Plan to increase the number of nearly zero-energy single-family buildings by 2020

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Name of the study:

Plan to increase the number of nearly zero-energy single-family buildings

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1.1 DETAILED PRESENTATION OF A NEARLY ZERO-ENERGY BUILDING DEFINITION, INCLUDING A NUMERICAL INDICATOR OF THE ANNUAL PRIMARY ENERGY CONSUMPTION IN KWH/M^2

The following chapters define the minimum performance of nearly zero-energy single-family reference buildings in terms of the properties of the building envelope and building geometry, and of the efficiency of systems for heating, cooling and domestic hot water generation, and lighting. The maximum specific primary energy consumption of buildings is presented in the following tables: Table 1-2 Relevant data for the calculation of the energy performance of nearly zero energy buildings - continental Croatia, and Table 1-4 Relevant data for the energy performance calculation of nearly zero-energy buildings - coastal Croatia; it amounts to E_{prim} = 40.91 kWh/m²a in continental Croatia, and E_{prim} = 33.40 kWh/m²a in coastal Croatia.

Taking into account a restriction of specific primary energy consumption of a reference nearly zero-energy single-family building, the potential for energy generation from renewable sources on site at the building has been assessed in terms of potential energy generation for export beyond the system's limits; it amounts to 28.92 kWh/m²a (4,460.05 kWh/a) or 36.42 kWh/m²a (5,585.90 kWh/a) in coastal Croatia.

1.1.1 Description of a nearly zero-energy single-family building in continental Croatia

The house is built of hollow block brick in cement-lime mortar. External load-bearing walls are made of hollow block brick, 25 cm thick, with a 20 cm ETICS façade system of graphite expanded polystyrene. Internal load-bearing hollow block brick walls are 20 cm thick, and plastered on both sides. The walls are bordered by horizontal and vertical reinforced concrete tie beams. External wall tie beams are insulated by 5 cm sandwich panels, and additionally with the same ETICS system as that used on the wall. The U-value of the wall is U=0.14 W/m^{2}K.

The floor structure is a floating floor with 2 cm elastic polystyrene (EPS-T) and rigid expanded polystyrene (EPS-200) panels, laid on a concrete base and hydro insulation. An additional layer of 10 cm extruded polystyrene (XPS) is placed underneath the base. The U-value of the floor structure varies, but is as follows: U = 0.15 W/m^{2}K.

Laying 10 cm XPS along the sides and under the foundation fully interrupts a thermal bridge occurring there. All thermal bridges over the joints connecting two external walls, and the wall with the roof have negative values.

The intermediate floor structure on the ground floor is a 16 cm solid reinforced concrete slab, smoothed and painted on the underside, with a floating floor on the upper side. The intermediate floor structure does not border with unheated or exterior space, and is not included in the calculation.

The upper-floor ceiling structure bordering an unheated attic is a 16 cm reinforced concrete slab, smoothed and painted on the underside and insulated on the attic side with 4 cm EPS-T and 16 cm XPS with double-oriented strand boards (OSB) as the flooring finish. The attic space is unheated, but contributes to the thermal resistance of the ceiling structure. The U-value of the ceiling structure to the unheated attic is U=0.15 W/m^{2}K.

The inclined roof is a light timber structure made of planks, with a 20-24 cm mineral wool (MW) infill, a gypsum-cardboard (GC) underside with a 5 cm MW infill and a vapour barrier. There are OSBs, a rain barrier, counter battens and battens (ventilated layer) fixed on the planks, with trapezoid aluminium sheeting as the roof covering.

The U-value of the ceiling structure is U=0.13 W/m^{2}K.

The windows incorporate a 5-chamber PVC profile glazed with triple insulated 6+15+4+15+4 mm glass, with a Low-E coating, PVC distancers and 90% argon fill. Some windows are shaded by an overhang to reduce overheating in the summer, while allowing incident sunlight in the space in the winter.

Protection is provided by external roll-up shutters (for skylights as well).

Window characteristics are as follows: U_w=0.75 W/m^{2}K; F_c=0.30; $g_\perp$=0.50, F_s=1.00.

The U-value of the roll-up shutter casing is as follows: $U_{shutt\ c}$=0.46 W/m^{2}K

The front door leaf is thermally insulated, U=1.80 W/m^{2}K.

