

CO2 EMISSION REDUCTION THROUGH GREEN BUILDING CONCEPTS

- 25 November 2014
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Real Estate Sector's Global Impact

Buildings are responsible for
40%
of world's global greenhouse gas emissions.

Buildings are responsible for
40%
of solid waste generation globally.

Buildings use
12%
of the world's water.

Air quality in buildings typically contains up to
5x (and at times greater than 100)
more pollutants than outdoor air.

Buildings utilize
1/3 of
the world's resources.

Energy Efficiency Index (KWH/m².yr)



IFC Study 2011
JICA Study 2009

Energy Saving for New Building

Conventional

500-700 Btuh/m²

Efficient

320-400 Btuh/m²

**High Performance
Building**

PASSIVE DESIGN :
Reduce Cooling Load

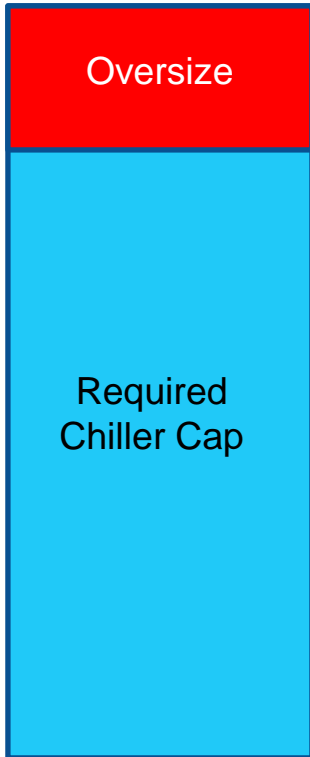
- Building Orientation
- OTTV < 35 W/m²
- Shading, SHGF, WWR,
- Natural lighting > 30%
- Interior : light color

ACTIVE DESIGN :
More Efficient System

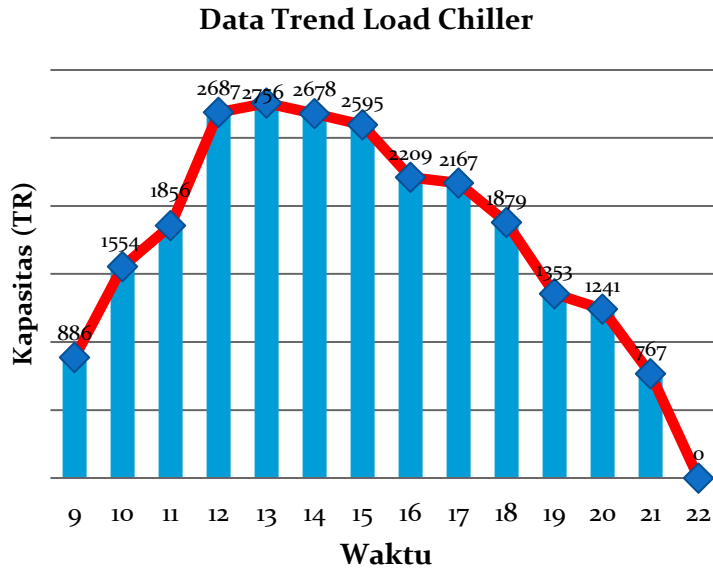
- Chiller plant < 0,60 KW/TR
- Low flow chilled water
- VSD on pumps & CT
- Efficient light (T5, LED)
- Lux & occupant sensor

