Mark Managers and Professionals trained through various BCA Academy courses, and growing number of Environmentally Sustainable Design (ESD) consultants. Singapore is currently aiming to train 20,000 green collar specialists by 2020, comprising of industry personnel at Professional, Manager, Executive and Technician (PMET) level, to meet the market demand for professionals in design, maintenance and management of green buildings.

IV. Lessons learned for replication

IV-i Key drivers of success

Stakeholder engagement

BCA officers have made efforts to build close ties with various stakeholder communities such as developers, ESCOs, MCSTs, M&E consultants, building managers and government agencies. The input of these stakeholders into the design and refining of the various elements forming the wider framework of the EB legislation (see Figure 4.2.8) have helped

to achieve a higher degree of acceptance for the EB legislation as well as various green building initiatives implemented under the GBMPs.

In June 2013, several industry briefing sessions were held before implementing the annual mandatory submission of building information and energy consumption data. These outreach efforts guided the affected building owners and representatives such as MCSTs, managing agents and facilities managers through the new legislative requirements. Communication channels such as telephone hotlines, emails, onsite visits and consultations with BCA officers were established to facilitate the smooth implementation of the legislation. Through these measures, the government aims to encourage compliance to the new EB legislation and secure ample information and energy consumption data from the commercial building stock for analysis.

IV-ii Main challenges

Cooperation from building owners

Establishing contact and gaining the cooperation of building owners proved time intensive during the early implementation stages. To ensure a substantial compliance rate for data analysis and benchmarking, it was necessary to directly reach out to all targeted building owners on the new legislative requirements. The data collection cycle was initialised through written notices issued at the end of March 2013. This provided targeted building owners with three months of advance notice to prepare the required building information for submission and complete the first time account registration through BESS. At the end of the submission period, BCA officers conducted onsite enforcement visits to establish direct contact with the non-compliant building owners in November and December 2013. Following onsite visits, BCA officers followed up with reminder emails and phone calls directly to non-responding building owners to further notify them about penalties for non-compliance, while also extending assistance in completing submissions, if required.

Small and medium building owners

Many small and medium building owners lack expertise in building management. Outreach efforts revealed that these owners typically lack the capacity to collate necessary building information to complete their submissions due to the absence of building professionals such as facility managers. To overcome this obstacle, BCA officers provided step-by-step assistance to direct these building owners to various channels to retrieve the building information.

Market information asymmetry

It was observed that existing building owners may not possess comprehensive building information and energy consumption data to allow for the monitoring of energy efficiency. On the other hand, tenants and occupants are also usually unaware of the energy performance of a particular building. As a means of bridging this information gap, the annual mandatory submission of building information and energy consumption data requires the aggregation of building information for the common spaces and tenanted areas. In parallel, aggregated energy consumption data for the entire building obtained from the utilities are shared by BCA, with the building owners during their submissions. Together with the submitted building information, the energy performance of the buildings is provided to building owners through the simple energy benchmarking reports available on BESS. The detailed analyses of the submitted data are shared with the industry through the BCA BEBR 2014.

Manpower challenges for enforcement and administration

The limited headcount (three part-time) is a major challenge on the ability of the BCA team to assist building owners in compliance.

Attempts to influence tenant behaviour

Since 2010, BCA has introduced an array of new occupant-centric Green Mark Schemes targeted at office, retail, restaurant and supermarket tenants. In parallel, many owners of large buildings have also implemented a series of initiatives to engage tenants in green practices such as recycling, energy and water saving and waste reduction. Despite such efforts, larger building owners have reported that take-up rates for these tenant engagement initiatives are relatively low. Increased tenant demand for energy efficient buildings has not been observed to any significant degree, as tenants are mostly unaware or unconcerned of the energy performance of commercial buildings. Increasing tenant awareness on building energy consumption and sustainability is therefore a key focus area for the future. As part of the 3rd GBMP (see Figure 4.2.8), building energy performances are shared publicly, beginning with voluntary energy disclosure through the BCA BEBR 2014.

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4.2.9

SYDNEY – *Smart Green Apartments programme*

Abstract: To investigate how private sector apartment buildings can contribute to a vision of Sustainable Sydney 2030, the City piloted the Smart Green Apartments programme with 30 buildings between 2011 and 2013. This sought to guide multi-apartment buildings to decrease energy and water consumption and waste outputs through free audits and information on government rebates.

Citywide reduction target

Sydney's highest level of strategy is the Sustainable Sydney 2030 plan, which paints a vision of the City of Sydney as 'Green, Global and Connected' and a leading environmental performer and global partner addressing the challenges of climate change. To confirm how the City will achieve its targets, one of which includes a 70% reduction in GHG emissions by 2030 from 2006 levels, the City has developed a suite of strategic Master Plans to map out the potential of technology and process changes. At the same time they are also developing various customer focussed strategies which confirm the specific actions that must be undertaken by all customers and stakeholders within target sectors.

Building-specific reduction target

Buildings and their occupants account for 80% of the City's emissions, with the commercial building sector being the largest contributor. The residential apartment sector accounts for 10% of the City's emissions. In its first customer focussed strategy, the City is considering setting a goal to reduce emissions in the residential apartments sector by 40%, and water consumption by 7%, by 2030 from 2006 levels.

