Building Intelligence Quotient 2.0 Development Update

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Sustainable Resources Management
What is an intelligent (smart) building?

- An Intelligent Building provides owner, operator and occupant with an environment which is flexible, effective, comfortable and secure through the use of integrated technological building systems, communications and controls.
Smart Grids need Smart Buildings

Traditional electric grid with generators, distribution lines and meters

Distributed energy resources (DER) which may include photovoltaic, windmills and fuel cells

Demand response networks with attached devices
Energy costs are the largest and fastest growing facility cost behind tax and insurance.

* 2008 BOMA Experience Exchange Report, All Buildings
Traditional Utility Analysis

Database for M&V, kWh and kW data, weather-correlated baseline established, anomalies identified

Graph 1 - Dominican University - Electricity Consumption Trend

Initial Observations
Baseline (Lighting, Plugs, HVAC Fans/Pumps) 88.2% of Annual Total kWh
Cooling/Summer Extra 10.0%
Winter/Heating Extra 1.8%

The electricity consumption trend shows a notable cooling related increase from May through October, but with a poor overall correlation to summer weather in both 2008 and 2009, indicating opportunity for improved HVAC systems control. The baseline is consistent and predictable over the winter months, with no appreciable heating related increase. The baseline shows an 8% decrease in 2009-2010 versus 2008-2009. The average monthly load factor (ratio of peak electricity demand to actual kWh) is high at 72%, indicating main building lighting and HVAC systems operate over 17 hours per day, 7 days per week, suggesting a potential opportunity for trimming energy use in the morning and evenings. However, overall electricity use at 9.6 kWh/ft² is at the low end of the expected range, indicating limited savings potential.
More Efficient Systems and Equipment

Scoping Assessment identified 60 potential measures

Integrated Energy Retrofit

Optimum bundle of measures in terms of NPV

38% reduction

Case Study ESB
Energy Management Feedback Loop

1. Make Commitment
2. Assess Performance & Set Goals
3. Create Action Plan
4. Implement Action Plan
5. Evaluate Progress
6. Recognize Achievements
7. Re-Assess

Time Lag
Time-of-use rates

Winter Weekdays (November 1 - April 30)

Summer Weekdays (May 1 - October 31)

Weekends & Holidays

On-peak (9.9¢/kWh) – demand is highest
Mid-peak (8.1¢/kWh) – demand is moderate
Off-peak (5.1¢/kWh) – demand is lowest

ES Engineered Systems
High-Performance Buildings

BiQ™
Buildings Are The Key to Smart Grid Savings

Building must have functional control systems to be able to hook into the smart grid.

Source: PECI | Wiring the Smart Grid for Energy Savings
Converged Building System

Middleware Server
Translation of disparate protocols to Common format

Energy Management, Building Management
Facility Management, Security Management, Maintenance Management

IT Network Management

Wireless

TelePresence

ENTERPRISE APPLICATIONS

Energy and Power Metering

BMS

Lighting Control

UPS Monitoring

CCTV

DVR

Energy Management, Building Management
Facility Management, Security Management, Maintenance Management

IP Camera

IP Telephony

Access Control

Door Controllers

Intruder Panels

Fire Alarm System

VAV

Boilers

Chillers

Smoke Sensor

Break Glass

Sounder

DSI/DALI Interface

Occupancy Detectors

Reader Technology

BiQ™

Engineered Systems
High-Performance Buildings
1.0 had the following industry support:

- Berleke Lab
- Honeywell
- TENG
- Liberty Property Trust
- Jones Lang LaSalle
- Public Works and Government Services Canada
- Intelligent Buildings
- Robinson
- WTA
- Engineered Systems High-Performance Buildings
What is BIQ?

- A program developed by the BiQ Consortium (CABA members) on Green Globe platform (ECD Canada now part of Jones Lang LaSalle) that is viewed by the industry as the de-facto standard to evaluate building intelligence.

