GREEN BUILDINGS RETURN ON INVESTMENT: EUROPEAN REGIONAL TAKEAWAYS

IFC International Finance Corporation
WORLD BANK GROUP

Creating Markets, Creating Opportunities

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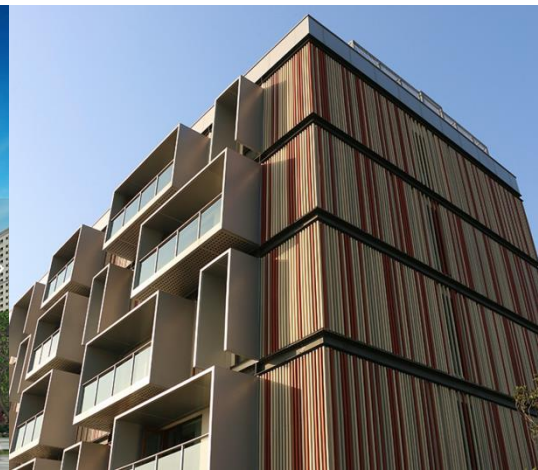

ARMENIA: GREEN BUILDINGS RETURN ON INVESTMENT

IFC International Finance Corporation
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Creating Markets, Creating Opportunities

ARMENIA – ROI NEEDED TO REACH EDGE STANDARD

	Incremental Cost	Utility Savings / month	Payback Period in Years
Homes	$780/unit	$18/unit	3.7
Hotels	$75,970	$10,306	0.6
Shopping Centers	$498,421	$11,152	4
Offices	$27,842	$1,639	1.42
Schools	$9,834	$858	0.96
Hospitals	$847,406	$11,387	6.2
Light Industry	$277,043	$4,420	5.22

HOMES – ARMENIA CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Unit	Average Unit Area	Bedrooms / Unit	Floors	Units
Low Income	80m^2	2	10	50

Energy Measures – 44% Savings through:

- Air conditioning system
- Reduced Window to Wall Ratio
- Solar Photovoltaics

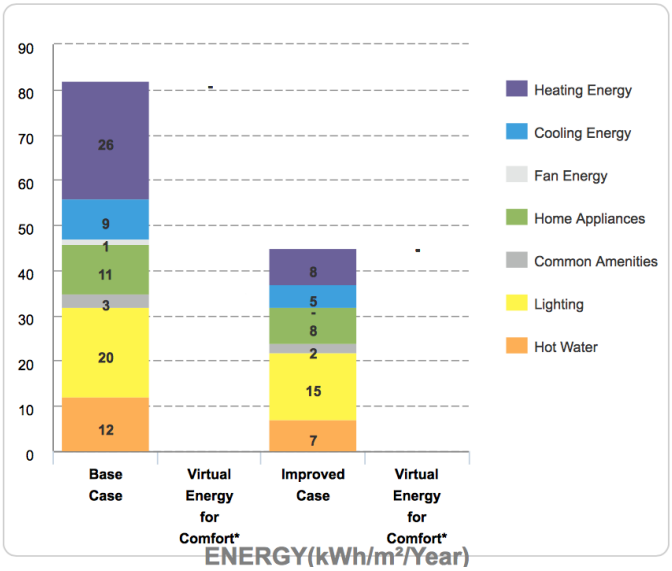
Water – 22% Savings through:

- Low-Flow Showerheads
- Low-Flow Faucets for Washbasins & Kitchen Sinks
- Single and Dual Flush for Water Closets

Materials – 25% Savings through:

- External Walls – Cement Fiber Boards on Timber Studs

43.94% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$780/unit

Utility Costs Savings

$18/ unit / month

Payback in Years

3.7

Operational CO_2 Savings

1.84 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 23% Savings through:

- Reduced Window to Wall Ratio
- Insulation of Roof and External Walls

Water – 41% Savings through:

- Low-Flow faucets in kitchens and bathrooms
- Dual Flush Water Closets

Materials – 69% Savings through:

- Concrete filler slab for floor slabs and roof construction
- Medium weight hollow concrete blocks for internal and external walls
- Ceramic tile

GOLF LOS INCAS (PERU)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

HOTELS – ARMENIA CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Hotel	Floors Above Ground	Total Guest Units	Internal Area
4 Star Hotel	8	200	15,599 m^2

Energy Measures – 29% Savings through:

- Air conditioning system
- Energy saving Lightbulbs – Internal Spaces

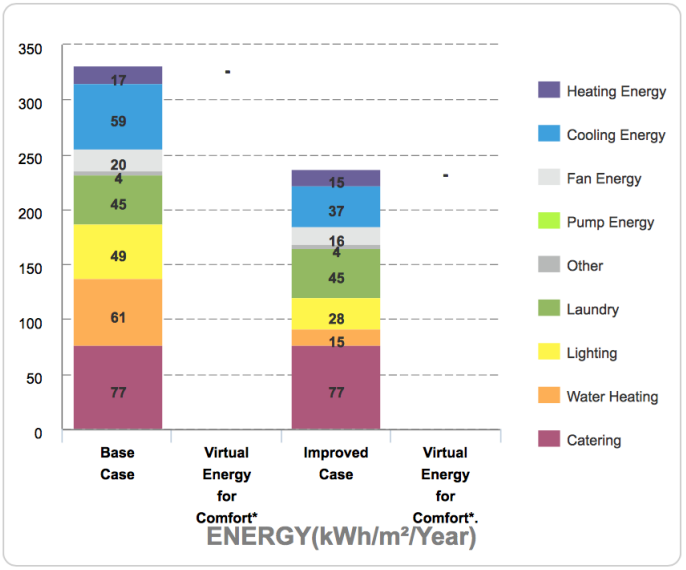
Water – 27% Savings through:

- Low-Flow Showerheads
- Low-Flow Faucets for Guest Rooms
- Single and Dual Flush for Water Closets
- Dual Flush for Water Closets in Guest Rooms and Bathrooms

Materials – 43% Savings through:

- Floor Slabs – In-Situ Trough Concrete Slab

28.74% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$75,978

Utility Costs Savings

$10,306 / month

Payback in Years

0.6

Operational CO_2 Savings

612 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 21% Savings through:

- Reduced Window to Wall Ratio and External Shading Devices
- Insulation of Roof and External Walls, Natural Ventilation in Corridors, Air Conditioning with Air Cooled Screw Chiller
- Energy-Saving Light Bulbs and Solar Photovoltaics

Water – 21% Savings through:

- Low-Flow Plumbing Fixtures for Washbasins and Showerheads,
- Dual Flush Water Closets
- Water-Efficient Kitchen Faucets and Landscaping

Materials – 37% Savings through:

- Micro Concrete Tiles on Steel Rafters for Roof, Stone Profile Cladding and Autoclaved Aerated Concrete Block Walls, Wood Block Finish Flooring

SPRINGHILL CONDOTEL AT JIMBARAN JIJAU (BALI)

In-country certified project to replace related example once an EDGE project is certified.

Retail

SHOPPING CENTERS – ARMENIA CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Site Area	Car Parking	Floors	Amenities
15,000 m^2	Indoor Car Parking	1	Supermarket, Food Court

Energy Measures – 36% Savings through:

- Insulation of Roof and External Walls
- Air Conditioning with Air Cooled Screw Chiller
- Energy Saving Light Bulbs

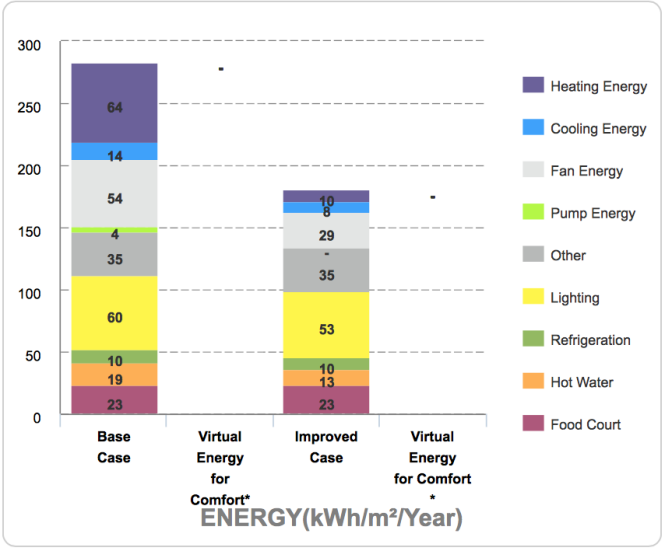
Water – 37% Savings through:

- Dual Flush for Water Closets
- Water-Efficient Urinals and Auto Shut-off Faucets

Materials – 24% Savings through:

- Floor Slabs: In-Situ Concrete with >25% GGBS

36.23% **Meets EDGE energy standard**



PROJECT METRICS

Incremental Cost

$498,421

Utility Costs Savings

$11,152/ month

Payback in Years

4

Operational CO_2 Savings

631 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 29% Savings through:

- Reduced Window to Wall ratio, Insulated Roofs and External Walls
- Occupancy Sensors in Bathrooms, Energy saving lighting

Water – 24% Savings through:

- Single Flush Water Closets
- Water-Efficient Urinals
- Aerators and Auto Shut-Off Faucet in Bathrooms

Materials – 23% Savings through:

- Steel Sheets on Steel Rafters Roof Construction
- Cement Fibre Boards on Metal Studs for all External Walls and In-Situ Reinforced External Walls

RETAIL AT SANTA VERDE (COSTA RICA)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

OFFICES – ARMENIA CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Gross Internal Area	Floors Above Grade	Floors Below Grade	Floor-to-Floor Height
5000m^2	3	2	3.5m

Energy Measures – 35% Savings through:

- Air Conditioning with Air Cooled Screw Chiller
- Variable refrigerant flow system
- Energy Saving Light Bulbs

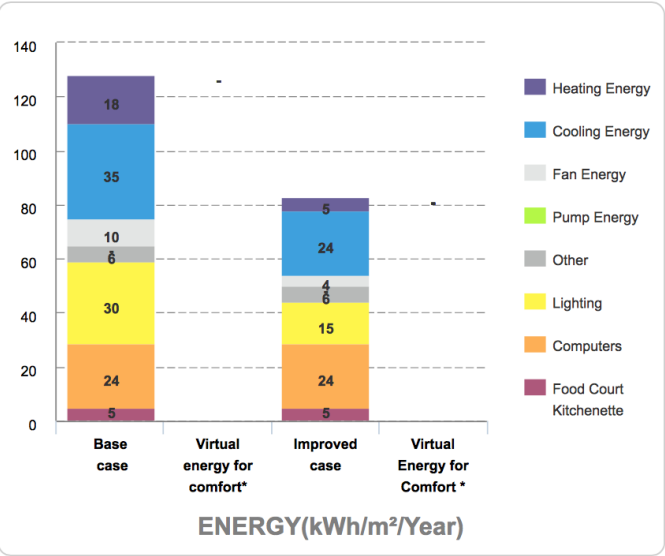
Water – 35% Savings through:

- Water-efficient bathroom urinals and faucets for kitchen sinks
- Dual flush for water closets in bathrooms

Materials – 35% Savings through:

- Floor Slabs: In-Situ Concrete with >30% PFA

35.21% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$27,842

Utility Costs Savings

$1,639/ month

Payback in Years

1.42

Operational CO_2 Savings

93 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 27% Savings through:

- High Performance Glass
- Reduced Window To Wall Ratio
- Energy-Saving Lighting
- Efficient Cooling Systems

Water – 65% Savings through:

- Low-Flow Faucets For Washbasins
- Dual Flush For Water Closets
- Water-efficient Urinals

Materials – 37% Savings through:

- Gypsum Walls And Stone Tile Floors For The Retail Space
- Steel Profile Cladding and Finished Concrete Floors

CITRA TOWERS KEMAYORAN (JAKARTA)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

Education

SCHOOLS – ARMENIA CASE STUDY

BUILDING DETAILS

Occupancy Density	Operational Hours	Working Days	Holidays / Year
3	6	5	60

Energy Measures – 50% Savings through:

- Reduced Window to Wall ratios
- Insulation of Roof and External Walls
- Variable Refrigerant Volume Cooling System
- Air Conditioning with Air and Water Cooled Chiller
- Ground Source Heat Pump
- Photoelectric Sensors to harvest Daylight

Water – 31% Savings through:

- Low-Flow Showerheads and Faucets
- Dual Flush for Water Closets
- Water-Efficient Urinals and faucets for Kitchen Sinks

Materials – 22% Savings through:

- Precast RC Planks and Joist System

PROJECTED PROJECT METRICS

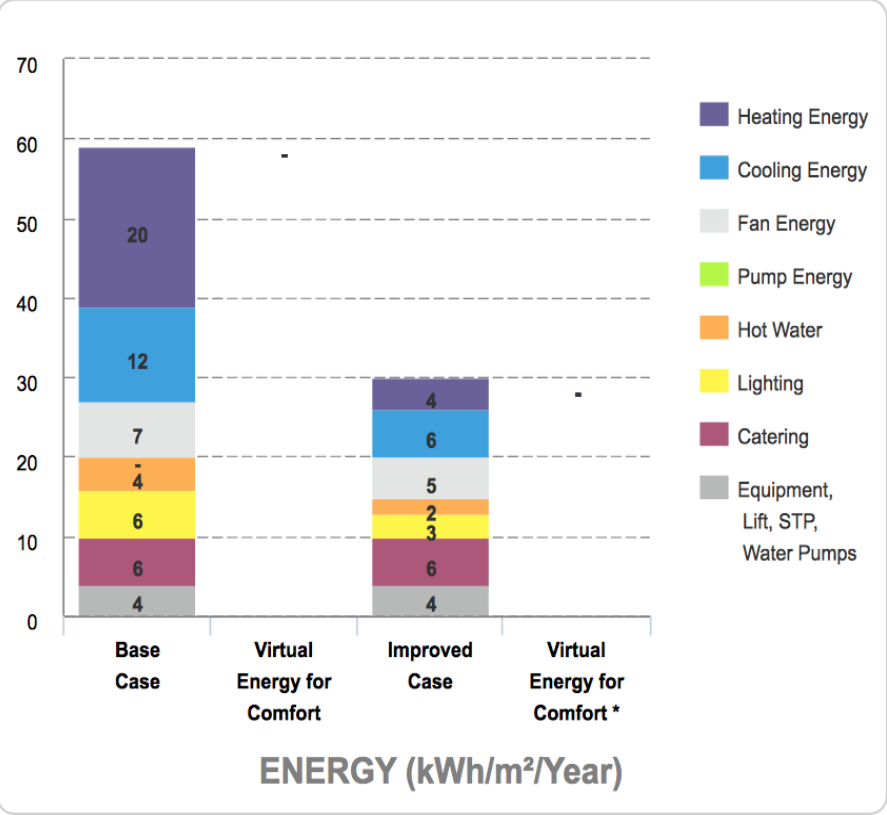
Incremental Cost
$9,834

Utility Costs Savings
$858 / month

Payback in Years
0.96

Operational CO2 Savings
63 tCO_2/Year

50.1% Meets EDGE Energy Standard



Education is a new sector in the EDGE application.
Relevant certified project to be included as soon as case study is published.