I. Programme context

Key elements

With up to 73% of its residents living in apartments, many of which are towers, Sydney is often referred to as 'the Vertical City'. These residential buildings account for 10% of the City's GHG emissions, 38% of its water use and 14% of its waste. City data predicts that half of the population in the state of New South Wales (NSW) will be living in apartments by 2030. In response to this situation, the City launched the Smart Green Apartments (SGA) Programme in 2011 to help apartment owners and managers to reduce energy and water use, minimise waste and GHG emissions, and improve environmental sustainability.

The programme consists of despatching professional auditors to selected residential apartment buildings to conduct sustainability assessments and investigate potential improvements regarding water and energy consumption, renewable energy and waste. The programme started off with five pilot buildings in 2011 and has since expanded to 30. Participating building owners and managers receive the following benefits:

- free water and energy audit of building, including performance indicators monitoring and efficiency plans;
- assessments of waste and recycling practices;
- action plan with retrofitting recommendations;
- business case information on capital costs, projected savings and pay back periods, and government rebates;

- knowledge and capacity building.

Each building received a tailored action plan that was presented to apartment building decision makers such as executive committees and strata and building managers to enhance the capacity of owner corporations to implement upgrades.

Benefits from participation include: (1) financial advantages from lower energy costs, (2) improved attractiveness of property in real-estate market where energy prices and demand for energy efficient buildings are growing, and (3) stronger resident and management communities.

The programme has established a database consisting of energy consumption, opportunities identified and progress of any improvements implemented. This serves as the empirical evidence base for designing the above-mentioned Residential Apartment Sector Sustainability Strategy. Experiences from these 30 buildings will be disseminated to other buildings via initiatives in this strategy. Initial learnings are being shared through a network of over 100 apartment buildings across the City through targeted communications and workshops.

Strata schemes

A strata scheme is a system of building ownership. Individuals each own a unit (i.e. a single apartment or townhouse) while sharing a responsibility for operations and maintenance of common assets. These include, for example, energy and water consuming central plants, equipment for hot water and heating, ventilation and air conditioning systems, driveways, pathways, fences, gardens, external walls, entertainment areas and so on. For a strata scheme to exist, a property must comprise at least two individually owned units, which can be residential, commercial or a mixture of both. Such a property can be a single level set of units, townhouses or commercial offices, or a vertical block of apartments.

Although each state and territory in Australia uses different terminology, Strata Community Australia defines related concepts (especially in New South Wales) as the following:

- **Owner:** A person or company owning a strata unit registered on the Certificate of Title.
- **Owners corporation:** Also known as a body corporate, this is the body composed of all the owners in the strata scheme. Each owner of a unit is part of the owners corporation and has the right to participate in its decision making.
- **Strata building:** A building with at least two individually owned unit dwellings. The vast majority of apartments in the City of Sydney are classified as strata.
- **Strata manager:** A professional responsible for the general maintenance of the building and common areas. Also referred to as body corporate managers, strata managing agents, managers, and agents, depending on the state or territory.
- **Unit (Lot):** A portion of property that can be separately owned and sold. In a strata scheme, a unit is generally a single apartment or townhouse.

Apartment buildings in the City of Sydney

There are over 20,000 buildings in the local government area containing private dwellings. Of these, over 1900 are apartment buildings, out of which 40% are low rise (3 storeys and less), 30% are medium rise (4-5 storeys) and 30% are high rise buildings (6 storeys and above). While the number of apartment buildings is smaller compared to other residential building types, they accommodate the vast majority of dwellings. Of the almost 100,000 dwellings in the City approximately, 75% are accommodated in apartments. Looking ahead,

approximately 20,000 dwellings are expected to be built in the next eight years, with over 90% being new high rise building developments.

Programme target and scope

The target for the SGA programme was multi-unit residential apartment buildings with over 20 units in the City of Sydney, and more specifically, owners corporations and management service providers. Since its launch, over 100 apartment buildings expressed their interest in participating in the programme. Of these, a total of 30 were selected, with efforts to ensure representation of diverse profiles and expertise levels in regards to building sustainability (i.e. frontrunners and late adopters etc.). Another focus of the City was on medium and high rise apartment buildings over four storeys as these generally have centralised systems and therefore higher resource consumption.

Overall goals of the programme

SGA does not have any specific metrics such as reduction targets. However, it was conceived to play an important role in achieving the Sustainable Sydney 2030 objectives by contributing to the reduction of water and energy consumption—two core elements of the Sustainable Sydney 2030 vision.

Links to other programmes

Concurrent to the Smart Green Apartments programme, the City has contributed to the creation of an online toolkit called Smart Blocks. This was developed in collaboration with Strata Community Australia, City of Melbourne, Green Strata and Owners Corporation Network. This national programme provides guidelines on how to navigate strata decision making concerning energy efficiency upgrades of common areas in apartment buildings. It offers resources such as case studies, specific strategies to decrease energy consumption, information on costs, funding options and rebates.

In parallel, the City is currently developing a strategy to address the specific opportunities and challenges identified in the Smart Green Apartments programme on a sectoral level. Knowledge outcomes from the programme are being used to shape policies such as the above-mentioned Apartment Building Sector Strategy. This Strategy will eventually fix specific reduction goals and enable the Sustainable Sydney 2030 vision to be realised in both existing and new apartment buildings.

II. Inputs for the programme

Inputs during the design phase

The design of SGA took place over a year, beginning in 2011. A key element of this conception phase involved a pilot phase of five buildings. Staffing was 0.6 FTE for design and 1 FTE for the pilot programme, with no specific budget allocated.

