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**International  
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WORLD BANK GROUP

# Easing Green Transformation of the Building Sector

# I WANT TO DEVELOP A PROJECT FOR BUILDING EFFICIENCY IMPROVEMENT BUT...

1. Where to get the **Baseline** data?
2. What are the **Futurelines Options**?
3. How to compare Incremental **Cost & Impacts** of Futurelines?

For  
**Bottom-up**  
&  
**Hybrid**  
CCM approaches

*MRV approach requires all of the above*



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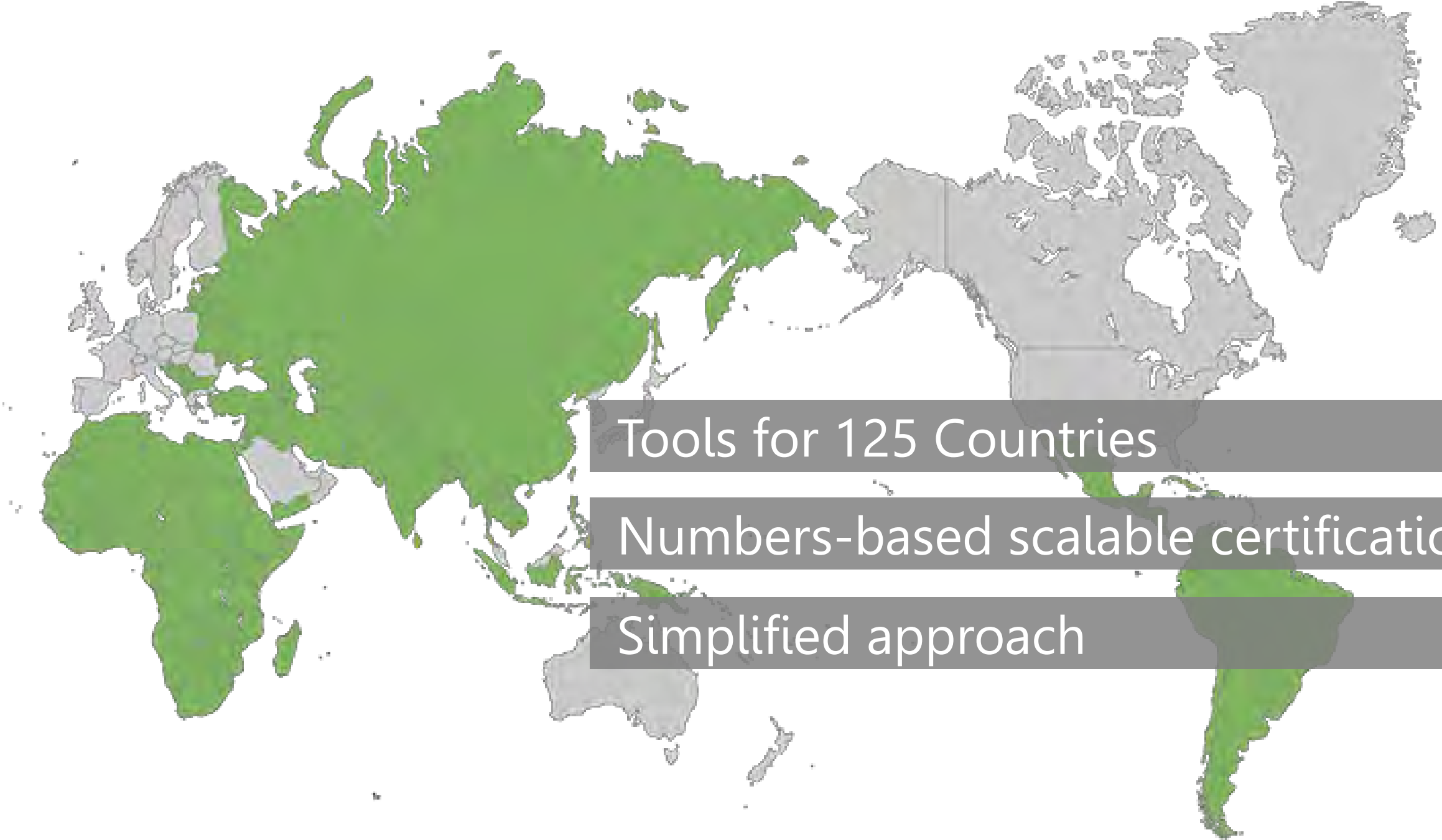
*AIMS TO REDUCE POVERTY AND INCREASE SHARED PROSPERITY*