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HOSPITALS – ARMENIA CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Unit	Gross Internal Area	Occupancy Rate	Floors	Beds
Multi Specialty	9,700m^2	70%	7	100

Energy Measures – 35% Savings through:

- Reduced Window to Wall ratios
- Insulation of Roof and External Walls
- Variable Refrigerant Volume Cooling System

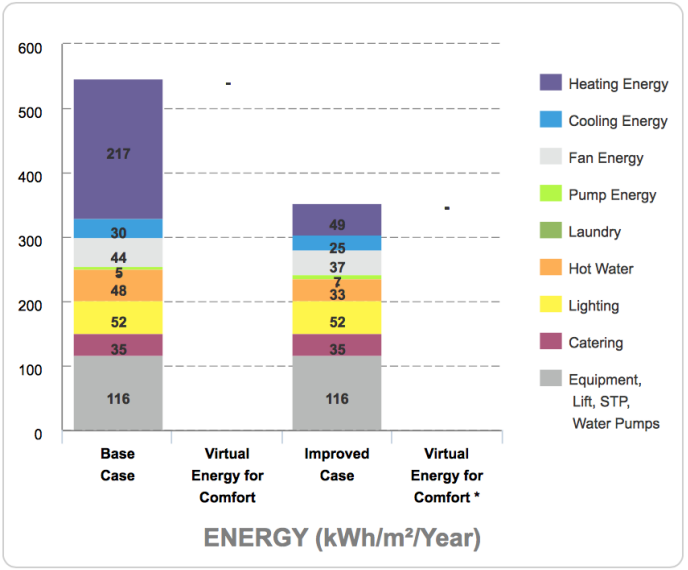
Water – 37% Savings through:

- Low-Flow Showerheads and Faucets
- Dual Flush for Water Closets
- Water-Efficient Urinals and faucets for Kitchen Sinks

Materials – 33% Savings through:

- Timber Floor Construction Floor Slabs

35.22% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$847,406

Utility Costs Savings

$11,387/ month

Payback in Years

6.2

Operational CO_2 Savings

801 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 21% Savings through:

- Reduced Window to Wall Ratio
- Higher Thermal Performance Glass
- Wall Insulation
- Air Economizers
- Energy-Efficient Air Conditioning with Air Cooled Chiller
- Sensible Heat Recovery from Exhaust Air

Water – 25% Savings through:

- Low-Flow Faucets and Dual Flush Water Closet in bathrooms
- Water-Efficient Faucets for Kitchen Sinks

Materials – 26% Savings through:

- Clay Roofing Tiles on Steel Rafters

KESERWAN MEDICAL CENTER (LEBANON)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

Retail

LIGHT INDUSTRY– ARMENIA CASE STUDY

BUILDING DETAILS

Floors Above Ground	Shifts in a day (8 hour, 6 workday)	Gross Internal Area
1	1	15,000 m^2

Energy Measures – 38% Savings through:

- Reduced Window to Wall ratios
- Insulation of Roof and External Walls
- Variable Refrigerant Volume Cooling System
- Solar Photovoltaics

Water – 43% Savings through:

- Dual Flush, Water-Efficient Urinals
- Aerators and Auto Shut-off, Efficient Faucets
- Water-Efficient Kitchen Faucets

Materials – 24% Savings through:

- Precast RC Planks and Joist System

PROJECTED PROJECT METRICS

Incremental Cost

$277,043

Utility Costs Savings
$4,420 / month

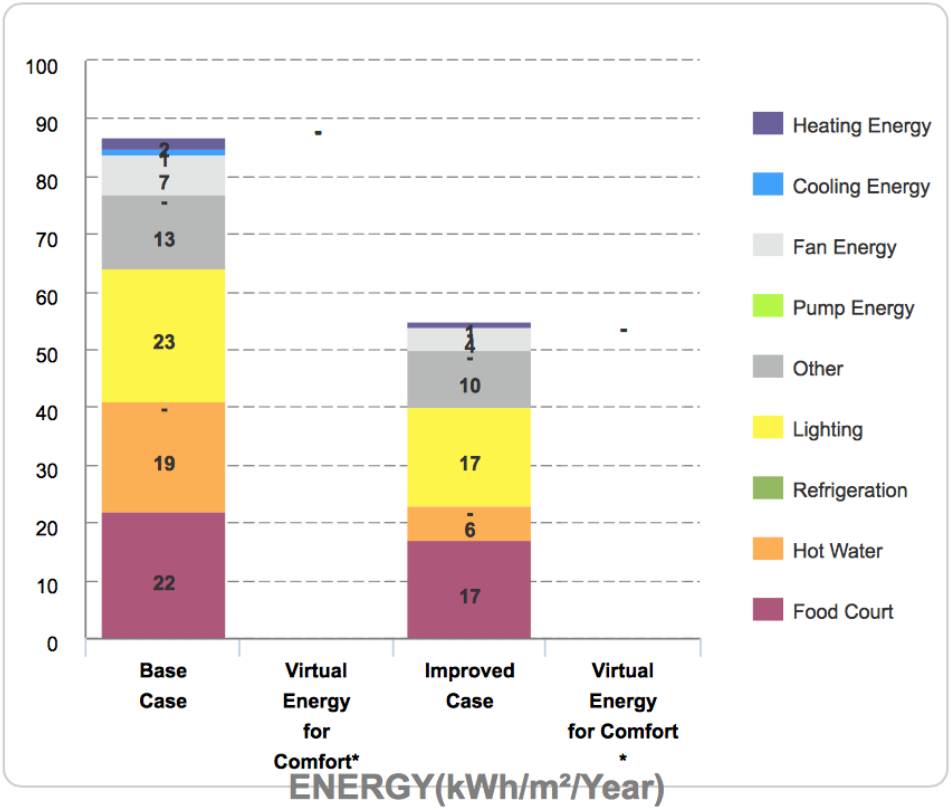
Payback in Years

5.22

Operational CO2 Savings

207 tCO_2/Year

37.82% **Meets EDGE energy standard**



Light Industry is a new sector in the EDGE application.
Relevant certified project to be included as soon as case study is published.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

POLAND: GREEN BUILDINGS RETURN ON INVESTMENT

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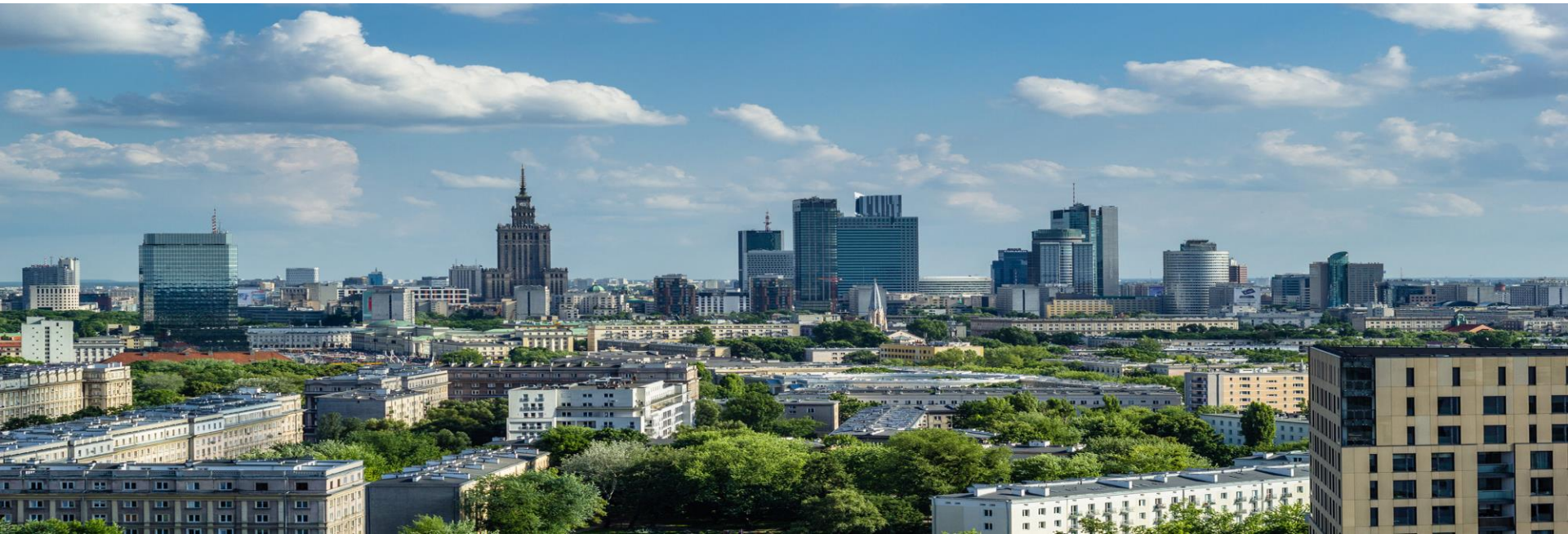
Creating Markets, Creating Opportunities

POLAND – ROI NEEDED TO REACH EDGE STANDARD

	Incremental Cost	Utility Savings / month	Payback Period in Years
Homes	$1,095/unit	$42/unit	2.1
Hotels	$82,344	$15,005	0.5
Shopping Centers	$9,530	$27,987	0.03
Offices	$25,735	$3,800	0.6
Schools	$9,482	$1,592	0.5
Hospitals	$2,334	$30,289	0.01
Light Industry	$86,859	$9,804	0.8



HOMES – POLAND CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Unit	Average Unit Area	Bedrooms / Unit	Floors	Units
Low Income	80m^2	2	10	50

Energy Measures – 46% Savings through:

- Air conditioning system
- Reduced Window to Wall Ratio
- Solar Photovoltaics

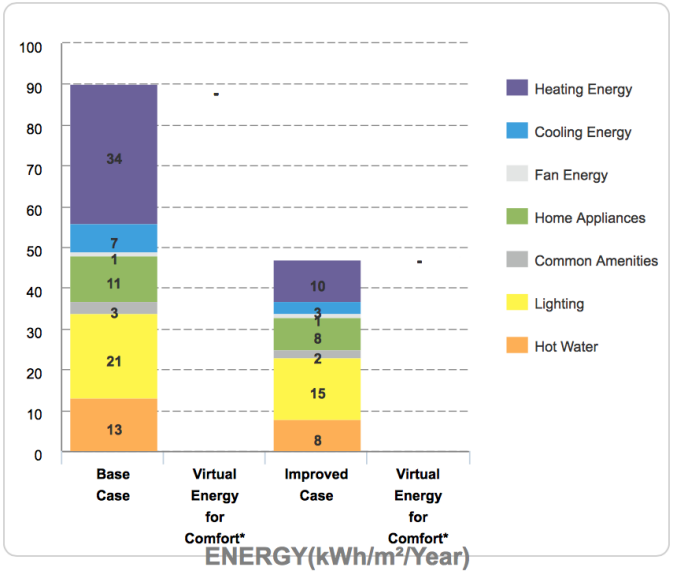
Water – 22% Savings through:

- Low-Flow Showerheads
- Low-Flow Faucets for Washbasins & Kitchen Sinks
- Single and Dual Flush for Water Closets

Materials – 21% Savings through:

- External Walls – Cement Fiber Boards on Timber Studs

46.35% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$1,095/unit

Utility Costs Savings

$42/ unit / month

Payback in Years

2.1

Operational CO_2 Savings

2.62 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 30% Savings through:

- Reduced Window to Wall Ratio
- Roof insulation
- Solar hot water collectors and smart heaters

Water – 28% Savings through:

- Low-Flow Showerheads and Faucets
- Dual-Flush water closets

Materials – 36% Savings through:

- Hollow core precast floor slabs
- Steel sheets on timber rafters
- Facing brick and solid concrete blocks for external walls
- Solid dense concrete blocks for internal walls

CANDLEWOOD CRESCENT (SOUTH AFRICA)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

HOTELS – POLAND CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Hotel	Floors Above Ground	Total Guest Units	Internal Area
4 Star Hotel	8	200	15,599 m^2

Energy Measures – 20% Savings through:

- Occupancy Sensors in Bathrooms
- Energy saving Lightbulbs – Internal Spaces

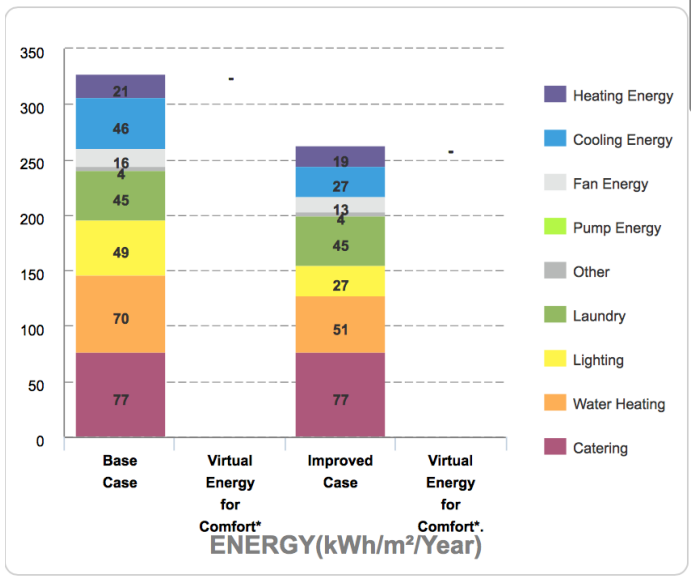
Water – 27% Savings through:

- Low-Flow Showerheads
- Low-Flow Faucets for Guest Rooms
- Single and Dual Flush for Water Closets
- Dual Flush for Water Closets in Guest Rooms and Bathrooms

Materials – 50% Savings through:

- Timber Floor Construction

20.05% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$82,344

Utility Costs Savings

$15,005 / month

Payback in Years

0.5

Operational CO_2 Savings

776 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 21% Savings through:

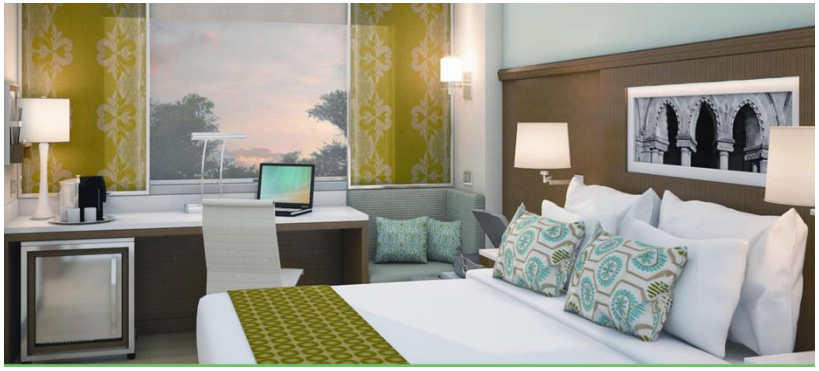
- Reduced Window to Wall Ratio Low-E Coated Glass, Variable Speed Drives on the Fans of Cooling Tower
- Air Conditioning with Water Cooled Screw Chiller
- Energy Saving Lighting for Back of House, Heat Pumps

Water – 23% Savings through:

- Dual Flush Water Closets
- Blackwater Treatment and Recovery System

Materials – 30% Savings through:

- 150mm In-Situ Reinforced Concrete Slab for Floors and Roof
- 200mm Solid Dense Concrete Blocks for Internal and External Walls
- Laminated Wooden Flooring



SAMHI- FAIRFIELD BY MARRIOTT (INDIA)

In-country certified project to replace related example once an EDGE project is certified.