Previous research by the city was important, such as the Multi Unit Residential Building Energy and Peak Demand Study (Energy Australia, 2005). One of its key findings was that, contrary to common belief, residents living in high rise apartment buildings produce higher GHG emissions than people living in detached houses, mid-rise, low-rise and townhouses. This is due to smaller household size in relation to single houses, and centralised systems on common property, of which energy intensity increases with building height. A second study informing the SGA programme came from the University of New South Wales in 2012 on the role and effectiveness of strata management. It found that residents in strata titled apartments are often unaware of their rights and responsibilities and lack capacity to tackle



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complex issues relating to governance and administration, maintenance and sustainability upgrades.

Stakeholder engagement also formed a key component of the design phase. In June 2011, a Smart Green Apartments stakeholder reference group was established to encourage collaboration across government and industry stakeholders. It consisted of state planners, energy utilities, members from the Green Building Council and owner/tenant representation organisations. This group was made possible by previous collaborations between the City and the community, which emerged during the formation of the Sustainable Sydney 2030 strategy in 2007.

Inputs during the implementation phase

Apartment building owners have received free energy audits up to a value of AU\$ 10,000 each. These were jointly financed by a State government partner (NSW Office of Environment and Heritage) and the City of Sydney. In addition, the City spent AU\$ 100,000 for water auditing, events and monitoring and verification of the program. The City's residential engagement has been enhanced through the development of the National Smart Blocks resource, funded by an Australian government grant of \$1.09 million.

As of June 2013, the City has spent one year delivering the remaining 25 pilot buildings. This coincided with the launch of Smart Blocks in June 2013 after 18 months of preparation. The Apartment Building Sector Strategy is also being developed in conjunction with the implementation of Smart Blocks during the period of 2013-14. It is expected that this will involve advocacy for policy reform over the next five to ten years.

In terms of staffing, the City allocated between 1-1.5 FTE in the second year for conducting the assessment of 30 buildings, with 1 FTE in the third for follow-up support and development of the Apartment Building Sector Strategy.

The City continued stakeholder engagement during implementation. In addition, they sought collaboration with other governmental departments such as the NSW Government's Office of Environment and Heritage (OEH) to link the pilot with existing energy savings programmes, which subsidise up to 80% of energy audit costs to owner corporations.

The City has also provided the owner corporations and managers of participating apartment buildings with resources to engage residents. These included posters, flyers and Internet alerts on various details of a building's participation such as the type of activities in progress. Green Villages and Strata Skills 101 also aim to foster the engagement, knowledge and capacity of residents regarding residential sustainability and strata living.

III. Programme results

The City has identified that, on average, buildings can reduce energy consumption by up to 30% by implementing a variety of cost effective measures. Together these savings amount to an average of AU\$ 74,000 per year per building, with less than 3.6 years required to recover investment costs.

Programme effects on retrofit market

SGA has succeeded in stimulating retrofitting activity in apartment buildings either participating or affiliated with the programme. Of all sustainability improvement recommendations made by the City to the 30 participating buildings, approximately 37% have been implemented. Furthermore, over 100 buildings have expressed interest in the programme to date. This suggests that lessons from SGA will be assimilated by other owner corporations and managers around the city.

Other findings to emerge from the programme are as follows. Firstly, the City has identified that nearly 60% of energy consumption comes from the shared portions of properties such as lighting, swimming pools (pumps and heating), heating and ventilation systems etc. Since lighting upgrades generate the highest return on investment within the shortest payback period (usually less than two years), many buildings have saved 20-30% of lighting costs by upgrading lighting fixtures (e.g. more efficient bulbs or installation of motion detectors).

Regarding water, programme data indicates that almost 90% of water consumption in participant buildings comes from individual apartments (40% from showering, 30% from bathrooms and basins etc.). The programme identified that sub-metering of water usage is one of the keys to promote water efficiency as it gives a clearer idea of water-wise practices for owners, managers and occupants.

In addition, other improvements to the sustainability of apartment living have occurred through the programme. For instance, efforts were made to foster waste reduction by encouraging recycling and adding multi-lingual signage. Some apartments have installed bike racks to encourage alternative transport usage, whilst others have built rooftop green patches and vegetable planting areas to improve common areas and strengthen community connectivity.

IV. Lessons learned for replication

IV-i Key drivers of success

Information plus financial incentives

The City aimed to provide information combined with support to take action. Firstly, audits were subsidised (around 20-30% by the City and the rest by other government programmes). Secondly, these audits identified specific measures to improve energy and water performance, in addition to estimating capital costs and payback periods. Thirdly, information was also provided for government rebates available to help finance property improvements. In this way, this auditing exercise generated convincing financial arguments and incentives to spur apartment decision makers into action.

Existing sustainability framework

The broader vision and targets set out in the Sustainable Sydney 2030 strategy helped justify the need to tackle GHG emissions and water and energy efficiency in the apartment sector.

Collaboration with key stakeholders

Support from key stakeholder communities was crucial for SGA, which relied on voluntary participation from the residential apartment sector. Dating back to the formation of the Sustainable Sydney 2030 strategy, the City developed a reputation for forming strong collaborations and achieving concrete outcomes with industry and the community. It was able to leverage this trust when assembling the reference groups with stakeholders. Support and momentum for the design of the SGA programme was gained by holding regular meetings and keeping these stakeholders informed of developments in the programme. Another important factor in gaining support for the programme was the various benefits for stakeholders, additional to the opportunity to advance sustainability. For example, this included the opportunity to meet other government and industry stakeholders in the same sector and exchange knowledge.