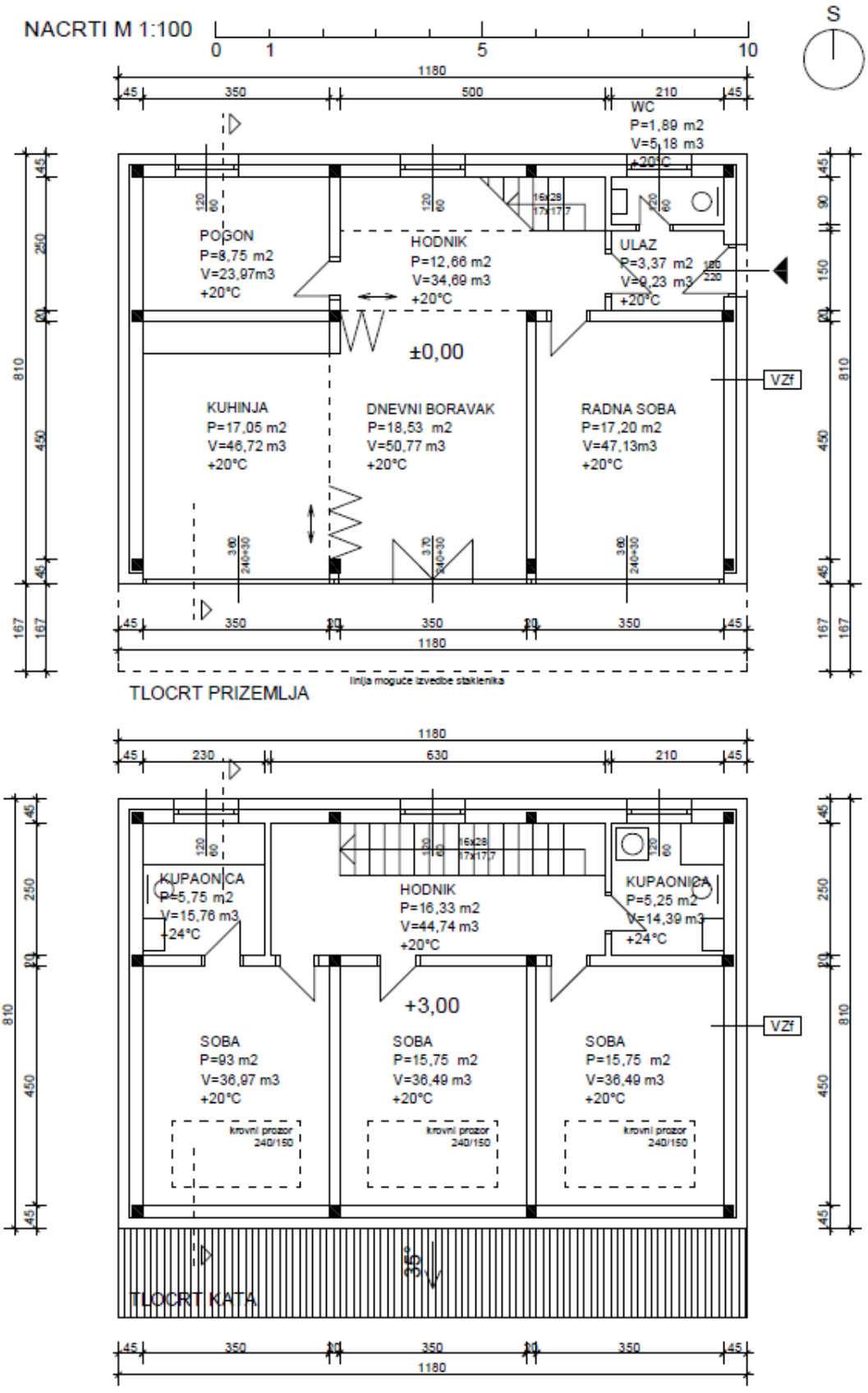

Figure 1-1 Floor plans - GROUND FLOOR and UPPER FLOOR

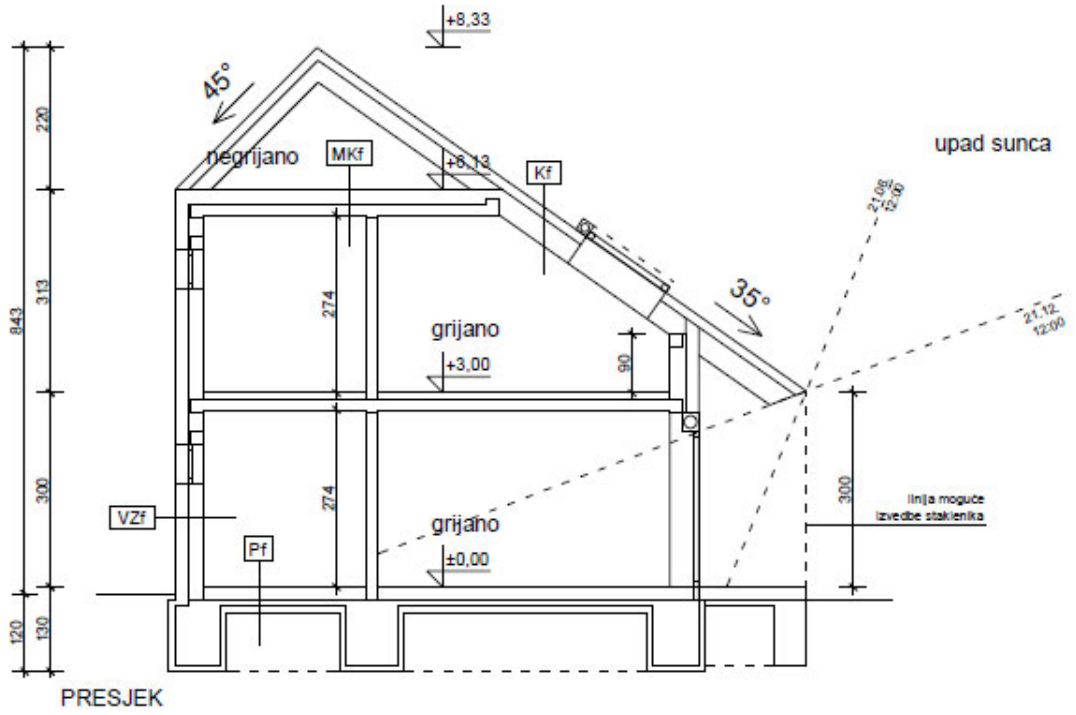

Figure 1-2 Section

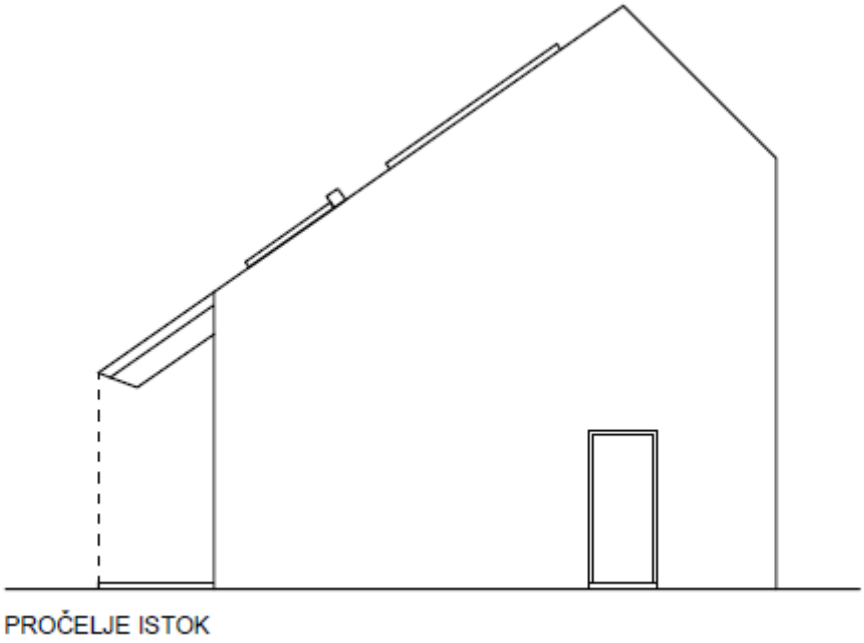

Figure 1-3 East and West side elevation

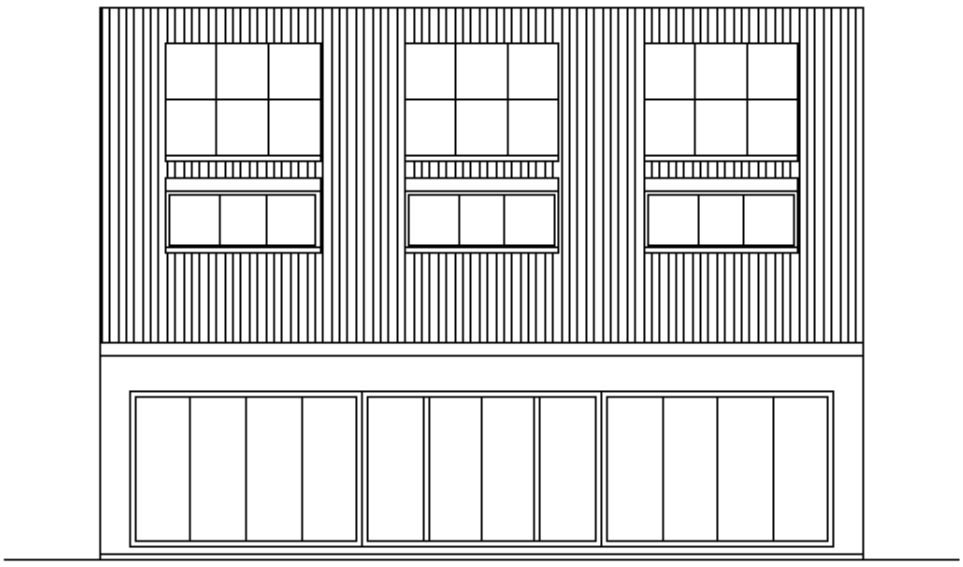

Figure 1-4 South side elevation

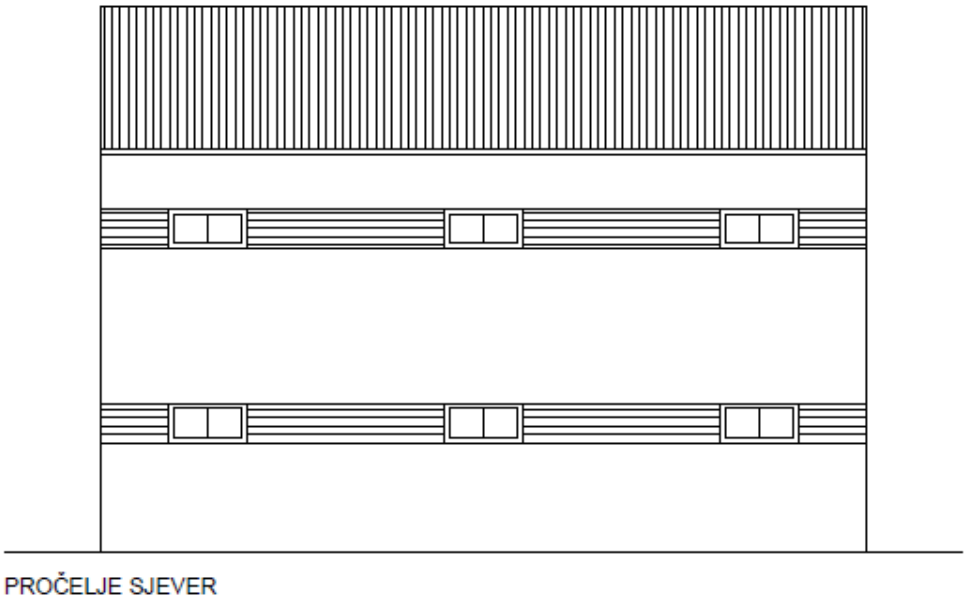

Figure 1-5 North side elevation

Key to the figures above:

POGON	TECHNICAL ROOM
HODNIK	HALL
ULAZ	ENTRY
KUHINJA	KITCHEN
DNEVNI BORAVAK	LIVING ROOM
RADNA SOBA	STUDY
KUPAONICA	BATHROOM
SOBA	ROOM
krovni prozor	skylight
linija moguće izvedbe staklenika	possible greenhouse installation outline
grijano / negrijano	heated / unheated
upad sunca	incident sunlight

Table 1-1 Layers of perimetral and partition structural elements

(The layers of vertical partitions are listed from the internal towards the external ones, while the layers of horizontal partitions are listed from the upper towards the lower ones.)