Retail

SHOPPING CENTERS – POLAND CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Site Area	Car Parking	Floors	Amenities
15,000 m^2	Indoor Car Parking	1	Supermarket, Food Court

Energy Measures – 38% Savings through:

- Insulation of Roof and External Walls
- Air Conditioning with Air Cooled Screw Chiller
- Ground Source Heat Pump

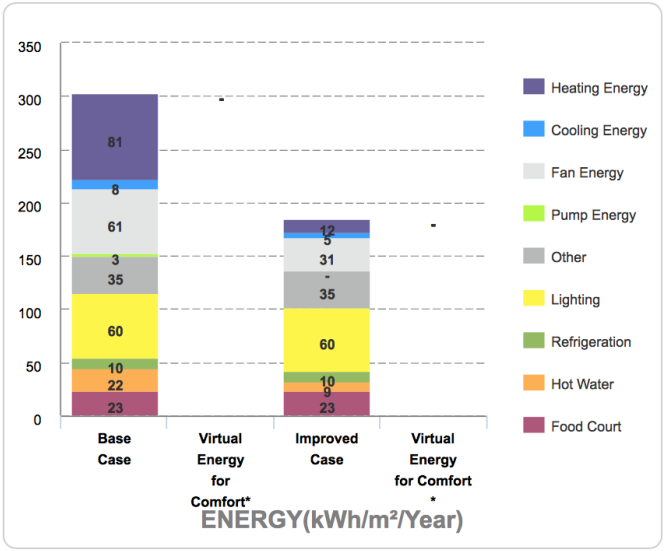
Water – 44% Savings through:

- Dual Flush for Water Closets
- Water-Efficient Urinals and Auto Shut-off Faucets

Materials – 24% Savings through:

- Floor Slabs: In-Situ Concrete with >25% GGBS

38.84% **Meets EDGE energy standard**



PROJECT METRICS

Incremental Cost

$9,530

Utility Costs Savings

$27,987/ month

Payback in Years

0.03

Operational CO_2 Savings

1,333 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 58% Savings through:

- Reduced Window to Wall Ratio
- Insulation of roofs and walls
- Energy efficient VRV cooling system
- Energy –saving lighting and occupancy sensors in bathrooms

Water – 41% Savings through:

- Dual-flush waster closets in all bathrooms
- Water-efficient urinals and kitchen faucets
- Aerators and auto-shut-off faucets in all bathrooms

Materials – 44% Savings through:

- Hollow core precast slab floors
- Steel-clad sandwich panel for roofs
- Finished concrete flooring

VILNIUS FABIJONISKES BY LIDL (LITHUANIA)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

OFFICES – POLAND CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Gross Internal Area	Floors Above Grade	Floors Below Grade	Floor-to-Floor Height
5000m^2	3	2	3.5m

Energy Measures – 35% Savings through:

- Air Conditioning with Air Cooled Screw Chiller
- Variable refrigerant flow system
- Energy Saving Light Bulbs

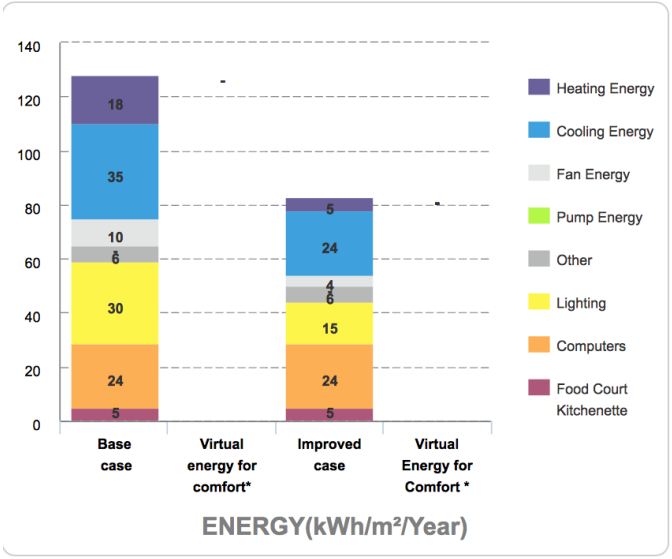
Water – 35% Savings through:

- Water-efficient bathroom urinals and faucets for kitchen sinks
- Dual flush for water closets in bathrooms

Materials – 35% Savings through:

- Floor Slabs: In-Situ Concrete with >30% PFA

35.21% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$25,735

Utility Costs Savings

$3,800/ month

Payback in Years

0.56

Operational CO_2 Savings

185 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 45% Savings through:

- Reduced Window to Wall Ratio
- Insulation of Roof and External Walls
- Higher Thermal Performance Glass
- Energy-Efficient Air Conditioning with Water-Cooled Chiller
- Sensible Heat Recovery from Exhaust Air

Water – 42% Savings through:

- Low-Flow Plumbing Fixtures and Dual-Flush Water Closets
- Grey Water Treatment and Recycling System

Materials – 21% Savings through:

- In-situ Concrete with Pulverized Fly Ash for Floor Slabs and Roof Construction

JOHNSON CONTROLS HQ (SHANGHAI)

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SCHOOLS – POLAND CASE STUDY

BUILDING DETAILS

Occupancy Density	Operational Hours	Working Days	Holidays / Year
3	6	5	60

Energy Measures – 48% Savings through:
- Reduced Window to Wall ratios
- Insulation of Roof and External Walls
- Variable Refrigerant Volume Cooling System
- Air Conditioning with Air and Water Cooled Chiller
- Ground Source Heat Pump

Water – 31% Savings through:
- Low-Flow Showerheads and Faucets
- Dual Flush for Water Closets
- Water-Efficient Urinals and faucets for Kitchen Sinks

Materials – 22% Savings through:
- Precast RC Planks and Joist System

PROJECTED PROJECT METRICS

Incremental Cost

$9,482

Utility Costs Savings
$1,592 / month

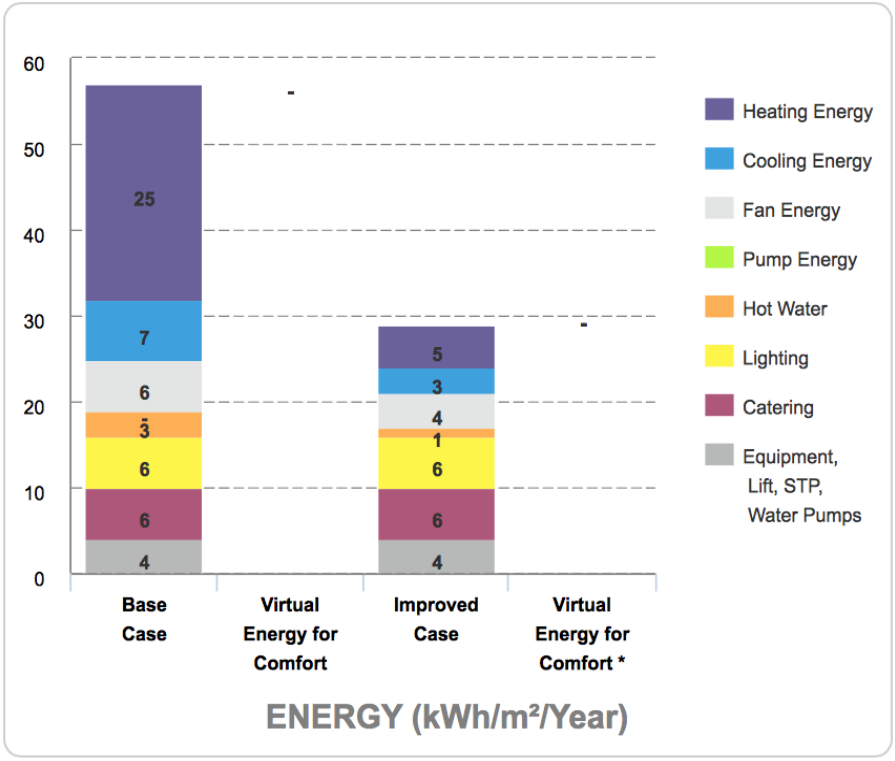
Payback in Years

0.5

Operational CO2 Savings

108 tCO_2/Year

47.8% **Meets EDGE Energy Standard**



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Health

HOSPITALS – POLAND CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Unit	Gross Internal Area	Occupancy Rate	Floors	Beds
Multi Specialty	9,700m²	70%	7	100

Energy Measures – 42% Savings through:

- Reduced Window to Wall ratios
- Insulation of Roof and External Walls
- Variable Refrigerant Volume Cooling System
- Solar Hot Water Collectors

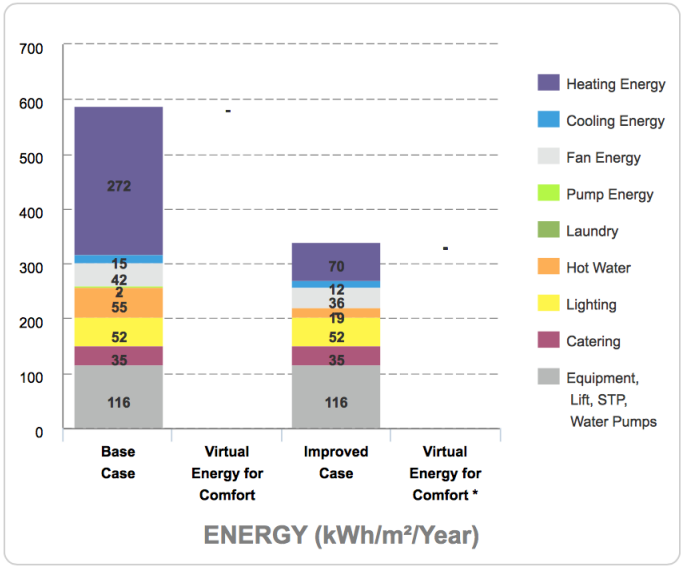
Water – 36% Savings through:

- Low-Flow Showerheads and Faucets
- Dual Flush for Water Closets
- Water-Efficient Urinals and faucets for Kitchen Sinks

Materials – 21% Savings through:

- Timber Floor Construction Floor Slabs

42.35% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$2,334

Utility Costs Savings

$30,289/ month

Payback in Years

0.01

Operational CO_2 Savings

1,912 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 32% Savings through:

- Reduced Window To Wall Ratio
- Reflective Paint and Insulation For External Walls
- Natural Ventilation For Corridors
- Energy-Saving Lighting Systems
- Occupancy Sensors In Bathrooms
- Solar Photovoltaics

Water – 35% Savings through:

- Low-flow Faucets In Kitchens And Bathrooms
- Single-flush And Flush Valve For Water Closets
- Water-efficient Urinals, Faucets And Landscaping
- Rainwater Harvesting System

Materials – 43% Savings through:

- Steel Sheets On Steel Rafters For Roof Construction
- Medium Weight Hollow Concrete Blocks For Internal And External Walls
- Finished Concrete Flooring

SEDE DE EBAIS (COSTA RICA)

In-country certified project to replace related example once an EDGE project is certified.

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LIGHT INDUSTRY– POLAND CASE STUDY

BUILDING DETAILS

Floors Above Ground	Shifts in a day (8 hour, 6 workday)	Gross Internal Area
1	1	15,000 m^2

Energy Measures – 20% Savings through:

- Reduced Window to Wall ratios
- Insulation of Roof and External Walls
- Variable Refrigerant Volume Cooling System
- Sensible Heat Recovery from Exhaust Air

Water – 43% Savings through:

- Dual Flush, Water-Efficient Urinals
- Aerators and Auto Shut-off, Efficient Faucets
- Water-Efficient Kitchen Faucets

Materials – 24% Savings through:

- Precast RC Planks and Joist System

PROJECTED PROJECT METRICS

Incremental Cost

$86,859

Utility Costs Savings
$9,084 / month

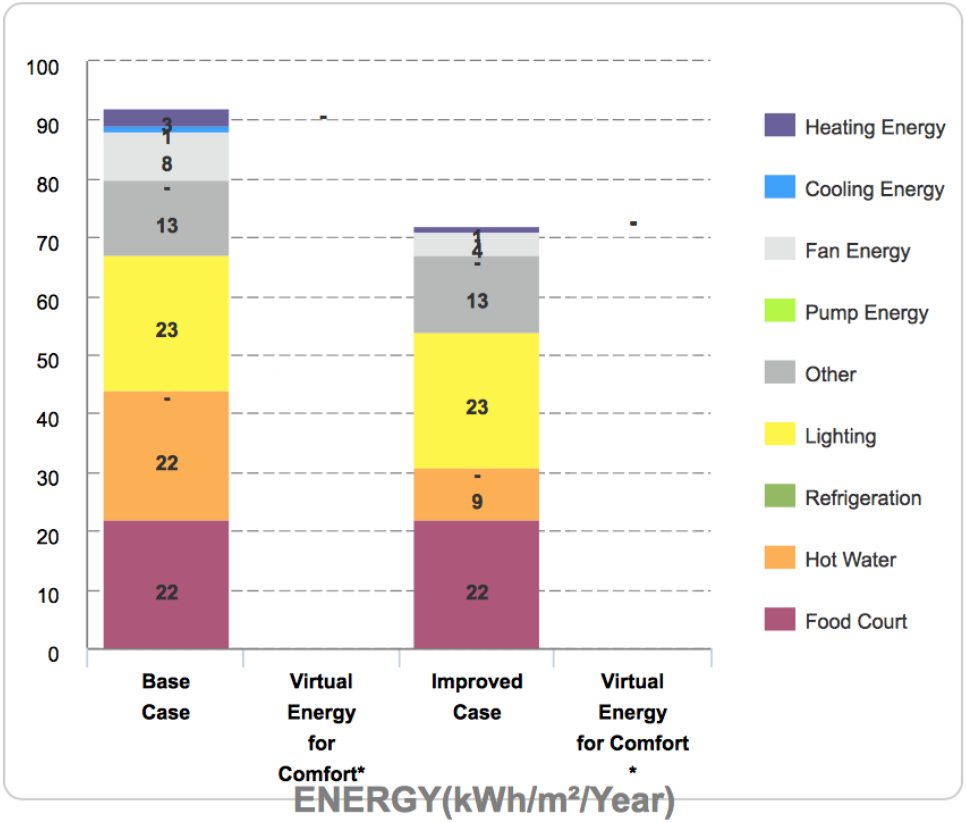
Payback in Years

0.8

Operational CO2 Savings

213 tCO_2/Year

20.34% **Meets EDGE energy standard**



Light Industry is a new sector in the EDGE application.
Relevant certified project to be included as soon as case study is published.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

RUSSIA: GREEN BUILDINGS RETURN ON INVESTMENT

IFC International Finance Corporation
WORLD BANK GROUP

Creating Markets, Creating Opportunities

RUSSIA – ROI NEEDED TO REACH EDGE STANDARD

	Incremental Cost	Utility Savings / month	Payback Period in Years
Homes	$1.171/unit	$13/unit	7
Hotels	$148,167	$15,488	0.8
Shopping Centers	$61,490	$8,841	0.6
Offices	$25,101	$2,489	0.8
Schools	$9,522	$2,489	0.3
Hospitals	$56,762	$33,468	0.1
Light Industry	$136,651	$3,973	2.9

HOMES – RUSSIA CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Unit	Average Unit Area	Bedrooms / Unit	Floors	Units
Low Income	80m^2	2	10	50

Energy Measures – 21% Savings through:

- Reduced Window to wall ratios
- Natural ventilation
- Insulation of external walls
- Air conditioning system

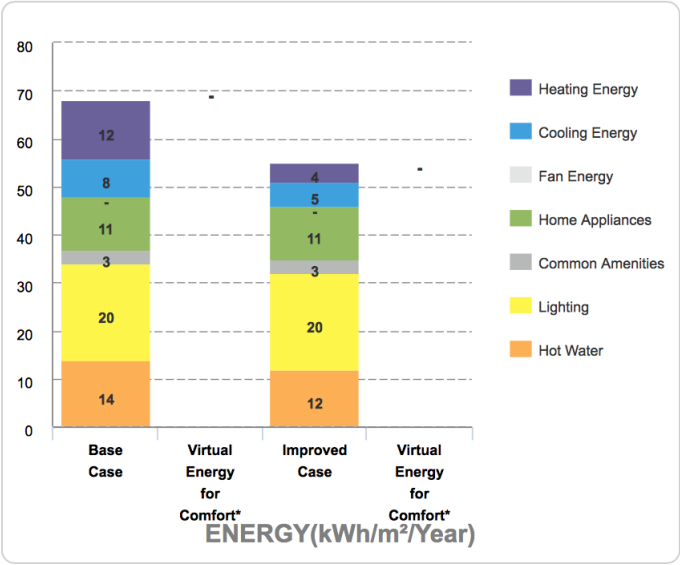
Water – 22% Savings through:

- Low-Flow Showerheads
- Low-Flow Faucets for Washbasins & Kitchen Sinks
- Single and Dual Flush for Water Closets

Materials – 21% Savings through:

- External Walls – Cement Fiber Boards on Timber Studs

20.84% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$1,171/unit

Utility Costs Savings

$13/ unit / month

Payback in Years

7

Operational CO_2 Savings

0.5 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 22% Savings through:

- Reduced Window to Wall Ratio
- Energy-Saving Lighting in outdoor areas
- Reflective paint and tiles for the roof
- External shading devices

Water – 25% Savings through:

- Low-Flow Showerheads
- Water-efficient kitchen and bathroom faucets
- Dual-flush water closets
- Recycled grey water for flushing

Materials – 70% Savings through:

- Autoclaved aerated concrete blocks for internal and external walls
- Ceramic tile flooring and UPVC window frames

TCP ALTURA (INDIA)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

HOTELS – RUSSIA CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Hotel	Floors Above Ground	Total Guest Units	Internal Area
4 Star Hotel	8	200	15,599 m^2

Energy Measures – 27% Savings through:

- Occupancy Sensors in Bathrooms
- Energy saving Lightbulbs – Internal Spaces
- Insulation of External Walls
- Recovery of Waste Heat from the Generator for Space Heating

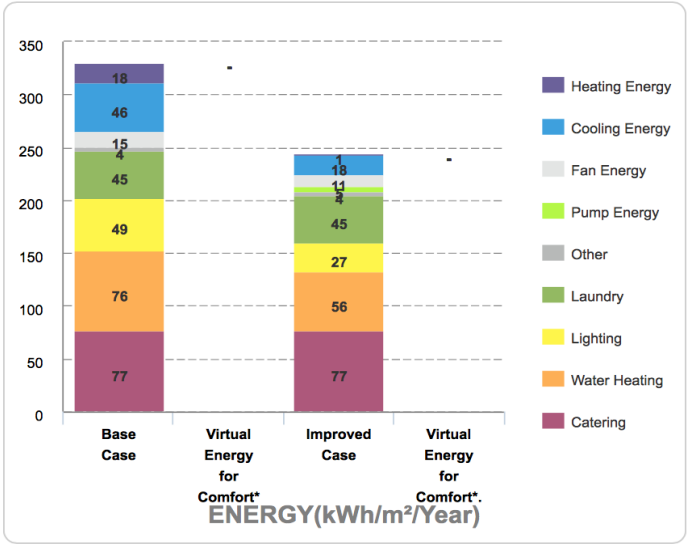
Water – 24% Savings through:

- Low-Flow Showerheads
- Low-Flow Faucets for Guest Rooms
- Single and Dual Flush for Water Closets
- Dual Flush for Water Closets in Guest Rooms

Materials – 43% Savings through:

- Timber Floor Construction

26.49% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$148,167

Utility Costs Savings

$15,488 / month

Payback in Years

0.8

Operational CO_2 Savings

579 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 47% Savings through:

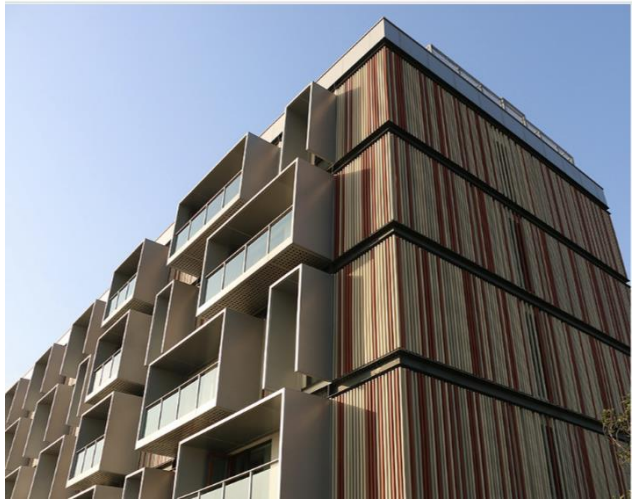
- External Shading Devices, Insulation of Roof and External Walls
- Higher Thermal Performance Glass, Energy-Efficient Air Conditioning, Energy-Saving Lighting System

Water – 42% Savings through:

- Low-Flow Showerheads and Faucets, Dual Flush Toilets
- Rainwater Harvesting System
- Gray Water Treatment & Recycling System

Materials – 34% Savings through:

- Solid Dense Concrete Blocks for Internal and External Walls
- Laminated Wooded Floors
- Timber Window Frames



BRUCK PASSIVE HOUSE HOTEL (NANJING)

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

Retail

SHOPPING CENTERS – RUSSIA CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Site Area	Car Parking	Floors	Amenities
15,000 m^2	Indoor Car Parking	1	Supermarket, Food Court

Energy Measures – 21% Savings through:

- Insulation of Roof and External Walls
- Air Conditioning with Air Cooled Screw Chiller
- Ground Source Heat Pump

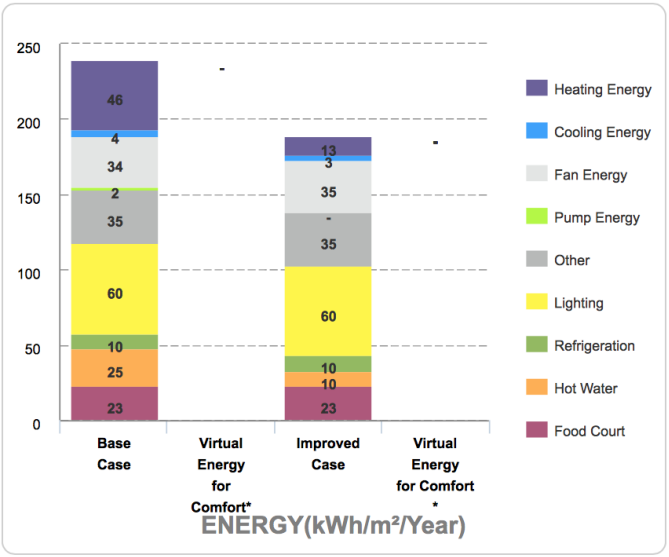
Water – 43% Savings through:

- Dual Flush for Water Closets
- Water-Efficient Urinals and Auto Shut-off Faucets

Materials – 24% Savings through:

- Floor Slabs: In-Situ Concrete with >25% GGBS

20.62% **Meets EDGE energy standard**



PROJECT METRICS

Incremental Cost

$61,490

Utility Costs Savings

$8,841/ month

Payback in Years

0.58

Operational CO_2 Savings

311 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 58% Savings through:

- Reduced Window to Wall Ratio
- Insulation of roofs and walls
- Energy efficient VRV cooling system
- Energy –saving lighting and occupancy sensors in bathrooms

Water – 41% Savings through:

- Dual-flush waster closets in all bathrooms
- Water-efficient urinals and kitchen faucets
- Aerators and auto-shut-off faucets in all bathrooms

Materials – 44% Savings through:

- Hollow core precast slab floors
- Steel-clad sandwich panel for roofs
- Finished concrete flooring

VILNIUS FABIJONISKES BY LIDL (LITHUANIA)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

OFFICES – RUSSIA CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Gross Internal Area	Floors Above Grade	Floors Below Grade	Floor-to-Floor Height
5000m^2	3	2	3.5m

Energy Measures – 36% Savings through:

- Air Conditioning with Air Cooled Screw Chiller
- Variable refrigerant flow system
- Energy Saving Light Bulbs

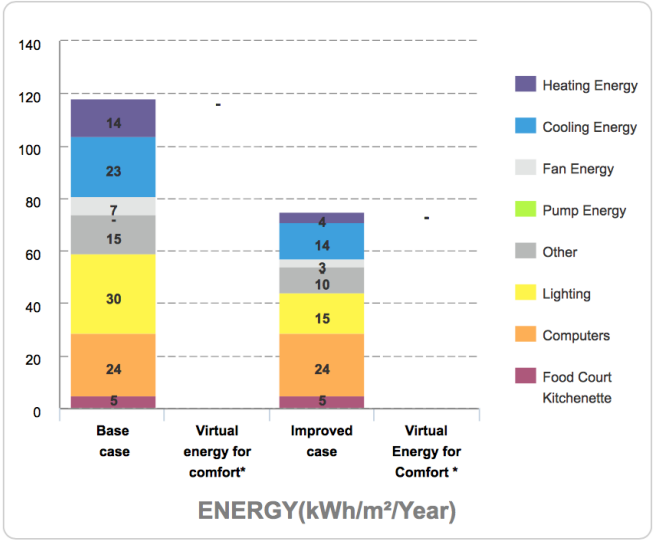
Water – 35% Savings through:

- Water-efficient bathroom urinals and faucets for kitchen sinks
- Dual flush for water closets in bathrooms

Materials – 23% Savings through:

- Floor Slabs: In-Situ Concrete with >30% PFA

36.49% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$25,101

Utility Costs Savings

$2,489/ month

Payback in Years

0.84

Operational CO_2 Savings

91 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 25% Savings through:

- Low E-Coated Glass
- Variable Refrigerant Volume Cooling System
- Sensible Heat Recovery from Exhaust Air
- Energy-Saving Light Bulbs for Internal and External Spaces
- Occupancy sensors for bathrooms and offices

Water – 57% Savings through:

- Low-Flow faucets in bathrooms
- Water-Efficient Urinals and kitchen faucets
- Dual-flush water closets

Materials – 32% Savings through:

- In-situ reinforced concrete for floors and roofs
- Autoclaved aerated concrete blocks in internal and external walls

M-BUILDING COMMERCIAL OFFICE TOWER (VIETNAM)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

Education

SCHOOLS – RUSSIA CASE STUDY

BUILDING DETAILS

Occupancy Density	Operational Hours	Working Days	Holidays / Year
3	6	5	60

Energy Measures – 57% Savings through:
- Reduced Window to Wall ratios
- Insulation of Roof and External Walls
- Variable Refrigerant Volume Cooling System
- Air Conditioning with Air and Water Cooled Chiller
- Ground Source Heat Pump

Water – 31% Savings through:
- Low-Flow Showerheads and Faucets
- Dual Flush for Water Closets
- Water-Efficient Urinals and faucets for Kitchen Sinks

Materials – 22% Savings through:
- Precast RC Planks and Joist System

PROJECTED PROJECT METRICS

Incremental Cost

$9,522

Utility Costs Savings
$2,489 / month

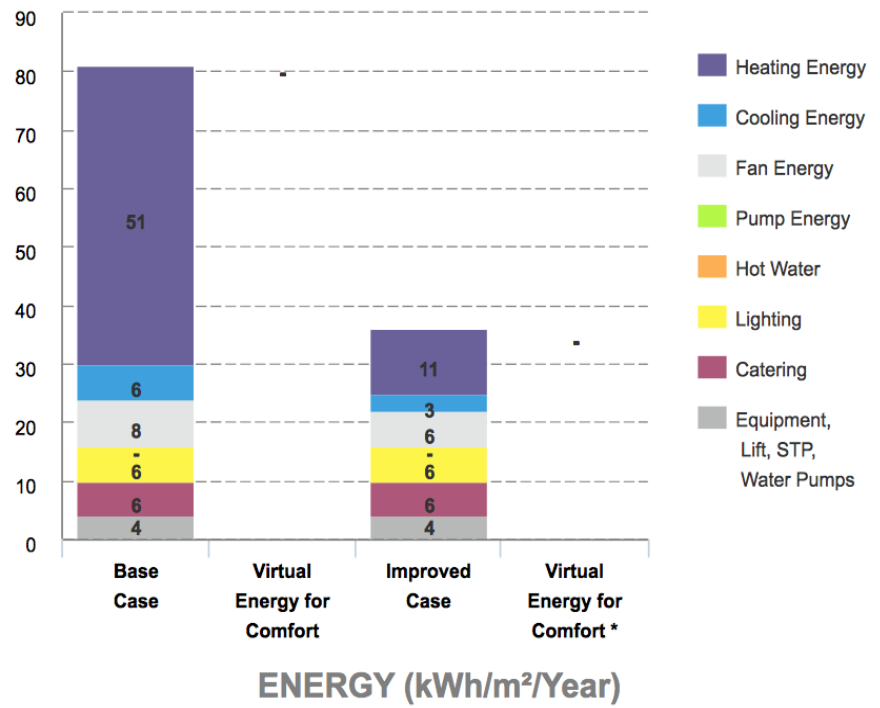
Payback in Years

0.32

Operational CO2 Savings

101 tCO_2/Year

56.8% **Meets EDGE Energy Standard**



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Health

HOSPITALS – RUSSIA CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Unit	Gross Internal Area	Occupancy Rate	Floors	Beds
Multi Specialty	9,700m²	70%	7	100

Energy Measures – 45% Savings through:

- Reduced Window to Wall ratios
- Insulation of Roof and External Walls
- Variable Refrigerant Volume Cooling System
- Recovery of Waste Heat from the Generator for Space Heating

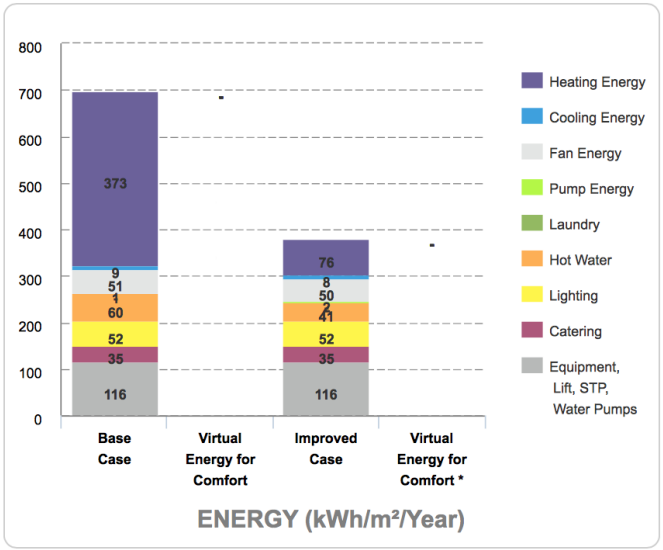
Water – 35% Savings through:

- Low-Flow Showerheads and Faucets
- Dual Flush for Water Closets
- Water-Efficient Urinals and faucets for Kitchen Sinks

Materials – 22% Savings through:

- Timber Floor Construction Floor Slabs

45.37% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$56,762

Utility Costs Savings

$33,468/ month

Payback in Years

0.14

Operational CO_2 Savings

1,351 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 21% Savings through:

- Reduced Window to Wall Ratio
- Higher Thermal Performance Glass
- Wall Insulation
- Air Economizers
- Energy-Efficient Air Conditioning with Air Cooled Chiller
- Sensible Heat Recovery from Exhaust Air

Water – 25% Savings through:

- Low-Flow Faucets and Dual Flush Water Closet in bathrooms
- Water-Efficient Faucets for Kitchen Sinks

Materials – 26% Savings through:

- Clay Roofing Tiles on Steel Rafters

KESERWAN MEDICAL CENTER (LEBANON)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

Retail

LIGHT INDUSTRY– RUSSIA CASE STUDY

BUILDING DETAILS

Floors Above Ground	Shifts in a day (8 hour, 6 workday)	Gross Internal Area
1	1	15,000 m^2

Energy Measures – 23% Savings through:

- Reduced Window to Wall ratios
- Insulation of Roof and External Walls
- Variable Refrigerant Volume Cooling System
- Solar Hot Water Collectors

Water – 43% Savings through:

- Dual Flush, Water-Efficient Urinals
- Aerators and Auto Shut-off, Efficient Faucets
- Water-Efficient Kitchen Faucets

Materials – 25% Savings through:

- Precast RC Planks and Joist System

PROJECTED PROJECT METRICS

Incremental Cost

$136,651

Utility Costs Savings
$3,973 / month

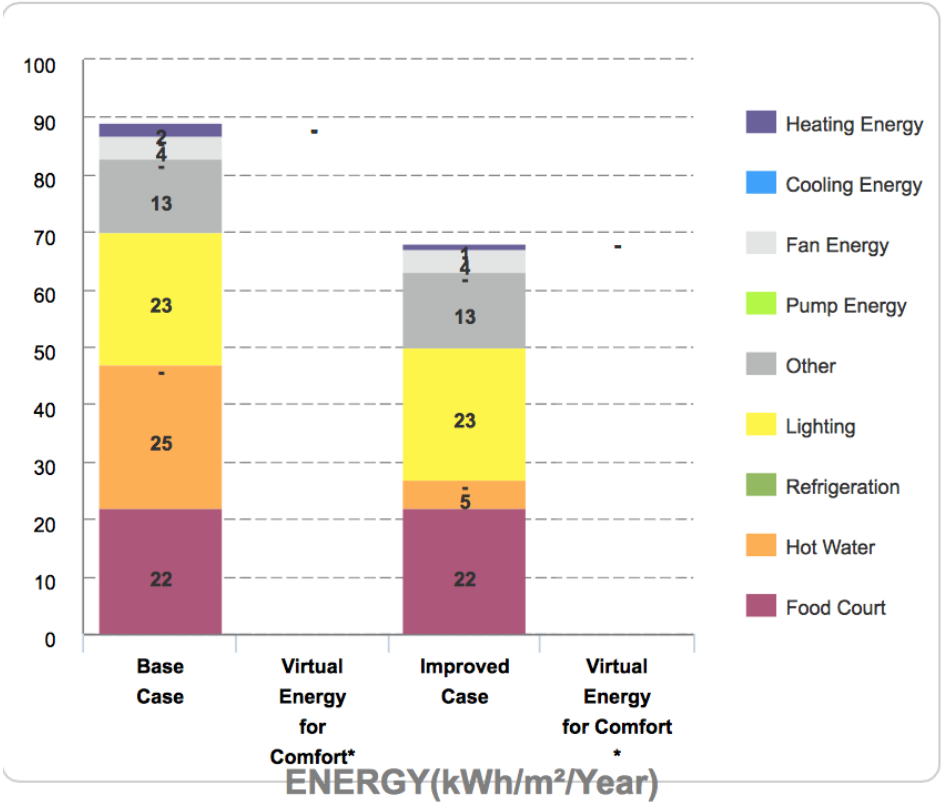
Payback in Years

2.87

Operational CO2 Savings

127 tCO_2/Year

22.50% **Meets EDGE energy standard**



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SERBIA: GREEN BUILDINGS RETURN ON INVESTMENT

IFC International Finance Corporation
WORLD BANK GROUP

Creating Markets, Creating Opportunities

SERBIA – ROI NEEDED TO REACH EDGE STANDARD

	Incremental Cost	Utility Savings / month	Payback Period in Years
Homes	$601/unit	$25/unit	2
Hotels	$70,724	$15,744	0.4
Shopping Centers	$3,795	$120,578	0.2
Offices	$5,339	$555	0.8
Schools	$29,985	$770	3.2
Hospitals	$668,359	$11,717	4.8
Light Industry	$94,808	$25,408	0.3

