

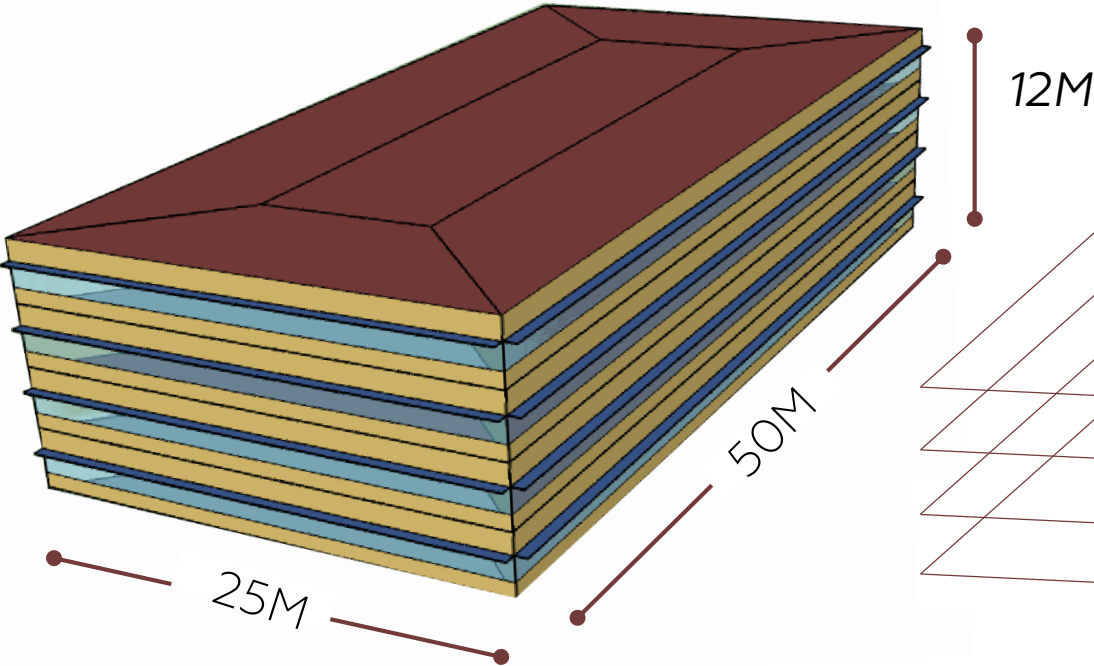
# TECHNICAL ENVIRONMENTAL SYSTEMS

## FINAL PROJECT PRESENTATION

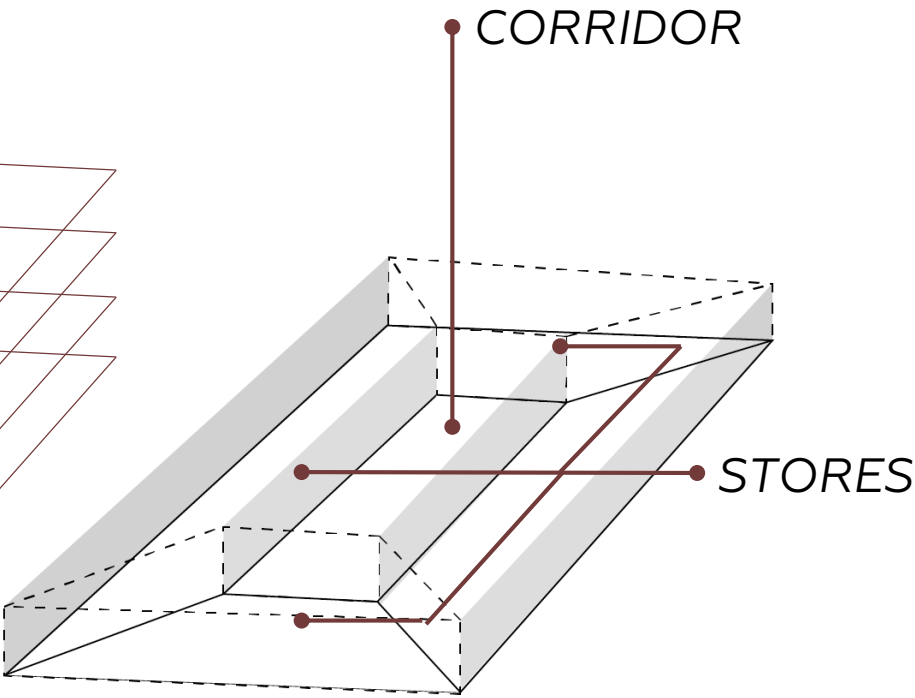
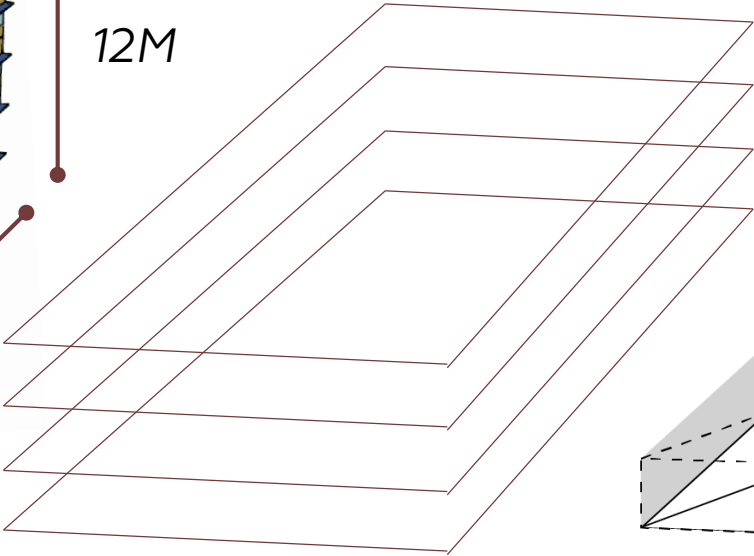
*SOFIA LOPEZ  
LIZET BONILLA  
RUBEN URIZA  
SHIBANI MANIMARAN*

# BUILDING DESCRIPTION

$A = 1250\text{M}^2$



4 STOREYS



# PIACENZA ITALY



Longitude: 11.5465

Latitude: 45.1286

Elevation: 61 m

Time Zone: 1

Weather data:

max 29° / 16° min (summer)