Name and composition of the structural element	U = heat transfer coefficient λ = thermal conductivity	Thickness (cm)	Area (m^2) (by cardinal directions)			
VZf - EXTERNAL WALL	**U = 0.14 W/m²K**	**47.5**	N	S	E	W
lime-cement plaster (1,800 kg/m³)	λ = 1 W/mK	2.0	59.19	17.77	39.29	41.77
block brick (1,000 kg/m³)	λ = 0.45 W/mK	25.0				
graphite expanded polystyrene (EPS-F) under HRN EN 13163 (18 kg/m³)	λ = 0.032 W/mK	20.0				
polymer-cement plaster (1,100 kg/m³) and glass-fibre mesh	λ = 0.7 W/mK	0.3				
finishing coat of thin layered silicate façade plaster (1800 kg/m³)	λ = 0.9 W/mK	0.2				
SVZf – EXTERNAL WALL TIE BEAM	**U = 0.13 W/m²K**	**47.5**	N	S	E	W
lime-cement plaster (1800 kg/m³)	λ = 1 W/mK	2.0	11.18	6.32	6.58	6.30
reinforced concrete (2500 kg/m³)	λ = 2.60 W/mK	20.0				
three-layered sandwich panel with an EPS core (190 kg/m³)	λ = 0.039 W/mK	5.0				
graphite expanded polystyrene (EPS-F) under HRN EN 13163 (18 kg/m³)	λ = 0.032 W/mK	20.0				
polymer-cement plaster (1,100 kg/m³) and glass-fibre mesh	λ = 0.7 W/mK	0.3				
finishing coat of thin layered silicate façade plaster (1,800 kg/m³)	λ = 0.9 W/mK	0.2				
Kf – SLIGHTLY INCLINED ROOF, 30° angle	**U = 0.13 W/m²K**	**43.9**	N	S	E	W
metal sheeting on roof substructure	not included in calculation	0.07	0	33.54	0	0
ventilated air layer		10.0				
rain barrier - vapour-proof and water-proof film	λ = 0.04 W/mK	0.1				
oriented strand board - OSB (650 kg/m³)	λ = 0.13 W/mK	2.2				
mineral wool (MW) fleece - under HRN EN 13162 (30 kg/m³) - with glass-fibre facing on the air-layer side	λ = 0.035 W/mK	24.0				
polyethylene (PE) film (1,000 kg/m³)	λ = 0.50 W/mK	0.02				
mineral wool (MW) fleece - under HRN EN 13162 (30 kg/m³)	λ = 0.035 W/mK	5.0				
double gypsum-cardboard panels (900 kg/m³)	λ = 0.25 W/mK	2.5				

Name and composition of the structural element	U = heat transfer coefficient λ = thermal conductivity	Thickness (cm)	Area (m^2)
Pf – GROUND FLOOR	**U = 0.15 W/m²K**	**56.2**	floor area of the ground fl. contained within external load-bearing walls = 78.48 m^2
parquet glued to the base (700 kg/m^3)	λ = 0.18 W/mK	2.4	
cement screed (2,000 kg/m³)	λ = 1.60 W/mK	8.0	
polyethylene (PE) film (1,000 kg/m³)	λ = 0.50 W/mK	0.02	exposed perimeter = 39.80 m
expanded polystyrene (EPS-200) under HRN EN 13163 (30 kg/m³)	λ = 0.033 W/mK	8.0	
elastic polystyrene (EPS-T) under HRN EN 13163 (12 kg/m³)	λ = 0.042 W/mK	2.0	thermal bridge extension at the foundation: vertical XPS perimeter insulation λ = 0.033 W/mK XPS panel thickness = 10 cm XPS panel length = 100 cm
hydro insulation - two layers (0.4 + 0.4 cm) of bituminous membranes	λ = 0.23 W/mK	0.8	
concrete slab (2,200 kg/m³)	λ = 1.65 W/mK	10.0	
extruded polystyrene (XPS) under HRN EN 13164 (25 kg/m³)	λ = 0.030 W/mK	10.0	
compacted gravel (1700 kg/m³)	not included in calculation	15.0	
MKf – CEILING TO UNHEATED ATTIC	**U = 0.15 W/m²K**	**39.1**	area = 59.89 m^2
oriented strand board - OSB (650 kg/m³)	λ = 0.13 W/mK	3.0	***Note:** The actual U-value of the ceiling to unheated attic is U = 0.16 W/m²K, but thermal resistance of the unheated bordering space reduces it to U = 0.15 W/m²K
extruded polystyrene (XPS) under HRN EN 13164 (25 kg/m³)	λ = 0.033 W/mK	16.0	
elastic polystyrene (EPS-T) under HRN EN 13163 (12 kg/m³)	λ = 0.042 W/mK	4.0	
reinforced concrete slab (2,500 kg/m³)	λ = 2.60 W/mK	16.0	
smoothed underside (1,500 kg/m³)	λ = 0.54 W/mK	0.1	

Name and composition of the structural element	U = heat transfer coefficient	Thickness (cm)	Area (m^2) (by cardinal directions)			
WINDOW			N	S	E	W
frames	5-chamber PVC profile					
glazing	triple insulated glass with Low-E coating, interlayer with 90% argon fill	6 mm 15 mm 4 mm 15 mm 4 mm	4.32	26.16	0	0
$g_\perp$	0.5					
F_c (roll-up shutters or no protection)			1.00	0.30		
F_f	0.75					
U_f	1.20 W/m²K					
U_g	0.60 W/m²K					
distancers (spacers)	PVC		F_S = 1.0	F_S = 0.74		
U_w - total thermal transmittance (including thermal transmittance through frame elements, glass and linear heat loss - Uframes + Uglass + Ψglass edge):	**0.75 W/m²K**					
SKYLIGHT - 30° inclination			N	S	E	W
frames	5-chamber PVC profile					
glazing	triple insulated glass with Low-E coating, interlayer with 90% argon fill	6 mm 15 mm 4 mm 15 mm 4 mm				
$g_\perp$	0.5					
F_c (roll-up shutters)	0.3		0	10.8	0	0
F_f	0.75					
U_f	1.20 W/m²K					
U_g	0.60 W/m²K					
distancers (spacers)	PVC					
U_w - total thermal transmittance (including thermal transmittance through frame elements, glass and linear heat loss - Uframes + Uglass + Ψglass edge):	**0.75 W/m²K**					
ROLL-UP SHUTTER CASING	**U = 0.46 W/m²K**	**5.2**	N	S	E	W
aluminium sheeting (2,800 kg/m³)	λ = 160 W/mK	0.2	0	3.27	0	0

rigid polyurethane (PUR) foam under HRN EN 13165 (30 kg/m³)	λ = 0.025 W/mK	5.0				
DOOR	**U = 1.80 W/m²K**		N	S	E	W
The door has a thermally insulated leaf.			0	0	2.2	0

Table 1-2 Relevant data for the calculation of nearly zero-energy building's energy performance - continental Croatia

Calculation	done in accordance with HRN EN ISO 13790:2008 standard, the Technical regulation on energy economy and heat retention in buildings and the Algorithm			
	primary energy conversion factors	electrical energy	1.6153	
		natural gas	1.0965	
		pellets	1.1955	
		solar	1.0484	
Climatic conditions	location		Zagreb Maksimir 45°49' N 16°02' E	
	heating degree - days		3045.2	HDD
	cooling degree - days			CDD
	source of climatic dataset		national monthly data	
	terrain description		suburban area, no impact of neighbouring buildings	
Building geometry	length x width x height		11.80 x 8.10 x 6.13	m x m x m
	useful floor area		154.21	m²
	number of floors		2.00	-
	shape factor		0.75	m²/m³
	window area ratio to the total building envelope area	South	36.96	m²
		East	0.00	m²
		North	4.32	m²
		West	0.00	m²
	orientation		180	°
Internal gains	building utilisation		single-family building	
	average thermal gain from the occupants		5.00	W/m²
	specific electric power of the lighting system		6.23	W/m²
	specific electric power of the electrical equipment		0.00	W/m²
Building elements	average U-value of the walls		0.13-0.14	W/m²K
	average U-value of the roof		0.13-0.15	W/m²K
	average U-value of the basement		0.15	W/m²K
	average U-value of the windows		0.75	W/m²K
	thermal bridges	total length	62.10	
		average linear thermal transmittance	-0.05	
	thermal capacity per unit area	total thermal capacity of the building J/m²K	302 965 982.02	
	type of shading systems		shutters or roll-up shutters	
	average g-value of	glazing	0.5	-
		glazing + shading	0.15-0.50	-

	infiltration rate			1/h
Technical systems	ventilation	air changes per hour	0.5	1/h
		heat recovery efficiency	75%	%
	heating system efficiency	generation	106.17	%
		distribution	98.48	%
		greenhouse	97.19	%
		control	99.00	%
	cooling system efficiency	generation	599.25	%
		distribution	100	%
		greenhouse	88.12	%
		control	100	%
	DHW generation system efficiency	generation	106.17	%
		distribution	89.53	%
Building setpoints and schedules	temperature setpoint	winter	20	°C
		summer	-	°C
	humidity setpoint	winter	-	%
		summer	-	%
	operation schedules and controls	occupancy	24/7	
		lighting	24/7	
		appliances	24/7	
		ventilation	24/7	
		heating	24/7	
		cooling	24/7	
Energy needs	(thermal) energy contribution of main passive strategies implemented	1	0.00	kWh/a
		2	0.00	kWh/a
		3	0.00	kWh/a
	energy need for heating		1,072.13	kWh/a
	energy need for cooling		4,505.00	kWh/a
	energy need for DHW		1,927.60	kWh/a
	energy need for other (humidification, dehumidification)		-	kWh/a
	energy use for ventilation		-	kWh/a
	energy use for internal lighting		606.50	kWh/a
	energy use for other (appliances, external lighting, auxiliary systems, etc.)		374.00	kWh/a
Energy generation on site	thermal energy from RES (e.g. thermal solar collectors)		0.00	kWh/a
	electrical energy generated in the building and used on site		0.00	kWh/a
	electrical energy generated in the building and exported to the market		4,460.05	kWh/a
	primary energy total		**6,308.54**	**kWh/a**

	primary energy specific	**40.91**	kWh/m²a

1.1.2 Description of a nearly zero-energy single-family building in coastal Croatia

The house is built of hollow block brick in cement-lime mortar. External load-bearing walls are made of hollow block brick, 25 cm thick, with a 12 cm ETICS façade system of graphite expanded polystyrene. Internal load-bearing hollow block brick walls are 20 cm thick, and plastered on both sides. The walls are bordered by horizontal and vertical reinforced concrete tie beams. External wall tie beams are insulated by 5 cm sandwich panels, and additionally with the same ETICS system as that used on the wall. The U-value of the wall is U=0.22 W/m^{2}K.