*CLIMATE CHANGE CAN DISRUPT LIVES AND ECONOMIES*

*BUILDINGS ARE BIG GHG CONTRIBUTORS*

*BUT ONE OF MOST COST-EFFICIENT WAYS OF REDUCING GHG EMISSIONS*

**IFC GREEN BUILDING PROGRAM**



Tools for 125 Countries

Numbers-based scalable certification

Simplified approach

# STRATEGIC PARTNERSHIP: WORKING IN COORDINATION WITH NATIONAL GOVERNMENTS



Government of China



Government of Indonesia



Government of Philippines



Government of Vietnam



Government of Colombia



Government of Panama



Government of Peru



Government of Costa Rica



Government of India

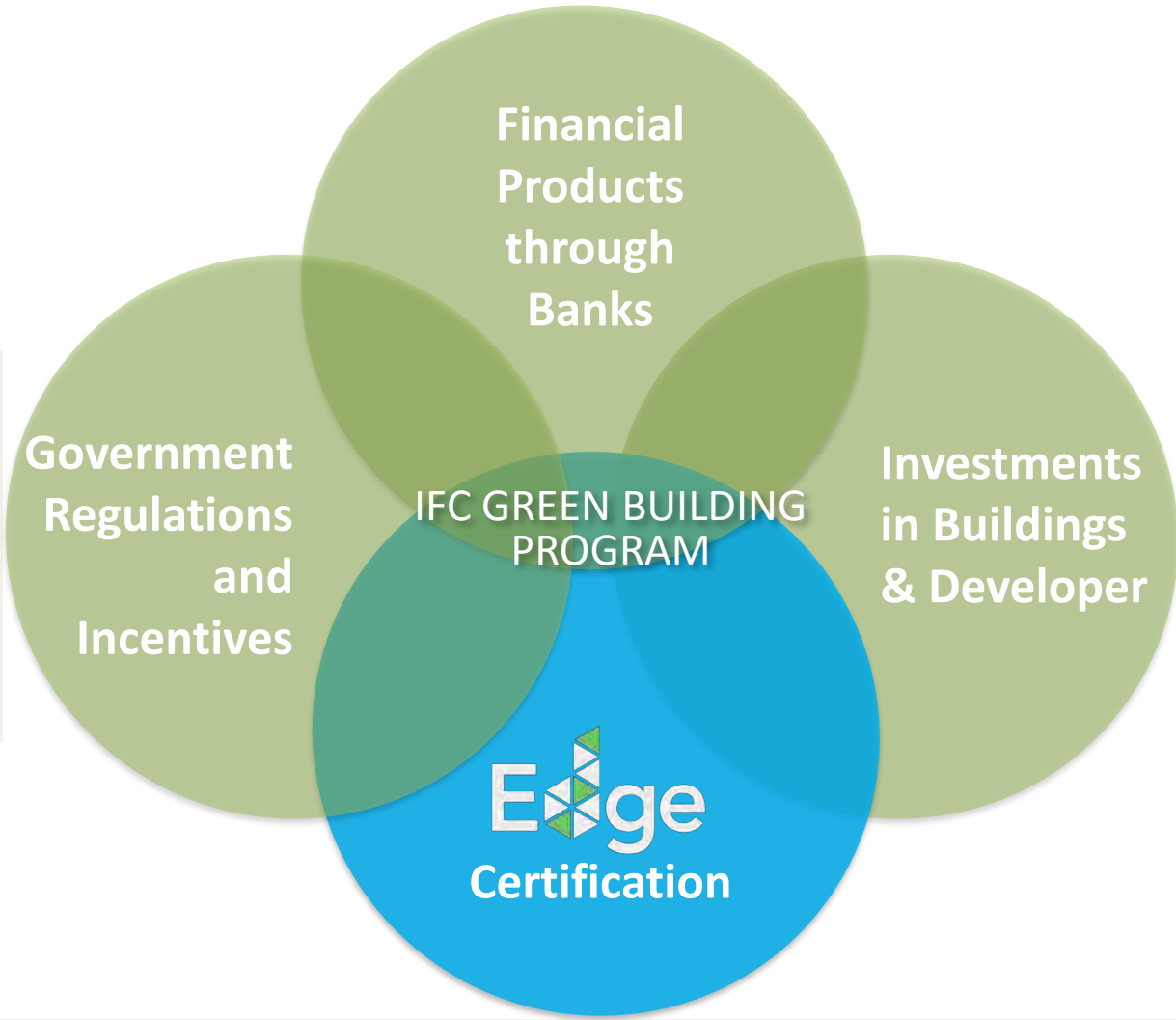


Government of Mongolia

# STRATEGIC PARTNERSHIP: JOIN ALL THOSE WHO ARE EMBRACING EDGE IN EMERGING MARKETS.



Mandatory Green Building/  
Energy Efficiency Codes  
developed for **6 countries**  
**16 Million m2** of floor  
space complied with codes