Max 16° / -2° (winter)

# WALL TYPE 1 GYPSUM - WOOD - INSULATION – WOOD- GYPSUM

## END USE

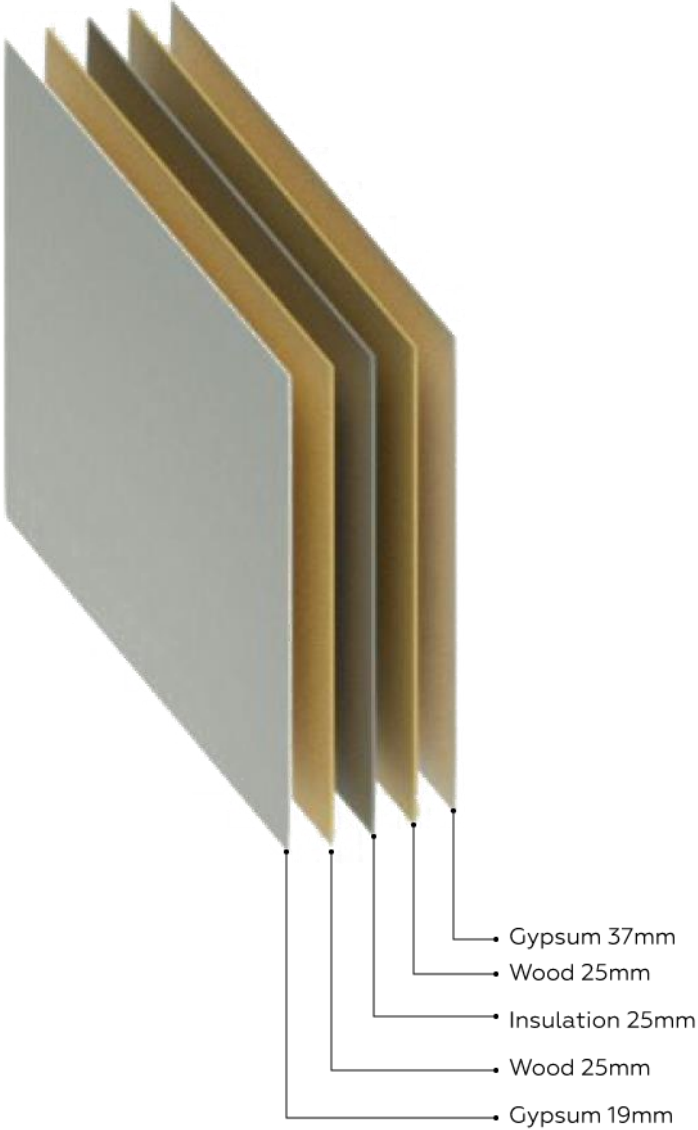
COOLING	52.11 GJ
HEATING	855.58 GJ

## DESIGN DAY

	<i>MAX DRY BULB</i>
COOLING .4DB	27,4 °C
HEATING 99.6DB	-6,1 °C

## DEMAND END USE COMPONENTS

	<i>DISTRICT COOLING</i>	<i>DISTRICT HEATING</i>
TIME OF PEAK	10 JULY AT 3PM	4 DECEMBER AT 4:15PM
HEATING		331951.72W
COOLING	66049.91 W	



ENVELOPE WINDOW WALL RATIO

	<i>TOTAL</i>	<i>NORTH</i>	<i>EAST</i>	<i>SOUTH</i>	<i>WEST</i>
GROSS WALL AREA	1828.80 m <sup>2</sup>	609.60 m <sup>2</sup>	304.80 m <sup>2</sup>	609.60 m <sup>2</sup>	304.80 m <sup>2</sup>
GROSS WINDOW-WALL RATIO	40%	40%	40%	40%	40%
WINDOW OPENING AREA	731.52 m <sup>2</sup>	243.84 m <sup>2</sup>	121.92 m <sup>2</sup>	243.84 m <sup>2</sup>	121.92 m <sup>2</sup>

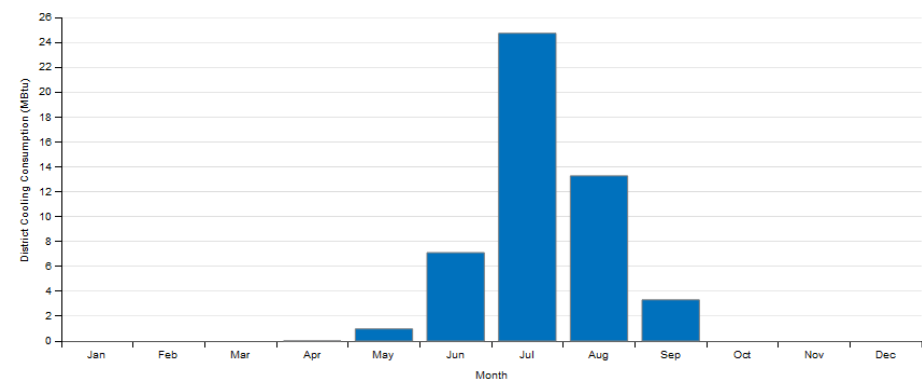
ENVELOPE SUMMARY

REFLECTANCE	0,60
U FACTOR WITH FILM	0,733 W/m2-K
U FACTOR NO FILM	0,824 W/m2-K

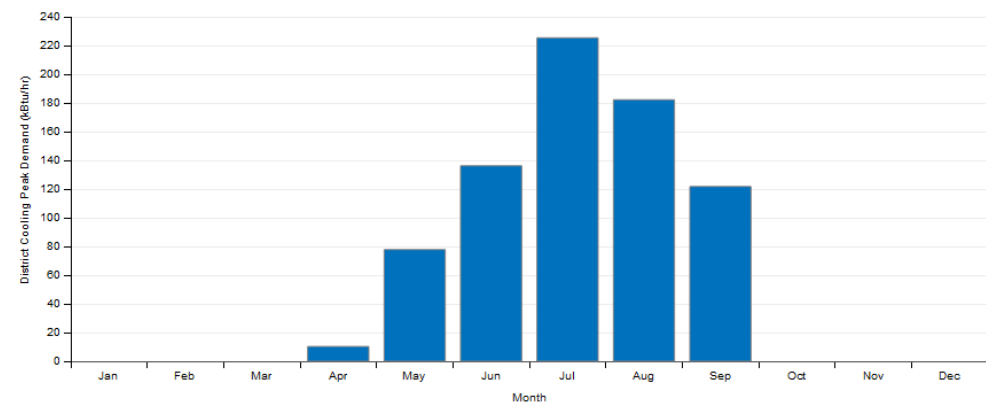
SITE AND SOURCE ENERGY

	<i>TOTAL ENERGY</i>	<i>ENERGY PER TOTAL BUILDING AREA</i>
TOTAL SITE ENERGY	1173.70 GJ	938.96 MJ/m <sup>2</sup>
TOTAL SOURCE ENERGY	3988.95 GJ	3191.16 MJ/m <sup>2</sup>