Selection of diverse buildings

The City deliberately chose participants with varying sustainability expertise and capability. This was to capture as broad a data set as possible for informing the Apartment Building Sector Strategy and future programmes. Participants ranged from early adopters with a history of energy initiatives to those just beginning to adopt sustainability practices.

IV-ii Main challenges

Strata scheme governance and decision making

Strata schemes are unique in the way that they consist of an owners corporation, where individual unit owners take part in a collective governance mechanism for the entire property. In this body, decisions are made through a specific governance structure stipulated in state legislation. Since there are numerous stakeholders involved in each multi-apartment building, a key challenge for the City was to ensure that participants signing up for the programme had engaged the various people required for the decision making process to apply for and deliver the programme. This process took considerable time and effort for both the building stakeholders and the City.

Data collection issues

Like many other cities implementing sustainability programmes, the City of Sydney faced issues in data collection. Since most of the pilot buildings were not accustomed to collecting aggregated energy performance data for the entire property, it proved a key challenge for the City to ensure that the necessary data was collected. To this end, the City forged a partnership with an energy network provider to help buildings determine whether this data

was already available, and where necessary, to integrate consumption data from each individual unit dwelling.

Credible benchmarking or rating tools

The most important challenge for City officials will be the development of credible benchmarking or rating tools to equip both programme participants and the community in assessing a particular property's energy efficiency. One of the learning outcomes of the programme was the need for the development of key performance indicators for this purpose, which did not exist. Yet it could be quite misleading to compare a diverse range of buildings with differing structures, ages and equipment. A key challenge for the future is therefore the development of a reliable benchmarking or rating system to drive understanding in the apartment market regarding sustainability performance and, in particular, energy efficiency. One barrier to realising this, however, is that the current housing market in Sydney is thriving due to a supply shortage. It is therefore expected that high energy efficiency will not be a key differentiator in such conditions. That said, officials believe that even the presence of simple star ratings scheme would have the potential to encourage people to choose buildings with superior energy performance.

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4.2.10

TOKYO – Tokyo Cap-and-Trade Program

Abstract: A mandatory cap-and-trade programme set up by the Tokyo Metropolitan Government to reduce GHG emissions in the most energy intensive building sector in the Tokyo Metropolitan Government jurisdiction. Key features include flexible approaches for facility owners and substantial measures to ensure the accuracy of data reporting and realisation of reduction targets.

Citywide reduction target

The Tokyo Metropolitan Government (TMG) aims to reduce citywide GHG emissions by 25% and energy consumption by 20% below 2000 levels by 2020.

Building-specific reduction target

As part of this wider target, Tokyo has called for a 17% reduction in GHG emissions from commercial and industrial sectors by the year 2020. This target also applies to the cap-and-trade programme targeting large facilities.

I. Programme context

Key elements

The Tokyo Metropolitan Government (TMG) has until now taken several measures to promote building energy efficiency. The Tokyo Cap-and-Trade Program (TCTP) implemented on the 1st of April 2010 is one such initiative, also being the world's first urban cap-and-trade scheme. The programme is a stepped-up measure of the Tokyo Carbon Reduction Reporting Program that started in April 2002. Under the former reporting programme, targeted facilities were required to annually report emissions and reduction plans, and encouraged to reduce emissions. This initiative resulted in a mere average reduction of 2%. In contrast, by the end of FY2012 the current TCTP has achieved a total 22% reduction from baseline emissions (itself determined by the average of any three consecutive years between FY2002-2007). The flow of the implementation cycle is illustrated below in **Figure 4.2.10**. A complete compliance cycle of the TCTP consists of the following three key elements:

1. **Compliance period:** Each compliance cycle lasts five years, after which the next begins. Within that period, covered (i.e. mandated) facilities are required to report energy consumption and GHG emissions by the end of November next year. If the target is not met through internal measures, facility managers or owners will plan the procurement of external carbon credits and implement further reduction measures to ensure the emissions target will be met by the end of the cycle.
2. **Compliance adjustment period:** This lasts one and a half years, beginning from the end of the first compliance period. During this time, total actual emissions and emission allowances are confirmed. To meet emissions reduction targets, facilities owners or managers are permitted to continue trading credits until the end of the adjustment period.