The floor structure is a floating floor with 2 cm elastic polystyrene (EPS-T) and rigid expanded polystyrene (EPS-200) panels, laid on a concrete base and hydro insulation. The U-value of the floor structure is: U = 0.30 W/m^{2}K

The thermal bridge at the foundation is reduced by laying 10 cm thick extruded polystyrene (XPS) along its sides. All thermal bridges over the joints connecting two external walls, and the wall with the roof have negative values.

The intermediate floor structure on the ground floor is a 16 cm solid reinforced concrete slab, smoothed and painted on the underside, with a floating floor on the upper floor. The intermediate floor structure does not border with unheated or exterior space, and is not included in the calculation.

The upper-floor ceiling structure bordering an unheated attic is a 16 cm solid reinforced concrete slab, smoothed and painted on the underside and insulated on the attic side with 4 cm EPS-T and 8 cm EPS with double-oriented strand boards (OSB) as the flooring finish. The attic space is unheated, but contributes to the thermal resistance of the ceiling structure. The U-value of the ceiling structure to the unheated attic is U=0.25 W/m^{2}K.

The inclined roof is a light timber structure made of planks with a 16 cm mineral wool (MW) infill, with a gypsum-cardboard (GC) underside with a 5 cm MW infill and a vapour barrier. There are OSBs, a rain barrier, counter battens and battens (ventilated layer) fixed on the planks, with trapezoid aluminium sheeting as the roof covering. The U-value of the ceiling structure is U=0.17 W/m^{2}K.

The windows incorporate a 5-chamber PVC profile glazed with double insulated 6+16+4 mm glass, with Low-E coating, PVC distancers and 90% argon fill. Some windows are shaded by an overhang to reduce overheating in the summer, while allowing incident sunlight in the space in the winter.

Protection is provided by external roll-up shutters (for skylights as well).

Window characteristics are as follows: U_w=1.18 W/m^{2}K; F_c=0.30; $g_\perp$=0.60, F_s=1.00.

The U-value of the roll-up shutter casing is as follows: $U_{shutt\ c}$=0.73 W/m^{2}K

The front door leaf is thermally insulated, U=1.80 W/m^{2}K.