**USD 2.5 Billion**  
invested in Green Buildings

One of the fastest growing Green Building Certifications globally  
About **4 Million m2** of floor space in various stages of certification across **15 countries**

# THE SOLUTION IS EDGE: A SOFTWARE, A STANDARD, AND A GREEN BUILDING CERTIFICATION SYSTEM.

Free Software

+

Standard

+

Certification



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# EDGE: A GREEN BUILDING STANDARD

## CLEAR, ACHIEVABLE TARGETS.



20%

ENERGY USE



20%

WATER USE



20%

EMBODIED ENERGY IN  
MATERIALS

‘A building that has **20% less energy, water and material consumption** compared to an equivalent **local benchmark**.’  
The standard provides a performance assurance to buyers and investors.

# CURRENT LOCAL CERTIFICATION PARTNERS WITH A TARGET 20% OF NEW CONSTRUCTION CERTIFIED GREEN BY YEAR 7 OF LAUNCHING A LOCAL PROGRAM

Costa Rica	India	Indonesia	South Africa	Vietnam
 <p>Green Building Council Costa Rica</p>	 <p>Green Business Certification Inc.</p>	 <p>Green Building Council Indonesia</p>	 <p>Green Building Council South Africa</p>	 <p>SGS</p>

## GLOBAL CERTIFICATION PARTNERS THAT CAN CERTIFY PROJECTS GLOBALLY



thinkstep

thinkstep-SGS



Green Business Certification Inc.