- BiQ Awards 2012 were made to 4 buildings at CABA IIBC meeting at AHR Expo –Philadelphia (Comcast), Toronto (MaRS) and Ottawa (EMS), New York (AMEX)

- “Provides a means for the real estate industry to hold the building controls companies accountable for building smartness” - Frank Dougherty of Liberty Property

- “CABA’s BiQ ranking tool has three functions. It serves as: a means to evaluate and measure the "value" of intelligent building performance; a design guide for integration of building intelligence in new building projects; and a building automation retrofit action plan tool.” - CABA Press Release
BiQ 1.0 History

- CABA Integrated Intelligent Building Council meeting at RealComm 2003
  - Discussion on Energy Star and LEED for Existing Buildings
  - Appraisal Institute expresses interest in rating of intelligence or smart
  - IIBC promotes Integration and Interoperability in Technology Roadmap
  - Decision to develop Request for Proposals for Intelligence rating tool

- CABA Integrated Intelligent Building Council meeting at AHR Expo 2004
  - IIBC develops framework for the rating of an Intelligent Building
  - BuildConn holds Roundtable discussion and gets input for rating
  - IIBC prepares the RFP for rating existing Building Automation
  - IIBC also works on Life Cycle Costs Tool for New Intelligent Buildings

- CABA Integrated Intelligent Building Council meeting Feb 2005
  - IIBC receives 2 proposals to develop rating of an Intelligent Building
  - Building Intelligence Consortium (ECD, IBI, SRM) and Clasma
  - IIBC requests BiQC to develop the BiQ on a cost recovery / use
  - IIBC requests Clasma to promote and market BiQ development
MOU signed with the Building Intelligence Quotient Consortium (BiQC)

- BiQC agree to a revenue sharing due to the lack of CABA initial sponsorship funding
- Consortium members are to engage their fellow CABA IIBC members in developing the infrastructure for the Building Intelligence Certification Process.

The initial members of the BiQ Consortium are:

- Sustainable Environmental Solutions Inc. – David Katz - Project Management
- ECD Energy and Environment Canada – Jiri Skopek - On Line Building Assessment Program
- IBI Group – Frank Spitzer – CABA Technology Roadmap Update and Technical Support

The initial members of the IIBC BiQ Steering Committee are:

- TENG Solutions – Tom Lohner - Chair
- Pacific Northwest National Laboratories- Krishnan Gowri – Building Certification Interest
- FASTEK International – Ray Murray – System Integration and Web site experience
- SRS Canada – Phil Fung – Integrated Building System Installation experience
- Distech Controls – Omar Tabba – Open System Alliance Integrator – French Translation

Subsequent additions to the BIQC Steering Committee are:

- Clasma Inc. – Anto Budiardjo- Marketing and Promotion of CABA BiQ
- University of Reading - Dr. Zhen (George) Chen – Researcher under Derek Croome-Clement.
- Asian Intelligent Building Association was contacted for possible collaboration on the BiQ.

IIBC Members were updated at each IIBC meeting and conference call

- IIBC Advise support from Rick LeBlanc, Roy Kolasa, Terry Hoffman, Paul Ehrlich Tom Shircliff, Claude Boudria, Ron Bernstein and others.
BiQ 1.0 Steering Committee provides input and feedback

BiQ 1.0 was developed for existing commercial building automation and be based on:

- Technology Roadmap for Intelligent Buildings
- Green Globes Rating Assessment Protocol that is used for:
  - Integrated design of new buildings
  - Improving existing buildings (BOMA Go Green)
  - Facility fit-up (Commercial Interiors)
  - Emergency management of buildings
BiQ 1.0 “www.building-iq.com” uses Green Globe Platform

Why online?

- Web System already used by BOMA Go Green
- Interactive and can be sold per building
- Change inputs at the click of a mouse
- Generates scores and reports effortlessly
- Makes it easy to store and compare data about various properties - Portfolio Comparison
- Allows for multiple users answering for their BAS
- Puts BAS education, training and product information at your fingertips

BiQ™

Engineered Systems
High-Performance Buildings
Building Intelligence Quotient - BIQ Areas of Assessment

- System Overview
- Power Distribution to Offices
- Voice and Data Systems to Offices
- Connectivity Options for the Building
- Building facility Management Applications
- Sub-system Operation
- Intelligent Building System Features
Building Intelligence Quotient- Where does it Fit?