Energy Saving for Existing Building

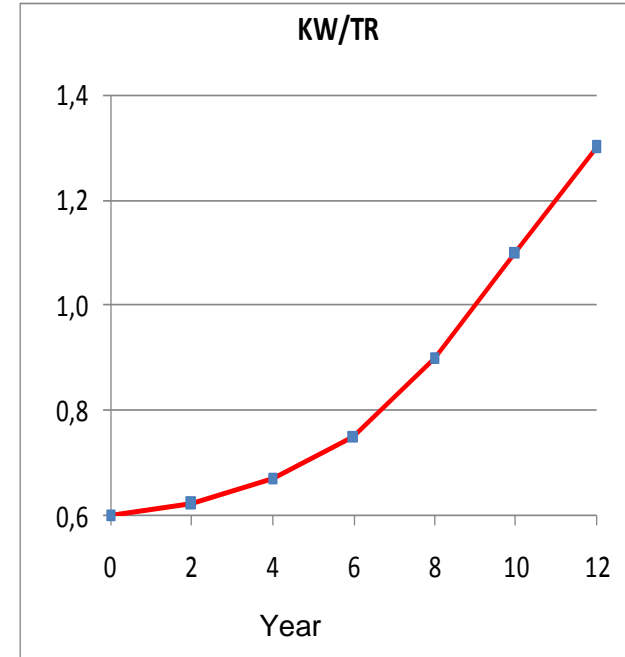
Rightsizing



Load Profile - Scheduling

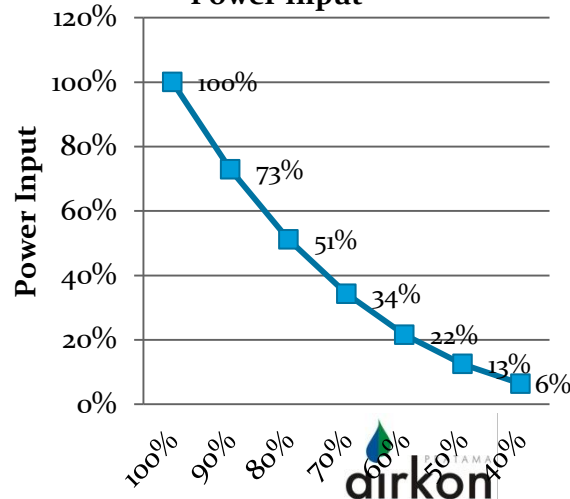


Upgrading Performance - Retrocomm



Providing w/ VSD

VSD : Comparison of Flow Rate vs Power Input



Replacement Chiller



Energy Efficiency from Green Building

No.	Nama Proyek	NLA (m2)	Energy Saving		CO2 Reduction (Ton)
			%	KWH/year	
1	New Building (Certified)	37,443	42.5%	3,979,621	3,546
2	New Building (DR)	260,768	36.9%	24,034,887	21,415
3	Existing Building	397,867	11.2%	14,179,986	12,634
TOTAL		696,078	24.2%	42,194,494	37,595



What is “Excellence in Design for Greater Efficiencies?”



An Assessment Tool + Rating System

+

ENERGY

↓

20%

WATER

↓

20%

MATERIALS

↓

20%

A Universal Standard

+



A Certification System

Access : www.ifc.org/edge



Ciputra Homes and retail development, Indonesia



RESULTS	Final Energy Use	901 kWh/Month	Operational CO2 Savings	2.4 tCO2/year	Base case utility costs	81.4 \$/month
	Final Water Use	20.8 m3/Month	Embodied Energy Savings	- MJ	Utility costs reduction	15.6 \$/month

