Case Study of Refurbishment and Green Cost
GBI Non Residential Existing Building (Provisional Certificate)

Bangunan Perdana Putra
GBI Non Residential Existing Building
(Provisional Certificate)

Menara Citibank
GBI Non Residential Existing Building (Provisional Certification)

ASR PADU Existing Building Redevelopment
When and Why...

- Inefficient, poorly functioning, unhealthy, and uncomfortable buildings.
- High operating costs
- High consumption of resources
- Deterioration of indoor environmental quality
- Corporate Social Responsibility
- “Walk the talk”
- End of life
Setting the Target

* How green?
* Use of relevant rating tool
* Target reduction in use of resources and energy
* Target increase in productivity
* Target increase in value
Refurbishing and Retrofitting
Balancing Act

- Time
- Cost
- Disruption
- Minimizing Waste
- Maintainability
- Occupants' behavior

Balancing Act for
Greening existing buildings
Green Strategy Stages...

Level 1: Energy Audit, Rebalancing, Repair and Optimization of Existing System

Level 2: Replacement/Upgrade of Existing Equipment and Fittings

Level 3: Upgrade/Modification of Existing System

Level 4: Introduction of Sustainable Policies and Procedures

Level 5: Introduction of Renewable Energy and State of the art ‘Green’ Systems

Higher Sustainability Impact

Level of Difficulty and Cost Increases
Example: The Energy Pyramid

- Renewable Energy
- Energy Efficient Equipment
- Energy Conservation

More Cost
The Composition of Cost

Capital Cost
* Repair / Refurbish
* Façade treatment / redesign
* Equipment / Controls / Services upgrade
* Reprogramming and Retro-commissioning
* Introduction of Renewables
* Policy Changes

Execution Cost
* Losses Due to Disruption
* Losses Due to Rental
Green Cost

* Cost from base state of building to green building
* Includes all works including ID and landscape
* What is the base?
  * Compliance to Code and By Laws i.e Building By Law
  * Compliance/Reference to Standard i.e MS 1525 : 2007
Auditing for Base Reference

- Establishing Base Energy Consumption and Trend
- Establishing Use of Other Resources (i.e. Water)
- Establishing State of Indoor Environmental Quality
Statistics are not yet available.

Pool of Retrofit buildings with certification and green cost will only be available within next few years.

Retrofitting buildings prior to the implementation of UBBL :1984 is anticipated to be more costly.

Green Cost for retrofitting from Base building* is expected to follow the trend for Newly constructed building.
The Number Game

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# The Number Game

<table>
<thead>
<tr>
<th>Green Building Index Rating</th>
<th>Average M’sian Bldg</th>
<th>Meets MS1525</th>
<th>GBI Certified</th>
<th>GBI Silver</th>
<th>GBI Gold</th>
<th>GBI Platinum</th>
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</thead>
<tbody>
<tr>
<td>BEI kWh/m².year</td>
<td>250</td>
<td>200 - 220</td>
<td>150 - 180</td>
<td>120 - 150</td>
<td>100-120</td>
<td>&lt;100</td>
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<tr>
<td>Energy Savings %</td>
<td>Base</td>
<td>10 - 20</td>
<td>30 - 40</td>
<td>40 -50</td>
<td>50 – 60</td>
<td>&gt; 60</td>
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<tr>
<td>Incremental construction cost %</td>
<td>Base</td>
<td>1 – 3</td>
<td>5 – 8</td>
<td>8 – 12</td>
<td>12 – 15</td>
<td>&gt;15</td>
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</tbody>
</table>

* Denotes revised projection in 2011

Source: Green Building Index
No definitive cost guide for retrofitting and greening for various types of building

Require more retrofit building green cost for analysis

Green cost depends on the base condition / state of a building and the target to achieve
The End