DISTRICT COOLING CONSUMPTION (MBTU)

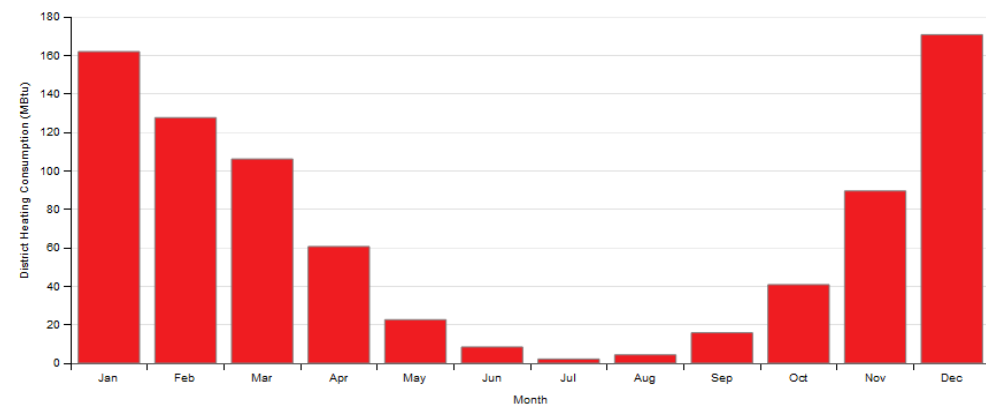


DISTRICT COOLING PEAK DEMAND (KBTU/HR)

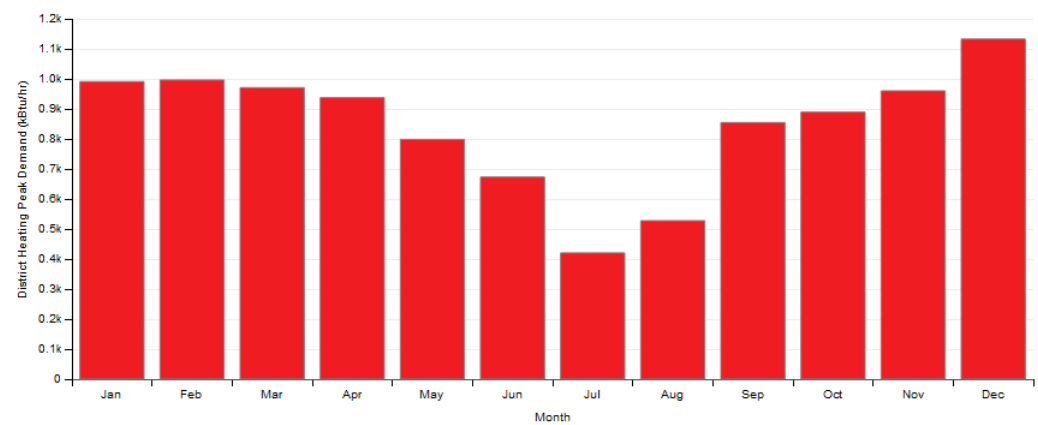


ENERGY PLUS RESULTS: 52.11 GJ

DISTRICT HEATING CONSUMPTION (MBTU)



DISTRICT HEATING PEAK DEMAND (KBTU/HR)



ENERGY PLUS RESULTS: 855.58 GJ

# WALL TYPE 2 STUCCO – CONCRETE - STUCCO

## END USE

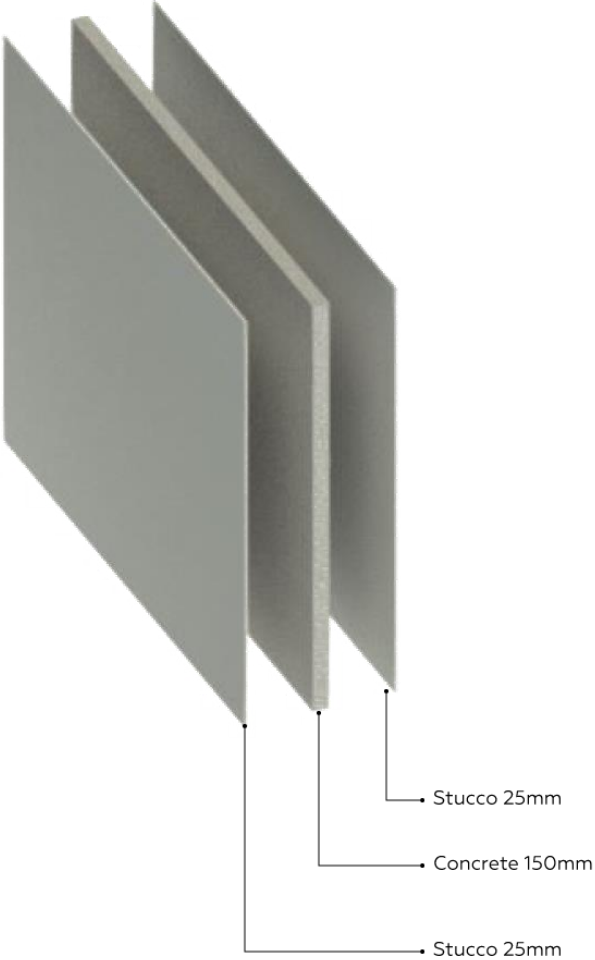
COOLING	86.65 GJ
HEATING	1017.46 GJ

## DEMAND END USE COMPONENTS

	<i>DISTRICT COOLING</i>	<i>DISTRICT HEATING</i>
TIME OF PEAK	11 JULY AT 4PM	4 DECEMBER AT 4:15
HEATING		363344.21 W
COOLING	90596.77 W	