# EDGE CASE STUDIES ONLINE: OFFICES, RETAIL, HOSPITALS, HOTELS AND HIGH TO LOW INCOME RESIDENTIAL



Kaufland  
📍 Bulgaria



First Home Premium - Binh Duong  
📍 Vietnam



Keserwan Medical Center  
📍 Lebanon



Citra Towers Kemayoran  
📍 Indonesia



City Express Hotels  
📍 Mexico



VBHC  
📍 India

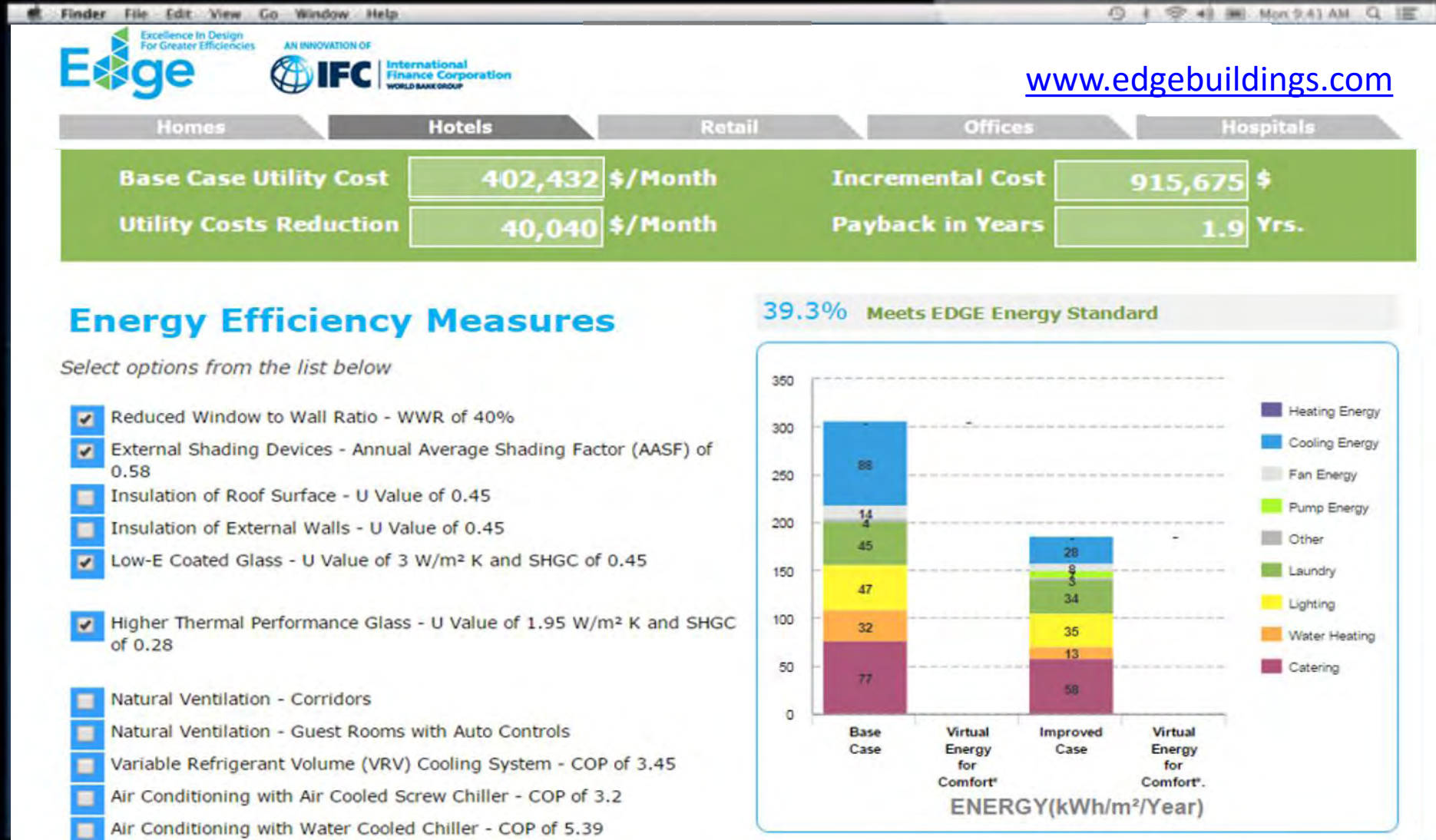


Johnson Controls HQ Asia Pacific  
📍 China



Canopus  
📍 Brazil

# THE FREE SOFTWARE SHOWS HOW THE WAY TO RESOURCE INTENSITY



**BASELINES**

# EDGE BASELINE

**UNIQUE BASELINE DEVELOPED FOR EVERY BUILDING USING CALCULATIONS AT 3 LEVELS**

## Global

*Incorporated in EDGE online software*

Energy Calculation Methodology

Water Calculation Methodology

Embodied Energy Calculation  
Methodology

Carbon Calculation Methodology

## Local

*Survey data for Baseline development*

Operating assumptions

Typical Specifications (or code reqmts.)