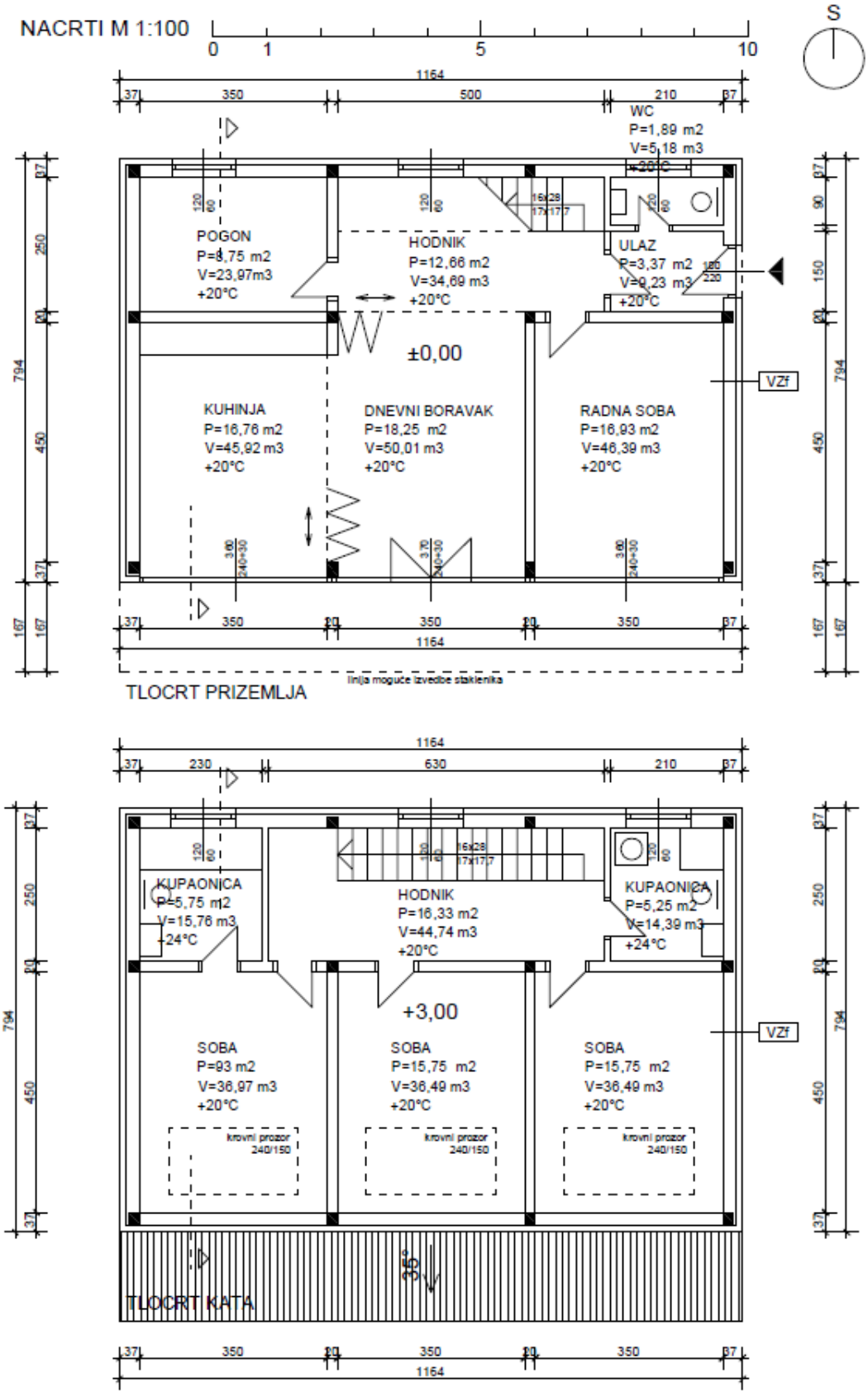

Figure 1-6 Floor plans - GROUND FLOOR and UPPER FLOOR

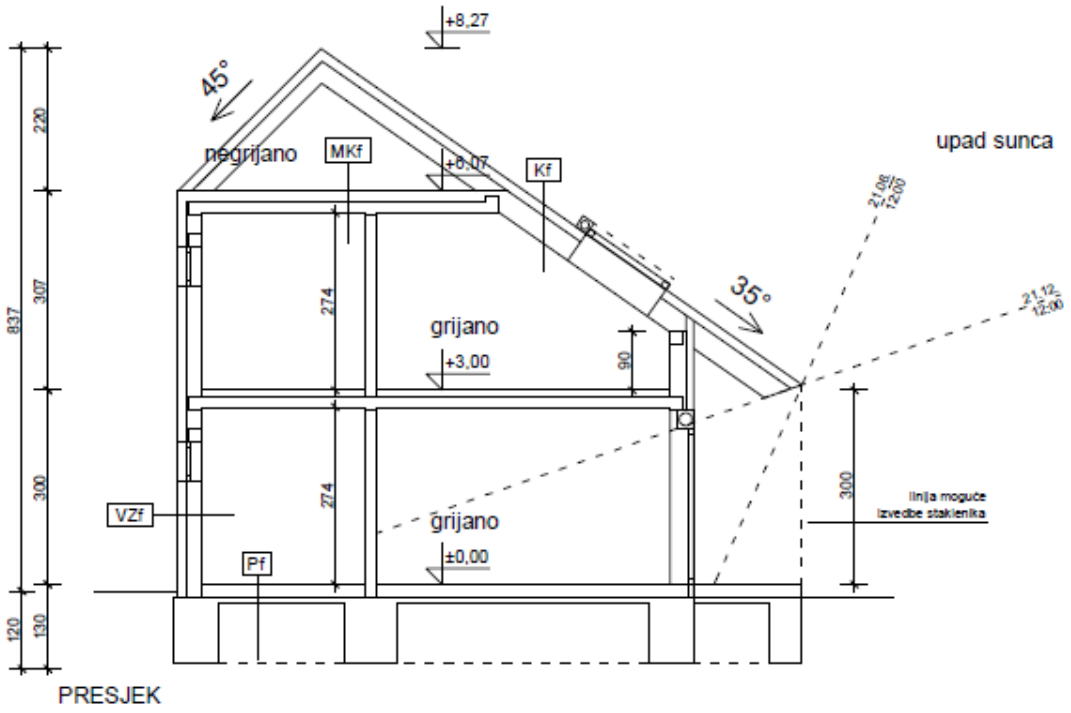

Figure 1-7 Section

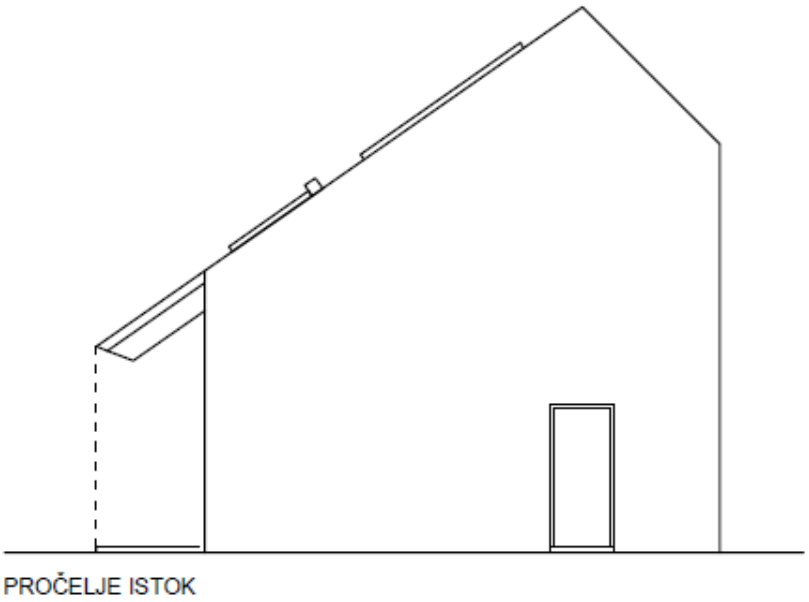

Figure 1-8 East side elevation

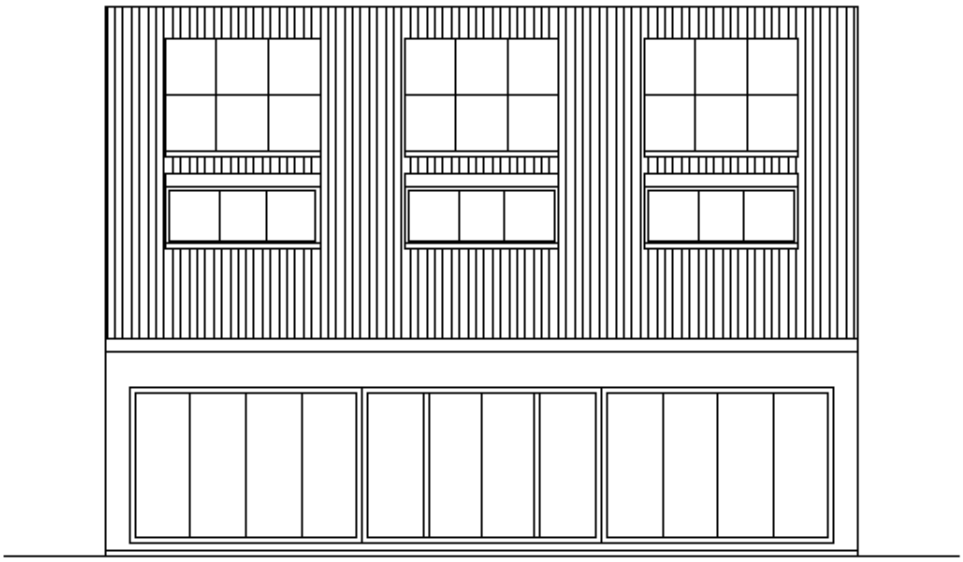

Figure 1-9 South side elevation

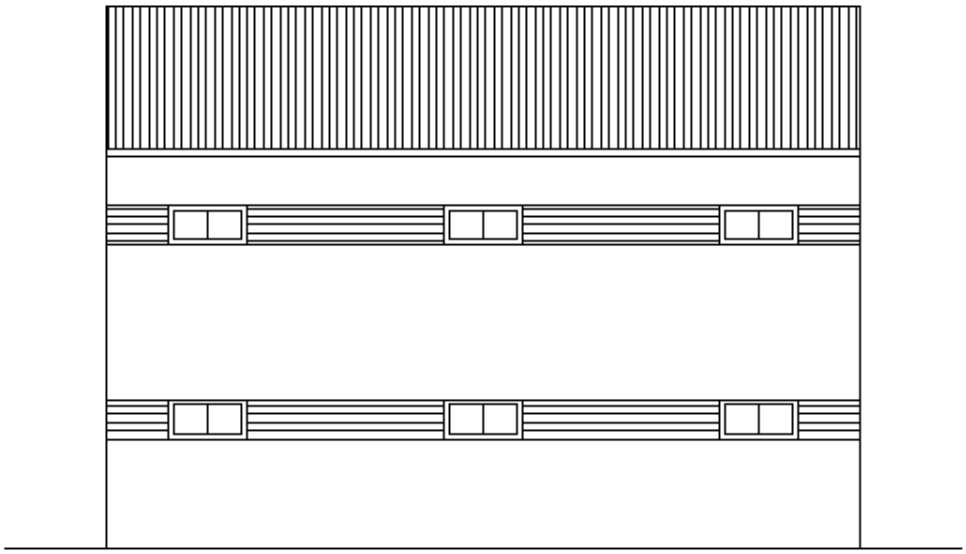

Figure 1-10 North side elevation

Key to the figures above:

POGON	TECHNICAL ROOM
HODNIK	HALL
ULAZ	ENTRY
KUHINJA	KITCHEN
DNEVNI BORAVAK	LIVING ROOM
RADNA SOBA	STUDY
KUPAONICA	BATHROOM
SOBA	ROOM
krovni prozor	skylight
linija moguće izvedbe staklenika	possible greenhouse installation outline
grijano / negrijano	heated / unheated
upad sunca	incident sunlight

Table 1-3 Layers of perimetral and partition structural elements

(The layers of vertical partitions are listed from the internal towards the external ones, while the layers of horizontal partitions are listed from the upper towards the lower ones.)

Name and composition of the structural element	U = heat transfer coefficient λ = thermal conductivity	Thickness (cm)	Area (m^2) (by cardinal directions)			
VZf – EXTERNAL WALL	**U = 0.22 W/m²K**	**39.5**	N	S	E	W
lime-cement plaster (1,800 kg/m³)	λ = 1 W/mK	2.0	57.25	17.04	38.14	40.62
block brick (1,000 kg/m³)	λ = 0.45 W/mK	25.0				
graphite expanded polystyrene (EPS-F) under HRN EN 13163 (18 kg/m³)	λ = 0.032 W/mK	12.0				
polymer-cement plaster (1,100 kg/m³) and glass-fibre mesh	λ = 0.7 W/mK	0.3				
finishing coat of thin layered silicate façade plaster (1,800 kg/m³)	λ = 0.9 W/mK	0.2				
SVZf – EXTERNAL WALL TIE BEAM	**U = 0.20 W/m²K**	**39.5**	N	S	E	W
lime-cement plaster (1.800 kg/m³)	λ = 1 W/mK	2.0	11.18	6.32	6.58	6.30
reinforced concrete (2,500 kg/m³)	λ = 2.60 W/mK	20.0				
three-layered sandwich panel with an EPS core (190 kg/m³)	λ = 0.039 W/mK	5.0				
graphite expanded polystyrene (EPS-F) under HRN EN 13163 (18 kg/m³)	λ = 0.032 W/mK	12.0				
polymer-cement plaster (1,100 kg/m³) and glass-fibre mesh	λ = 0.7 W/mK	0.3				
finishing coat of thin layered silicate façade plaster (1,800 kg/m³)	λ = 0.9 W/mK	0.2				
Kf – SLIGHTLY INCLINED ROOF, 30° angle	**U = 0.17 W/m²K**	**35.9**	N	S	E	W
metal sheeting on roof substructure	not included in calculation	0.07	0	33.54	0	0
ventilated air layer		10.0				
rain barrier - vapour-proof and water-proof film	λ = 0.04 W/mK	0.1				
oriented strand board - OSB (650 kg/m³)	λ = 0.13 W/mK	2.2				
mineral wool (MW) fleece - under HRN EN 13162 (30 kg/m³) - with glass-fibre facing on the air-layer side	λ = 0.035 W/mK	16.0				
polyethylene (PE) film (1,000 kg/m³)	λ = 0.50 W/mK	0.02				
mineral wool fleece (MW) - under HRN EN 13162 (30 kg/m³)	λ = 0.035 W/mK	5.0				
double gypsum-cardboard panels (900 kg/m³)	λ = 0.25 W/mK	2.5				