## ENVELOPE SUMMARY

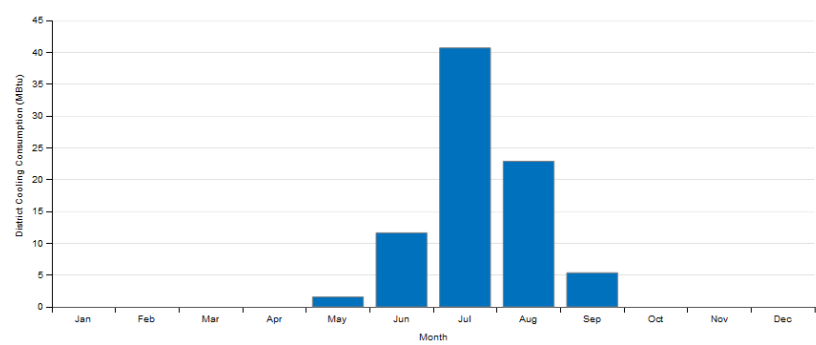
REFLECTANCE	0,08
U FACTOR WITH FILM	2.938 W/m²-K
U FACTOR NO FILM	5.244 W/m²-K



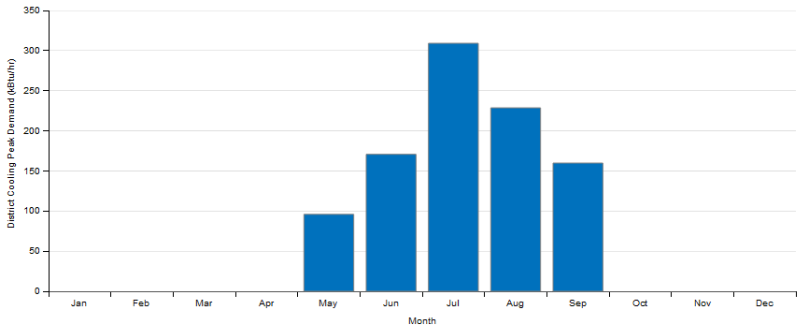
# SITE AND SOURCE ENERGY

	TOTAL ENERGY	ENERGY PER TOTAL BUILDING AREA
TOTAL SITE ENERGY	1370.12 GJ	1096.10 MJ/m <sup>2</sup>
TOTAL SOURCE ENERGY	4610.36 GJ	3688.29 MJ/m <sup>2</sup>

DISTRICT COOLING CONSUMPTION (MBTU)

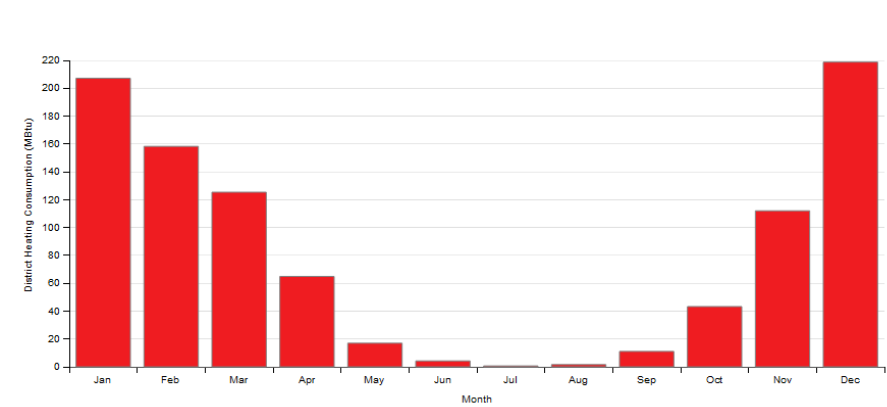


DISTRICT COOLING PEAK DEMAND (KBTU/HR)

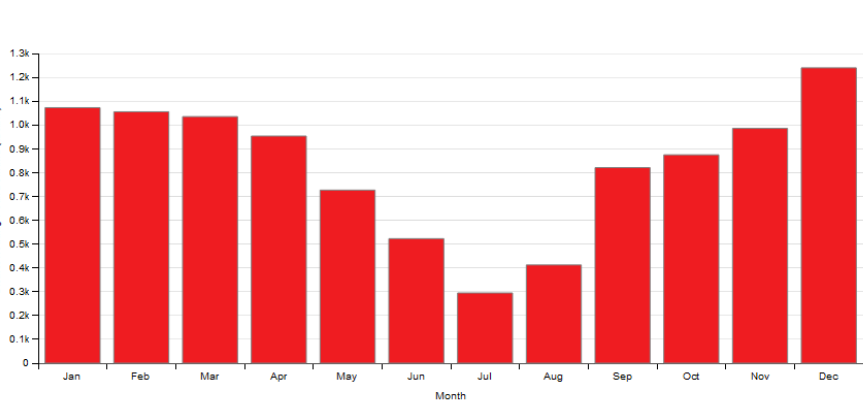


Energy Plus Results: 85.65 GJ

DISTRICT HEATING CONSUMPTION (MBTU)



DISTRICT HEATING PEAK DEMAND (KBTU/HR)



