Smart Buildings

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1 BACKGROUND

ITU-T Study Group 5

- ITU-T Study Group 5 (SG5) is responsible for studies on methodologies for evaluating ICT effects on climate change and publishing guidelines for using ICTs in an eco-friendly way.
- SG5 work encompasses globally agreed methodologies for measuring the carbon footprint of ICTs, to facilitate measurement of the impact of ICTs on emissions and support meaningful reporting and comparisons. ITU's common methodology will help establish the business case to go green and support informed consumer choices and climate-friendly business procurement.

BOMA Canada

- Largest Trade Association for Commercial and Institutional Real Estate
- Over 3,000 members
- Own and manage over 200,000,000 m2
- Canadian Pension Funds rank as five of the top 30 global real estate investors and seven of the world's biggest international infrastructure investors

BOMA BEST - Green Building Assessment Program

- Launched in 2005
- Focused on improving the sustainability performance of buildings
- Reducing environmental impact through ICT and best management practices
- Available globally
- Looking to submit to SG5 as the basis for a new recommendation

2 What is a Smart Building

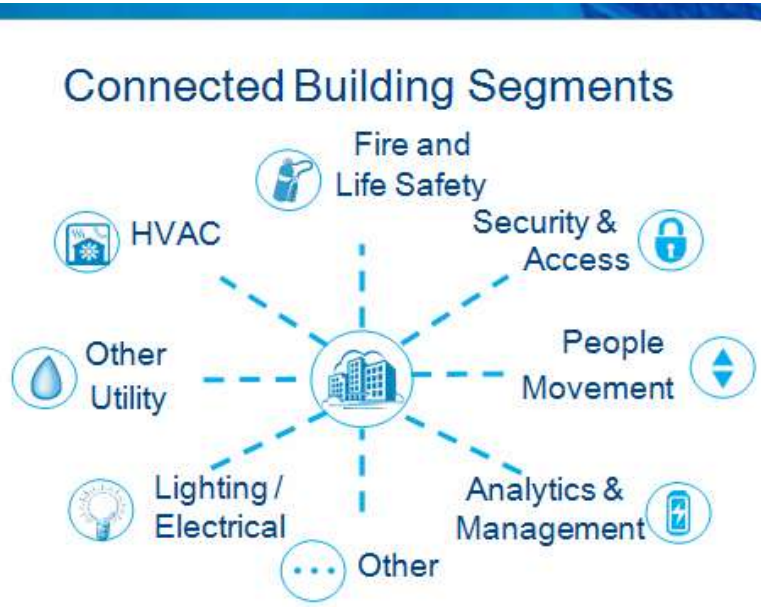
Definition

1. Provides actionable information regarding the performance of building systems and facilities;
2. Proactively monitors and detects errors or deficiencies in building systems;
3. Integrates systems to an enterprise business level for real-time reporting and management utilization of operations, energy and occupant comfort;
4. Incorporates the tools, technologies, resources and practices to contribute to energy conservation and environmental sustainability.

