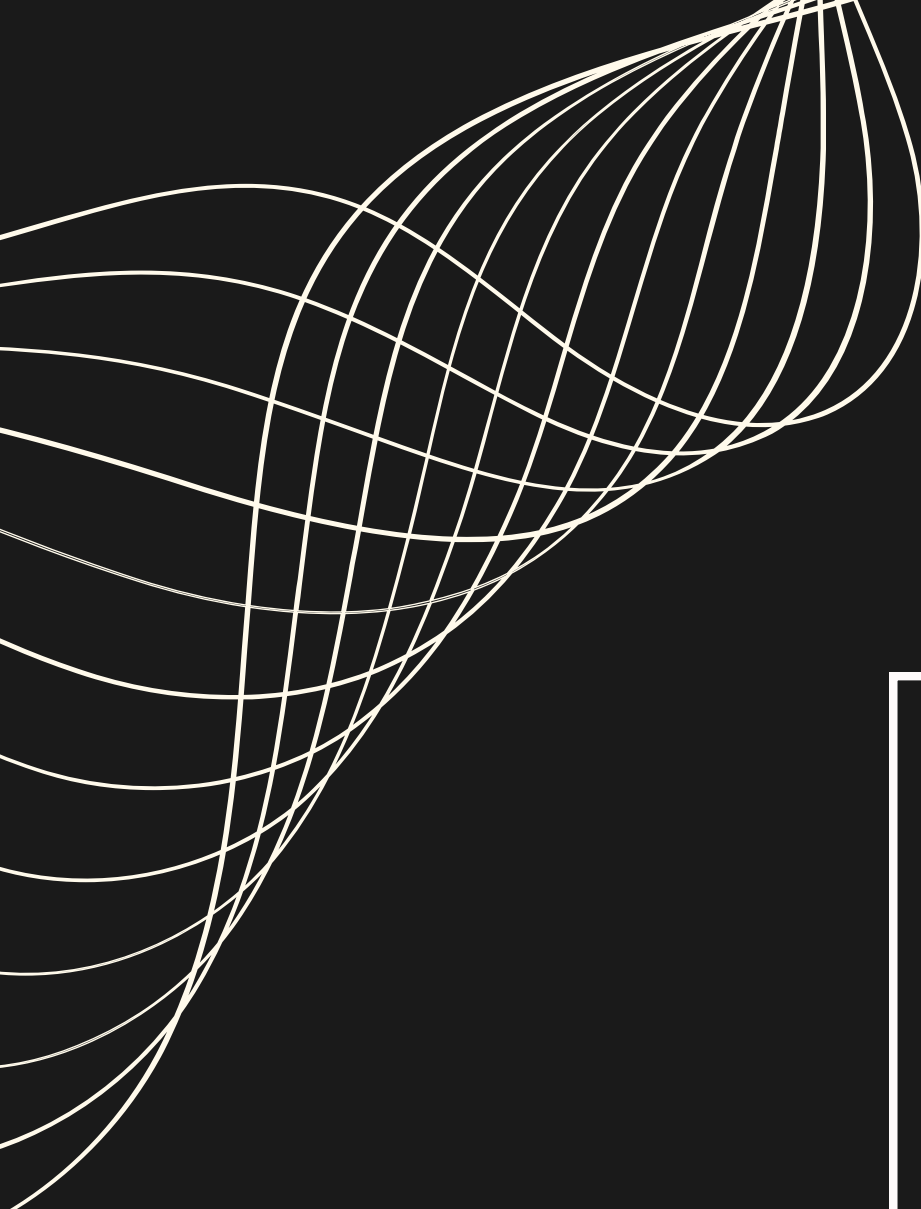




MODUL 6:

ARSITEKTUR HEMAT ENERGI

DIVA SYAFITRI AZWALIA
215060501111051

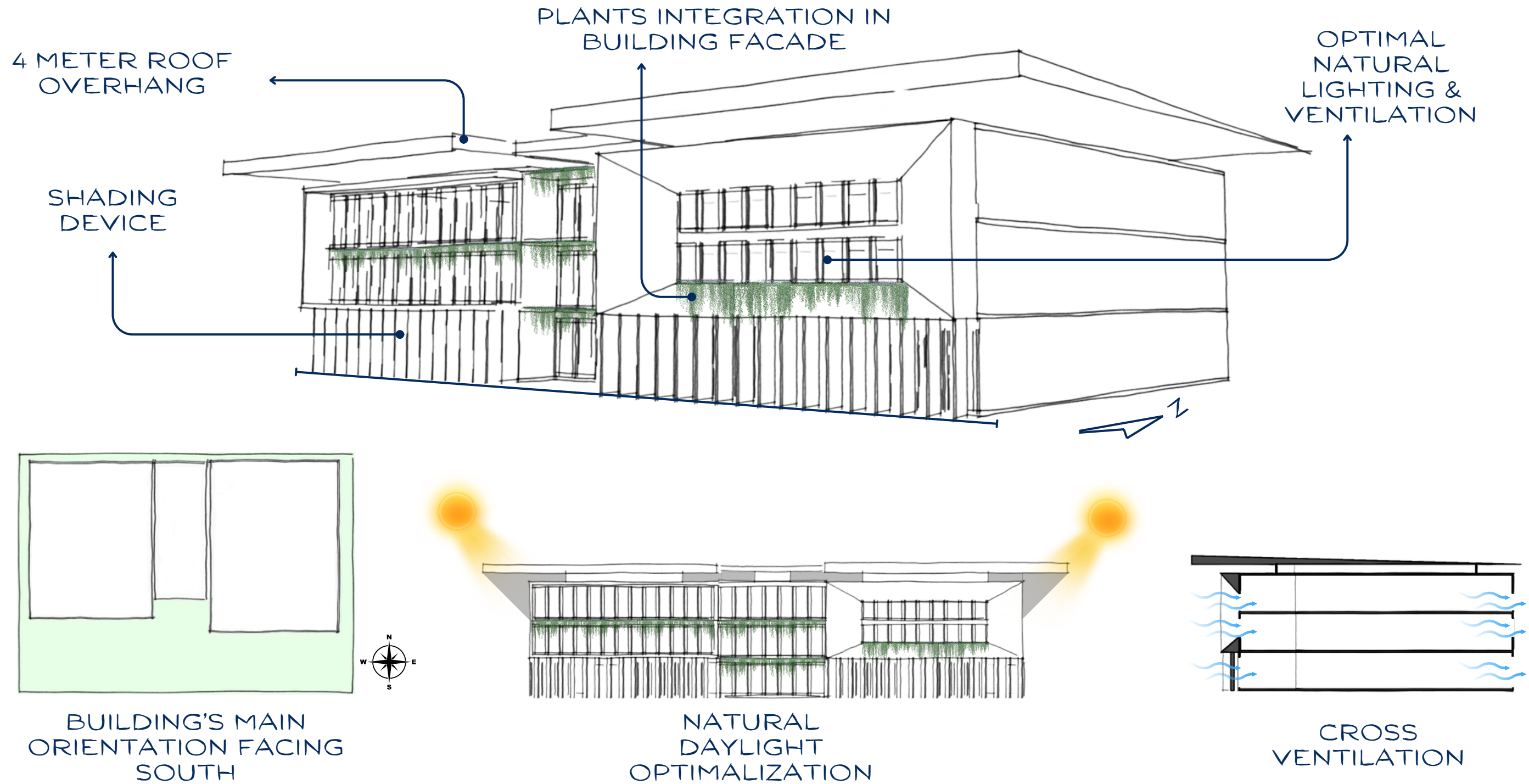


MODUL 6:
**FINAL DESIGN
EXERCISE**



1. | CONCEPTUAL DESIGN

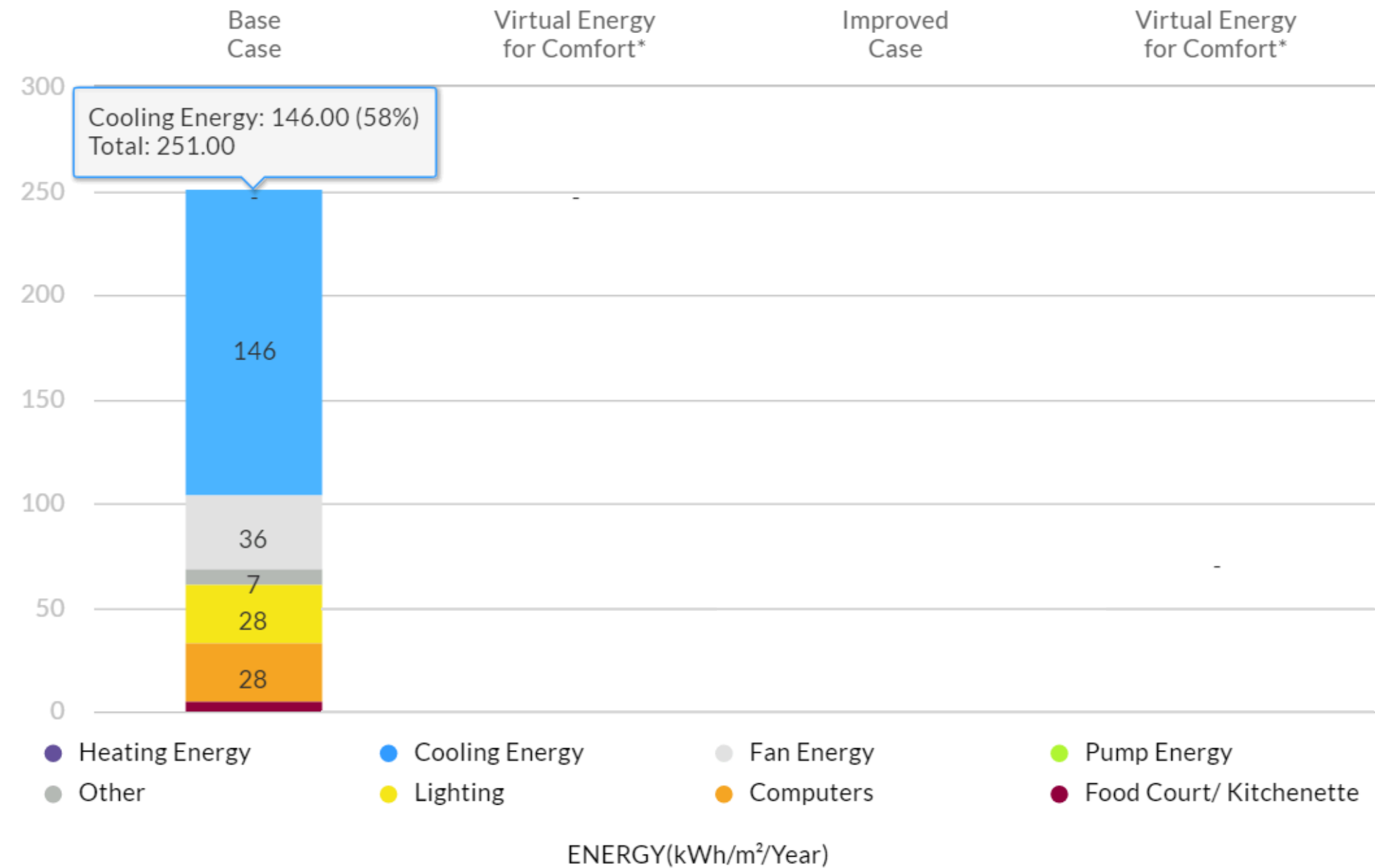
Total Subproject Floor Area 4,500.00 m ²	Final Energy Use 90,191.32 kWh/Month	Final Water Use 865.14 m ³ /Month	Base Case Utility Cost 147,160.65 Thousand Rp/Month	Utility Cost Reduction 5,881.00 Thousand Rp/Month	Incremental Cost -67,397.08 Thousand Rp
Payback in Years 0.00 Yrs.	Operational CO ₂ Savings 42.88 tCO ₂ /Year	Embodied Energy Savings 0.00 MJ/m ²	Energy Savings 48.81 MWh/Year	Water Savings 0.00 m ³ /Year	Carbon Emissions 950.80 tCO ₂ /Year



2. | EFFICIENCY MEASURE ADOPTED

ENERGY MEASURES

1. OFE05-ROOF INSULATION: U-VALUE 0.39
2. OFE08-HIGH THERMAL PERFORMANCE GLASS: U-VALUE 1.95 AND SHGC 0.28
3. OFE13-AIR CONDITIONING WITH WATER COOLED CHILLER
4. OFE24-ENERGY SAVING LIGHTBULBS-INDOOR
5. OFE26-LIGHTING CONTROLS FOR CORRIDOR & STAIRCASE
6. OFE27 - OFE28-OCCUPANCY SENSORS
7. OFE30-SOLAR PHOTOVOLTAICS - 30% OF TOTAL ENERGY USE (BASED ON AVAILABLE ROOF SPACE)