Energy Plus Results: 1017.46 GJ



# WALL TYPE 3 STUCCO –WOOD – AIR GAP – METAL SURFACE – AIR GAP –WOOD- STUCCO

## END USE

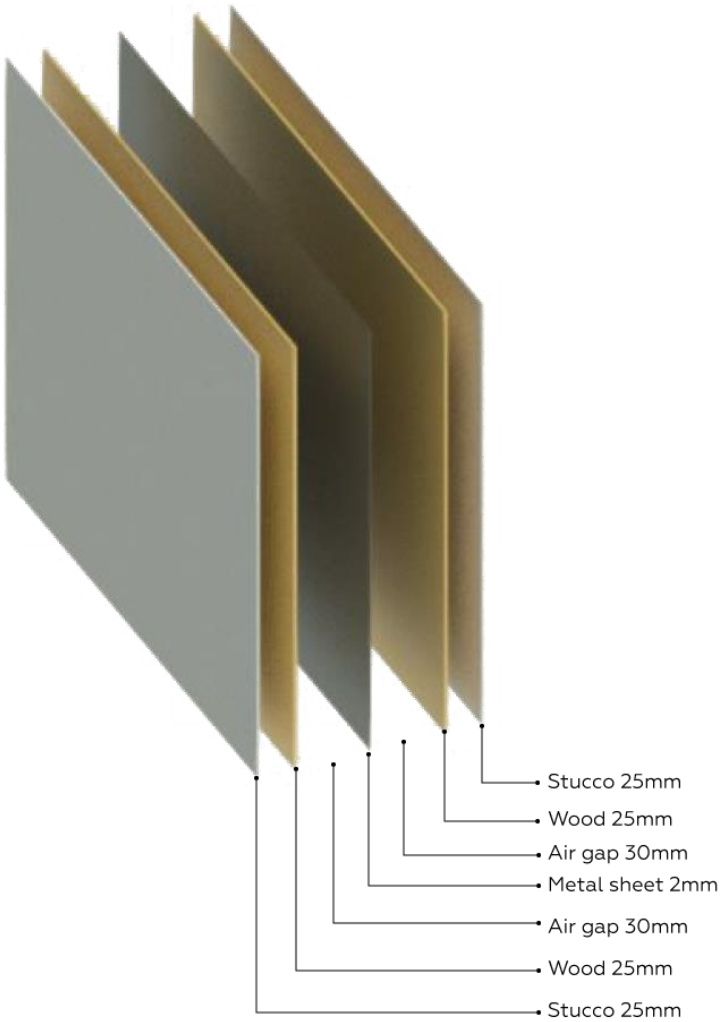
COOLING	67.57 GJ
HEATING	877.95 GJ

## DEMAND END USE COMPONENTS

	DISTRICT COOLING	DISTRICT HEATING
TIME OF PEAK	11 JULY AT 4PM	4 DECEMBER AT 4:15PM
HEATING		340255.90 W
COOLING	79521.96 W	

## ENVELOPE SUMMARY

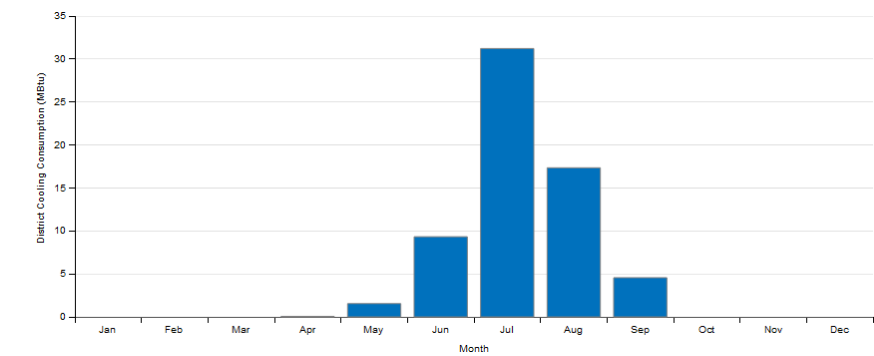
REFLECTANCE	0,08
U FACTOR WITH FILM	1.161 W/m²-K
U FACTOR NO FILM	1.405 W/m²-K



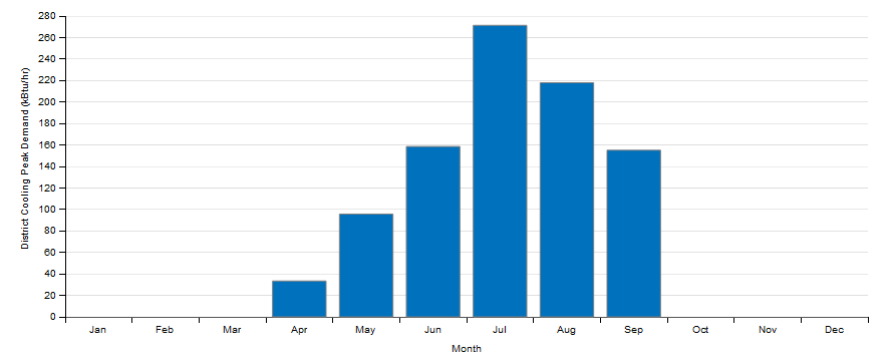
# SITE AND SOURCE ENERGY

	TOTAL ENERGY	ENERGY PER TOTAL BUILDING AREA
TOTAL SITE ENERGY	1211.53 GJ	969.22 MJ/m <sup>2</sup>
TOTAL SOURCE ENERGY	4086.11 GJ	3268.89 MJ/m <sup>2</sup>

DISTRICT COOLING CONSUMPTION (MBTU)

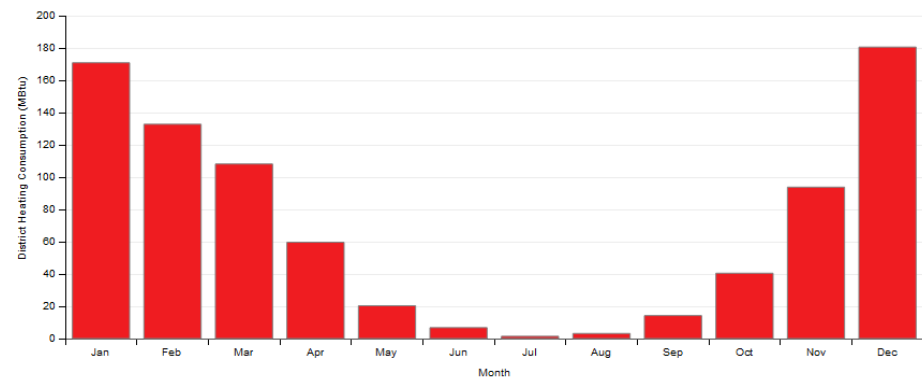


DISTRICT COOLING PEAK DEMAND (KBTU/HR)

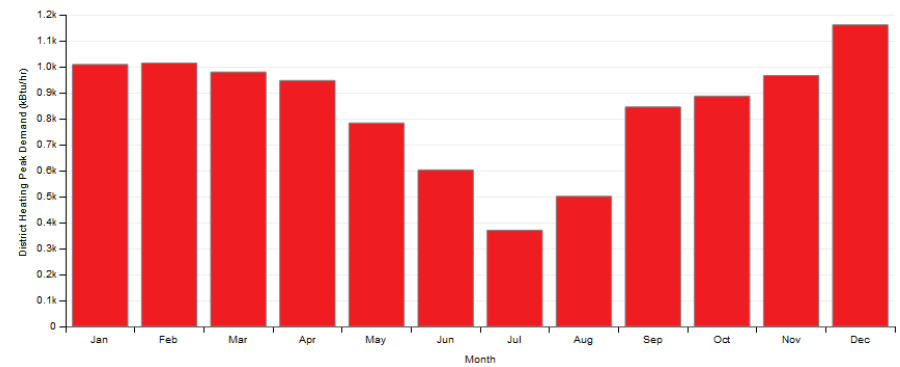


Energy Plus Results: 67.57 GJ

DISTRICT HEATING CONSUMPTION (MBTU)