Energy Efficiency Measures

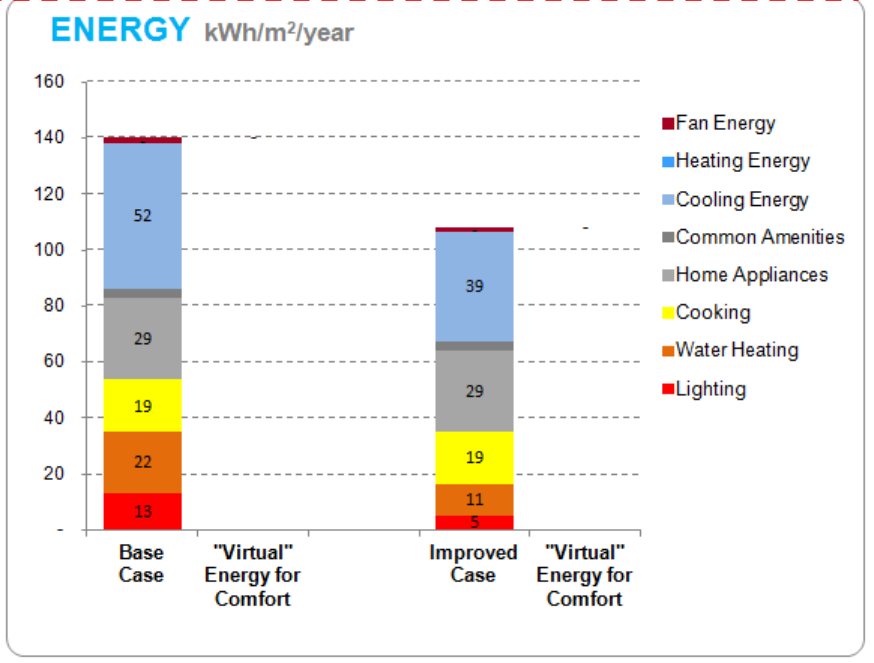
Select option from the list below

- EM01 Reflective Paint/Tiles for Roof
- EM02 Reflective Paint for External Wall
- EM03 External Shading Devices with HSA or VSA of 70 degrees
- EM04 Insulation of Roof Surface
- EM05 Insulation of External Wall
- EM06 Single Low-E, Solar Control glass

Edit default values, if req.	
U Value [W/m2 K]	3.00
SHGC	0.45
- EM07 Double Low-E, Solar Control glass

Edit default values, if req.	
U Value [W/m2 K]	1.95
SHGC	0.28
- EM08 Design Cross ventilation (Living spaces with opening on >2 orientations)
- EM09 Install Ceiling Fans in all habitable rooms
- EM10 Install efficient (VRV/VRF) Cooling (< 0.34 kWh/kWh) 0.29
- EM11 Solar Water Heaters - User to enter % value of total heating requirement 50%
- EM12 High efficiency gas boiler for Space Heating @ >80% Eff. User to enter % 80%
- EM13 High efficiency gas boiler for hot water heating @ >80% Eff. User to enter % 80%
- EM14 Low energy [CFL/LED/T5] Light Fixtures for all Living Spaces
- EM15 Low energy [CFL/LED/T5] Light Fixtures for Corridors & Outdoor Common area
- EM16 Automatic Controls for all Corridors & Outdoor Lighting
- EM17 Solar Photovoltaics to meet of annual electricity use - User to enter % 50%

22.9% ENERGY SAVING **Meets EDGE energy standard**



Scenario for fighting the gobal warming

- BAU : Business As Usual → no action, energy consumption grow without any concern to reduce
- 6DS :
 - Vision to limit the global average temperature rise to no more than 6° C in 2050
- 2DS :
 - Vision to limit the global average temperature rise to no more than 2° C in 2050
 - Gives a reduction of CO₂ emission to halve in the 2050

Building Trend for future



Green Building



Current Building



Traditional Building



High Performance Building



Healthy Building



Near Zero Energy
Bldg



Zero Carbon Bldg

Countries with Zero Target for Building Codes

- **Denmark:** all new buildings must be energy **strict** reductions of consumption
- **France:** all public buildings in 2020
- **UK:** commercial / public buildings in 2018/19
- **European Union:** all building codes must be close to zero in 2020
- **California :** commercial building in 2030



Methodology for Calculation of CO2 Reduction in Building Sector

Data Collection

EE Approach

EE Achievement

Carbon Reduction

Building Stock

- New Building
- Exist Building

- House
- Apartment
- Office
- Hotel
- Mall
- Hospital

Green Building Approach

Penetration Rate

EDGE Approach

Penetration Rate

Certified Green Building

Energy Saving Achievement – 30%

Certified EDGE

Energy Saving Achievement – 20%

CO2 Emission Reduction

B.A.U.

Regulator Involvement

NUMBER OF NEW APARTMENT - JAKARTA

APARTMENT

Market Potential Assumptions	Projected Number of New Buildings	Average floor area perbuilding	Projected Floor Area of New Buildings (sqm)	Energy Intensity Baseline (kwh/sqm/year)	Energy consumption BAU (kwh)
2015	45	16,000	720,000	200	144,000,000
2016	22	16,000	352,000	200	70,400,000
2017	18	16,000	288,000	200	57,600,000
2018	15	16,000	240,000	200	48,000,000
2019	15	16,000	240,000	200	48,000,000
2020	15	16,000	240,000	200	48,000,000
2021	15	16,000	240,000	200	48,000,000
Total	145		2,320,000		464,000,000