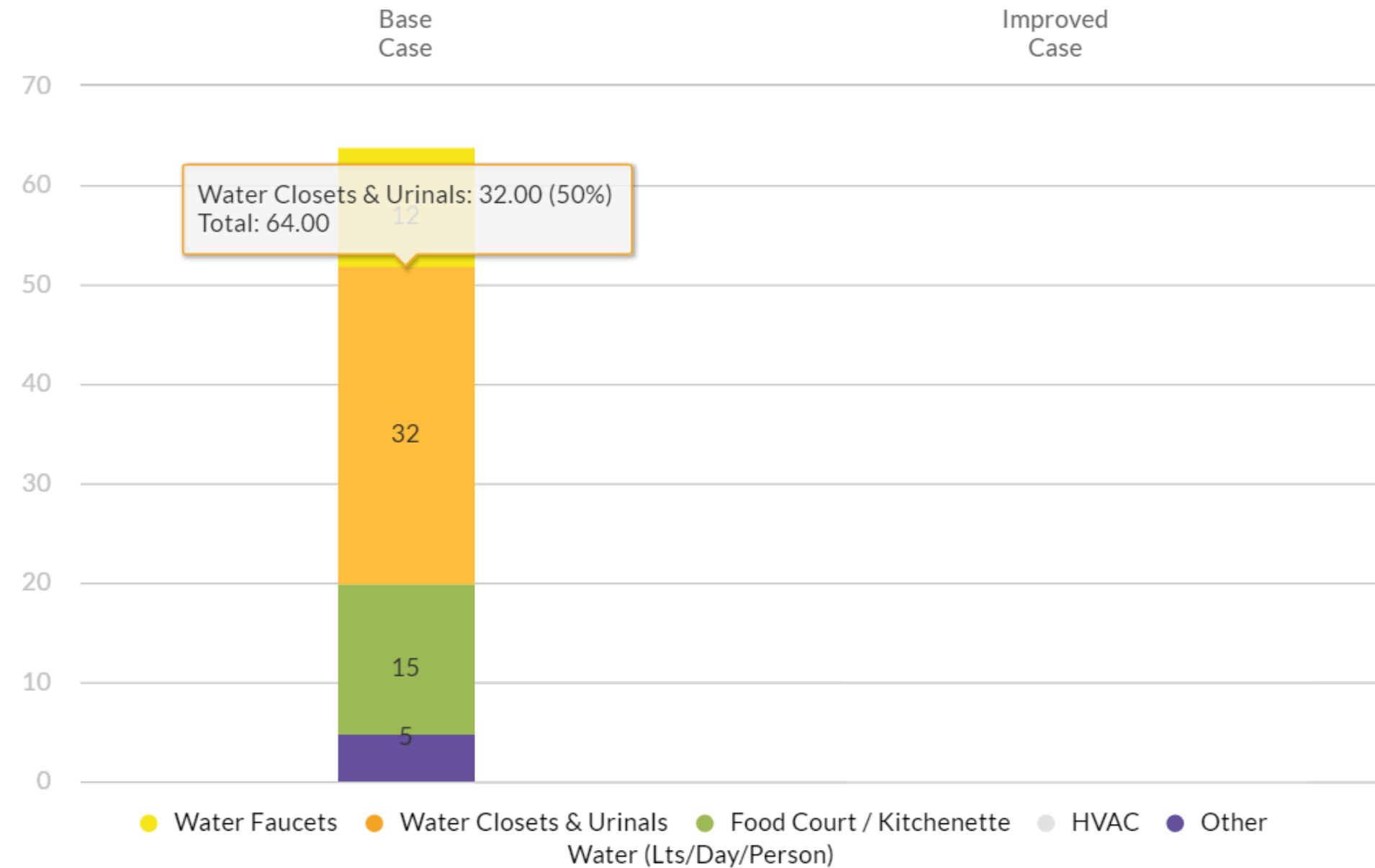


THE ENERGY MEASURES ADOPTED FOCUSES ON REDUCING ENERGY USED FOR COOLING AND LIGHTING, AS IT TAKES THE HIGHEST ENERGY CONSUMPTION ACCORDING TO THE GRAPH.

2. | EFFICIENCY MEASURE ADOPTED

WATER MEASURES

1. OFW01-LOW FLOW FAUCETS IN BATHROOMS
2. OFW02 DUAL FLUSH FOR WATER CLOSETS IN ALL BATHROOMS
3. OFW03-WATER EFFICIENT URINALS IN ALL OTHER BATHROOMS
4. OFW-06RAINWATER HARVESTING SYSTEM
5. OFW08 BLACK WATER TREATMENT AND RECYCLING SYSTEM