DISTRICT HEATING PEAK DEMAND (KBTU/HR)



Energy Plus Results: 877.95 GJ

# ACAPULCO MEXICO



Longitude: -99.8816  
Latitude: 16.8638  
Elevation: 30 m  
Time Zone: -6  
Weather data:  
max 30° / 23° min

# WALL TYPE 2 STUCCO – CONCRETE - STUCCO

## END USE

COOLING	1011.98 GJ
HEATING	0.00 GJ

## DEMAND END USE COMPONENTS

	DISTRICT COOLING	DISTRICT HEATING
TIME OF PEAK	23 OCTOBER AT 4:15PM	
HEATING		
COOLING	205674.68 W	

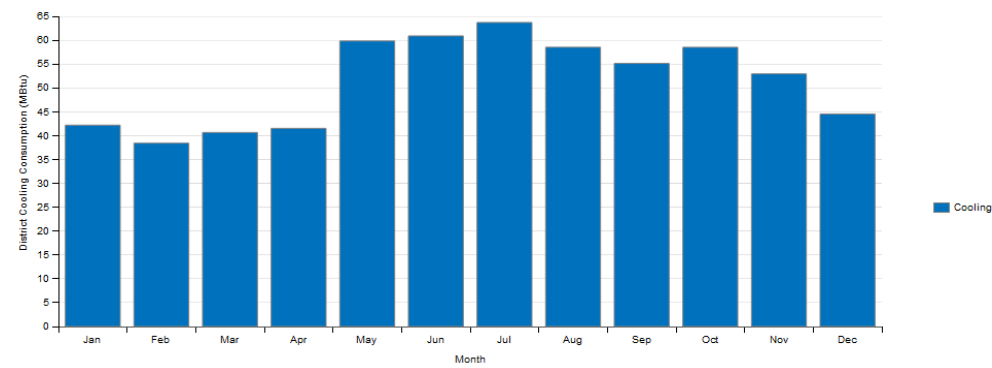
## ENVELOPE SUMMARY

REFLECTANCE	0,08
U FACTOR WITH FILM	2.938 W/m²-K
U FACTOR NO FILM	5.244 W/m²-K

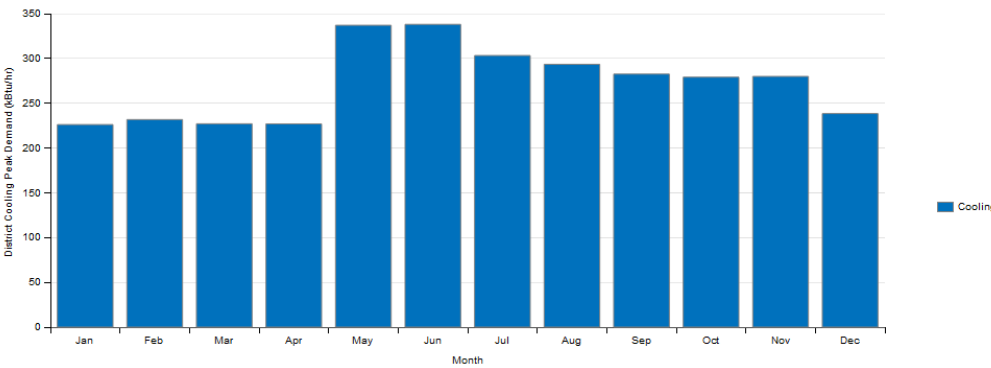
# SITE AND SOURCE ENERGY

	TOTAL ENERGY	ENERGY PER TOTAL BUILDING AREA
TOTAL SITE ENERGY	1278.00 GJ	1022.40 MJ/m <sup>2</sup>
TOTAL SOURCE ENERGY	1910.78 GJ	1528.62 MJ/m <sup>2</sup>

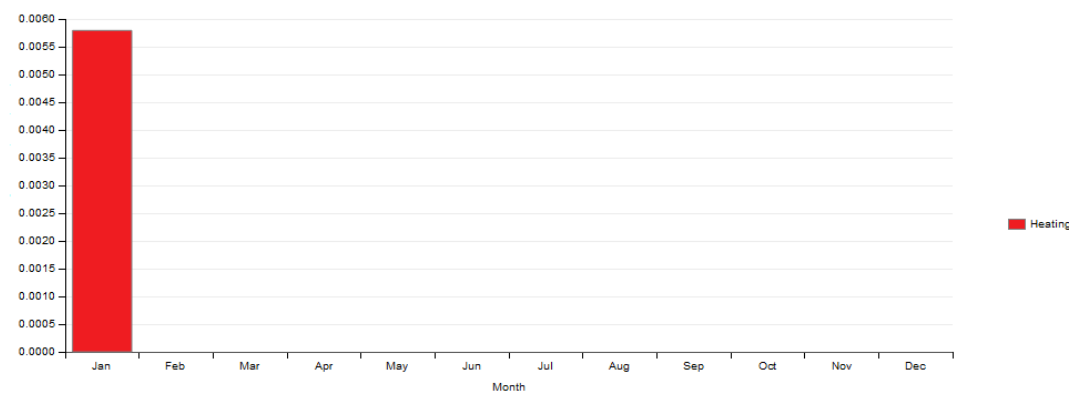
DISTRICT COOLING CONSUMPTION (MBTU)