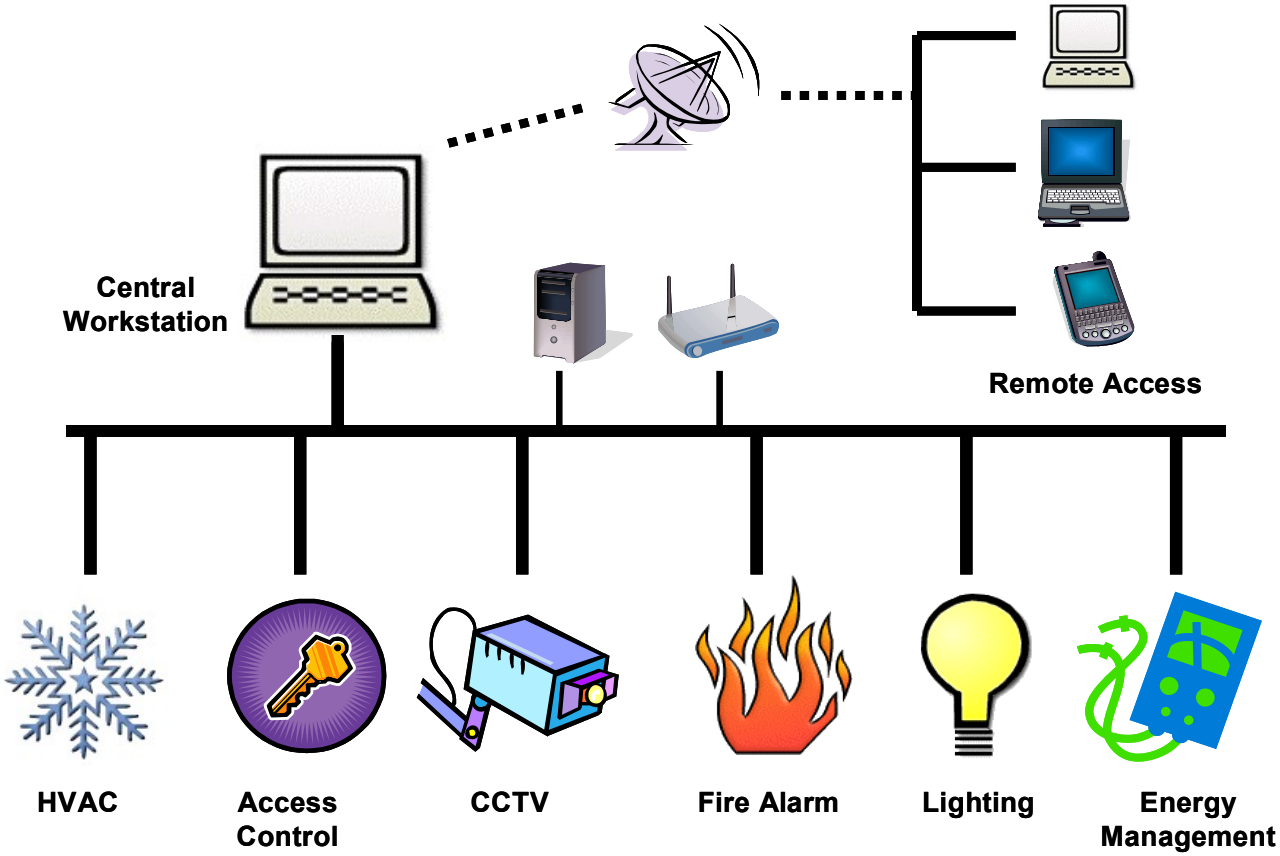
With smart technology, we can learn anything we want about a building and optimize its performance.
But real performance means happier, more productive tenants.