NOTES :

- Data from AMPRI, REI etc
- Only for high class of apartment
- Excluded :
 - Ordinary high rise residence (Rusunawa)
 - Gap Housing
- Only Jakarta area, role of local government

PROJECTED NUMBER OF NEW BUILDING - JAKARTA

Market Potential Assumptions	Apartment	Office	Hotel	Mall	Hospital
2015	45	19	10	10	9
2016	22	20	11	11	10
2017	18	22	12	12	11
2018	15	24	13	13	12
2019	15	26	14	14	13
2020	15	28	15	15	14
2021	15	30	16	16	15
Total	145	169	1	89	1

EE ANALYSIS FOR ALL NEW BUILDING from GB – JAKARTA -1)

SAVINGS POTENTIAL FROM GB CERTIFICATION with B.A.U. - JAKARTA 2015-2021

Market Potential Assumptions	Projected Number of New Buildings	Average floor area perbuilding	Energy Intensity Baseline (kwh/sqm/year)	Penetration Rate to GB	Projected Number of Buildings to GB	Floor area in certified to GB (sqm)	Energy consumption BAU (kwh)	Energy saving (%) contributed by GB CODE	Energy Consumption after saving (kwh)	Energy Saving from GB (kwh)
Apartment	145	16,000	200	5.5%	8	128,000	25,600,000	30%	17,920,000	7,680,000
Office	169	20,000	240	16.6%	28	560,000	134,400,000	30%	94,080,000	40,320,000
Hotel	89	10,000	293	16.9%	15	150,000	43,950,000	30%	30,765,000	13,185,000
Mall	44	40,000	297	24.7%	11	440,000	130,680,000	30%	91,476,000	39,204,000
Hospital	62	10,000	270	22.5%	14	140,000	37,800,000	30%	26,460,000	11,340,000
Total	510			14.9%	76	1,418,000	372,430,000		260,701,000	111,729,000

SAVINGS POTENTIAL FROM GB CERTIFICATION with REGULATOR INVOLVEMENT - JAKARTA 2015-2021

Market Potential Assumptions	Projected Number of New Buildings	Average floor area perbuilding	Energy Intensity Baseline (kwh/sqm/year)	Penetration Rate tgo GB	Projected Number of Buildings to GB	Floor area in certified to GB (sqm)	Energy consumption BAU (kwh)	Energy saving (%) contributed by GB CODE	Energy Consumption after saving (kwh)	Energy Saving from GB (kwh)
Apartment	145	16,000	200	13.1%	19	304,000	60,800,000	30%	42,560,000	18,240,000
Office	169	20,000	240	29.0%	49	980,000	235,200,000	30%	164,640,000	70,560,000
Hotel	89	10,000	293	24.7%	22	220,000	64,460,000	30%	45,122,000	19,338,000
Mall	89	40,000	297	41.6%	37	1,480,000	439,560,000	30%	307,692,000	131,868,000
Hospital	82	10,000	270	48.8%	40	400,000	108,000,000	30%	75,600,000	32,400,000
Total	574			29.1%	167	3,384,000	908,020,000		635,614,000	272,406,000

EE ANALYSIS FOR ALL NEW BUILDING from GB – JAKARTA -2)

SAVINGS POTENTIAL FROM GB CERTIFICATION with B.A.U. - JAKARTA 2015-2021

Market Potential Assumptions	Projected Number of New Buildings	Projected Floor Area (sqm) of New Buildings	Energy consumption BAU (kwh)	Penetration Rate tgo GB	Floor area in certified to GB (sqm)	Energy Saving from GB (kwh)	Energy saving (%) contributed by GB CODE
Apartment	145	2,320,000	464,000,000	5.5%	128,000	7,680,000	1.7%
Office	169	3,380,000	811,200,000	16.6%	560,000	40,320,000	5.0%
Hotel	89	889,474	260,615,789	16.9%	150,000	13,185,000	5.1%
Mall	44	1,778,947	528,347,368	24.7%	440,000	39,204,000	7.4%
Hospital	62	622,632	168,110,526	22.5%	140,000	11,340,000	6.7%
Total	510	8,991,053	2,232,273,684	14.9%	1,418,000	111,729,000	5.0%