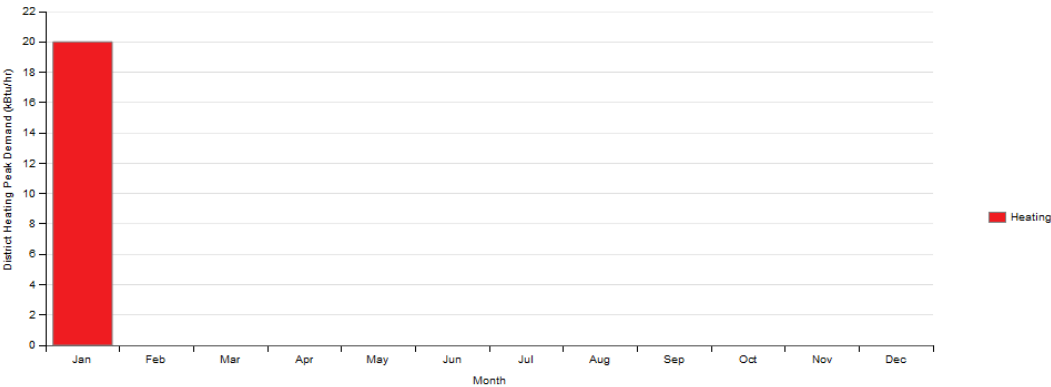
DISTRICT COOLING PEAK DEMAND (KBTU/HR)



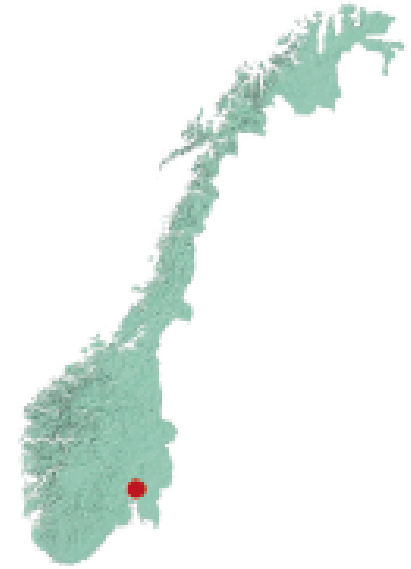
DISTRICT HEATING CONSUMPTION (MBTU)



DISTRICT HEATING PEAK DEMAND (KBTU/HR)



# OSLO NORWAY



Longitude: 10.7360

Latitude: 59.9190

Elevation: 23 m

Time Zone: +1

Weather data:

max 21° / 12° min (summer)

Max 3° / -7° (winter)



# WALL TYPE 2 STUCCO – CONCRETE - STUCCO

## END USE

COOLING	7.82 GJ
HEATING	1757.72 GJ

## DEMAND END USE COMPONENTS

	<i>DISTRICT COOLING</i>	<i>DISTRICT HEATING</i>
TIME OF PEAK	31 JULY AT 4:45PM	16 JANUARY AT 6:15AM
HEATING		400846.99 W
COOLING	47701.34 W	

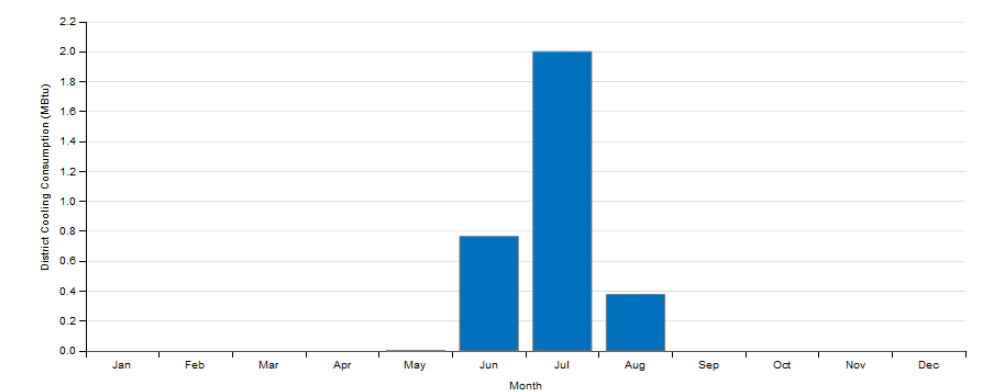
## ENVELOPE SUMMARY

REFLECTANCE	0,08
U FACTOR WITH FILM	2.938 W/m²-K
U FACTOR NO FILM	5.244 W/m²-K

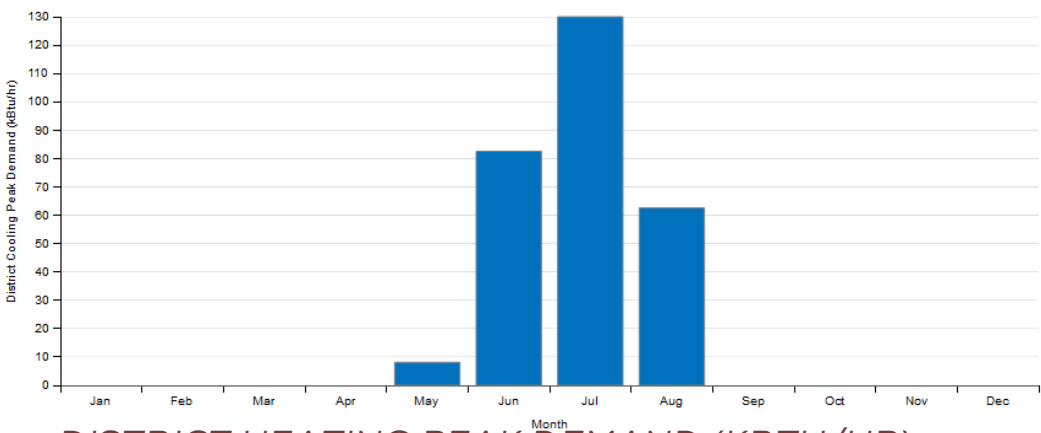
# SITE AND SOURCE ENERGY

	TOTAL ENERGY	ENERGY PER TOTAL BUILDING AREA
TOTAL SITE ENERGY	2031.55 GJ	1625.24 MJ/m <sup>2</sup>
TOTAL SOURCE ENERGY	7201.94 GJ	5761.55 MJ/m <sup>2</sup>