Name and composition of the structural element	U = heat transfer coefficient λ = thermal conductivity	Thickness (cm)	Area (m^2)
Pf – GROUND FLOOR	**U = 0.30 W/m²K**	**46.2**	
parquet glued to the base (700 kg/m^3)	λ = 0.18 W/mK	2.4	ground floor area contained within external load-bearing walls = 78.48 m^2 exposed perimeter = 39.16 m
cement screed (2,000 kg/m³)	λ = 1.60 W/mK	8.0	
polyethylene (PE) film (1,000 kg/m³)	λ = 0.50 W/mK	0.02	
expanded polystyrene (EPS-200) under HRN EN 13163 (30 kg/m³)	λ = 0.033 W/mK	8.0	
elastic polystyrene (EPS-T) under HRN EN 13163 (12 kg/m³)	λ = 0.042 W/mK	2.0	
hydro insulation - two layers (0.4 + 0.4 cm) of bituminous membranes	λ = 0.23 W/mK	0.8	
concrete slab (2,200 kg/m³)	not included in calculation	10.0	
compacted gravel (1,700 kg/m³)		15.0	
MKf – CEILING TOWARD AN UNHEATED ATTIC	**U = 0.25 W/m²K**	**31.1**	area = 59.89 m2 ***Note:** the actual U-value of the ceiling to unheated attic is U = 0.28 W/m²K, but thermal resistance of the unheated bordering space reduces it to U = 0.25 W/m²K
oriented strand board - OSB (650 kg/m³)	λ = 0.13 W/mK	3.0	
expanded polystyrene (EPS-100) under HRN EN 13163 (20 kg/m³)	λ = 0.036 W/mK	8.0	
elastic polystyrene (EPS-T) under HRN EN 13163 (12 kg/m³)	λ = 0.042 W/mK	4.0	
reinforced concrete slab (2,500 kg/m³)	λ = 2.60 W/mK	16.0	
smoothed underside (1,500 kg/m³)	λ = 0.54 W/mK	0.1	

Name and composition of the structural element	U = heat transfer coefficient	Thickness (cm)	area (m^2) (by cardinal directions)			
WINDOW			N	S	E	W
frames	5-chamber PVC profile					
glazing	double insulated glass with Low-E coating, interlayer with 90% argon fill	6 mm 16 mm 4 mm	4.32	26.16	0	0
$g_\perp$	0.6					
F_c (roll-up shutters or no protection)			1.00	0.30		
F_f	0.75					
U_f	1.40 W/m²K					
U_g	1.10 W/m²K					
distancers (spacers)	PVC		F_s = 1.0	F_s = 0.74		
U_w - total thermal transmittance (including thermal transmittance through frame elements, glass and linear heat loss - Uframes + Uglass + Ψglass edge):	**1.18 W/m²K**					
SKYLIGHT - 30° inclination			N	S	E	W
frames	5-chamber PVC profile					
glazing	double insulated glass with Low-E coating, interlayer with 90% argon fill	6 mm 16 mm 4 mm				
$g_\perp$	0.6					
F_c (roll-up shutters)	0.3		0	10.8	0	0
F_f	0.75					
U_f	1.40 W/m²K					
U_g	1.10 W/m²K					
distancers (spacers)	PVC					
U_w - total heat transmittance (including heat transmittance through frame elements, glass and linear heat loss - Uframes + Uglass + Ψglass edge):	**1.18 W/m²K**					
ROLL-UP SHUTTER CASING	**U = 0.73 W/m²K**	**3.2**	N	S	E	W
aluminium sheeting (2,800 kg/m³)	λ = 160 W/mK	0.2				
rigid polyurethane (PUR) foam under HRN EN 13165 (30 kg/m³)	λ = 0.025 W/mK	3.0	0	3.27	0	0

DOOR	U = 1.80 W/m²K		N	S	E	W
The door has a thermally insulated leaf.			0	0	2.2	0

Table 1-4 Relevant data for the calculation of nearly zero-energy building's energy performance - coastal Croatia

Calculation	done in accordance with HRN EN ISO 13790:2008 standard, the Technical regulation on energy economy and heat retention in buildings and the Algorithm			
	primary energy conversion factors	electrical energy	1.6153	
		natural gas	1.0965	
		pellets	1.1955	
		solar	1.0484	
Climatic conditions	location		Split Marjan 43°31' N 16°26' E	
	heating degree - days		1437.7	HDD
	cooling degree - days			CDD
	source of climatic dataset		national monthly data	
	terrain description		suburban area, no impact of neighbouring buildings	
Building geometry	length x width x height		11.80 x 8.10 x 6.13	m x m x m
	useful floor area		153.37	m²
	number of floors		2.00	-
	shape factor		0.77	m²/m³
	window area ratio to the total building envelope area	South	36.96	m²
		East	0.00	m²
		North	4.32	m²
		West	0.00	m²
	orientation		180	°
Internal gains	building utilisation		single-family building	
	average thermal gain from the occupants		5.00	W/m²
	specific electric power of the lighting system		6.19	W/m²
	specific electric power of the electrical equipment		0.00	W/m²
Building elements	average U-value of the walls		0.13-0.14	W/m²K
	average U-value of the roof		0.13-0.15	W/m²K
	average U-value of the basement		0.15	W/m²K
	average U-value of the windows		0.75	W/m²K
	thermal bridges	total length	62.1	m

		average linear thermal transmittance	0.05	W/mK
	thermal capacity per unit area	total thermal capacity for the building J/m²K	290,469,422.00	J/m²K
				J/m²K
				J/m²K
	type of shading systems		shutters or roll-up shutters	
	average g-value of	glazing	0.5	-
		glazing + shading	0.15-0.50	-
	infiltration rate		0.5	1/h
Technical systems	ventilation	air changes per hour	-	1/h
		heat recovery efficiency	-	%
	heating system efficiency	generation	0.00	%
		distribution	0.00	%
		greenhouse	0.00	%
		control	0.00	%
	cooling system efficiency	generation	599.25	%
		distribution	100	%
		greenhouse	87.98065405	%
		control	100	%
	DHW generation system efficiency	generation	106.34	%
		distribution	86.78	%
Building setpoints and schedules	temperature setpoint	winter	20	°C
		summer	-	°C
	humidity setpoint	winter	-	%
		summer	-	%
	operation schedules and controls	occupancy	17 hours, 7 days	
		lighting	17 hours,7 days	
		appliances	17 hours, 7 days	
		ventilation	17 hours, 7 days	
		heating	17 hours, 7 days	
		cooling	17 hours, 7 days	
Energy needs	(thermal) energy contribution of main passive strategies implemented	1	0.00	kWh/a
		2	0.00	kWh/a
		3	0.00	kWh/a
	energy need for heating		1,072.13	kWh/a

	energy need for cooling		6,069.00	kWh/a
	energy need for DHW		1,927.60	kWh/a
	energy need for other (humidification, dehumidification)		-	kWh/a
	energy use for ventilation		-	kWh/a
	energy use for internal lighting		576.50	kWh/a
	energy use for other (appliances, external lighting, auxiliary systems, etc.)		374.00	kWh/a
Energy generation on site	thermal energy from RES (e.g. thermal solar collectors)		0.00	kWh/a
	electrical energy generated in the building and used on site		0.00	kWh/a
	electrical energy generated in the building and exported to the market		5,585.90	kWh/a
	primary energy total		**5,122.13**	**kWh/a**
	primary energy specific		**33.40**	**kWh/m²a**

1.2 PRIMARY ENERGY FACTORS USED IN DETERMINING PRIMARY ENERGY CONSUMPTION

The factors applied to calculate the primary energy of all energy sources and energy systems used in the Republic of Croatia to supply energy to buildings have been determined. In the total energy consumption structure, or on the primary side of the energy balance, primary energy refers to the energy consumption resulting from the use of a certain amount of energy in a building or at the level of final energy consumption in the energy balance. The factor calculation relies on Croatian energy system relations, and uses the three-year averages found in Croatia's energy balances in the period between 2009 and 2011. All the figures and relations in the energy balances used in the calculation of primary energy factors were determined by applying the EUROSTAT energy balance methodology.

The energy supply to buildings in Croatia relies on brown coal, lignite, natural gas, firewood, solar energy, geothermal energy, wood briquettes, wood pellets, wood chips, charcoal, liquefied petroleum gas, kerosene, extra light heating oil, heating oil, electricity and district heating. As to district heating, both large and small systems are available, with thermal energy generated basically in the following two ways:

- public cogeneration plants,

- public heating plants.

Public cogeneration plants are thermal power plants – namely, the cogeneration plants in Zagreb and Osijek, as the two large district heating systems. The generation of district heating in these plants relies on the use of natural gas, extra light heating oil and heating oil. Public heating plants are located in other cities and they supply a large or a small number of buildings, as these are smaller or very small individual district heating systems. Thermal energy generation at these plants also relies on the use of natural gas, extra light heating oil and heating oil; however, considering that these are individual systems, certain plants use one or two of the listed energy sources at the most.

Calculations have been done for each of the energy sources mentioned above which are used to supply buildings, and for all district heating systems, yielding appropriate factors for the primary energy calculation, as well as total CO2 emissions resulting from the use of a particular energy source or system. Primary energy factors for district heating systems have been determined for the average relations applicable at the level of the Republic of Croatia, in particular for the district heating systems in Zagreb and Osijek, and separately also for individual heating plants in the cities which rely on them for their supply. Additionally, primary energy factors have been determined for the average heating plants which use natural gas, extra light heating oil or heating oil, that is, in those cases or locations for which separate analysis had not been conducted.

All calculations of primary energy factors, as well as of corresponding CO2 emissions, have been carried out by using a model developed especially in Microsoft Excel. The following table shows all the primary energy factors and CO2 emissions

for the energy sources used in Croatian building construction, and which result from Croatian energy system relations. The total primary energy factor is divided into a renewable component, a non-renewable (fossil) component and an import component. The import component is included since imported electricity always contributes to the electrical energy consumption; however, it is difficult to determine whether the imported energy comes from renewable, fossil or nuclear energy.