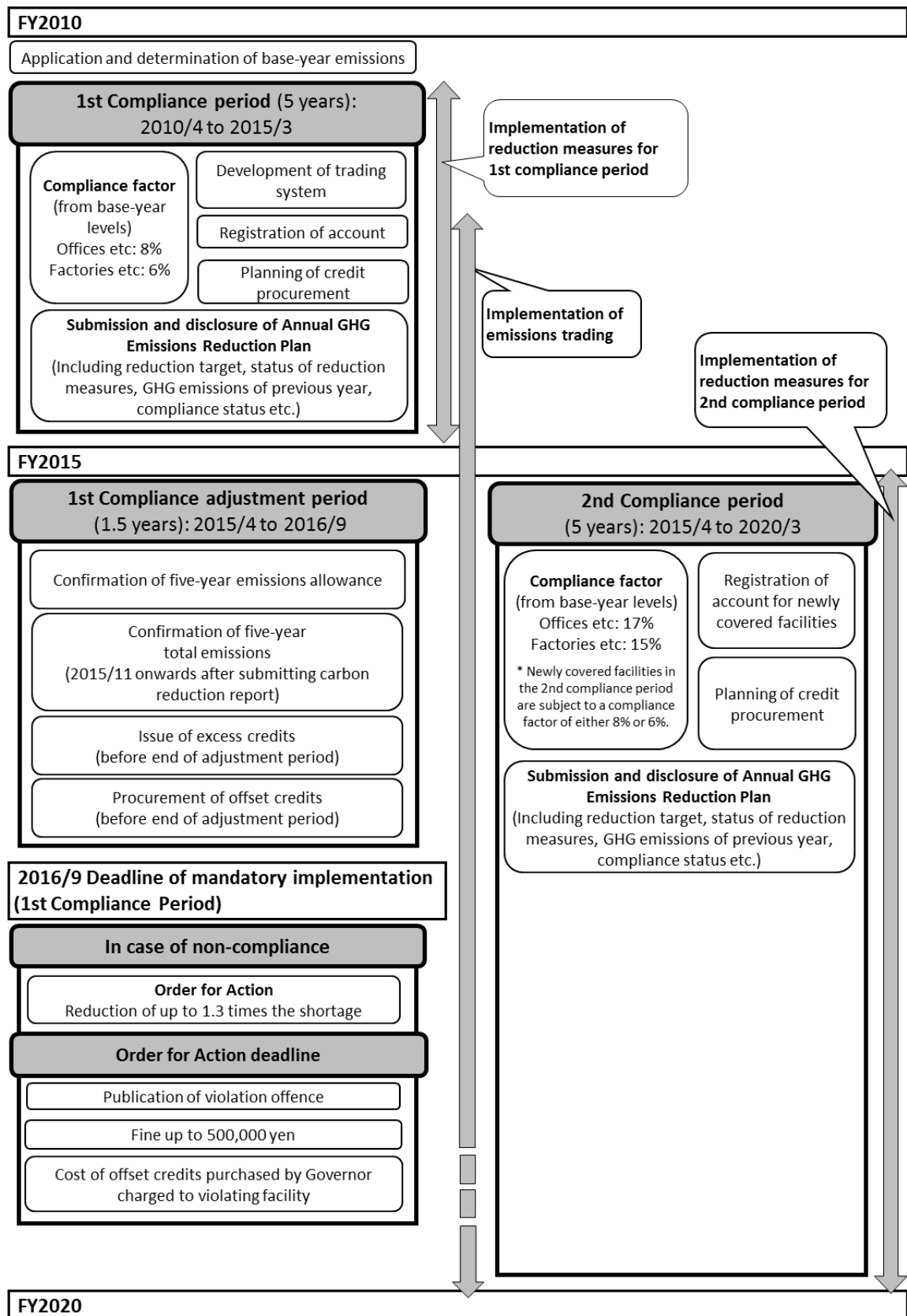


Figure 4.2.10 Flow of the Tokyo Cap-and-Trade Program

3. **Deadlines for mandatory implementation and Order for Action:** In the case where mandatory emissions reduction targets are not met, an Order for Action will be issued to non-compliant facilities. This administrative order will oblige managers and owners to reduce emissions to an amount of up to 1.3 times greater than the target shortfall. If a facility does not fulfil this requirement by the deadline, the act of violation will be rendered public and the facility will be fined an amount of up to 500,000 yen. In addition, they will have to pay the purchase price for offset credits procured by the Governor of Tokyo to cover the shortage.

Currently as of 2014 May, the first compliance period of TCTP is in full implementation citywide and will terminate at the end of March 2015. After this the adjustment period and second compliance period will start.

Data from covered facilities is currently disclosed publically on the Internet. This includes detailed facility-level information on emissions from energy and water consumption, progress towards reduction targets and details of any credit procurement or sale. It also includes overall statistics for the programme regarding total emissions reductions achieved and the volume and nature of credit trading.

Programme target and scope

TCTP targets existing large facilities from the commercial and industrial sector, also inclusive of government buildings. It targets buildings whose previous fiscal-year energy consumption is superior to 1500 kilolitres of crude oil equivalent. Under this condition, approximately 1400 buildings (about 1100 commercial [mainly offices] and 300 industrial [e.g. factories and water/sewage treatment plants], both of which include government and municipal facilities) are covered. Although these facilities represent only about 0.2% of all commercial and industrial facilities in Tokyo, they nevertheless account for about 40% of the total CO₂ emissions from those sectors.

A covered facility is designated as 'Facilities with GHG Reporting Obligations' (Reporting Facilities) and required to report to TMG every year. When a Reporting Facility meets the above energy consumption condition for three consecutive years (first fiscal year excluded), it will be designated as a 'Facility with CO₂ Reduction Obligations' (i.e. a Compliance Facility). A Compliance Facility has to meet an emissions reduction target by implementing reduction measures and participating in emissions trading.

In principle, the owner of a Compliance Facility holds the responsibility to ensure achievement of the emissions reduction target. Yet since the scope of covered facilities in the whole building extends to include tenanted space, tenants are therefore obliged under this programme to cooperate with building owners. For large tenants who either (1) occupy a floor area of 5000 m² or greater, and/or (2) consume in excess of 6 million kWh or more annually in electricity, they must meet stricter requirements including the submission of an annual report to the TMG via the owner. Such tenants may also, where necessary, directly receive guidance and warnings from TMG.