HOMES – SERBIA CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Unit	Average Unit Area	Bedrooms / Unit	Floors	Units
Low Income	80m^2	2	10	50

Energy Measures – 22% Savings through:

- Air conditioning system
- Reduced Window to Wall Ratio

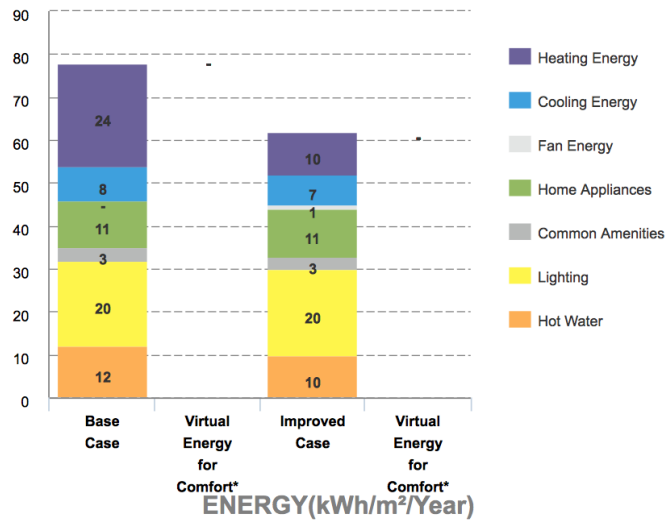
Water – 22% Savings through:

- Low-Flow Showerheads
- Low-Flow Faucets for Washbasins & Kitchen Sinks
- Single and Dual Flush for Water Closets

Materials – 21% Savings through:

- External Walls – Cement Fiber Boards on Timber Studs

22.43% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$601/unit

Utility Costs Savings

$25/ unit / month

Payback in Years

2

Operational CO_2 Savings

1 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 32% Savings through:

- Reduced Window to Wall Ratio
- Roof insulation
- Heat pump for hot water

Water – 25% Savings through:

- Low-Flow Faucets
- Dual-flush water closets

Materials – 35% Savings through:

- Clay roofing tiles on timber rafters for roof construction
- Cored bricks with plaster on both sides for internal and external walls
- Cellulose roof insulation

FOURLEAF ESTATE (SOUTH AFRICA)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

HOTELS – SERBIA CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Hotel	Floors Above Ground	Total Guest Units	Internal Area
4 Star Hotel	8	200	15,599 m^2

Energy Measures – 20% Savings through:

- Energy saving Lightbulbs – Internal Spaces
- Ground Source Heat Pump

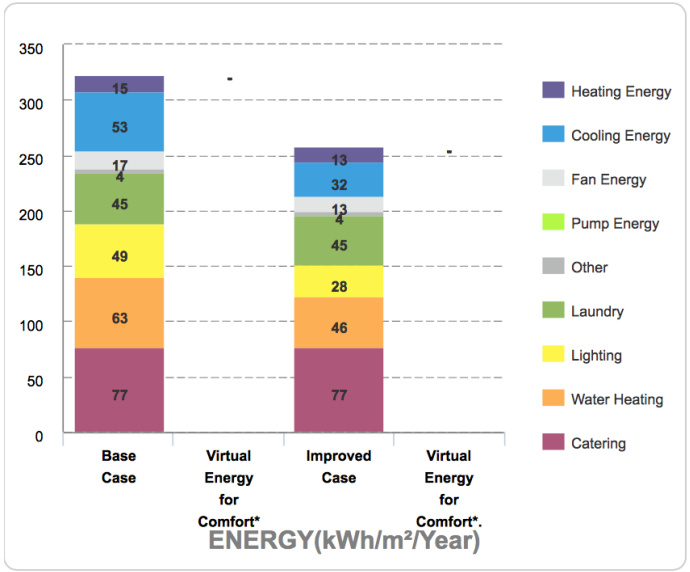
Water – 27% Savings through:

- Low-Flow Showerheads
- Low-Flow Faucets for Guest Rooms
- Single and Dual Flush for Water Closets
- Dual Flush for Water Closets in Guest Rooms and Bathrooms

Materials – 27% Savings through:

- Hollow Core Precast Slab

20.10% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$70,724

Utility Costs Savings

$15,774 / month

Payback in Years

0.4

Operational CO_2 Savings

815 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 60% Savings through:

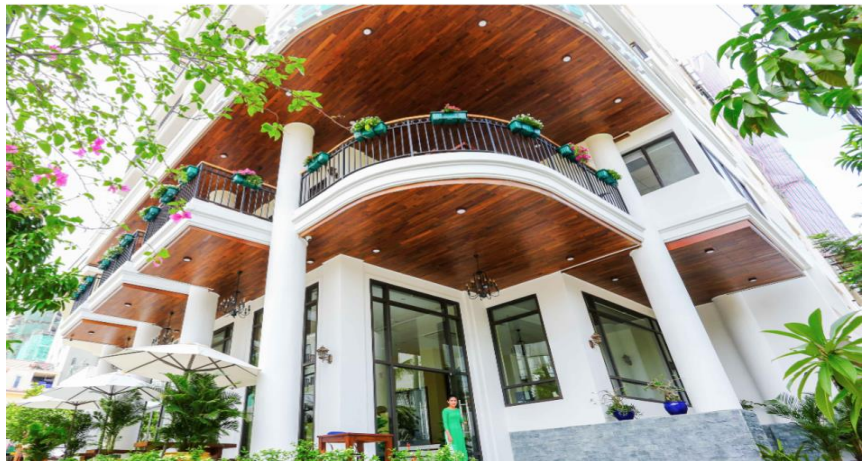
- Reduced Window to Wall Ratio
- External shading devices
- Variable refrigerant volume cooling system, heat pump for hot water
- Energy Saving Lighting for internal and external spaces, solar photovoltaics

Water – 26% Savings through:

- Low-Flow shower heads and faucets in guest rooms
- Dual-flush water closets in all bathrooms
- Water-efficient kitchen faucets

Materials – 34% Savings through:

- Cored bricks with plaster for internal and external walls
- Parquet wood flooring



ECO GREEN BOUTIQUE HOTEL (VIETNAM)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

SHOPPING CENTERS – SERBIA CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Site Area	Car Parking	Floors	Amenities
15,000 m^2	Indoor Car Parking	1	Supermarket, Food Court

Energy Measures –35% Savings through:

- Insulation of Roof and External Walls
- Air Conditioning with Air Cooled Screw Chiller
- Ground Source Heat Pump

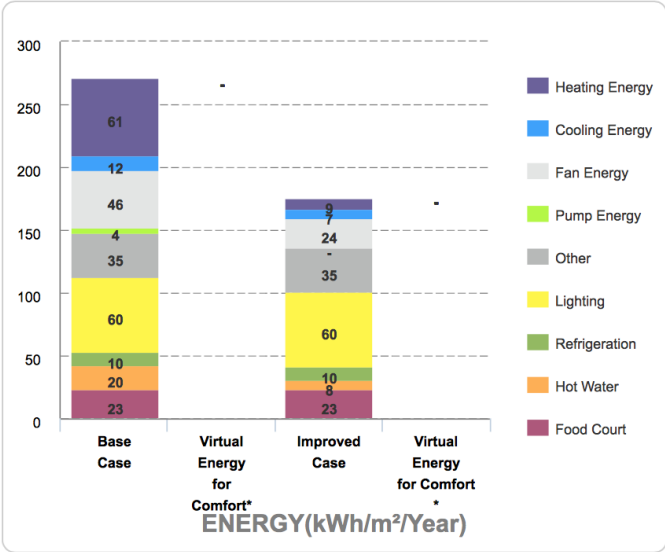
Water – 44% Savings through:

- Dual Flush for Water Closets
- Water-Efficient Urinals and Auto Shut-off Faucets

Materials – 24% Savings through:

- Floor Slabs: In-Situ Concrete with >25% GGBS

34.71% **Meets EDGE energy standard**



PROJECT METRICS

Incremental Cost

$3,795

Utility Costs Savings

$120,578/ month

Payback in Years

0.2

Operational CO_2 Savings

1,127 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 47% Savings through:

- Reduced Window to Wall Ratio, Reflective Paint and Insulation for Roof and Walls, Recovery of Waste Heat from Generator for Heating
- High Efficiency Condensing Boiler for Space Heating
- High Efficiency Refrigerated Cases and Energy Efficient Lighting

Water – 42% Savings through:

- Dual Flush Water Closets, Water Efficient Urinals
- Aerators and Auto Shut-Off Faucets

Materials – 34% Savings through:

- Corrugated Zinc Sheets for Roof
- Steel Profile Cladding for External Walls
- Solid Dense Concrete Blocs for External Walls

KAUFLAND (BULGARIA)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

OFFICES – SERBIA CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Gross Internal Area	Floors Above Grade	Floors Below Grade	Floor-to-Floor Height
5000m^2	3	2	3.5m

Energy Measures – 23% Savings through:

- Air Conditioning with Air Cooled Screw Chiller
- Variable refrigerant flow system
- Ground source heat pump

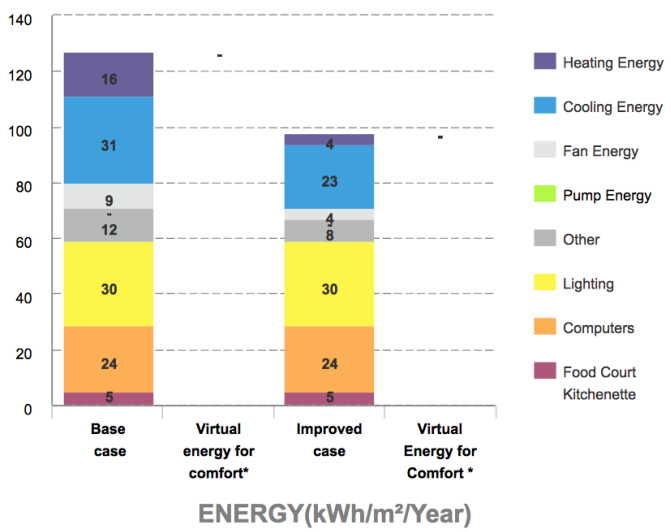
Water – 35% Savings through:

- Water-efficient bathroom urinals and faucets for kitchen sinks
- Dual flush for water closets in bathrooms

Materials – 23% Savings through:

- Floor Slabs: In-Situ Concrete with >25% GGBS

22.50% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$5,339

Utility Costs Savings

$555/ month

Payback in Years

0.8

Operational CO_2 Savings

115 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 27% Savings through:

- Reduced window to wall ratio
- Reflective paint and tiles for the roof and external walls
- Energy-Saving lighting for internal and external spaces

Water – 26% Savings through:

- Low-flow showerheads
- Low-flow faucets in kitchens and bathrooms
- Water-efficient water closets

Materials – 53% Savings through:

- Plasterboards on metal studs for internal walls

ALEGRA CONJUNTO CERRADO (COLOMBIA)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

SCHOOLS – SERBIA CASE STUDY

BUILDING DETAILS

Occupancy Density	Operational Hours	Working Days	Holidays / Year
3	6	5	60

Energy Measures – 46% Savings through:
- Reduced Window to Wall ratios
- Insulation of Roof and External Walls
- Variable Refrigerant Volume Cooling System
- Air Conditioning with Air and Water Cooled Chiller
- Ground Source Heat Pump
- Recovery of Waste Heat from the Generator for Space Heating

Water – 31% Savings through:
- Low-Flow Showerheads and Faucets
- Dual Flush for Water Closets
- Water-Efficient Urinals and faucets for Kitchen Sinks

Materials – 22% Savings through:
- Precast RC Planks and Joist System

PROJECTED PROJECT METRICS

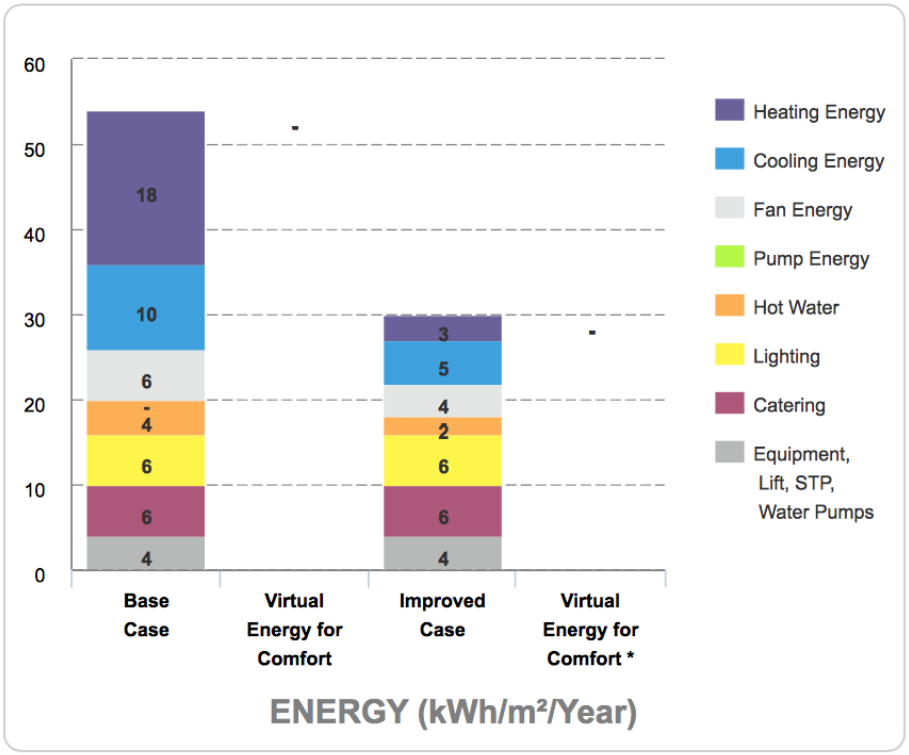
Incremental Cost
$29,985

Utility Costs Savings
$770 / month

Payback in Years
3.24

Operational CO2 Savings
101 tCO_2/Year

45.5% **Meets EDGE Energy Standard**



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Relevant certified project to be included as soon as case study is published.