Primary energy sources are defined on the territorial principle.

Table 1-5 Primary energy factors

Energy source		Primary energy factor				tCO2/TJ (kgCO2/GJ) emission
		Total	Renewable component	Non-renewable component	Imported component	
Hard coal		**1.038**	0.0000	1.038	0.0000	95.49
-Brown coal		**1.054**	0.0000	1.054	0.0000	98.09
Lignite		**1.082**	0.0001	1.081	0.0001	105.13
Firewood		**1.111**	1.0001	0.111	0.0001	8.08
Wood briquettes		**1.180**	1.0334	0.117	0.0296	9.10
Wood pellets		**1.191**	1.0364	0.123	0.0322	9.56
Wood chips		**1.211**	1.0303	0.154	0.0268	11.76
Charcoal		**1.286**	1.1866	0.100	0.0002	7.27
Solar energy		**1.048**	1.0130	0.024	0.0115	1.96
Geothermal energy		**1.211**	1.0933	0.080	0.0383	6.52
Natural gas		**1.097**	0.001	1.095	0.001	61.17
LPG		**1.162**	0.001	1.160	0.001	72.47
Kerosene		**1.033**	0.000	1.033	0.000	73.54
Extra light heating oil		**1.140**	0.001	1.138	0.001	83.21
Heating oil		**1.132**	0.001	1.130	0.001	86.20
Electrical energy		**1.614**	0.433	0.798	0.383	65.22
District heating	Croatia - average	**1.523**	0.022	1.494	0.008	100.69
	CHS ZG+OS (cogeneration)	**1.486**	0.010	1.466	0.009	97.59
	CO - Croatia average	**1.605**	0.004	1.597	0.004	109.57
	CHS ZG (cogeneration)	**1.481**	0.010	1.462	0.009	96.05
	CHS OS (cogeneration)	**1.498**	0.010	1.478	0.009	110.15
	CO - Zagreb avg	**1.567**	0.004	1.559	0.004	107.86
	CO - Osijek avg	**1.537**	0.004	1.529	0.004	93.66
	CO - Rijeka avg	**1.577**	0.004	1.569	0.004	106.84
	CO - Slavonski Brod avg	**1.393**	0.004	1.385	0.004	100.12

	CO - Split avg	**1.548**	0.004	1.540	0.004	132.48
	CO - Karlovac avg	**1.442**	0.004	1.434	0.004	115.77
	CO - Varaždin avg	**1.498**	0.004	1.489	0.004	91.27
	CO - Vinkovci avg	**1.451**	0.004	1.442	0.004	103.52
	CO - Vukovar avg	**1.371**	0.004	1.363	0.004	86.00
	CO - Sisak avg	**2.427**	0.004	2.419	0.004	148.13
	CO - natural gas	**1.358**	0.004	1.350	0.004	82.74
	CO - heating oil	**1.452**	0.004	1.444	0.004	124.41
	CO - extra light heating oil	**1.437**	0.004	1.429	0.004	118.87

1.3 NATIONAL CO_2 EMISSION FACTORS

The national CO_2 emission factors corresponding to the flow of energy from the generation or import site to the final energy consumption site are shown in Table 5.

Table 1-6 **National CO_2 emission factors**

Energy source	**CO_2 emission factor per unit of energy [gCO_2/kWh]**
Hard coal	344.46
Brown coal	354.11
Lignite	379.94
Firewood	31.14
Heating oil	312.68
Extra light heating oil	311.14
Kerosene	289.00
Liquefied petroleum gas	271.56
Natural gas	220.20
Electricity*	235.82
District heating*	364.68

* - average for the period between 2009 and 2011, according to the energy balance data (Energy in Croatia)

2..... REVIEW OF EXISTING ENERGY EFFICIENCY IMPROVEMENT TARGETS FOR BUILDINGS AND NEARLY ZERO-ENERGY BUILDINGS

Due to lack of a definition of nearly zero-energy consumption buildings, the Second National Energy Efficiency Action Plan (NEEAP) for the period between 2011 and 2013 set no target for such buildings. Amendments to the relevant legislative and regulatory framework established new, stricter requirements for the energy performance of buildings which are yet to be built (new), as well as for the existing ones which are to be retrofitted.

The energy efficiency improvement targets for the buildings defined in the 2nd NEEAP are clearly presented in the table below:

Table 2-1 Energy efficiency improvement targets for 2nd NEEAP buildings

No	Title of the energy savings measure	Targeted [energy] end-use	Duration	Energy savings achieved in 2010 [PJ/ GWh]	Expected energy savings in 2016 [PJ/ GWh]	Share in the 2016 sector target[1] [%]	Status in relation to the 1st NEEAP
B.1.	Construction regulations and enforcement	New and existing buildings	2006-2016	households: 1.52 PJ (423 GWh) services: 0.64 PJ (177 GWh)	households: 0.38 PJ (105 GWh) services: 0.34 PJ (94 GWh)	households: 5.65 services: 9.04	Revised in view of planned activities for the purpose of alignment with EPBD II
B.2.	Heating and air-conditioning system energy audits	Heating and air-conditioning systems	2009-2016	N/D	N/D	N/D	Implementation to begin in the course of 2nd NEEAP period
B.3.	Building energy audits	New and existing buildings	2009-2016	N/D	N/D	N/D	Revised in view of planned activities for the purpose of alignment with EPBD II
B.4.	Increase in the number of nearly zero-energy buildings	New buildings and existing ones being retrofitted	2010-2016	0	households: 0.04 PJ (12 GWh) services: 0.06 PJ (17 GWh)	households: 0.60 services: 1.60	New measure
TOTAL:				households: 1.52 PJ (423 GWh) services: 0.64 PJ (177 GWh)	households: 0.42 PJ (117 GWh) services: 0.40 PJ (111 GWh)	households: 6.25 services: 10.64	

Amendments to the Technical regulation on rational energy use and heat retention in buildings (*Narodne Novine* (NN; Official Gazette of the Republic of Croatia) Nos 76/07, 38/09, 55/11, 90/11, 50/12, 55/12, 79/13 and 90/13) introduced primary energy limits for new single-family buildings at 90 kWh/m^2 annually in cities and towns with fewer than 2,200 heating degree days per year, and at 160 kWh/m^2 annually in cities and towns with 2,200 or more heating degree days per year. The same limits apply to larger-scale retrofits of existing buildings.

[1] The service (public and commercial) sector target defined in the 1st NEEAP is 3.76 PJ [for 2016], and 1.25 PJ for 2010; the [2016] household target is 6.72 PJ, and 2.24 PJ for 2010.

3..... REVIEW OF DEVELOPMENT ACTIVITIES AND PILOT PROJECTS AIMED AT IMPROVING THE ENERGY EFFICIENCY AND DEVELOPMENT OF NEARLY ZERO-ENERGY BUILDINGS

In the past period, the activities were aimed primarily at raising the awareness among citizens of the need for energy management and the benefits which may be brought by energy efficiency. The *Promotion of energy efficiency in Croatia* project, implemented by UNDP, proved particularly important in that sense. An extensive three-year information and education campaign aimed at the general public was conducted as part of the project. Public sector programmes being implemented, and especially the *Energy management in cities and counties* project, have established a network of EE info points at which citizens may obtain information about potential energy efficiency improvements.

The 2nd NEEAP presented the activities which are aimed at improving the household energy efficiency, including the mid-targets until 2016.

No	Title of the energy savings measure	Targe-ted [energy] end-use	Dura-tion	Expec-ted energy savings in 2016 [PJ/ GWh]	Share in the sector target[2] for 2016 [%]	Status in relation to the 1st NEEAP	Additional notes
R.1.	Info campaigns, activities, additional education-training and EE info centre network	Existing resi-dential buildings	2007-2013	N/D	N/D	National media campaign will no longer be imple-mented	Under the 1st NEEAP: - household sector measure - service (public and commercial) sector measure There is a connection with P.1 measure
R.2.	Energy labelling of household appliances	House-hold applian-ces	2006-2016	0.83 PJ (230 GWh)	12.35	Measure revised by introducing financial aid, but also due to amendments to EU directives	It is necessary to ensure monitoring the quantities of appliances in the market, considering their energy efficiency class, in order to evaluate the impacts of this measure more accurately
R.3.	Financial aid programme for natural persons	Energy consump-tion in residen-	2009-2016	0.11 PJ (29.45 GWh)	1.64	Revised measure	Counties, regional energy agencies- implementation and co-financing; primarily to foster the use of solar energy for DHW generation

[2] The residential sector target is 6.72 PJ for 2016, and 2.24 PJ for 2010.

	investing in solar heating systems and other EE measures	tial buildings, energy genera-tion in residen-tial buildings by using RES and heat pumps					
R.4.	Programme of LPG and solar energy use on islands	Heating require-ments of island house-holds	2008-2012 (2016)	0.005 PJ (1.36 GWh)	0.07	Implemente d as planned	Measure was not explicitly defined by the 1st NEEAP although it was implemented as planned under a special Programme; the Programme needs to be revised and its implementation extended until 2016
R.5.	Plan for energy retrofitting of residential buildings	Existing family buildings and apart-ment buildings	2011-2016	7.61 PJ (2,114 GWh)	113.24	New measure	Measure demands large investments – the Agency implements the programme, the EPEEF needs to provide co-financing from its own resources, ESCOs and EU funds need to be included
TOTAL[3]:				8.56 PJ (2,404.81 GWh)	127.30		

[3] Total savings achieved in the household sector are larger; presented in Chapter 3.3, they and are a result of general measures in building construction, as well as measures implemented by energy undertakings. Only the results and impact assessments of the measures related directly to households are listed here.