Types of credits for trading

A covered facility needs to procure credits in the event that the emissions cap is expected to be exceeded. Five types of credit can be traded: (1) excess credit from other covered facilities, (2) credit obtained from CO₂ reductions voluntarily achieved by small and medium facilities in Tokyo, (3) credit obtained from generation of renewable energy, (4) excess credit from large facilities outside of Tokyo, and (5) credit from facilities covered by the Saitama

Cap-and-Trade Program, a similar programme in an adjacent prefecture. Each type of credit has its own validity period. In general, a credit issued in a compliance period is valid until the end of the next compliance period.

Nomination of a general manager and technical manager

Covered facilities must nominate both a general manager and technical manager for each facility when complying with TCTP. A general manager must belong to a department charged with overseeing the implementation of global warming countermeasures in that facility and must occupy a position of decision-making authority. They must supervise and monitor employees and communicate with top-level management. Conversely, a technical manager must possess a technical certification such as that for an architect, engineer or energy technician. They must provide technical advice and recommendations to the general manager and top-level management. In the case where the role of a technical manager is contracted to an external party, a nominated manager may oversee no more than a total of five facilities simultaneously.

Top-level facilities

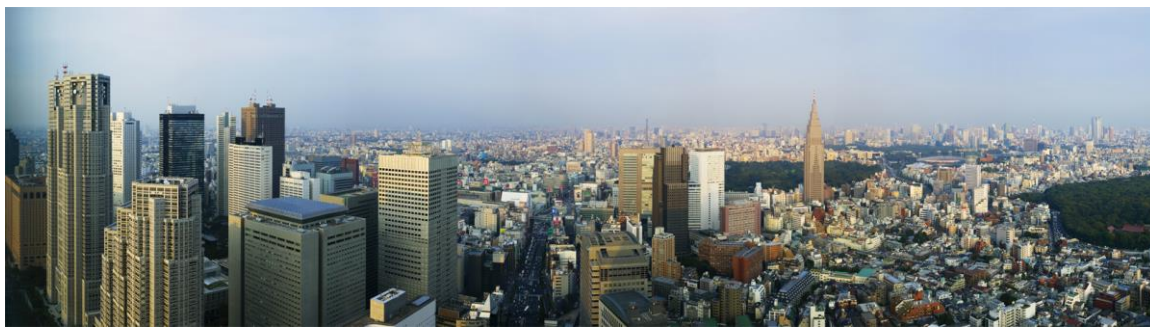
Facilities demonstrating outstanding performance in emissions reduction and satisfying high-level standards established by the Governor of Tokyo can apply to be recognised as a ‘top-level’ facility. These standards concern areas such as energy efficient design, equipment (lighting and cooling/heating etc.), renewable energy, building operations and the involvement of tenants in data gathering and monitoring. There are two categories: a ‘top-level’ and ‘near-top’ level. Facilities may gain certification after meeting minimal requirements and then conducting a compliance verification through a registered third party. Assessments are then conducted periodically after certification to ensure continued compliance. This voluntary certification system has a dual incentive effect. Firstly, certified facilities receive the benefit of a reduced compliance factor (reduction to 1/2 for top-level and 3/4 to near-top level). Secondly, certified facilities will gain increased societal recognition as a highly efficient building, which can serve to boost competitiveness in the market. For the period April 2010 (i.e. programme start) to March 2014, a total of 35 facilities have been certified as top-level, and 48 as near-top level.

Overall goals of the programme

The TCTP requires covered facilities to achieve absolute emissions reductions of either 6% (for factories etc.) or 8% (for offices etc.) from base-year emissions for the first compliance period, and then either 15% or 17% for the second. This goal is derived from the TMG emissions reduction target under the Tokyo Metropolitan Environmental Master Plan of 2008 and discussions in a TMG report to the Environmental Council. As part of an overarching strategy to achieve a citywide 25% reduction of GHG emissions below 2000 levels by year 2020, these documents have deemed a 17% reduction by the year 2020 as being a fair target for the commercial and industrial sectors in Tokyo. The progress of the programme is evaluated through annual reports of actual energy consumption and GHG emissions submitted by owners of each facility.

Links to other city policies or programmes

Since 2002, TMG has developed and enforced a policy called the ‘Green Building Program’ aiming to promote environmentally superior new architectural developments. Owners of buildings larger than 5000 m² are required to submit a building environmental plan. This includes comprehensive information on areas such as ratings for energy efficiency, renewables, construction materials, building lifetime, greenery and water cycles, and heat-island effect. As well as being required in advance to a building permit application, a report is



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also required after the completion of construction. There are even stricter requirements for buildings larger than 10, 000 m², with owners needing to meet higher energy standards and issue Energy Performance Certificates to potential buyers or tenants. This programme for new development was introduced in 2002 around the same time as the predecessor of TCTP (i.e. the Tokyo Carbon Reporting Program). In accord with several reforms of the TCTP and its predecessor, the Green Building Program has also been tightened twice, once in 2005 and once in 2010. At present, almost 400 buildings are required to submit plans annually under the Green Building Program, with many of these highly likely to be eligible for the TCTP in a few years' time as they cross the 1500 kilolitre threshold. Buildings submitting reports under the Green Building Program are therefore well placed to be tracked and followed up by the TCTP.