Key Highlights of Rating Tools

USGBC - LEED® Tool
- 6 interrelated tools
- 69-point scale
- Certified-1,674 (US)

GBI – Green Globes™ Tool
- Multiple Ratings
- 1000-point scale
- Certifications :Over 830 (NA)

iiSBE - SBTool™ Tool
- Generic Framework
- 18 building types
- 6-145 criteria

Energy Star Program
- By USEPA & USDOE
- Over 50 EE categories
- Rated 62,000 buildings (07)

» Intelligent technologies enable buildings to meet core objectives of sustainability (Energy, Water, CO2)
» Enhances social responsibility goals with measurable returns from active intelligence (Design Innovation, Integration, LCA, O&M Saving, ROI)

Currently only tool addressing building intelligence with a comprehensive framework.

CABA BIQ Tool
- By BIQC & CABA IIBC
- Evaluates intelligence
- Provides guidance to achieve desired integration

F R O S T & S U L L I V A N

Source: CABA’s Convergence of Green and Intelligent Buildings Report
Building Intelligence Quotient- Where does it Fit?

Green Ratings Overview & Forecasts


- 64,700 projects certified till date
- 400,000 projects by 2015
- Projected CAGR: 30%

Drivers are expected to far outweigh the restraining factors, leading to robust growth in cumulative certifications year-on-year by LEED, Energy Star, Green Globes, and BOMA Go Green.

Source: CABA’s Convergence of Green and Intelligent Buildings Report
“Green and Smart” Concepts

Green Building Assessment

- Training
- HVAC Control
- Operation Manual
- Maintenance Schedule
- Water management
- Filtration System
- Mould detection
- Storage Tank monitoring
- Emergency Response
- Emergency Power Generator
- CO2 & CO Control (air quality)
- Lighting and Daylighting Control
- Control over the ventilation
- Energy Monitoring, Metering and Sub-Metering
- Water consumption Monitoring, Metering and Sub-Metering

BIQ

Integrated systems

Building Automation

Life Safety

Integrated Approach to Reduction of Impacts

BiQ

Engineered Systems

High-Performance Buildings
BIQ Categories - Ability to evaluate Smart Grid readiness

• **Systems Overview** (Operators Skills, Training, Commissioning)

• Power Distribution

• **Voice And Data Systems** (Telecom Infrastructure)

• **Connectivity Options** (Networks)

• **Intelligent Building System Features** (Security, Life Safety, HVAC, Vertical Transport, Building Condition Monitoring)

• **Building/Facility Management Applications** (Utilities/ Management)

• **Sub-system Operation in Degraded Mode** (Failure, Emergency)

• **Sub-system Operation in a Building Automation Environment** (Integration, Interoperability)
### Updating information for ABC Center

**BUILDING INFORMATION**

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the name of the building?</td>
<td>ABC Center</td>
</tr>
<tr>
<td>What is the street address?</td>
<td>First Street</td>
</tr>
<tr>
<td>City?</td>
<td>Toronto</td>
</tr>
<tr>
<td>State/Province?</td>
<td>Ontario</td>
</tr>
<tr>
<td>Zip/Postal code?</td>
<td></td>
</tr>
<tr>
<td>Floor plate area (in square feet)?</td>
<td>20,000</td>
</tr>
<tr>
<td>Total area (in square feet)?</td>
<td>400,000</td>
</tr>
<tr>
<td>Number of stories above ground?</td>
<td>15</td>
</tr>
<tr>
<td>Number of stories below ground?</td>
<td>2</td>
</tr>
<tr>
<td>Number of occupants?</td>
<td>1,500</td>
</tr>
<tr>
<td>Number of independent organizations occupying the building?</td>
<td>70</td>
</tr>
<tr>
<td>Who owns the building?</td>
<td></td>
</tr>
<tr>
<td>Is the building owner-occupied?</td>
<td>☑️ Yes ☐ No</td>
</tr>
<tr>
<td>Type of building construction (describe)</td>
<td>Heritage Masonry, new concrete/curtain wall</td>
</tr>
<tr>
<td>Type of heating and ventilation (describe)</td>
<td>District steam heating/hot water; A/C form condenser water loop DX units</td>
</tr>
</tbody>
</table>
Tip: Intelligent systems may be capable of adjusting performance dynamically in response to modifications.
**Scoring Criteria**

To find out how the performance of TEST #2 compares to other buildings that have been assessed, and to obtain validation, the data must be validated by an independent third party who has undergone the BiQ evaluator training.