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HOSPITALS – SERBIA CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Unit	Gross Internal Area	Occupancy Rate	Floors	Beds
Multi Specialty	9,700m^2	70%	7	100

Energy Measures – 35% Savings through:

- Reduced Window to Wall ratios
- Insulation of Roof and External Walls
- Variable Refrigerant Volume Cooling System

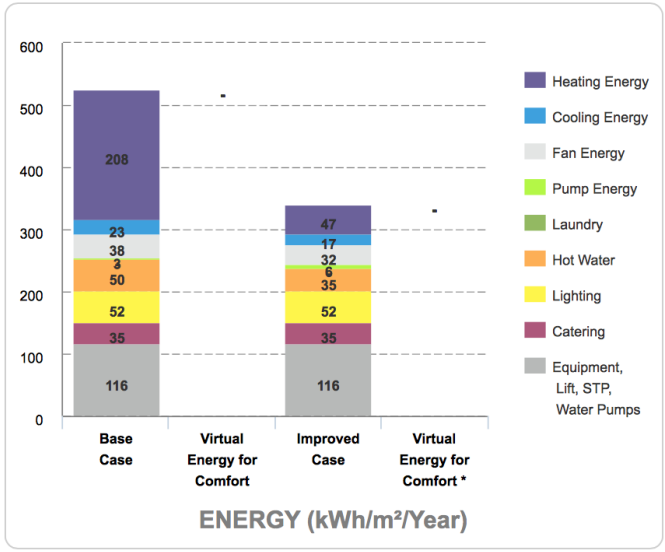
Water – 38% Savings through:

- Low-Flow Showerheads and Faucets
- Dual Flush for Water Closets
- Water-Efficient Urinals and faucets for Kitchen Sinks

Materials – 21% Savings through:

- Timber Floor Construction Floor Slabs

35.33% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$668,359

Utility Costs Savings

$11,717/ month

Payback in Years

4.8

Operational CO_2 Savings

1,511 tCO_2/Year

RELEVANT CERTIFIED PROJECT – LEBANON

Energy Measures – 56% Savings through:

- Reduced window to wall ratio
- Insulation of roof and external walls
- Low e-coated glass
- Air conditioning with air cooled chiller
- Energy-saving lighting systems for internal and external spaces
- Solar hot water collectors and solar photovoltaics

Water – 33% Savings through:

- Low-flow faucets in bathrooms
- dual-flush water closets

Materials – 42% Savings through:

- Aluminum sheets on steel rafters for roof construction
- 3-D wire panel with “shot-crete” on both sides for external and internal walls
- Ceramic tile flooring

MBU at KOMFO ANOKYE HOSPITAL (GHANA)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

Retail

LIGHT INDUSTRY– SERBIA CASE STUDY

BUILDING DETAILS

Floors Above Ground	Shifts in a day (8 hour, 6 workday)	Gross Internal Area
1	1	15,000 m^2

Energy Measures – 22% Savings through:

- Reduced Window to Wall ratios
- Insulation of Roof and External Walls
- Variable Refrigerant Volume Cooling System
- Solar Hot Water Collectors

Water – 43% Savings through:

- Dual Flush, Water-Efficient Urinals
- Aerators and Auto Shut-off, Efficient Faucets
- Water-Efficient Kitchen Faucets

Materials – 25% Savings through:

- Precast RC Planks and Joist System

PROJECTED PROJECT METRICS

Incremental Cost

$94,808

Utility Costs Savings
$25,408 / month

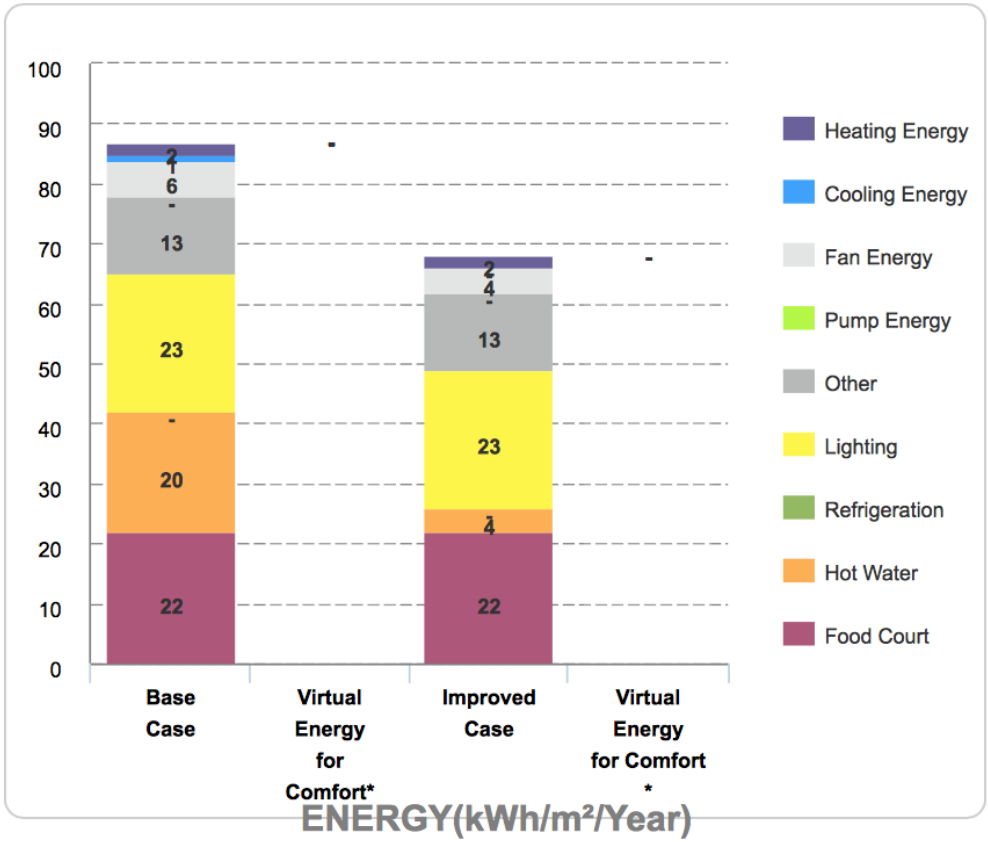
Payback in Years

0.31

Operational CO2 Savings

229 tCO_2/Year

21.60% **Meets EDGE energy standard**



Light Industry is a new sector in the EDGE application.
Relevant certified project to be included as soon as case study is published.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

UKRAINE: GREEN BUILDINGS RETURN ON INVESTMENT

IFC International Finance Corporation
WORLD BANK GROUP

Creating Markets, Creating Opportunities

UKRAINE – ROI NEEDED TO REACH EDGE STANDARD

	Incremental Cost	Utility Savings / month	Payback Period in Years
Homes	$553/unit	$4/unit	13
Hotels	$79,534	$3,820	1.7
Shopping Centers	$66,222	$4,734	1.2
Offices	$7,460	$563	1.3
Schools	$11,640	$430	2.3
Hospitals	$13,084	$5,387	0.2
Light Industry	$151,002	$1,364	9.2

HOMES – UKRAINE CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Unit	Average Unit Area	Bedrooms / Unit	Floors	Units
Low Income	80m^2	2	10	50

Energy Measures – 26% Savings through:

- Air conditioning system
- Insulation of External walls
- Solar Hot Water Collectors
- Reduced Window to Wall Ratio

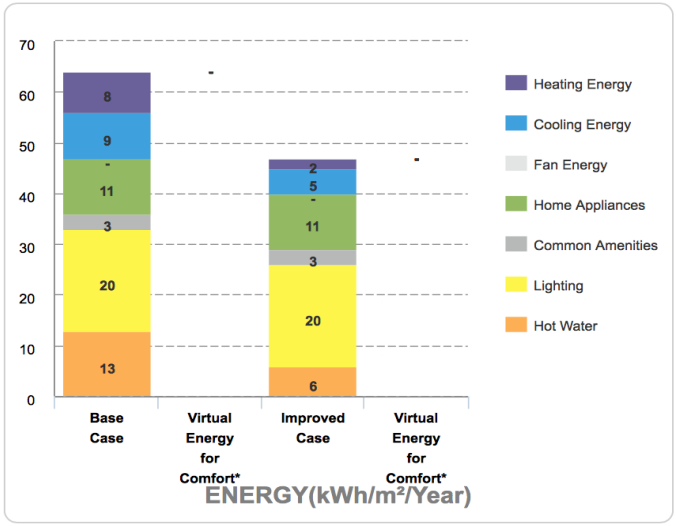
Water – 22% Savings through:

- Low-Flow Showerheads
- Low-Flow Faucets for Washbasins & Kitchen Sinks
- Single and Dual Flush for Water Closets

Materials – 21% Savings through:

- External Walls – Cement Fiber Boards on Timber Studs

26.14% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$553

Utility Costs Savings

$4/ unit / month

Payback in Years

12.65

Operational CO_2 Savings

0.8 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 30% Savings through:

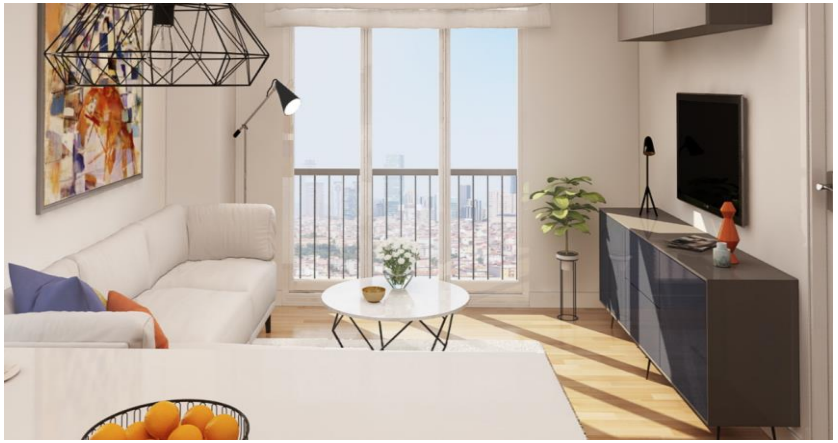
- Reduced window to wall ratio
- Insulation of roof and external walls
- Higher performance glass
- Energy-saving lighting systems for internal spaces, common areas and external spaces

Water – 20% Savings through:

- Low-flow faucets in kitchens and bathrooms
- Dual-flush water closets

Materials – 41% Savings through:

- Concrete filler slab for roof construction
- Autoclaved aerated concrete blocks for internal and external walls
- UPVC window frames



MINT CAGLAYAN (TURKEY)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

HOTELS – UKRAINE CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Hotel	Floors Above Ground	Total Guest Units	Internal Area
4 Star Hotel	8	200	15,599 m^2

Energy Measures – 20% Savings through:

- Energy saving Lightbulbs – Internal Spaces
- Ground Source Heat Pump
- Occupancy Censors in Bathrooms

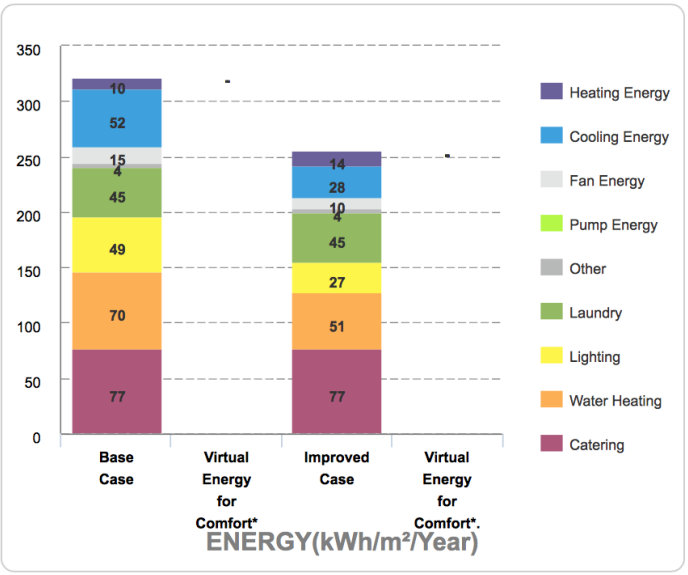
Water – 27% Savings through:

- Low-Flow Showerheads
- Low-Flow Faucets for Guest Rooms
- Single and Dual Flush for Water Closets
- Dual Flush for Water Closets in Guest Rooms

Materials – 27% Savings through:

- Hollow Core Precast Slab

20.46% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$79,534

Utility Costs Savings

$3,820 / month

Payback in Years

1.7

Operational CO_2 Savings

593 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 51% Savings through:

- Reduced window to wall ratio
- External shading devices
- Air conditioning with water cooled chiller
- Low-E coated glass
- Insulation of roof and external walls, and energy-efficient lighting.

Water – 32% Savings through:

- Low-flow showerheads
- Dual flush water closets
- Water-efficient urinals

Materials – 44% Savings through:

- Concrete filler slab for floors and roof
- Medium weight hollow concrete blocks for internal walls
- Finished concrete flooring

City Express Hotel (Mexico)

In-country certified project to replace related example once an EDGE project is certified.

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Retail

SHOPPING CENTERS – UKRAINE CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Site Area	Car Parking	Floors	Amenities
15,000 m^2	Indoor Car Parking	1	Supermarket, Food Court

Energy Measures –26% Savings through:

- Insulation of Roof and External Walls
- Air Conditioning with Air Cooled Screw Chiller
- Ground Source Heat Pump

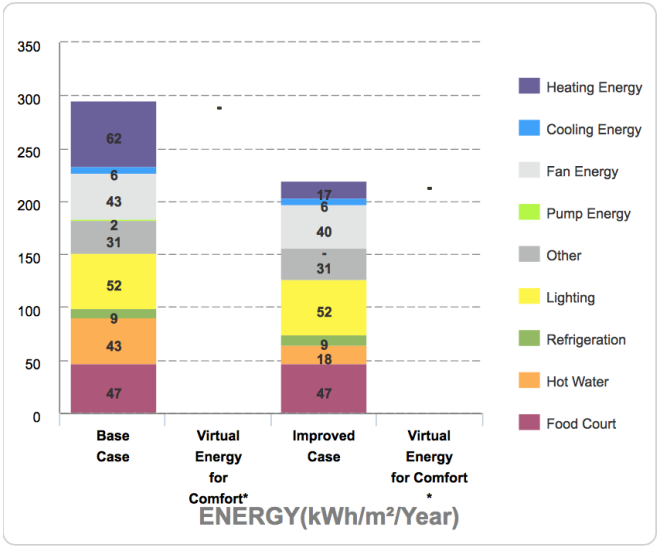
Water – 45% Savings through:

- Dual Flush for Water Closets
- Water-Efficient Urinals and Auto Shut-off Faucets

Materials – 24% Savings through:

- Floor Slabs: In-Situ Concrete with >25% GGBS

25.54% **Meets EDGE energy standard**



PROJECT METRICS

Incremental Cost

$66,222

Utility Costs Savings

$4,734/ month

Payback in Years

1.17

Operational CO_2 Savings

647 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 47% Savings through:

- Reduced Window to Wall Ratio, Reflective Paint and Insulation for Roof and Walls, Recovery of Waste Heat from Generator for Heating
- High Efficiency Condensing Boiler for Space Heating
- High Efficiency Refrigerated Cases and Energy Efficient Lighting

Water – 42% Savings through:

- Dual Flush Water Closets, Water Efficient Urinals
- Aerators and Auto Shut-Off Faucets

Materials – 34% Savings through:

- Corrugated Zinc Sheets for Roof, Steel Profile Cladding for External Walls and Solid Dense Concrete Blocs for External Walls

KAUFLAND (BULGARIA)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

OFFICES – UKRAINE CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Gross Internal Area	Floors Above Grade	Floors Below Grade	Floor-to-Floor Height
5000m^2	3	2	3.5m

Energy Measures – 22% Savings through:

- Occupancy Sensors in conference rooms and cabins
- Air Conditioning with Air Cooled Screw Chiller
- Variable refrigerant flow system
- Ground source heat pump

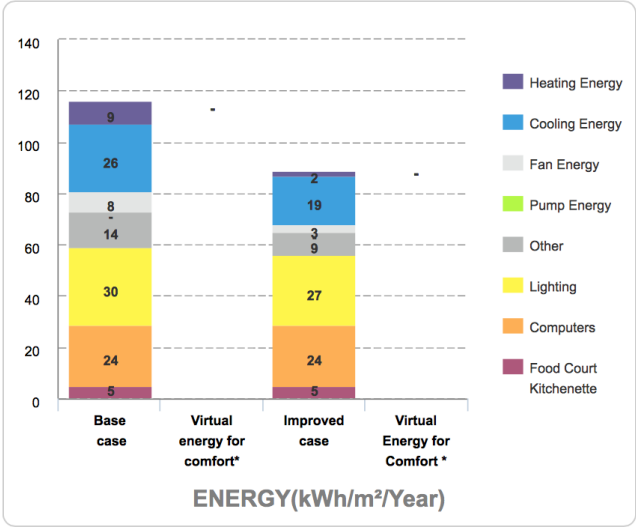
Water – 35% Savings through:

- Water-efficient bathroom urinals and faucets for kitchen sinks
- Dual flush for water closets in bathrooms

Materials – 22% Savings through:

- Floor Slabs: In-Situ Concrete with >25% GGBS

21.83% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$7,460

Utility Costs Savings

$563/ month

Payback in Years

1.25

Operational CO_2 Savings

72 tCO_2/Year

RELEVANT CERTIFIED 35PROJECT

Energy Measures – 30% Savings through:

- Reflective Paint, Tiles, and Insulation for Roof
- Low E-Coated Glass
- Variable Refrigerant Volume Cooling System
- Sensible Heat Recovery from Exhaust Air
- Energy-Saving Light Bulbs for Internal and External Spaces

Water – 70% Savings through:

- Low-Flow Faucets in Kitchens and Bathrooms
- Water-Efficient Urinals and Water Closets
- Grey Water Treatment and Recycling System

Materials – 45% Savings through:

- Curtain Walling for External Walls

DAAN MOGOT BARU OFFICE PARK (INDONESIA)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

SCHOOLS – UKRAINE CASE STUDY

BUILDING DETAILS

Occupancy Density	Operational Hours	Working Days	Holidays / Year
3	6	5	60

Energy Measures – 55% Savings through:
- Reduced Window to Wall ratios
- Insulation of Roof and External Walls
- Variable Refrigerant Volume Cooling System
- Air Conditioning with Air and Water Cooled Chiller
- Ground Source Heat Pump
- Photoelectric Sensors to harvest Daylight

Water – 31% Savings through:
- Low-Flow Showerheads and Faucets
- Dual Flush for Water Closets
- Water-Efficient Urinals and faucets for Kitchen Sinks