Material/ Equipment Costs

Weather and Tariff

## Building

*Calculate unique baseline & savings*

Size, geometry & orientation

Actual Design Specifications

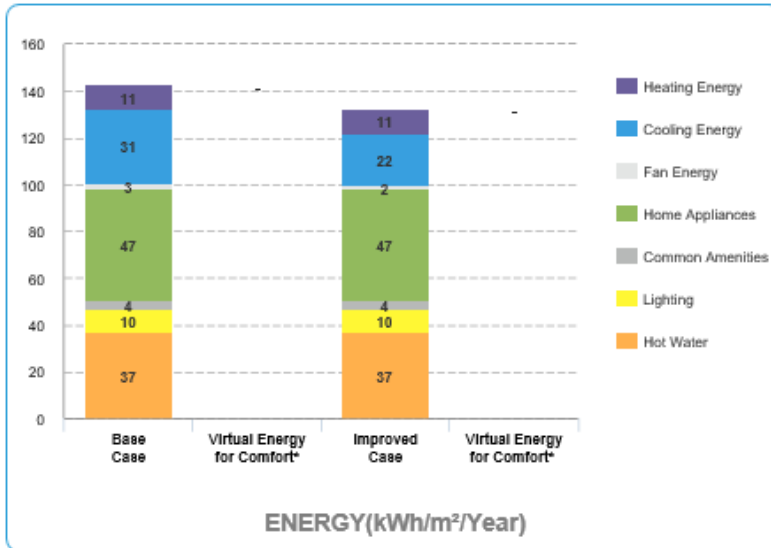
# **FUTURELINES**

**WITH COST AND IMPACT CALCULATIONS**

# EDGE FUTURELINE SCENARIOS

## 1. "Low Hanging Fruits"

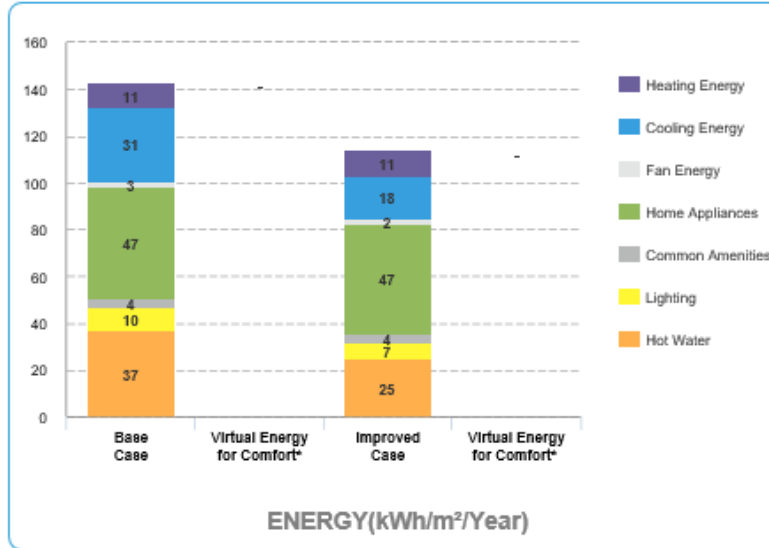
7.14% ENERGY SAVINGS



Up to **10%** savings

## 2. Moderate savings

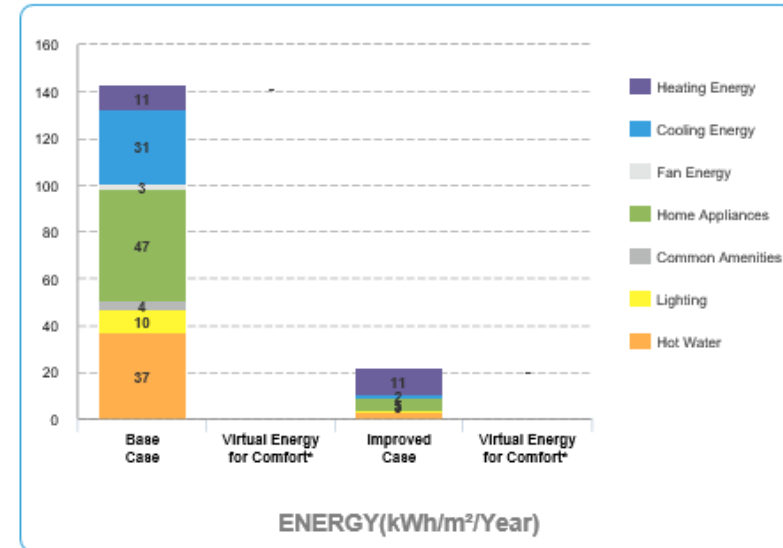
21.00% Meets EDGE Energy Standard



**10%-40%** savings

## 3. Deep Savings

85.32% Meets EDGE Energy Standard



**40-100%** savings



# What if you could know what works best, instantly?

CEILING FANS



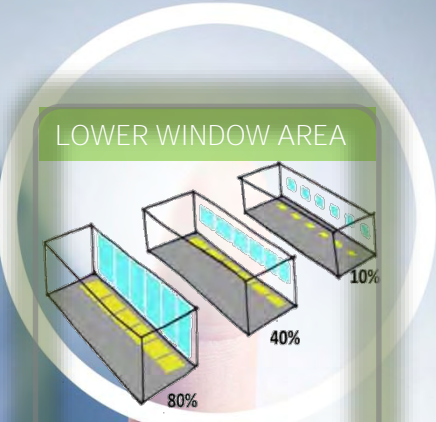
COST	SAVING
\$???	???

WALL INSULATION



COST	SAVING
\$???	???

LOWER WINDOW AREA



COST	SAVING
-\$200K	9%

EXTERNAL SHADING



COST	SAVING
\$???	???

NATURAL VENTILATION



COST	SAVING
\$???	???

CAVITY WALLS



COST	SAVING
\$???	???

NATURAL VENTILATION




COST	SAVING
\$???	???

EFFICIENT GLASS



COST	SAVING
\$???	???

DAYLIGHTING



COST	SAVING
\$???	???

WATER COOLED CHILLERS



COST	SAVING
\$???	???

ROOF TOP SOLAR PVs




COST	SAVING
\$???	???

SOLAR HOT WATER



COST	SAVING
\$???	???

EXPOSED SOFITS



COST	SAVING
\$???	???

SOLAR HOT WATER



COST	SAVING
\$???	???