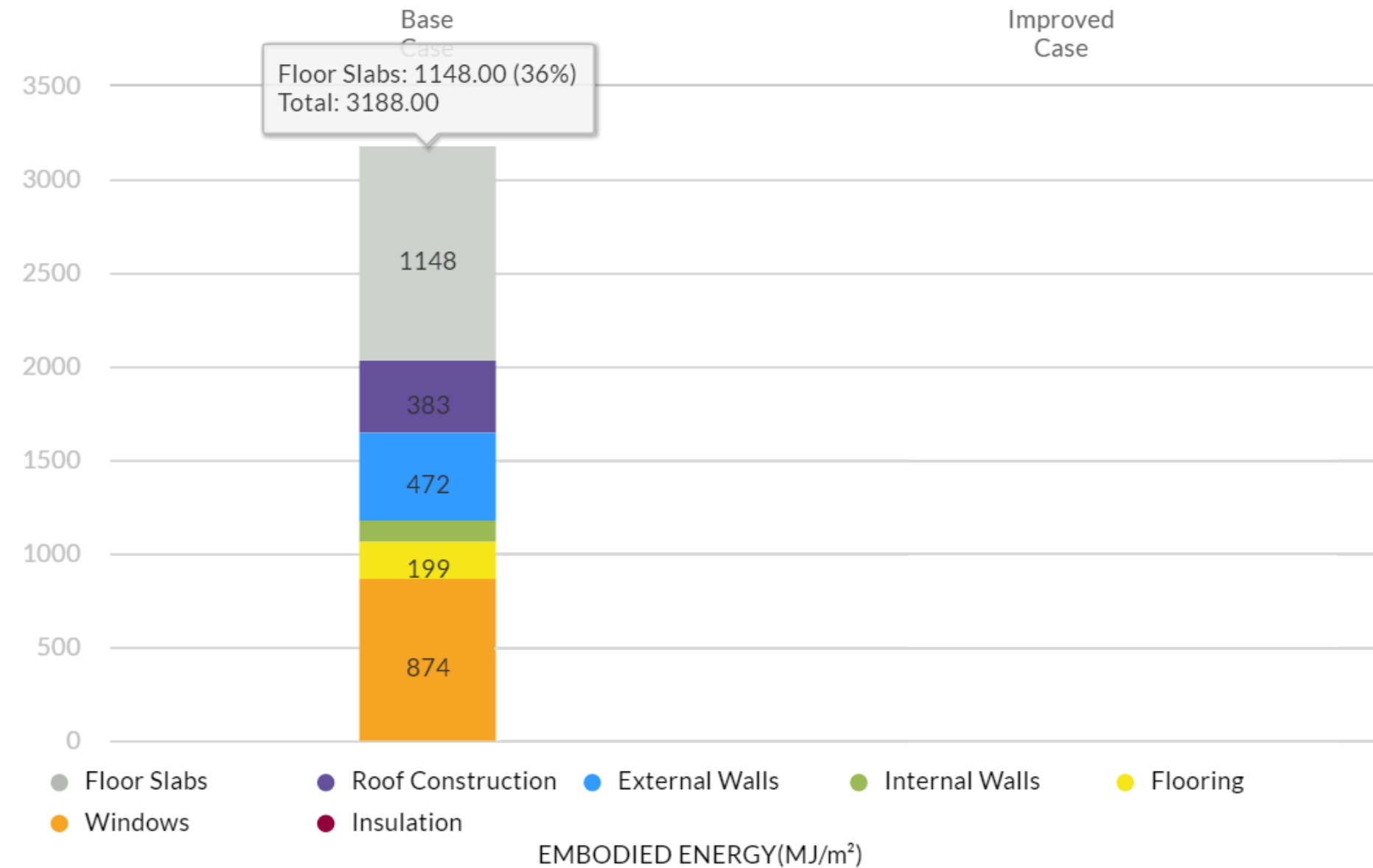


WATER MEASURES ADOPTED IN BUILDING FOCUSES ON REDUCING THE WATER CONSUMPTION IN BATHROOMS AND KITCHENS. CHOSEN WATER MEASURES ALSO RECYCLES WATER THROUGH RAINWATER HARVESTING AND BLACK WATER TREATMENT.

2. | EFFICIENCY MEASURE ADOPTED

MATERIAL SELECTION

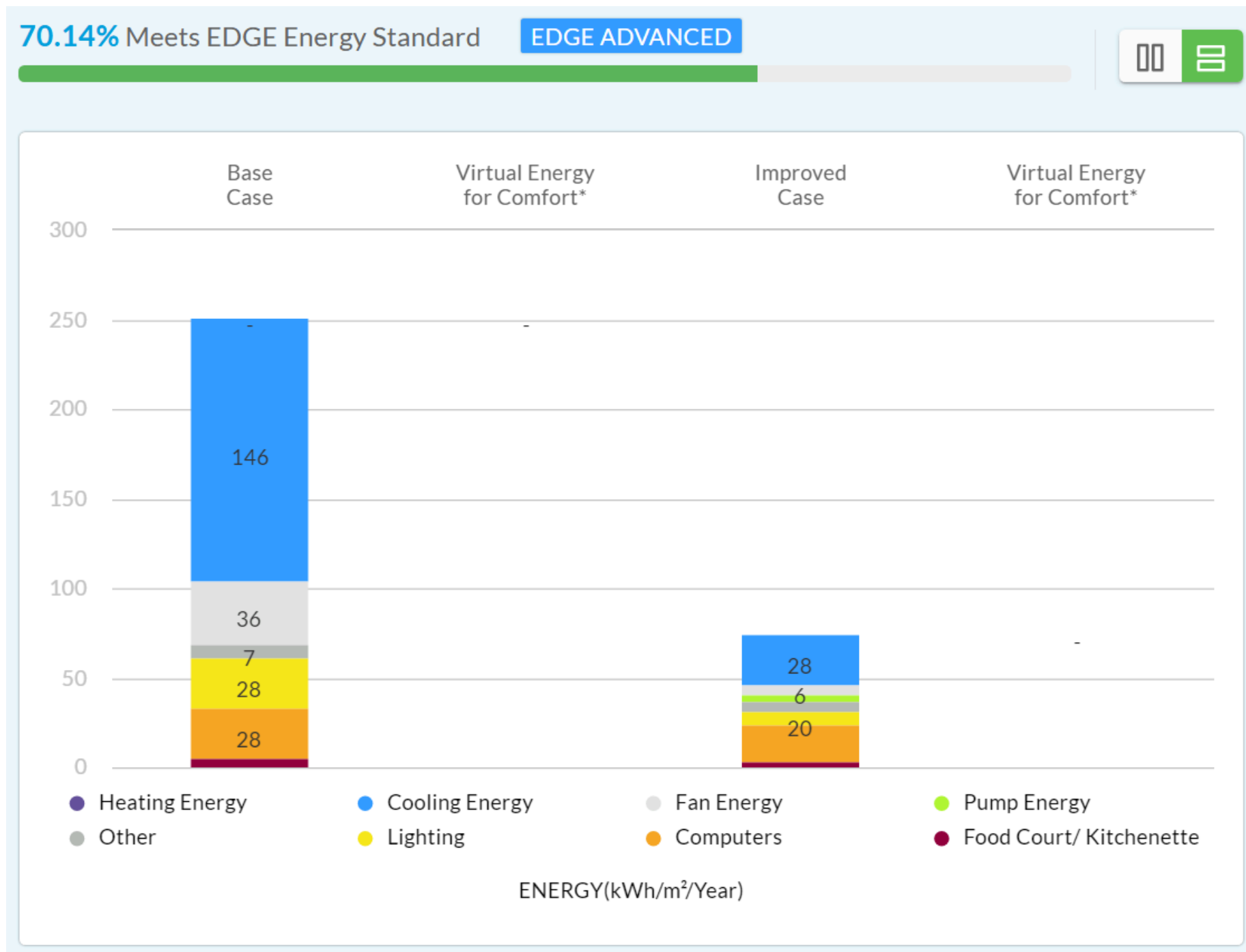
1. OFM01-FLOOR SLABS: IN-SITU WAFFLE CONCRETE SLAB
2. OFM02-ROOF CONSTRUCTION: IN-SITU REINFORCED CONCRETE SLAB
3. OFM03-EXTERNAL WALLS: COMPRESSED STABILIZED EARTH BLOCKS
4. OFM04-INTERNAL WALLS: COMMON BRICK WALL WITH PLASTER ON BOTH SIDES
5. OFM05-FLOORING: VINYL FLOORING
6. OFM06-WINDOW FRAMES: TIMBER
7. OFM08-ROOF INSULATION: AIR GAP <100 MM WIDE