Materials – 22% Savings through:
- Precast RC Planks and Joist System

PROJECTED PROJECT METRICS

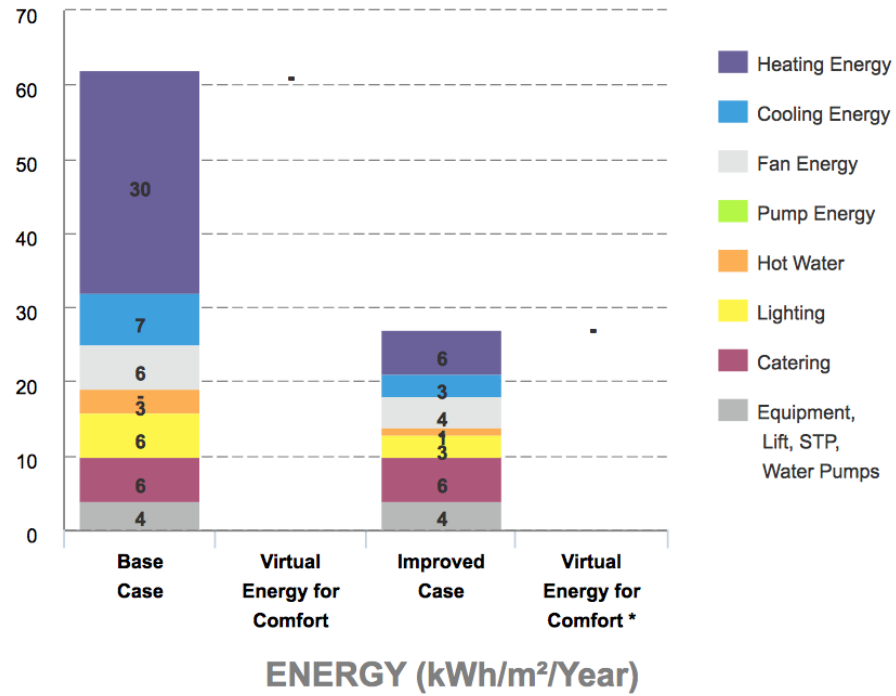
Incremental Cost
$11,640

Utility Costs Savings
$430 / month

Payback in Years
2.25

Operational CO2 Savings
103 tCO_2/Year

55.2% Meets EDGE Energy Standard



Education is a new sector in the EDGE application.
Relevant certified project to be included as soon as case study is published.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

HOSPITALS – UKRAINE CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Unit	Gross Internal Area	Occupancy Rate	Floors	Beds
Multi Specialty	9,700m^2	70%	7	100

Energy Measures – 39% Savings through:

- Reduced Window to Wall ratios
- Insulation of Roof and External Walls
- Variable Refrigerant Volume Cooling System
- Solar Hot Water Collectors

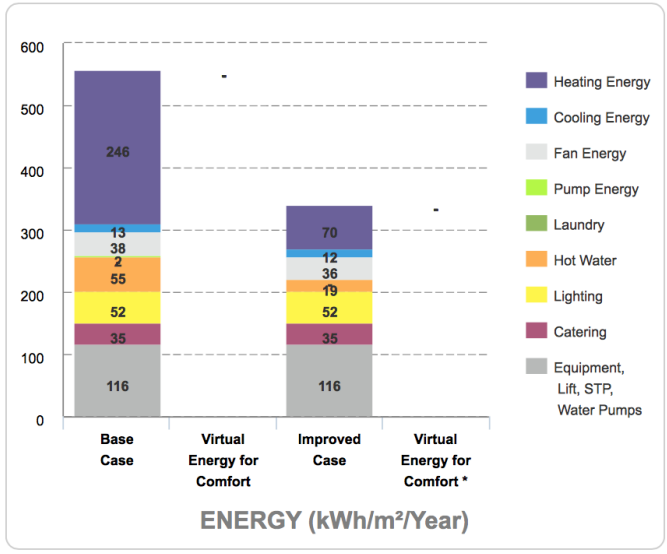
Water – 36% Savings through:

- Low-Flow Showerheads and Faucets
- Dual Flush for Water Closets
- Water-Efficient Urinals and faucets for Kitchen Sinks

Materials – 22% Savings through:

- Timber Floor Construction Floor Slabs

38.79% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$13,084

Utility Costs Savings

$5,387/ month

Payback in Years

0.2

Operational CO_2 Savings

1,258 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 32% Savings through:

- Reduced Window To Wall Ratio
- Reflective Paint and Insulation For External Walls
- Natural Ventilation For Corridors
- Energy-Saving Lighting Systems
- Occupancy Sensors In Bathrooms
- Solar Photovoltaics

Water – 35% Savings through:

- Low-flow Faucets In Kitchens And Bathrooms
- Single-flush And Flush Valve For Water Closets
- Water-efficient Urinals, Faucets And Landscaping
- Rainwater Harvesting System

Materials – 43% Savings through:

- Steel Sheets On Steel Rafters For Roof Construction
- Medium Weight Hollow Concrete Blocks For Internal And External Walls
- Finished Concrete Flooring

SEDE DE EBAIS (COSTA RICA)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

LIGHT INDUSTRY– UKRAINE CASE STUDY

BUILDING DETAILS

Floors Above Ground	Shifts in a day (8 hour, 6 workday)	Gross Internal Area
1	1	15,000 m^2

Energy Measures – 21% Savings through:

- Reduced Window to Wall ratios
- Insulation of Roof and External Walls
- Variable Refrigerant Volume Cooling System
- Solar Hot Water Collectors

Water – 43% Savings through:

- Dual Flush, Water-Efficient Urinals
- Aerators and Auto Shut-off, Efficient Faucets
- Water-Efficient Kitchen Faucets

Materials – 25% Savings through:

- Precast RC Planks and Joist System

PROJECTED PROJECT METRICS

Incremental Cost

$151,002

Utility Costs Savings
$1,364 / month

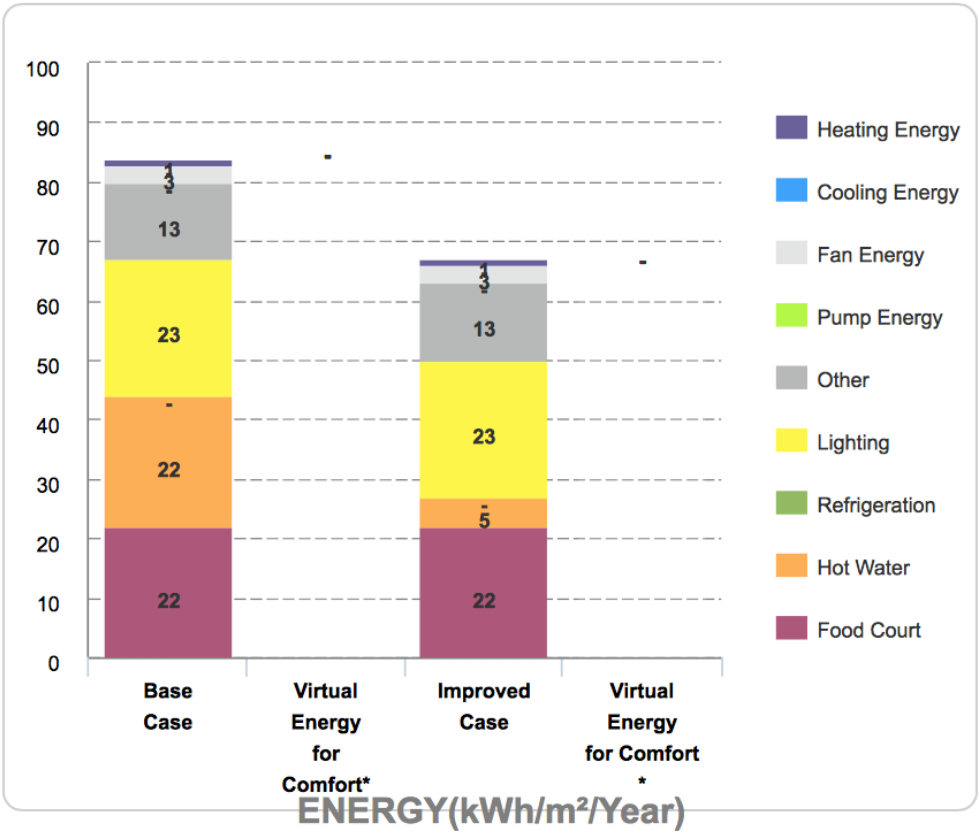
Payback in Years

9.23

Operational CO2 Savings

158 tCO_2/Year

21.34% **Meets EDGE energy standard**



Light Industry is a new sector in the EDGE application.
Relevant certified project to be included as soon as case study is published.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

TURKEY: GREEN BUILDINGS RETURN ON INVESTMENT

IFC International Finance Corporation
WORLD BANK GROUP

Creating Markets, Creating Opportunities

TURKEY – ROI NEEDED TO REACH EDGE STANDARD

	Incremental Cost	Utility Savings / month	Payback Period in Years
Homes	$464/unit	$16/unit	2
Hotels	$84,986	$12,300	0.6
Shopping Centers	$72,166	$14,021	0.4
Offices	$12,181	$563	0.5
Schools	$9,127	$1,076	0.7
Hospitals	$696,566	$14,304	4
Light Industry	$137,066	$5,087	2.3

HOMES – TURKEY CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Unit	Average Unit Area	Bedrooms / Unit	Floors	Units
Low Income	80m^2	2	10	50

Energy Measures – 31% Savings through:

- Air conditioning system
- Energy saving Lightbulbs – Internal Spaces

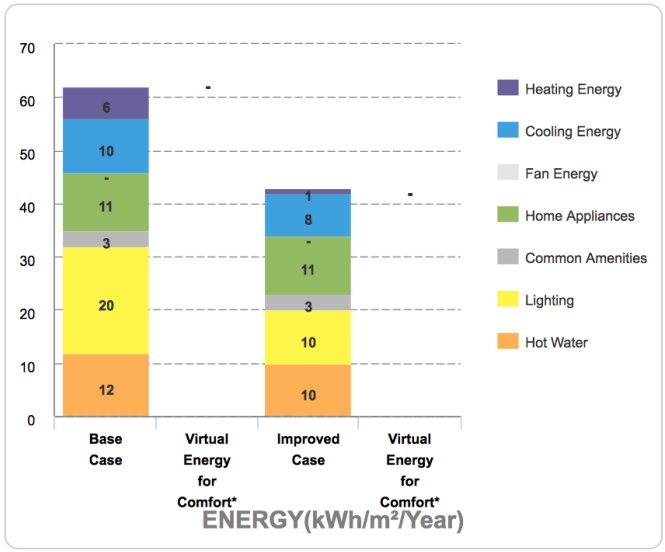
Water – 22% Savings through:

- Low-Flow Showerheads
- Low-Flow Faucets for Washbasins & Kitchen Sinks
- Single and Dual Flush for Water Closets

Materials – 26% Savings through:

- External Walls – Facing Brick and Hollow Concrete Blocks
- Floor Slabs – Light Gauge Steel Floor Cassette

31.41% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$464/unit

Utility Costs Savings

$16/ unit / month

Payback in Years

2

Operational CO_2 Savings

0.6 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 35% Savings through:

- Reduced Window To Wall Ratio
- Low E-coated glass
- VRV cooling system
- Reflective Paint and Insulation For External Walls
- Energy-Saving Lighting Systems
- High-efficiency boilers for heating and hot water

Water – 42% Savings through:

- Low-flow showerheads and faucets in kitchens and bathrooms
- Dual-flush water closets

Materials – 41% Savings through:

- Concrete filler slabs for floors and roofs
- Cored bricks with plaster for internal and external walls

GREENOX RESIDENCE (TURKEY)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

HOTELS – TURKEY CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Hotel	Floors Above Ground	Total Guest Units	Internal Area
4 Star Hotel	8	200	15,599 m^2

Energy Measures – 21% Savings through:

- Energy saving Lightbulbs – Internal Spaces
- Ground Source Heat Pump
- Occupancy Censors in Bathrooms

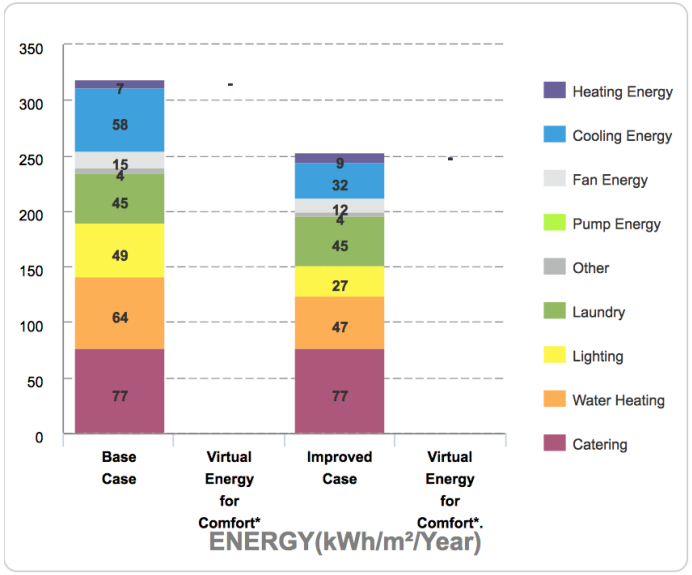
Water – 27% Savings through:

- Low-Flow Showerheads
- Low-Flow Faucets for Guest Rooms
- Single and Dual Flush for Water Closets
- Dual Flush for Water Closets in Guest Rooms

Materials – 27% Savings through:

- Hollow Core Precast Slab

21.03% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$84,986

Utility Costs Savings

$12,300 / month

Payback in Years

0.6

Operational CO_2 Savings

389 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 63% Savings through:

- Reduced Window to Wall Ratio, External Shading Device
- Low-E Coated Glass, Variable Refrigerant Volume Cooling System
- Heat Pump for Hot Water, Energy Saving Lighting

Water – 22% Savings through:

- Low-Flow Faucets in Kitchens and Bathrooms
- Dual Flush Water Closets
- Water-Efficient Urinals, Dishwashers and Landscaping
- Aerators and Auto Shut-off Faucet in Bathrooms

Materials – 44% Savings through:

- Autoclaved Aerators Concrete Blocks for External and Internal Walls
- UPVC Window Frames

THE 101 YOGYAKARTA TUGU (INDONESIA)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

SHOPPING CENTERS – TURKEY CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Site Area	Car Parking	Floors	Amenities
15,000 m^2	Indoor Car Parking	1	Supermarket, Food Court

Energy Measures –23% Savings through:

- Insulation of Roof and External Walls
- Air Conditioning with Air Cooled Screw Chiller
- Ground Source Heat Pump

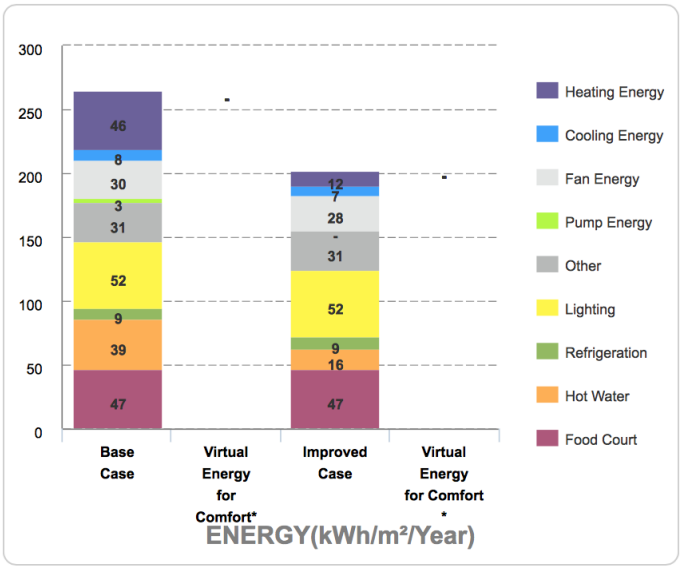
Water – 45% Savings through:

- Dual Flush for Water Closets
- Water-Efficient Urinals and Auto Shut-off Faucets

Materials – 24% Savings through:

- Floor Slabs: In-Situ Concrete with >25% GGBS

23.31% **Meets EDGE energy standard**



PROJECT METRICS

Incremental Cost

$72,166

Utility Costs Savings

$14,021/ month

Payback in Years

0.43

Operational CO_2 Savings

341 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 29% Savings through:

- Reduced window to wall ratio
- VRV cooling system
- Reflective Paint and Insulation For External Walls
- Energy-Saving Lighting Systems

Water – 27% Savings through:

- Low-Flow Faucets in Kitchens and Bathrooms
- Dual Flush Water Closets
- Water-Efficient Urinals
- Aerators and Auto Shut-off Faucet in Bathrooms

Materials – 36% Savings through:

- Steel sheets on steel rafters for roof construction
- Medium weight hollow concrete blocks for internal walls, and a finished concrete floor

BMB 001 CAMBUCI – OBRAMAX (BRAZIL)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

OFFICES – TURKEY CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Gross Internal Area	Floors Above Grade	Floors Below Grade	Floor-to-Floor Height
5000m^2	3	2	3.5m

Energy Measures – 26% Savings through:

- Occupancy Sensors in Open Offices
- Air Conditioning with Air Cooled Screw Chiller
- Variable refrigerant flow system
- Ground source heat pump

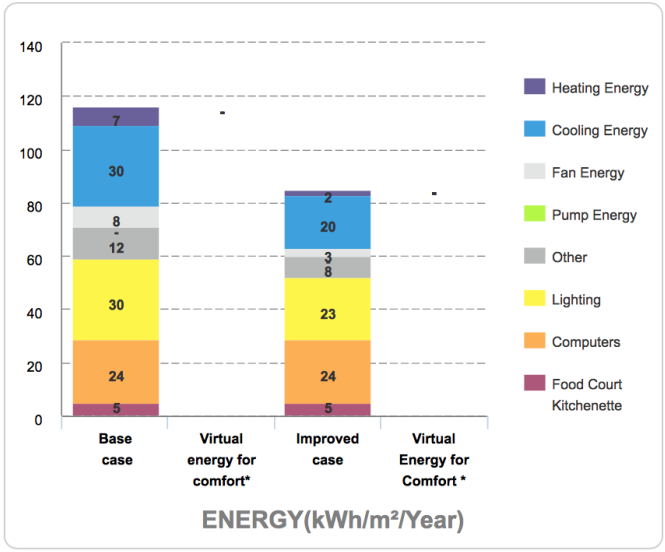
Water – 35% Savings through:

- Water-efficient bathroom urinals and faucets for kitchen sinks
- Dual flush for water closets in bathrooms

Materials – 22% Savings through:

- Floor Slabs: In-Situ Concrete with >25% GGBS

25.81% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$12,181

Utility Costs Savings

$563/ month

Payback in Years

0.5

Operational CO_2 Savings

55 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 68% Savings through:

- Reduced Window To Wall Ratio
- Reflective Paint and Insulation
- Higher Thermal Performance Glass;
- Variable Refrigerant Volume (VRV) Cooling System
- Sensible Heat Recovery From Exhaust Air
- Energy-Saving Light Bulbs For Internal Spaces
- Lighting Controls For Corridors And Staircases
- Solar Photovoltaics

Water – 83% Savings through:

- Low-flow Plumbing Fixtures For Washbasins And Kitchens
- Rainwater Harvesting System
- Black Water Treatment And Recycling System

Materials – 28% Savings through:

- Stone And Ceramic Tiles For Floors; UPVC Window Frames; Polystyrene Roof Insulation; And Autoclaved Aerated Concrete Blocks For External Walls

ABHIKALPAN OFFICE (INDIA)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

Education

SCHOOLS – TURKEY CASE STUDY

BUILDING DETAILS

Occupancy Density	Operational Hours	Working Days	Holidays / Year
3	6	5	60

Energy Measures – 44% Savings through:
- Reduced Window to Wall ratios
- Insulation of Roof and External Walls
- Variable Refrigerant Volume Cooling System
- Air Conditioning with Air and Water Cooled Chiller
- Ground Source Heat Pump

Water – 31% Savings through:
- Low-Flow Showerheads and Faucets
- Dual Flush for Water Closets
- Water-Efficient Urinals and faucets for Kitchen Sinks

Materials – 22% Savings through:
- Precast RC Planks and Joist System

PROJECTED PROJECT METRICS

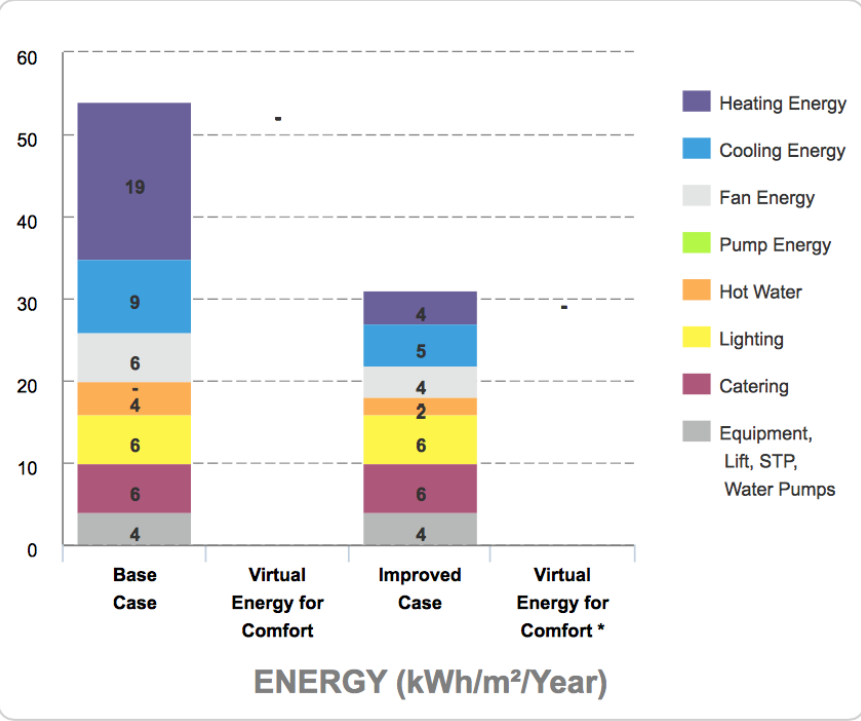
Incremental Cost
$9,127

Utility Costs Savings
$1,076 / month

Payback in Years
0.71

Operational CO2 Savings
45 tCO_2/Year

44.0% **Meets EDGE Energy Standard**



Education is a new sector in the EDGE application.
Relevant certified project to be included as soon as case study is published.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

HOSPITALS – TURKEY CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Unit	Gross Internal Area	Occupancy Rate	Floors	Beds
Multi Specialty	9,700m²	70%	7	100

Energy Measures – 31% Savings through:

- Reduced Window to Wall ratios
- Insulation of Roof and External Walls
- Variable Refrigerant Volume Cooling System

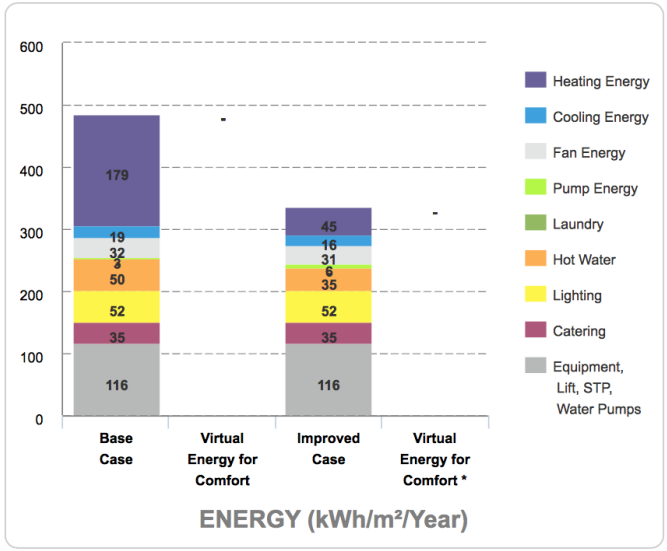
Water – 37% Savings through:

- Low-Flow Showerheads and Faucets
- Dual Flush for Water Closets
- Water-Efficient Urinals and faucets for Kitchen Sinks

Materials – 22% Savings through:

- Timber Floor Construction Floor Slabs

31.18% **Meets EDGE Energy Standard**



PROJECT METRICS

Incremental Cost

$696,566

Utility Costs Savings

$14,304/ month

Payback in Years

4.06

Operational CO_2 Savings

568 tCO_2/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 21% Savings through:

- Reduced Window to Wall Ratio
- Higher Thermal Performance Glass
- Wall Insulation
- Air Economizers
- Energy-Efficient Air Conditioning with Air Cooled Chiller
- Sensible Heat Recovery from Exhaust Air

Water – 25% Savings through:

- Low-Flow Faucets and Dual Flush Water Closet in bathrooms
- Water-Efficient Faucets for Kitchen Sinks

Materials – 26% Savings through:

- Clay Roofing Tiles on Steel Rafters

KESERWAN MEDICAL CENTER (LEBANON)

In-country certified project to replace related example once an EDGE project is certified.

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/

LIGHT INDUSTRY– TURKEY CASE STUDY

BUILDING DETAILS

Floors Above Ground	Shifts in a day (8 hour, 6 workday)	Gross Internal Area
1	1	15,000 m^2

Energy Measures – 22% Savings through:

- Reduced Window to Wall ratios
- Insulation of Roof and External Walls
- Variable Refrigerant Volume Cooling System
- Skylight to provide Daylight

Water – 43% Savings through:

- Dual Flush, Water-Efficient Urinals
- Aerators and Auto Shut-off, Efficient Faucets
- Water-Efficient Kitchen Faucets

Materials – 26% Savings through:

- Precast RC Planks and Joist System

PROJECTED PROJECT METRICS

Incremental Cost

$137,066

Utility Costs Savings
$5,087 / month

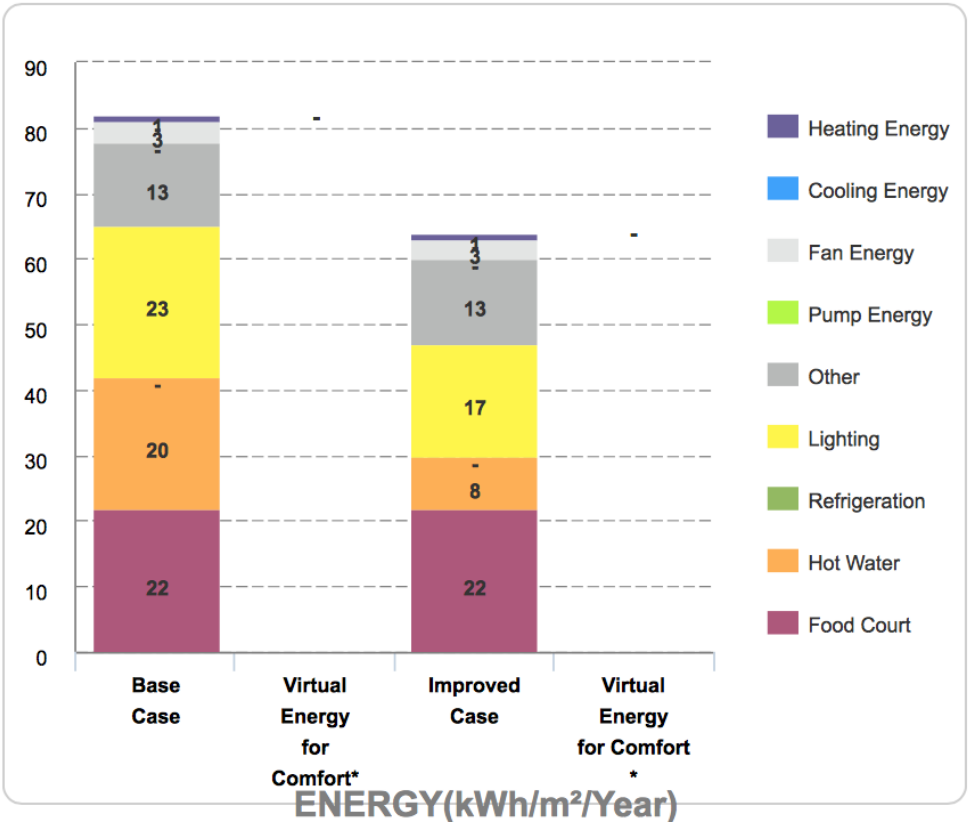
Payback in Years

2.25

Operational CO2 Savings

102 tCO_2/Year

22.09% **Meets EDGE energy standard**



Light Industry is a new sector in the EDGE application.
Relevant certified project to be included as soon as case study is published.



METHODOLOGY, NOTES, ACKNOWLEDGMENTS

IFC International Finance Corporation
WORLD BANK GROUP

Creating Markets, Creating Opportunities

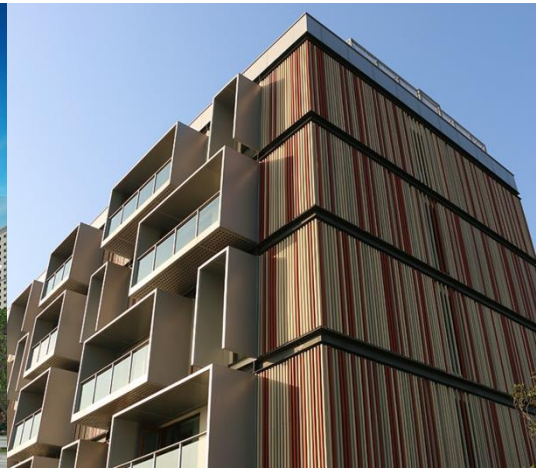
RESEARCH OBJECTIVE: MOST EFFECTIVE INTERVENTIONS TO REACH THE EDGE STANDARD

Reach 20% savings across the Energy, Water, and Materials categories in the most cost effective manner.

Analyzed focus countries in order to understand the environment and geographic impact on interventions.

Analyzed six sectors in each country – Homes, Hospitals, Hotels, Schools, Offices, and Retail – for best interventions unique to the sector and country in question in order to obtain EDGE certification.

By utilizing EDGE, we sought the most effective interventions in the passive building design phase that would in turn lead to the lowest possible payback and lowest cost for investors and builders.



OVERVIEW OF EDGE: A SOFTWARE, STANDARD, AND GREEN BUILDING CERTIFICATION SYSTEM

The EDGE application helps to determine the most cost-effective options for designing green within a local climate context. Free on-line application is available from www.edgebuildings.com.

A building has reached the EDGE standard when it achieves 20% reduction in each of the 3 categories: energy, water, and embedded energy in materials.

Third party certification verifies the resource efficiency savings so they can be credibly communicated between investors, developers, and buyers.

RESEARCH METHODOLOGY

The most cost effective interventions were determined through an iterative process using the EDGE application.

1

Determine top water measures that allow to pass the 20% minimum at the lowest Cost & Payback. Water was chosen first because it is tied to energy savings.

2

Once determined, proceed with next measure (energy) and repeat the process. Note: Water and energy measures may directly impact multiple categories.

3

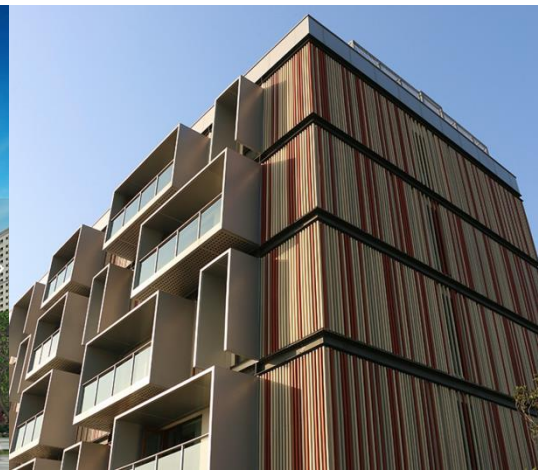
Proceed to test materials measures and review the final Incremental Cost & Payback in Years.

4 Repeat.

NOTES

- Case studies and certified projects are given for **illustrative purposes** only.
- Case studies included several assumptions in the building design, as per EDGE default values.
- Since case studies were chosen for the capital city only, the key takeaways for a country may be different in countries with varying climactic conditions across geographic regions.
- Education and Light Industrial are **new sectors** added to the EDGE application, have few certified buildings.
- Investors and developers of buildings should **use the dynamic EDGE software** with inputs specific to their respective building and climactic conditions, and then choose green interventions that **best address their specific needs**.
- IFC is **collecting additional data**, including operational savings of certified buildings – the operational data will be forthcoming, as will the ROI analysis for other regions.
- This research is part of ongoing series provided by IFC – in-depth country studies are available from: https://www.edgebuildings.com/marketing/research/





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Visit www.edgebuildings.com for more information