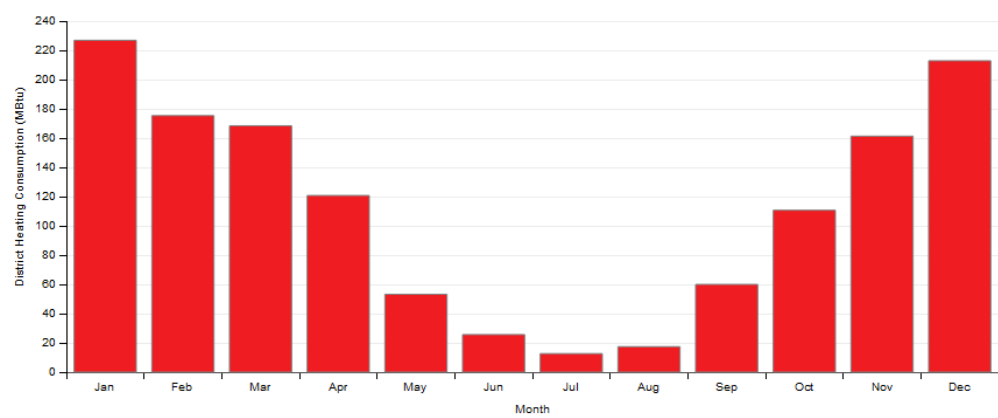
DISTRICT COOLING CONSUMPTION (MBTU)



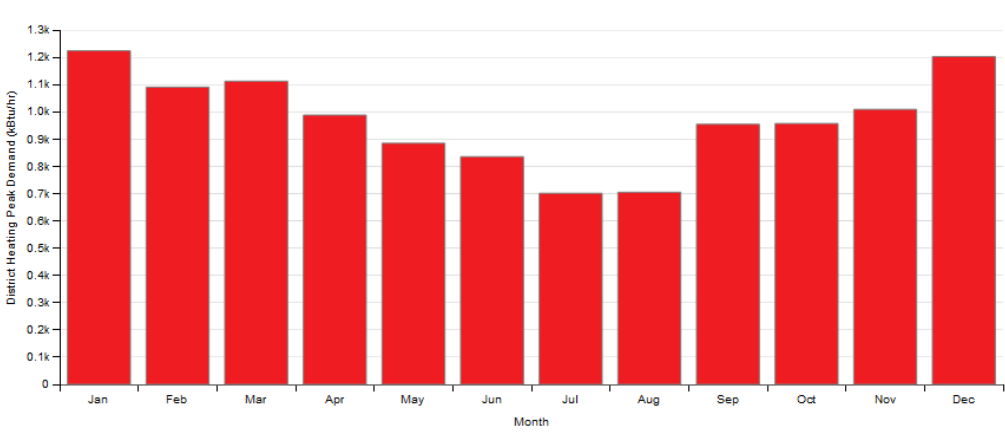
DISTRICT COOLING PEAK DEMAND (KBTU/HR)



DISTRICT HEATING CONSUMPTION (MBTU)



DISTRICT HEATING PEAK DEMAND (KBTU/HR)

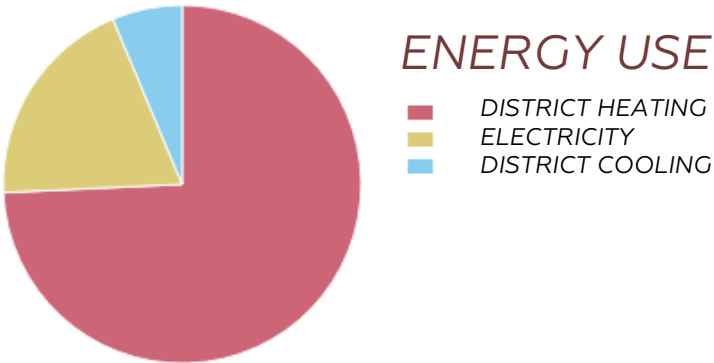
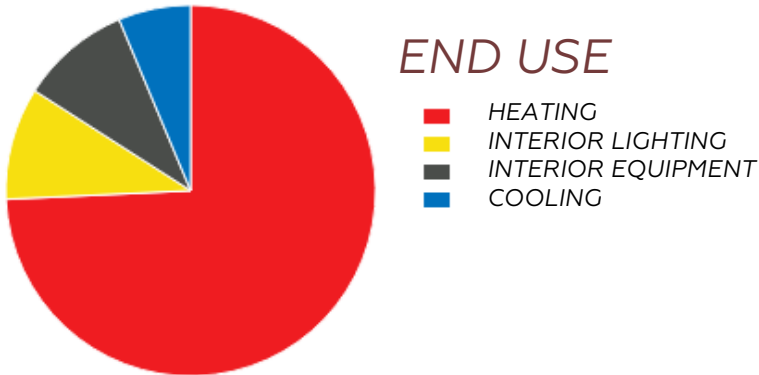




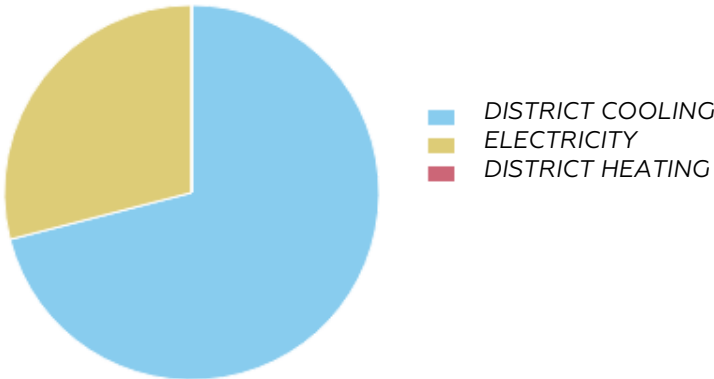
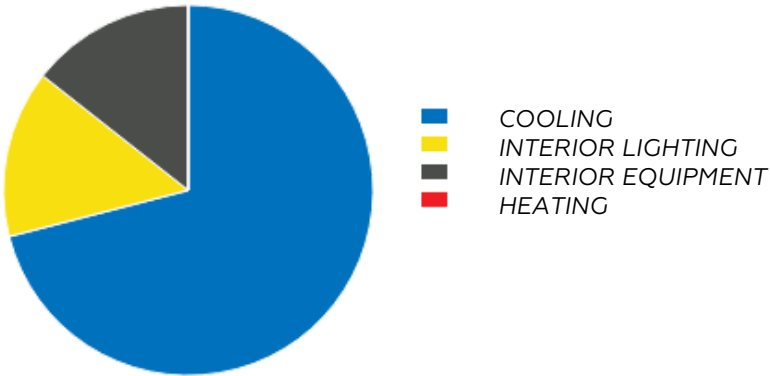
# ANNUAL OVERVIEW COMPARISON

WALL 2

PIACENZA



ACAPULCO



OSLO