THE CHOSEN MATERIALS ARE BASED ON WHICH MATERIALS CAN REDUCE EMBODIED ENERGY BEFORE, DURING AND AFTER CONSTRUCTION

3. | APPROACH TO ZERO CARBON

Total Subproject Floor Area 4,500.00 m ²	Final Energy Use 90,191.32 kWh/Month	Final Water Use 865.14 m ³ /Month	Base Case Utility Cost 147,160.65 Thousand Rp/Month	Utility Cost Reduction 5,881.00 Thousand Rp/Month	Incremental Cost -67,397.08 Thousand Rp
Total Subproject Floor Area 4,500.00 m ²	Final Energy Use 28,144.97 kWh/Month	Final Water Use 232.31 m ³ /Month	Base Case Utility Cost 147,160.65 Thousand Rp/Month	Utility Cost Reduction 103,546.73 Thousand Rp/Month	Incremental Cost 4,548,074.25 Thousand Rp



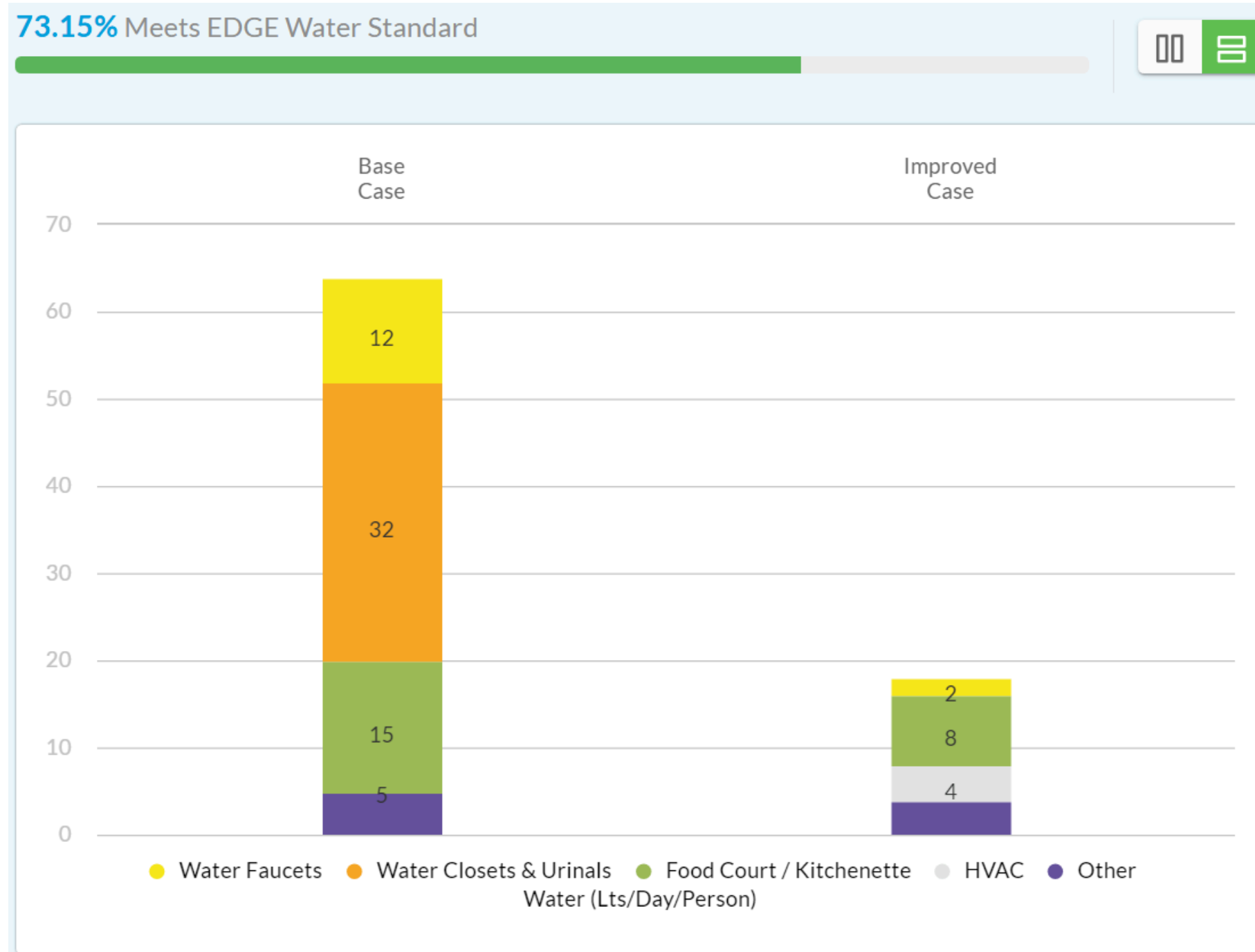
ENERGY SAVINGS

ADOPTING ENERGY MEASURES RESULTS IN THE DECREASE OF ENERGY CONSUMPTION BY 70.14% WHICH MEETS THE EDGE STANDARD.

THE ENERGY CONSUMPTION WENT FROM 90,191.32 KWH/MONTH TO 28,144.90 KWH/MONTH.

3. | APPROACH TO ZERO CARBON

Total Subproject Floor Area m ²	Final Energy Use kWh/Month	Final Water Use m ³ /Month	Base Case Utility Cost Thousand Rp/Month	Utility Cost Reduction Thousand Rp/Month	Incremental Cost Thousand Rp
4,500.00	90,191.32	865.14	147,160.65	5,881.00	-67,397.08
4,500.00	28,144.97	232.31	147,160.65	103,546.73	4,548,074.25