Programme effects on other initiatives for small and medium buildings

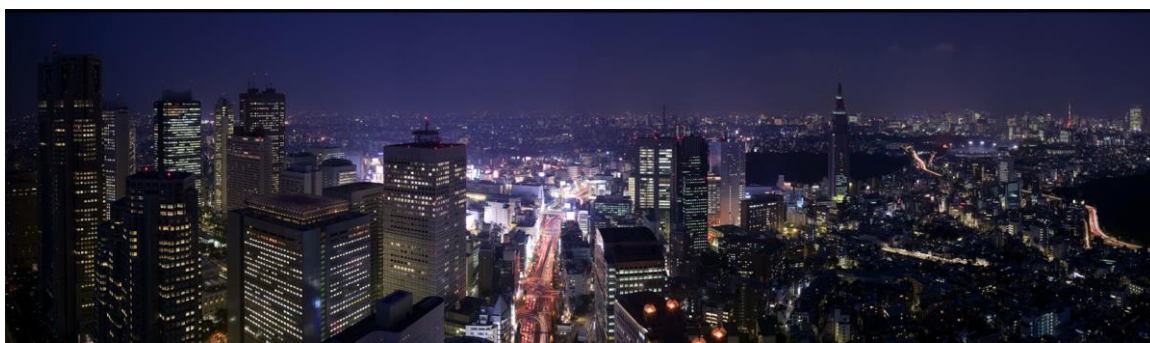
Under the TCTP, emission reduction measures taken by small and medium buildings are recognised and qualify as credits that can be traded with other large facilities.

On the other hand, TMG has a different programme called the Carbon Reduction Reporting Program for Small and Medium Facilities. This requires annual reporting from small and medium building owners and also involves disclosure of reported data. A benchmarking tool has been developed from the reported data, with the second version of the benchmark published in March 2014. The benchmarking tool can enable owners to understand the energy use of their facilities and then find potential energy management opportunities. The disclosure of data can also encourage competition amongst owners and encourage the implementation of energy efficiency measures. Besides this, TMG also offers free energy retrofit advice and tax incentives to small and medium building owners.

II. Inputs for the programme

Inputs during the design phase

Planning and design of TCTP took place from 2006 to 2008. Preparation started in late 2006 and was publicised via a proposal for a mandatory emissions reduction programme for large facilities during the announcement of the Tokyo Climate Change Strategy in June 2007. There were four full-time officers and two additional supporting members involved in the final design stage. Deliberate discussions were held at TMG's Environmental Council between May 2007 and March 2008. In addition, between July 2007 and January 2008, several stakeholder meetings concerning the introduction of TCTP were held. These involved representatives from industry groups such as real estate, department stores, hotels, ESCOs and utilities, as well as other participants such as NGOs and academics.



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Several research projects were commissioned to consulting firms with engineering, accounting and other backgrounds during both early planning and detailed design stages. In June 2008, a bill to amend the Tokyo Metropolitan Environmental Security Ordinance was passed. As this amendment incorporated various elements and objectives of TCTP, this reformed bill formed the legal framework to enable implementation of TCTP. After passage of the bill, consultation processes regarding the finer details of the programme design continued. These encompassed public consultation, expert meetings and consultations with the Environmental Council.

Inputs during the implementation phase

As mentioned, TCTP consists of two five-year compliance periods stretching from FY2010 to FY2019. About 15 in-house staff have been involved in the implementation stage (ten for implementation and administration and five for emissions trading). Typical tasks undertaken include management of annually submitted reports, certification of top-level facilities, certification and issuing of credits, outreach such as briefing sessions and diffusion of best practices, and management of verification system. Several briefing sessions are held each year to inform external parties about minor changes, annual schedules, achievements and other inputs to the programme. As mentioned above, tenants are required to cooperate with owners in collecting energy use data, reducing emissions and engaging in the cooperative structure. TMG also has arranged for the utilities (mainly Tokyo Electric Power Company (TEPCO) and Tokyo Gas) to provide energy use data to facility owners if requested.

III. Programme results

Progress to date

As of the year 2014, TCTP has entered its fifth and final year of the first compliance period. Progress is being monitored from energy use and emissions reduction data from the annual reports submitted by owners of covered facilities. This data is required to be externally checked by registered verification agencies before submission to TMG.

Based on a review of 98% of all covered facilities in January 2014, total base-year emissions were established at 13.61 million tonnes of CO₂. Based on this, it was reported that a total 13% reduction of GHG emissions was achieved in FY2010, growing to 22% in FY2011 and remaining steady at 22% again in FY2012. These progress results are highly promising as they all exceeded the maximum compliance factors for the first compliance period (8%) as well as the second compliance period (17%). By banking (i.e. carrying forward) excess credit into the next compliance period, most of the current covered facilities are expected to be able to fulfil emissions reduction requirements.

Market effects on retrofitting and building energy efficiency

TMG believes that TCTP has helped to stimulate growth of the retrofit market. Several indicators serve in testimony of a market transformation. These include, for instance, progress in building retrofitting technologies and techniques since introduction of the programme, an increase in the number of installations for BEMS and LED lighting, and lastly, a rise in the number of ESCO businesses. This said, in appraising effects on the retrofitting market, it is also necessary to take into account the influence of the Great East Japan Earthquake in March 2011 which has also been a substantial driver of retrofitting activity. This has occurred as many commercial and industrial buildings across greater Tokyo were forced to take drastic measures to reduce electricity consumption to cope with supply shortages following the Fukushima power plant disaster and National and Metropolitan Government calls for electricity conservation. Nevertheless, programme results in 2014 report that TCTP has succeeded in mitigating any growth in GHG emissions, even after government pressure for energy saving was significantly reduced. That is, the total reductions of 22% (achieved in FY2011) were maintained for the following year FY2012, a period where on the contrary, one might have expected a sudden rebound in GHG emissions as power supplies recovered.