SAVINGS POTENTIAL FROM GB CERTIFICATION with REGULATOR INVOLVEMENT - JAKARTA 2015-2021

Market Potential Assumptions	Projected Number of New Buildings	Projected Floor Area (sqm) of New Buildings	Energy consumption BAU (kwh)	Penetration Rate tgo GB	Floor area in certified to GB (sqm)	Energy Saving from GB (kwh)	Energy saving (%) contributed by GB CODE
Apartment	145	2,320,000	464,000,000	13.1%	304,000	18,240,000	3.9%
Office	169	3,380,000	811,200,000	29.0%	980,000	70,560,000	8.7%
Hotel	89	889,474	260,615,789	24.7%	220,000	19,338,000	7.4%
Mall	89	3,557,895	1,056,694,737	41.6%	1,480,000	131,868,000	12.5%
Hospital	82	819,474	221,257,895	48.8%	400,000	32,400,000	14.6%
Total	574	10,966,842	2,813,768,421	29.1%	3,384,000	272,406,000	9.7%

EE ANALYSIS FOR ALL NEW BUILDING from EDGE – JAKARTA -1)

SAVINGS POTENTIAL FROM EDGE with B.A.U. - JAKARTA 2015 - 2021

Market Potential Assumptions	Projected Number of New Buildings	Average floor area perbuilding	Energy Intensity Baseline (kwh/sqm/year)	Penetration Rate to EDGE	Projected Number of Buildings to EDGE	Floor area in certified to EDGE (sqm)	Energy consumption BAU (kwh)	Energy saving (%) contributed by EDGE	Energy Consumption after saving (kwh)	Energy Saving from EDGE (kwh)
Apartment	145	16000	200	17.9%	26	416,000	83,200,000	20%	66,560,000	16,640,000
Office	169	20000	240	17.8%	30	600,000	139,200,000	17%	115,200,000	24,000,000
Hotel	89	10000	293	20.2%	18	180,000	52,740,000	20%	42,192,000	10,548,000
Mall	44	40000	297	0.0%	0	0	0	20%	0	0
Hospital	62	10000	270	0.0%	0	0	0	20%	0	0
Total	510			14.5%	74	1,196,000	275,140,000	18.6%	223,952,000	51,188,000

SAVINGS POTENTIAL FROM EDGE CERTIFICATION with REGULATOR INVOLVEMENT - JAKARTA 2015-2021

Market Potential Assumptions	Projected Number of New Buildings	Average floor area perbuilding	Energy Intensity Baseline (kwh/sqm/year)	Penetration Rate to EDGE	Projected Number of Buildings to EDGE	Floor area in certified to EDGE (sqm)	Energy consumption BAU (kwh)	Energy saving (%) contributed by EDGE	Energy Consumption after saving (kwh)	Energy Saving from EDGE (kwh)
Apartment	145	16,000	200	28.3%	41	656,000	131,200,000	20.0%	104,960,000	26,240,000
Office	169	20,000	240	33.7%	57	1,140,000	262,400,000	16.6%	218,880,000	43,520,000
Hotel	89	10,000	293	34.9%	31	310,000	90,830,000	20.0%	72,664,000	18,166,000
Mall	89	40,000	297	0.0%	0	0	0	20.0%	0	0
Hospital	82	10,000	270	0.0%	0	0	0	20.0%	0	0
Total	574			22.5%	129	2,106,000	484,430,000	18.2%	396,504,000	87,926,000

EE ANALYSIS FOR ALL NEW BUILDING from EDGE – JAKARTA -2)

SAVINGS POTENTIAL FROM EDGE with B.A.U. - JAKARTA 2015 - 2021

Market Potential Assumptions	Projected Number of New Buildings	Projected Floor Area (sqm) of New Buildings	Energy consumption BAU (kwh)	Penetration Rate tgo GB	Floor area in certified to GB (sqm)	Energy Saving from GB (kwh)	Energy saving (%) contributed by GB CODE
Apartment	145	2,320,000	464,000,000	17.9%	416,000	16,640,000	3.6%
Office	169	3,380,000	811,200,000	17.8%	600,000	24,000,000	3.0%
Hotel	89	889,474	260,615,789	20.2%	180,000	10,548,000	4.0%
Mall	44	1,778,947	528,347,368	0.0%	-	0	0.0%
Hospital	62	622,632	168,110,526	0.0%	-	0	0.0%
Total	510	8,991,053	2,232,273,684	14.5%	1,196,000	51,188,000	2.3%