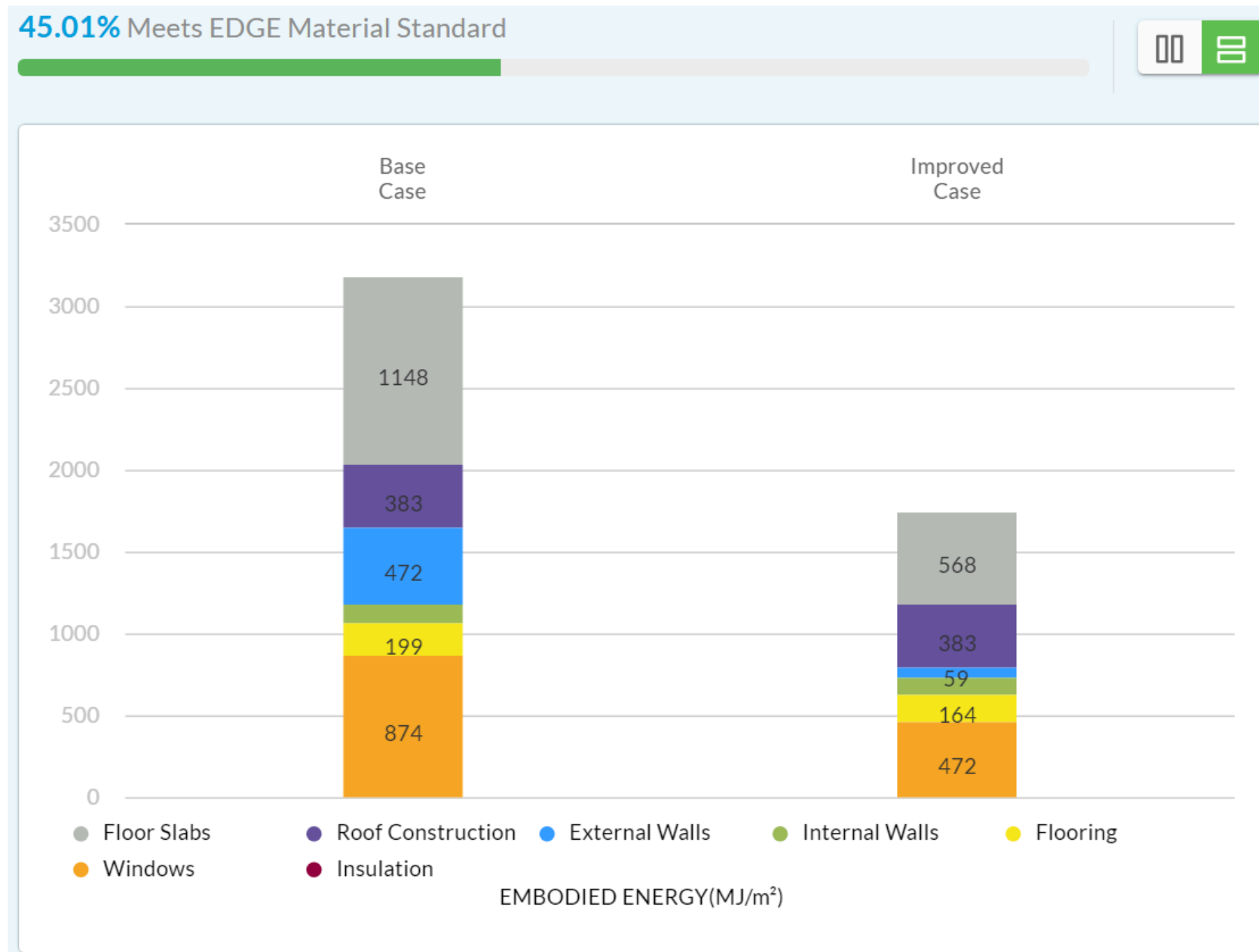
WATER SAVINGS

ADOPTING WATER MEASURES RESULTS IN THE DECREASE OF WATER USE BY 73.15% WHICH MEETS THE EDGE STANDARD.

THE WATER USE WENT FROM 865.14 M³/MONTH TO 232.31 M³/MONTH

3. | APPROACH TO ZERO CARBON

Payback in Years Yrs.	Operational CO ₂ Savings tCO ₂ /Year	Embodied Energy Savings MJ/m ²	Energy Savings MWh/Year	Water Savings m ³ /Year	Carbon Emissions tCO ₂ /Year
0.00	42.88	0.00	48.81	0.00	950.80
3.66	696.93	1,435.45	793.37	5,484.56	296.70



EMBODIED ENERGY SAVINGS

CHOOSING SPECIFIC MATERIALS REDUCED THE EMBODIED ENERGY NEEDED FOR CONSTRUCTION BBY 45.01% WHICH MEETS EDGE MATERIAL STANDARD.

THE EMBODIED ENERGY SAVINGS WENT FROM 0.00 MJ/M2 TO 1,435.45 MJ/M2.

3. | APPROACH TO ZERO CARBON

Total Subproject Floor Area 4,500.00 m ²	Final Energy Use 90,191.32 kWh/Month	Final Water Use 865.14 m ³ /Month	Base Case Utility Cost 147,160.65 Thousand Rp/Month	Utility Cost Reduction 5,881.00 Thousand Rp/Month	Incremental Cost -67,397.08 Thousand Rp
Total Subproject Floor Area 4,500.00 m ²	Final Energy Use 28,144.97 kWh/Month	Final Water Use 232.31 m ³ /Month	Base Case Utility Cost 147,160.65 Thousand Rp/Month	Utility Cost Reduction 103,546.73 Thousand Rp/Month	Incremental Cost 4,548,074.25 Thousand Rp

Payback in Years 0.00 Yrs.	Operational CO ₂ Savings 42.88 tCO ₂ /Year	Embodied Energy Savings 0.00 MJ/m ²	Energy Savings 48.81 MWh/Year	Water Savings 0.00 m ³ /Year	Carbon Emissions 950.80 tCO ₂ /Year
Payback in Years 3.66 Yrs.	Operational CO ₂ Savings 696.93 tCO ₂ /Year	Embodied Energy Savings 1,435.45 MJ/m ²	Energy Savings 793.37 MWh/Year	Water Savings 5,484.56 m ³ /Year	Carbon Emissions 296.70 tCO ₂ /Year

ADOPTING ENERGY & WATER SAVING MEASURES AS WELL AS CHOOSING SPECIFIC MATERIALS FOR THE BUILDING INCREASES THE ENERGY SAVINGS, WATER SAVINGS, EMBODIED ENERGY SAVINGS, UTILITY COST REDUCTION, AS WELL AS OPERATIONAL CO₂ SAVINGS. NOT ONLY IS THIS GOOD FOR ENVIRONMENT BUT ALSO A PROOF THAT USING ENERGY EFFICIENT MEASURES IS A GOOD INVESTMENT.