BOMA BEST 3.0 BEST Practices

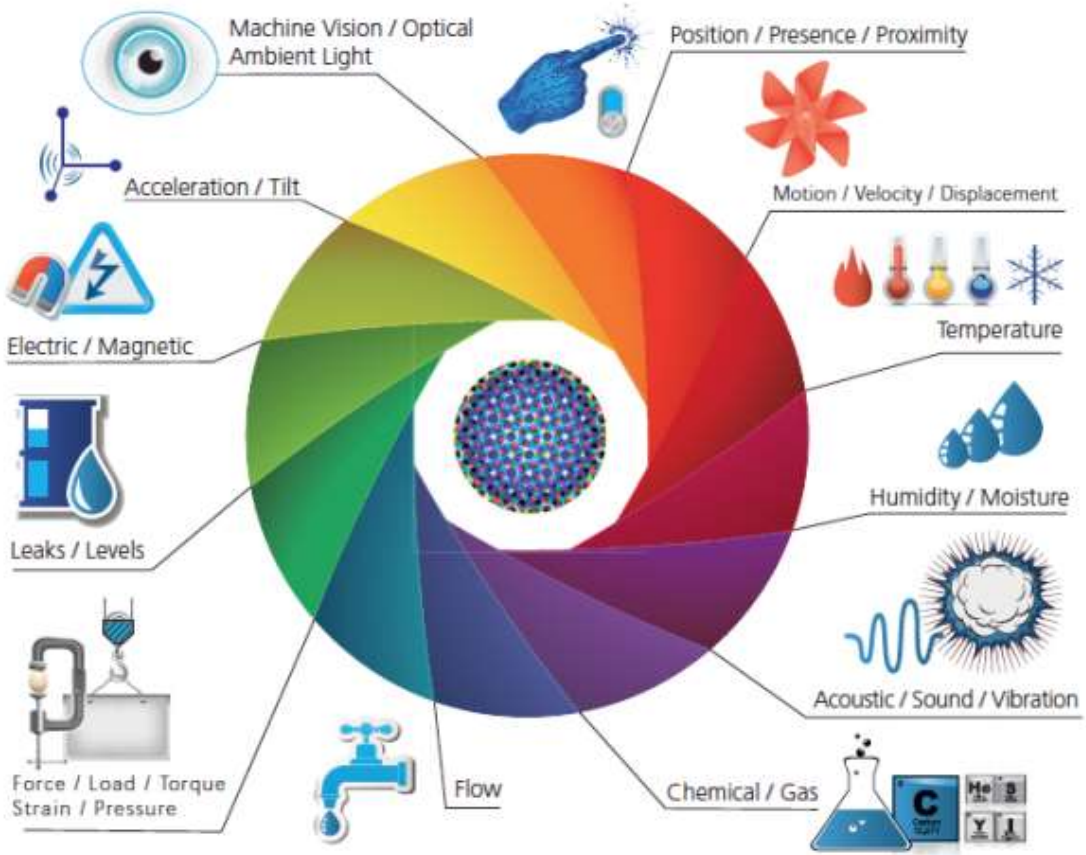
A Smart Building is an intelligent space that will transform efficiency, comfort, and safety for people and assets.