SAVINGS POTENTIAL FROM EDGE CERTIFICATION with REGULATOR INVOLVEMENT - JAKARTA 2015-2021

Market Potential Assumptions	Projected Number of New Buildings	Projected Floor Area (sqm) of New Buildings	Energy consumption BAU (kwh)	Penetration Rate tgo GB	Floor area in certified to GB (sqm)	Energy Saving from GB (kwh)	Energy saving (%) contributed by GB CODE
Apartment	145	2,320,000	464,000,000	28.3%	656,000	26,240,000	5.7%
Office	169	3,380,000	811,200,000	33.7%	1,140,000	43,520,000	5.4%
Hotel	89	889,474	260,615,789	34.9%	310,000	18,166,000	7.0%
Mall	89	3,557,895	1,056,694,737	0.0%	-	0	0.0%
Hospital	82	819,474	221,257,895	0.0%	-	0	0.0%
Total	574	10,966,842	2,813,768,421	22.5%	2,106,000	87,926,000	3.1%

• No of Buildings :

- 2%-5% New Construction
- 98 – 95%% Existing Building

• 2050 :

- 75-80% existing building on 2050 already exist now

Existing Building

POTENTIAL EXISTING BUILDING :

- Existing Building Stock is huge
- Inefficient building compare with neighbor country

EE ANALYSIS FOR ALL EXISTING BUILDING from GB – JAKARTA

SAVINGS POTENTIAL FROM GB CERTIFICATION with BAU - JAKARTA 2015-2021

Market Potential Assumptions	Projected Floor Area (sqm) of Existing Buildings	Energy consumption BAU (kwh)	Penetration Rate tgo GB	Floor area in certified to GB (sqm)	Energy Saving from GB (kwh)	Energy saving (%) contributed by GB CODE
Apartment	46,400,000	9,280,000,000	0.5%	240,000	5,376,000	0.1%
Office	67,600,000	16,224,000,000	11.6%	7,820,000	210,201,600	1.3%
Hotel	17,789,474	5,212,315,789	11.9%	2,110,526	69,259,032	1.3%
Mall	35,578,947	10,566,947,368	19.7%	7,021,053	233,548,295	2.2%
Hospital	12,452,632	3,362,210,526	17.5%	2,177,368	65,843,621	2.0%
Total	179,821,053	44,645,473,684	9.9%	19,368,947	584,228,547	1.3%

SAVINGS POTENTIAL FROM GB CERTIFICATION with REGULATOR INVOLVEMENT - JAKARTA 2015-2021

Market Potential Assumptions	Projected Floor Area (sqm) of Existing Buildings	Energy consumption BAU (kwh)	Penetration Rate tgo GB	Floor area in certified to GB (sqm)	Energy Saving from GB (kwh)	Energy saving (%) contributed by GB CODE
Apartment	46,400,000	9,280,000,000	8.1%	3,760,000	84,224,000	0.9%
Office	67,600,000	16,224,000,000	24.0%	16,220,000	435,993,600	2.7%
Hotel	17,789,474	5,212,315,789	19.7%	3,510,526	115,201,432	2.2%
Mall	71,157,895	21,133,894,737	36.6%	26,042,105	866,264,589	4.1%
Hospital	16,389,474	4,425,157,895	43.8%	7,180,526	217,139,116	4.9%
Total	219,336,842	56,275,368,421	24.1%	56,713,158	1,718,822,737	3.1%