As for other programme impacts, it has now become usual in Tokyo to design new buildings satisfying the requirements for a 'top-level facility' certification under TCTP. This signifies that the incentive of being recognised as a 'top-level facility' by the programme (together with the added reward of the reduction target being halved for that facility) is serving to spur low-carbon building practices for large new developments across Tokyo. As another indicator of the influence of TCTP, it is also widely recognised that Saitama prefecture has started a similar emission trading programme, which was influenced by Tokyo's leadership with TCTP.

IV. Lessons learned for replication

IV-i Key drivers of success

Stakeholder engagement

During the design stage in particular, TMG placed a large amount of emphasis on communication with stakeholders, especially owners and facility managers. Officials found that the involvement of as many stakeholders as possible during the design process was useful for obtaining various feedback, which was utilised to make a more feasible and acceptable programme. This process then contributed to reducing the level of resistance for the reason that stakeholders felt that their concerns were being adequately reflected.

Intensive background research

TMG officials made strenuous efforts to ensure the success of the programme through intensive background research. The EU Emissions Trading Scheme, started in 2005 and criticised by some for not setting a more aggressive baseline, served as an important point of reference. With substantial data collected through the previous Tokyo Carbon Reduction Reporting Program, TMG worked to use this existing knowledge base to set an optimal baseline for TCTP and convince stakeholders of their data-backed confidence that the programme would succeed. This confidence also came from extensive knowledge on the potential for higher energy performance in the facilities that would be affected by TCTP. This was gained from onsite visits and interviews with individual facilities, under the supervision of TMG's highly experienced professional energy contractors, since the beginning of the Carbon Reduction Reporting Program.

Mandatory establishment of management structure with technical experts

Since introduction of TCTP, senior decision makers have been in effect forced to take into account GHG emissions, energy efficiency and management in corporate management and planning. One of the ways this has been achieved is through the mandatory requirement that covered facilities establish a formal management structure for matters such as energy and GHG emissions. A distinguishing characteristic of this requirement is that the management structure must include a general manager as well as a technical manager (either in-house or a third-party) to provide advice on reduction measures. Before the TCTP programme, many technicians possessed knowledge on how emissions reductions could be achieved, yet were unable to implement these because they were unable to influence senior level decision making regarding facility upgrades. With introduction of TCTP, technical managers are now given the responsibility of reporting and advising directly to senior management boards about emissions reduction issues and measures that can be incorporated in business strategies or building management plans for concerned buildings. This TCTP-driven influence on senior-level decision making has, in many situations, facilitated the upgrading of inefficient equipment in many organisations.

Capacity building

For both stakeholders and City officials, capacity building is playing a crucial role. TMG is carrying out various initiatives to increase stakeholder awareness and knowledge about energy efficiency in buildings through seminars, educational events, the compilation of best practices into online case studies, and the provision of free energy audits to small-medium facilities. Capacity building is also taking place internally, with many TMG staff undertaking on the job training to build knowledge on energy efficiency techniques and initiatives in buildings and industry conditions. This knowledge is considered essential for dealing with external stakeholders and third parties. Officials are also seeking to build knowledge by learning from other cities, and international organisations.

Mid-term reduction obligation

In other cap-and-trade systems such as the EU Emissions Trading Scheme, for example, reduction obligations apply annually, which is optimal for stimulating short term carbon trading. In contrast, TCTP aims to achieve average reductions over a five year obligation period. This mid-term focus serves to encourage investments for energy efficiency upgrade measures.

IV-ii Main challenges

Determining baselines and emissions caps

It proved a highly technical challenge to determine the best method of setting baselines and emissions caps for the programme so that a meaningful reduction in emissions could actually be achieved, without excessively burdening the targeted facilities. The TMG team was acutely aware that the ultimate success of the programme depended on the ability to establish the optimal baseline. When establishing baseline emissions, TMG opted for a considerably flexible approach. Base-year emissions are calculated based on the average of any three consecutive fiscal years between 2002 and 2007 so that the facilities can incorporate the results from their efforts in past years (such as voluntary energy efficiency upgrades implemented during the previous Carbon Reduction Reporting Program). On the other hand, the emissions cap (compliance factor) was strictly set to either 6% or 8%—figures deemed as ‘fair’ by several studies conducted during the design stage.

Double checking of data verification

Substantial measures have been taken since the beginning to enhance data accuracy. Firstly,

annual reports submitted by the owners were required to be checked by registered verification agencies before submission to TMG. Secondly, Tokyo officials also check data accuracy and contact owners in cases of any problems, as there were some instances where data verified by registered agencies contained errors. The combination of this double checking process has thus helped to significantly improve the reliability of data obtained over the years. Data obtained through the programme is crucial as it will serve to monitor the effectiveness of the TCTP itself, whilst also identifying best practices. It is hoped that data obtained will allow City officials to make improvements to other existing programmes and implementation measures regarding energy efficiency and climate change governance.

Tenant engagement

TCTP mandates that tenants cooperate with building owners in pursuing energy efficiency and reducing GHG emissions. For example, this includes the provision of energy consumption data when needed, cooperation with owners responsible for reducing energy consumption, attendance in owner-initiated commission meetings, or cooperation with building operation guidelines in regards to energy consumption. Despite such stipulations, the TMG team finds it challenging to successfully engage tenants in energy efficiency and GHG reduction measures.

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