Architecture of a Building Automation System (BAS)



Sensors…Everywhere and in Everything - IoT



3 Opportunity

Opportunity

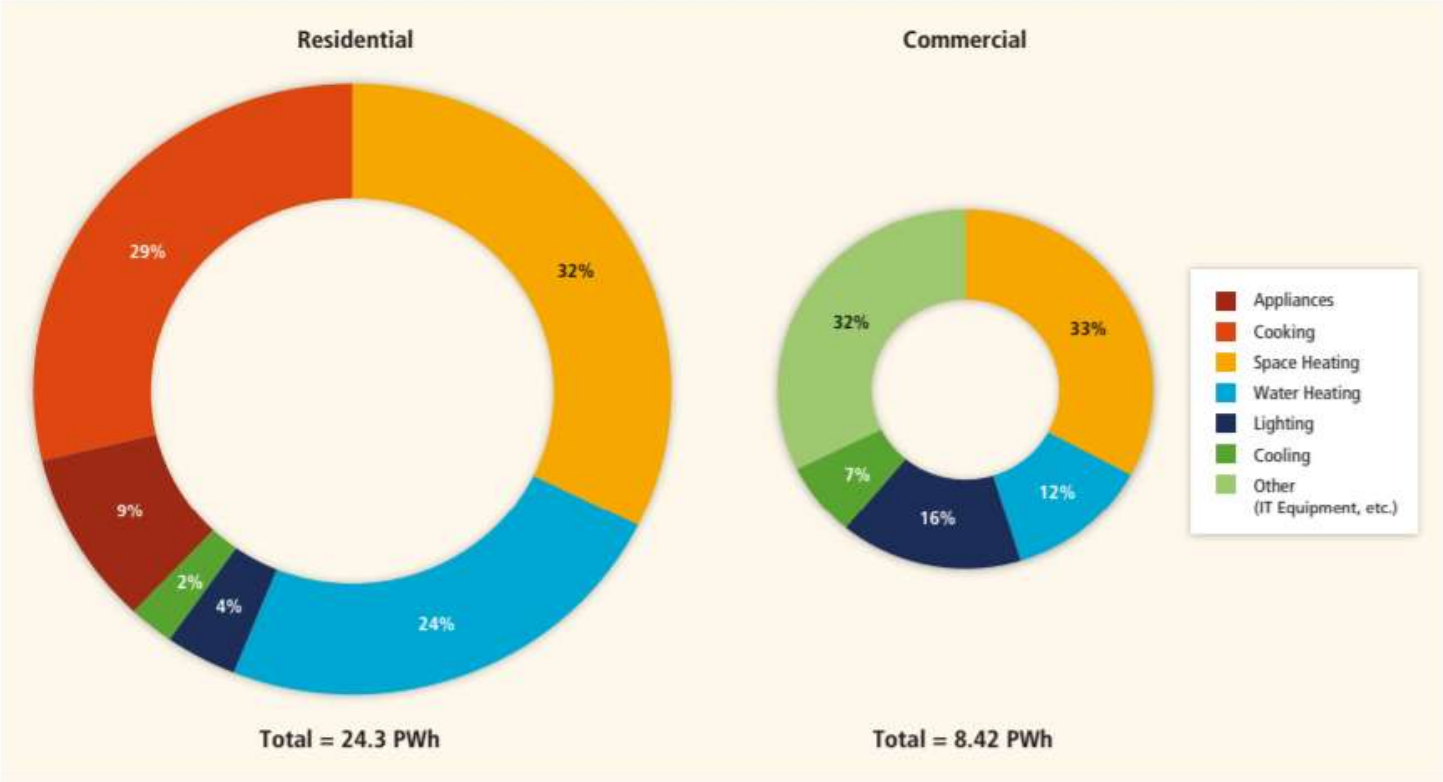


Figure 9.4 | World building final energy consumption by end-use in 2010. Source: IEA (2013).

Opportunity

Around three quarters of global greenhouse gas emissions come from cities, and the C40/ Arup Deadline2020 report shows that building energy use accounts for over half of total city emissions on average.

This means that decarbonising buildings in cities – by making them more efficient so they use less energy, and by cleaning up the energy that they do use – is one of the most fundamental things that we can do to avoid dangerous climate change

https://www.c40.org/programmes/building-energy-2020-programme


4 Challenges

Challenges for Smart Building Technology

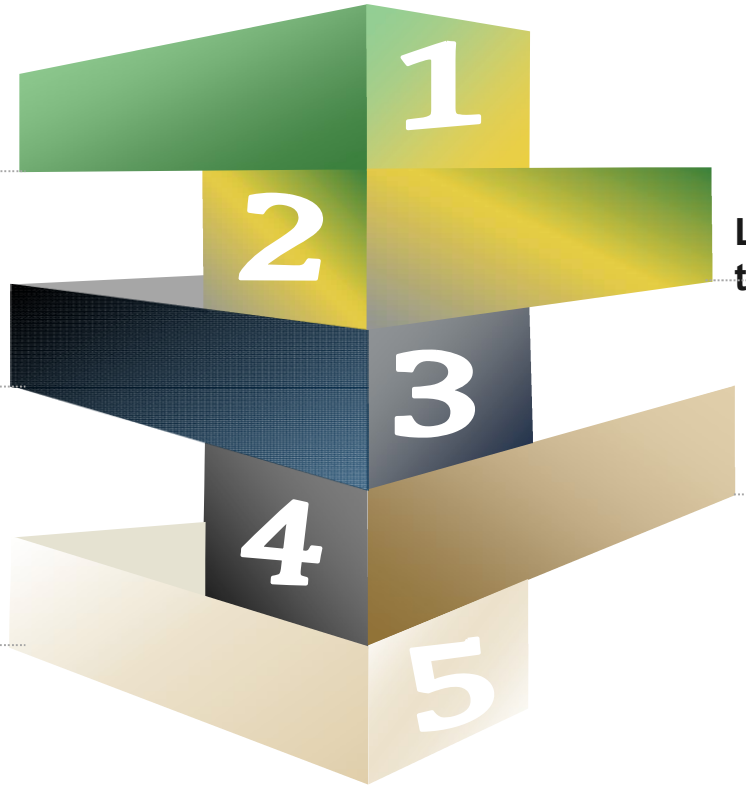
Lack of awareness of the benefits associated with an Smart Building