# PASSIVE DESIGN FOR ENERGY EFFICIENCY

Orientation

Shading

Natural Ventilation

Insulation

Window to Wall Ratio

Materials and Color

Bruck Passive House Hotel, EDGE Certified, 2015

# EFFICIENT AND LOW CARBON SYSTEMS

## Building Systems

- Lighting
- Air Conditioning (Cooling)
- Heating
- CHP
- Lifts and Escalators
- Hot Water
- Metering
- Small Power – Appliances

## Low Carbon and Renewable Energy Technologies

- Combined Heat and Power
- Solar Thermal Panels
- Photovoltaic Panels
- Solar Cooling
- Biomass & Biofuel
- Ground Source Heat Pumps
- Air Source Heat Pumps

# WATER EFFICIENCY

Low-flow Plumbing Fixture

Aerators and Auto Shut-off Faucets

Rainwater Harvesting System

Efficient Water Closets

Grey Water Treatment and  
Recycling System

Black Water Treatment and  
Recycling System

Water-efficient Landscaping

Condensate Water Recovery

Abhikalpan Office, EDGE-certified office project in India (2016)



# DEFINING GREEN DESIGN

## LOW EE MATERIALS

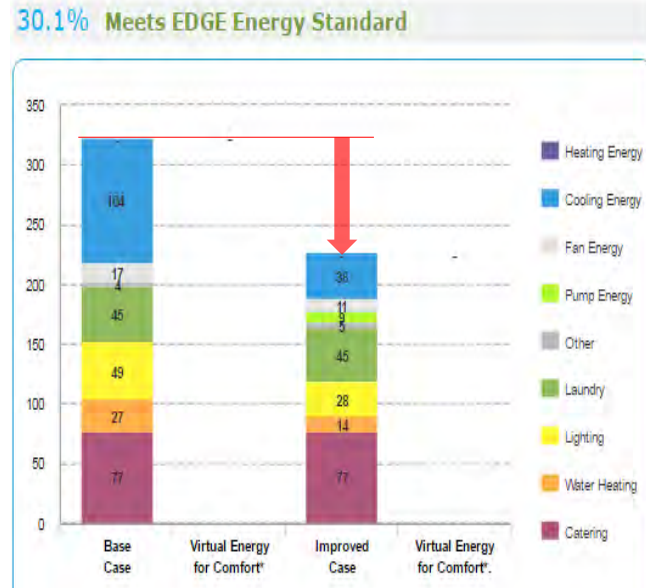
Reduce quantity

Substitute high-energy materials

Find alternatives with low embodied energy

**City Express Hotel-Santa Fe, Preliminary EDGE Certificate in Mexico (2012)**

# EDGE FUTURELINE SCENARIOS



RESULTS	
Final Energy Use	282,797 kWh/Month
Final Water Use	201 Lt./Guest/Night
Operational CO <sub>2</sub> Savings	178 tCO <sub>2</sub> /Year
Embodied Energy Savings	406 MJ/m <sup>2</sup>
Base Case Utility Cost	41,933 \$/Month
Utility Costs Reduction	13,786.11 \$/Month
Incremental Cost	180,671 \$
Payback in Years	1.0921 Yrs.

↓

Final Energy Use	282,797 kWh/Month
Final Water Use	201 Lt./Guest/Night

Futureline Scenario 1 Energy Consumption

↓

Utility Costs Reduction	13,786.11 \$/Month
Incremental Cost	180,671 \$
Payback in Years	1.0921 Yrs.

Futureline Scenario 1 Utility Reduction & Incremental Costs and Payback

# **STOCK PROJECTIONS**

## **AND INTERACTION WITH CCM TOOL**

# PROPOSED CCM-EDGE METHODOLOGY

## FOR BOTTOM-UP AND HYBRID APPROACHES

CCM	EDGE	EDGE	CCM				
Building Stock Data	Building Type Baseline	Futureline Scenarios	GHG Savings Potential				
Residential Buildings		Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
Low Income	145	120	90	23			
Middle Income	180	156	123	35			
High Income	193	175	132	55			
Commercial Buildings		Scenario 1	Scenario 2	Scenario 3			
Offices	230	210	128	56			
Hotels	342	234	178	98			
Hospitals	375	278	211	120			



# Apartment Building in Bangkok

Low Income

14 Floors- 45 Units @ 65 m<sup>2</sup> each

DX cooling units- 3.5 COP

High efficiency lamps

Solar hot water for 100% of hot water needs

Solar PV for 35% of electric needs

150 mm hollow concrete block wall

150 mm precast concrete floor slab



EDGE SIMULATION

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**IFC- WORLD BANK GROUP**