Each component of this questionnaire has been scored individually. The bar graph above demonstrates a consolidated score for each of the components while each component is subsequently reported on in separate paragraphs below. These scores are identified as percentages. The overall scoring algorithm is based on the answers to the questions and takes into consideration question where you may have answered “not applicable”. The results that we have attributed to your answers are intended to reflect the relative performance of your building. Naturally it is evident that you may believe your building to be “highly intelligent” and we may have provided a score of only 55%.

We believe that we have tried to address the interests of intelligent buildings in an objective and correct manner but we also understand that the purpose of the building will clearly influence the weighting of certain answers and we may not have correctly identified that weighting at this point in time. Please report any such apparent “mismatches”. These comments should identify the nature of the building and the apparent nature of your perceived mismatch.

In general it is our perception that no building will achieve “100%”, and no intelligent building should fall below “50%”. We believe that any building that achieves an overall score in excess of 75% will be regarded as a very intelligent building.

To find additional information on this topic CABA members can login and search the List of Information Series Reports in the Members-Only Section.

To find CABA members working in this area use the CABA website’s advanced industry expert search. You can easily search based on product area and expertise, among other criteria.

Non-members can search for this topic in CABA’s public materials.

In addition to the BiQ Report generated below, the following websites provide many documents on intelligent building automation:

- [California Energy Commission - Enhanced Automation Guide](#)
BiQ Rating and Areas with Opportunities for Improvement

BiQ Rating based on weights and scores for 1000 points

Building Intelligence Quotient = Overall Rating = 80%

- Systems Overview: 90%
- Power Distribution: 86%
- Voice and Data Systems: 100%
- Connectivity Options: 44%
- Intelligent Building System Features: 58%
- Facility Management Applications: 38%
- Degraded Mode Operation: 100%
- Building Automation Environment: 88%
BiQ Report = Highlights (Yes) and Opportunities (No)

Comprehensive report explaining rating process and covers each area with highlights for Yes answers and offers Opportunities for Improvement to Questions that were answered No. Links to research library and educational sites are provided for more specific information on the topic section. Report can be exported to PDF.
BiQ Advisory Board Chairs, Tom Lohner and Chris Larry of TENG suggested the following market, federal and socio-economic issues, trends and requirements must be addressed in version 2.0:

- Measurement and verification of building and sub-system performance compared to original high performance building specifications and/or optimized. performance following retro or re-commissioning of systems.
- Enable continuous commissioning by extracting real-time system data, analyzing data and developing system metrics to assess on-going performance.
- Enable predictive maintenance management.
- Ability to participate in the Smart Grid.
- Employ wireless technologies in a cost effective fashion to improve the occupied environment and optimize energy consumption (HVAC and lighting).
- Enable sustainability reporting (Global Reporting Initiative).
- Provide a energy and performance metrics that enable continuous improvements and energy reduction goals to be achieved.
- Provide a foundation for the Net Zero energy building by 2025.

BiQ 2.0 Questions addressing these issues have been developed and testing and review are needed.
BiQ Consortium is seeking new participants for the development of BiQ 2.0 that will address the new building automation technologies and the integration and interoperability with the Smart Grid. BiQ 2.0 will compliment the GREEN and High Performance and Net Zero and other rating and benchmarking programs. Contributors will be provided with a FREE BiQ 1.0 and discounted access to the new BiQ 2.0.

BiQ User Group will be formed to administer the program for sustainability.
Try a FREE BiQ 1.0 and Answer Survey
Join the BiQ 2.0 Development Team

Go to www.building-iq.com to register and submit. Then send email to dkatz@building-iq.com advising of participation. I will approve and send you confirmation and survey form. Contact David Katz @ 416-493-9232 for any BiQ related issues.