Lack of awareness of the latest technologies

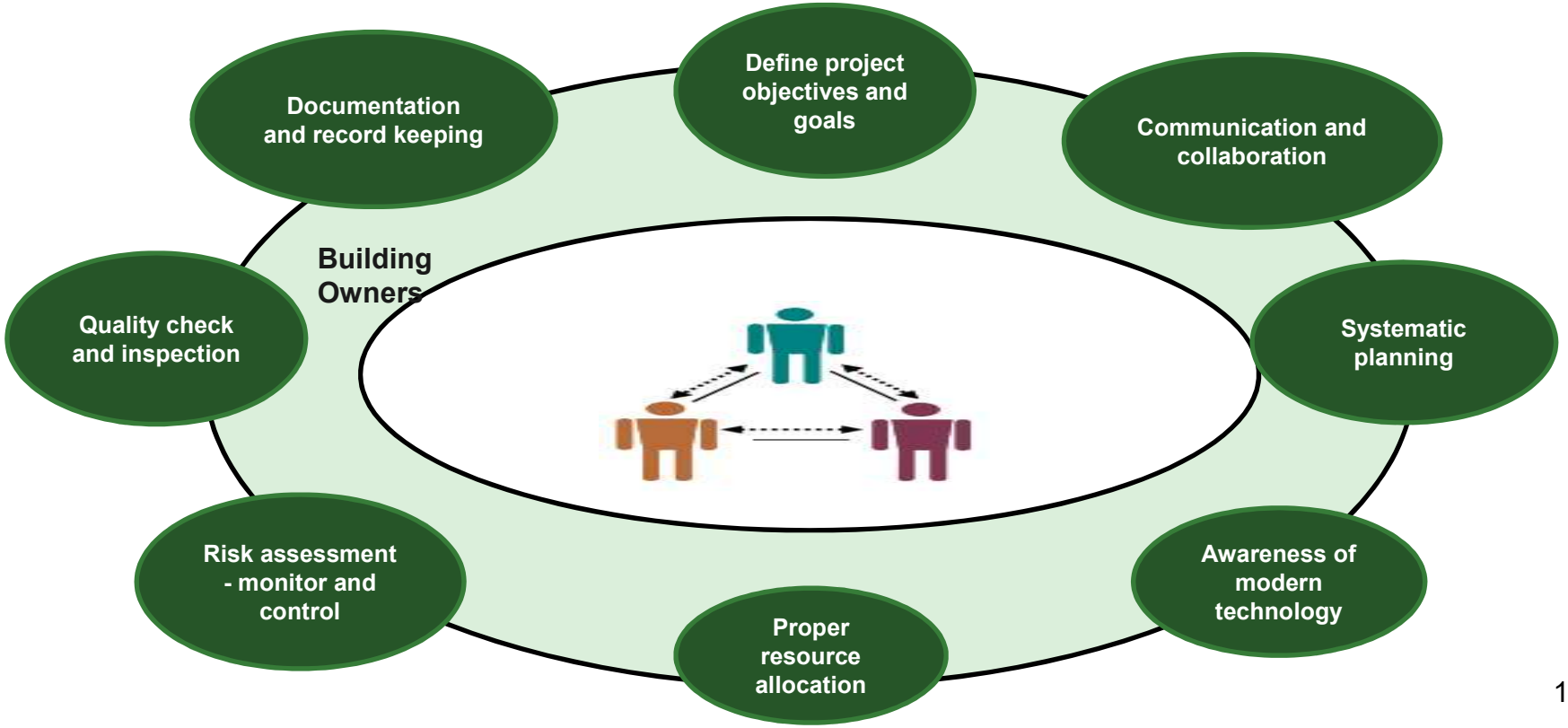
Challenge in compatibility of new technologies with existing equipment

The building owners perceive some of Smart building technologies as highly expensive

Due to budget constraints, there is more focus on the upfront cost of the building



Best Practices in Design and Implementation of Smart Buildings



Design and Implementation of Smart Buildings Process Optimization

Key Takeaway: Due to the frequent shortcomings, optimization is identified as a major need for seamless execution

Stage	Challenges in Traditional Processes	Areas of Focus
Design and Planning	• Disconnect among value chain partners • Cost-driven approach by owners • Inadequate efforts to understand project specifications • Lack of awareness about IBDI benefits • Lack of understanding of technology advancements • Team inexperience • Over-reliance on contractor	• Collaborate with project partners. • Early involvement of value chain partners • Focus more on long-term and operational costs. • Understanding of desired goals and project specifications • Stay updated on the latest technology • Have an experienced and multi-disciplinary team.
Execution	• Identification and allocation of resources • Slow to comprehend interoperability and integration of technology • Lack of communication and collaboration • Lack of in-depth knowledge of technology	• Precise material and manpower should be allocated • Establish an experienced team for execution. • Education and training is needed
Control	• Weak project monitoring and control	• Regularly monitor and control the progress • Monitor and control cost of the project • Building owner should also be involved

Design and Implementation of Smart Buildings

Integrated Design Process (IDP) allows for the systemic approach, which optimizes building performance iteratively, and involves all design team members from the start (Montanya et al., 2009; Pope and Tardiff,)

Savings at the system level are generally larger than for individual devices (pumps, motors, fans, heaters, chillers, etc.), as are related net investment-cost savings—usually several times higher (Levine et al., 2007; Harvey, 2008)

https://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_chapter9.pdf

Design and Implementation of Smart Buildings

Essential steps in the design of low-energy buildings are:
(1) building orientation, thermal mass, and shape;
(2) high-performance envelope specification;
(3) maximization of passive features (daylighting, heating, cooling, and ventilation);
(4) efficient systems meeting remaining loads;
(5) highest possible efficiencies and adequate sizing of individual energy-using devices
(6) proper commissioning of systems and devices.