EE ANALYSIS FOR ALL EXISTING BUILDING from EDGE – JAKARTA

SAVINGS POTENTIAL FROM EDGE CERTIFICATION with BAU - JAKARTA 2015-2021

Market Potential Assumptions	Projected Floor Area (sqm) of Existing Buildings	Energy consumption BAU (kwh)	Penetration Rate to EDGE	Floor area in certified to EDGE (sqm)	Energy Saving from EDGE (kwh)	Energy Saving from EDGE (%)
Apartment	46,400,000	9,280,000,000	12.9%	6,000,000	134,400,000	1.4%
Office	67,600,000	16,224,000,000	12.8%	8,620,000	231,705,600	1.4%
Hotel	17,789,474	5,212,315,789	15.2%	2,710,526	88,948,632	1.7%
Mall	35,578,947	10,566,947,368	0.0%	-	0	0.0%
Hospital	12,452,632	3,362,210,526	0.0%	-	0	0.0%
Total	179,821,053	44,645,473,684	9.6%	17,330,526	455,054,232	1.0%

SAVINGS POTENTIAL FROM EDGE CERTIFICATION with REGULATOR INVOLVEMENT - JAKARTA 2015-2021

Market Potential Assumptions	Projected Floor Area (sqm) of Existing Buildings	Energy consumption BAU (kwh)	Penetration Rate to EDGE	Floor area in certified to EDGE (sqm)	Energy Saving from EDGE (kwh)	Energy Saving from EDGE (%)
Apartment	46,400,000	9,280,000,000	23.3%	10,800,000	241,920,000	2.6%
Office	67,600,000	16,224,000,000	28.7%	19,420,000	522,009,600	3.2%
Hotel	17,789,474	5,212,315,789	29.9%	5,310,526	174,270,232	3.3%
Mall	71,157,895	21,133,894,737	0.0%	-	0	0.0%
Hospital	16,389,474	4,425,157,895	0.0%	-	0	0.0%
Total	219,336,842	56,275,368,421	16.2%	35,530,526	938,199,832	1.7%

EE and CO2 EMISSION REDUCTION – NEW & EXISTING BUILDING

EE from NEW & EXISTING BUILDING - BAU SCEANRIO

Market Potential Assumptions	Energy consumption BAU (kwh)	Energy Saving from both GB & EDGE (kwh)	Energy Saving (%)	GHG savings (ton CO2)
Apartment	9,744,000,000	13,056,000	0.1%	11,632,896
Office	17,035,200,000	250,521,600	1.5%	223,214,746
Hotel	5,472,931,579	82,444,032	1.5%	73,457,632
Mall	22,190,589,474	272,752,295	1.2%	243,022,295
Hospital	4,646,415,789	77,183,621	1.7%	68,770,606
Total	59,089,136,842	695,957,547	1.2%	620,098,175

EE from NEW & EXISTING BUILDING - REG INV SCEANRIO

Market Potential Assumptions	Energy consumption BAU (kwh)	Energy Saving from both GB & EDGE (kwh)	Energy Saving (%)	GHG savings (ton CO2)
Apartment	9,744,000,000	102,464,000	1.1%	91,295,424
Office	17,035,200,000	506,553,600	3.0%	451,339,258
Hotel	5,472,931,579	134,539,432	2.5%	119,874,634
Mall	22,190,589,474	998,132,589	4.5%	889,336,137
Hospital	4,646,415,789	249,539,116	5.4%	222,339,352
Total	59,089,136,842	1,991,228,737	3.4%	1,774,184,805

Result of Analysis

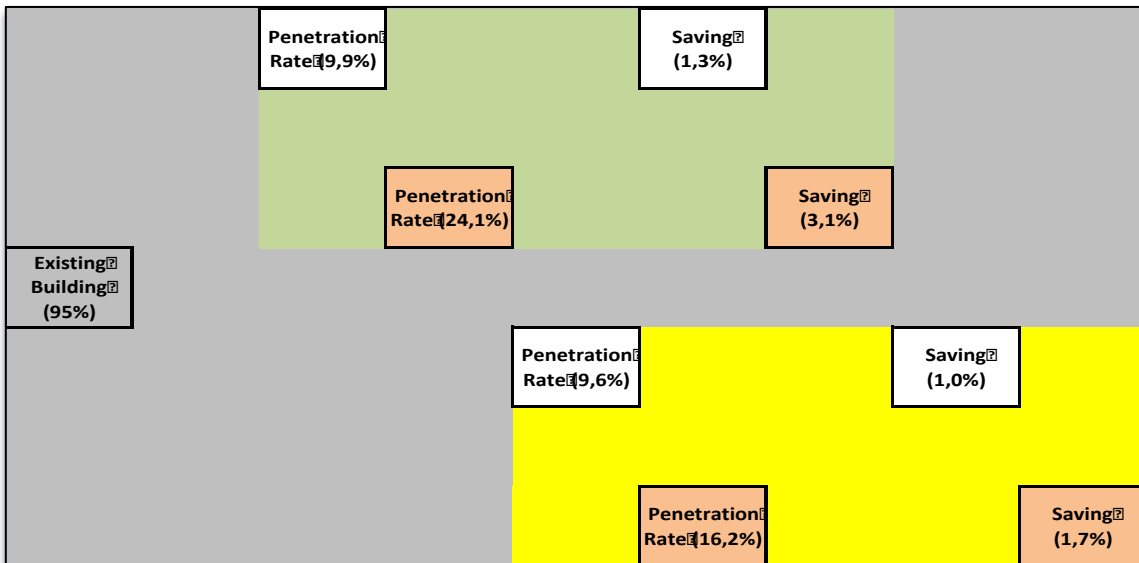
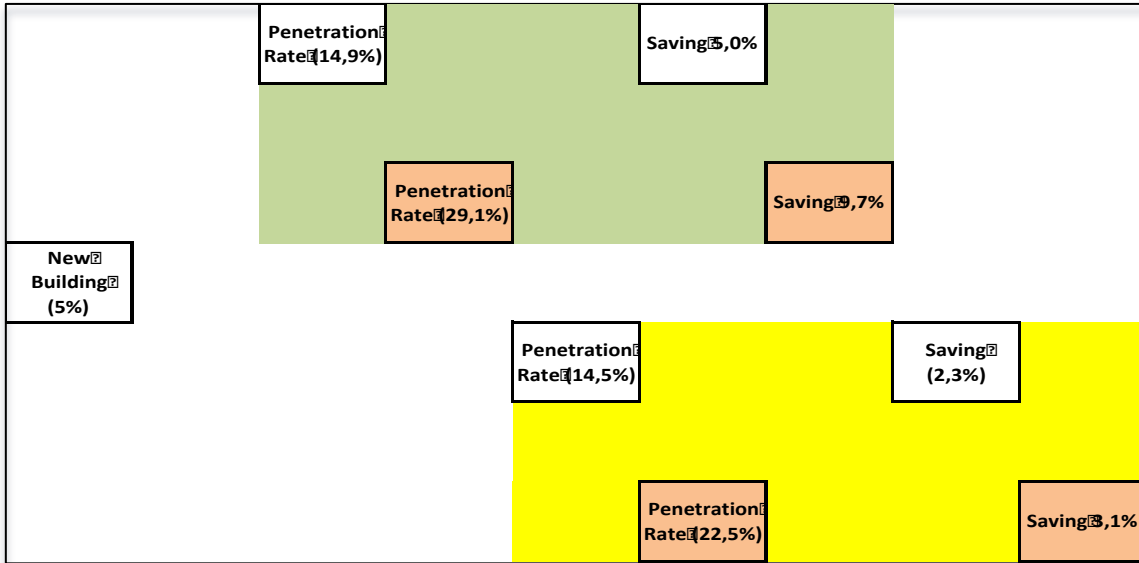
NOTES :

Green Building

EDGE Concepts

B.A.U.

Regulator Involvement



Energy Saving (1,2%)

Energy Saving (3,4%)

Total CO₂ Reduction 1.774.185 MT

Digital Meter Devices

Real Time Energy Dashboard

Engaging Building Occupants



Conclusions

The analysis only for high class building for a certain building type and only for Jakarta

Analysis for EE in Building Sector is complicated and a hard & big works and need involvement of all stake holders

Promotion to all building sector stakeholders is extremely required

Government should involve deeply in develop regulation.

Required Financial Scenario : soft loan & incentive

Coordination among Government is essential as Key Success Factor : Ministry of Public Works, Ministry of Energy and Ministry Environment

Capacity Building for all building professional & players

Monitoring & Tracking energy saving is very important for evaluation from time to time

THANK YOU

carbon footprint