Cost savings can substantially offset additional high-performance envelope and higher-efficiency equipment costs, of around 35–50% compared to standard practices of new commercial buildings (or 50–80% with more advanced approaches).
Retrofits can routinely achieve 25–70% savings in total energy use (Levine et al., 2007; Harvey, 2009).

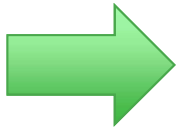
https://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_chapter9.pdf


5
Measure Success

Smart Building

+

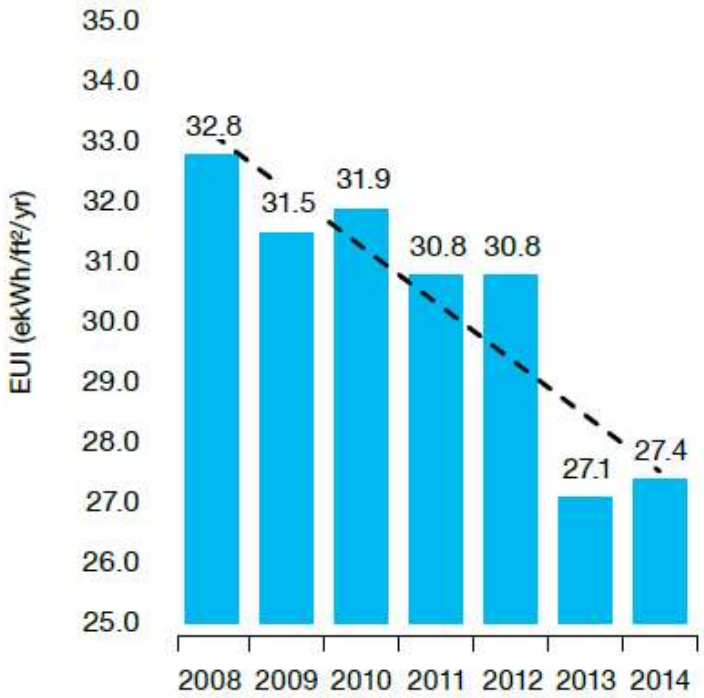
Optimized Building Operations



- Lower Operations Costs
- Reduced Energy Usage
- Reduced Water Usage
- Reduced GHG Emissions

Energy Performance in Canada

FIGURE 19: AVERAGE EUI BY YEAR CERTIFIED – OFFICE BUILDINGS



Overall, the Energy Use Intensity (EUI) for BOMA BEST certified Office buildings has dropped from 32.8 in 2008 to 27.4 in 2014.

This translates to cost savings of over **$200,000*** per year.

*assuming an average electricity cost of $0.15 per kWh/square foot for a 250,000 square foot building.

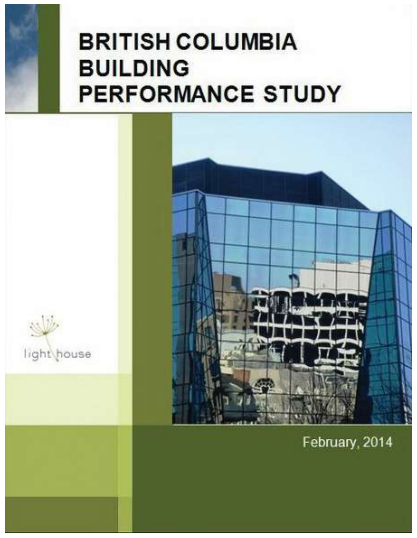
Sustainable Buildings - Performance Improvement

BOMA BEST Platinum office buildings
save on average $480,000/ year in energy costs
compared to the average building

BOMA BEST Gold office buildings
consume 17% less energy than the average building

BOMA BEST Silver office buildings
consume 15% less water than the average building

Light House Sustainable Building Centre



- **25% less energy use** intensity at recertification
- **30% reduction** in annual building water usage
- **8% increase** in diverted waste
- Recertification is strongly associated with improved building performance.