4..... REVIEW OF AVAILABLE FINANCING MODELS AND POLICY INSTRUMENTS TO INCREASE NEARLY ZERO ENERGY BUILDINGS AND ENERGY EFFICIENCY IN BUILDINGS AT THE LOCAL, REGIONAL AND NATIONAL LEVEL

4.1 CROATIAN BANK FOR RECONSTRUCTION AND DEVELOPMENT (CBRD)

NAME	PURPOSE	BORROWERS / BENEFICIARIES	TYPE OF FINANCING	AMOUNT OF FINANCING	TERMS
Loan programme for environmental protection, energy efficiency and renewable energy projects	Founding investments Land Construction investments Furnishings and equipment	Local and regional self-government units, utility companies, companies, craftsmen and other legal persons	Loan	Depends on the CBRD financing capacity, specific investment programme, creditworthiness of the borrower, value and quality of the security instruments offered. Loan applications for less than HRK 100,000.00 will generally not be considered. Loans are granted in HRK, with foreign currency indexation; CBRD finances up to 75% of the estimated investment value, excluding VAT.	Up to a 14-year loan tenor, 4% interest rate

Programme of bank guarantee issuance for energy efficiency projects	The project must be a new investment aimed at improving the energy efficiency use in buildings, and in heating sources, local heating systems and heating distribution networks where at least 50% of the energy is used to maintain a certain temperature of the heated space and for hot water generation in buildings. Investments in local and regional self-government unit infrastructure and those aimed at improving industrial processes are eligible. New projects, particularly those with an integrated building concept with reduced energy consumption, using efficient technologies/systems, provided that it is possible to establish a basis for the calculation of energy savings. The estimated period of return on investment of each project must not exceed 10 (ten) years.	Local and regional self-government units, utility companies and companies, craftsmen and other legal and natural persons.	Bank guarantee	Up to 50% of documented mature unpaid claims for the loan principle, but not exceeding an equivalent in HRK of USD 300,000 calculated at the middle exchange rate of the Croatian National Bank (CNB) on the issue date.	Period of bank guarantee validity – 10 (ten) years and 60 (sixty) days from the issue date.

Grant with a loan for energy efficiency projects (EEFF 2006 and EEFF 2007 European Commission programmes)	Industrial sector: investing in the industrial sector's energy demand side to achieve at least 20% energy savings and/or CO_2 reductions Building construction sector: investing in the building construction sector's energy demand side to achieve at least 30% energy savings and/or CO_2 reductions	Local and regional self-government units, utility companies, companies, craftsmen and other legal persons. Lending to end beneficiaries through commercial banks and direct lending is possible.		The minimum amount is EUR 40,000.00 (for all investments); a portion of the loan which may be eligible for grant funds is as follows: up to EUR 250,000.00 under EE projects in the housing sector, up to EUR 2,500,000.00 for other investments in the building construction sector and industry, and up to EUR 5,000,000.00 for renewable energy sources (RES).	

Loan programme for the energy renovation (retrofitting) of buildings	Modernisation and reconstruction of buildings, plus furnishings and equipment Lending through commercial banks and direct lending is possible.	➢ energy service providers ➢ energy service clients ➢ any companies and craftsmen investing in energy efficiency.	Loan	The maximum loan amount is not limited and, depending on the CBRD financing capacity, specific investment programme, creditworthiness of the borrower, project eligibility on the basis of the Certificate of Technical and Financial Project Feasibility and on the value and quality of the security instruments offered, CBRD may consider financing up to 100% of the estimated investment value, excluding VAT.	Up to a 14-year loan tenor, 4% interest rate

4.2 COMMERCIAL BANKS

4.2.1 ZAGREBAČKA BANKA

NAME	PURPOSE	BORROWERS	TYPE OF FINANCING	AMOUNT OF FINANCING	TERMS
Zagrebačka Banka "green" loans	➢ purchase of energy class A+, A or B house or flat ➢ construction, completion of low-energy houses ➢ energy efficiency improvements: financing the costs of project design, purchase and installation of solar collectors, air conditioning systems, water filtering systems, installation of external carpentry with insulated glass, thermal façades, roof replacement etc.	Private individual borrowers	Loan	EUR 2,500 to EUR 250,000	The effective interest rate for Bank clients is 6.1%, and for other borrowers 6.36%. Loan tenor from 13 to 360 months.

Zagrebačka Banka housing loans in kuna	➢ **Standard purpose:** property purchase, construction, completion, extension and reconstruction, internal decoration (renovation), purchase and municipal development of building plots, refinancing of outstanding housing loans at other banks ➢ **"Green" purpose** purchase of energy class A+, A and B house or flat, construction, completion of low-energy houses, energy efficiency improvement, financing the cost of project design, purchase and installation of solar collectors, air conditioning systems, water filtering systems, installation of external carpentry with insulated glass, thermal façades, roof replacement etc.	Private individual borrowers	Loan	HRK 15,000 to HRK 3,000,000	**For "green" purpose loans:** The effective interest rate for Bank clients is 5.76%, and for other borrowers 6.03%. **For standard purpose loans:** The effective interest rate for Bank clients is 5.97%, and for other borrowers 6.24%. Loan tenor from 13 to 180 months

***Prva stambena štedionica* [building society] "green" loans with foreign currency indexation**	Interim financing loans	➢ improving the energy efficiency of housing properties ➢ purchase of household appliances, video and audio equipment, energy class A+, A and B IT equipment and lighting for the house or flat ➢ purchase of energy class A+, A and B low-energy housing properties ➢ construction of energy class A+, A and B low-energy housing properties	Private individual borrowers	Loan	EUR 1,250 to EUR 2,000,000	The effective interest rate for interim financing is 4.73%; the loan tenor for loan amounts of up to EUR 20,000 is up to 15 years, for loan amounts between EUR 20,001 and EUR 60,000 it is up to 20 years and for loan amounts exceeding EUR 60,001 up to 25 years.
	Regular loans	➢ improving the energy efficiency of housing properties ➢ purchase of household appliances, video and audio equipment, energy class A+, A and B IT equipment and lighting for the house or flat ➢ purchase of energy class A+, A and B low-energy housing properties ➢ construction of energy class A+, A and B low-energy housing properties	Private individual borrowers	Loan	EUR 725 to EUR 140,000	The effective interest rate is 5.15 %; the loan tenor for loan amounts of up to EUR 20,000 is up to 15 years, for loan amounts between EUR 20,001 and EUR 60,000 it is up to 20 years and for loan amounts exceeding EUR 60,001 up to 25 years.

***Prva stambena štedionica* "green" loans in kuna**	Interim financing loans	improving the energy efficiency of housing properties purchase of household appliances, video and audio equipment, energy class A+, A and B IT equipment and lighting for the house or flat purchase of energy class A+, A and B low-energy housing properties construction of energy class A+, A and B low-energy housing properties	Private individual borrowers	Loan	HRK 8,000 to HRK 1,600,000	The effective interest rate for interim financing is 5.20%; the loan tenor for loan amounts of up to HRK 150,000 is up to 15 years, for loan amounts between HRK 150,001 and HRK 450,000 it is up to 20 years and for loan amounts exceeding HRK 450,001 up to 25 years.
	Regular loans	improving the energy efficiency of housing properties purchase of household appliances, video and audio equipment, energy class A+, A and B IT equipment and lighting for the house or flat purchase of energy class A+, A and B low-energy housing properties construction of energy class A+, A and B low-energy housing properties	Private individual borrowers	Loan	HRK 4,800 to HRK 1,120,000	The effective interest rate is 5.15 %; the loan tenor for loan amounts of up to HRK 150,000 is up to 15 years, for loan amounts between HRK 150,001 and HRK 450,000 it is up to 20 years and for loan amounts exceeding HRK 450,001 up to 25 years.

***Prva stambena štedionica* "green" plan**	A minimum 50% of the loan amount must be spent for the following "green purposes": - improving the energy efficiency of housing properties; - "green equipment" – including the purchase of household appliances, video and audio equipment; - energy class A+, A and B IT equipment and lighting; - purchase of energy class A+, A and B low-energy housing properties; construction of energy class A+, A and B low-energy housing properties. The remaining 50% of the loan amount may be spent on the following: - property, i.e. flat or family house, purchase; - flat or family house construction; flat or family house reconstruction, renovation, repair and purchase of equipment; - purchase of building parcel without or with a partially completed building; communal development of the building parcel.	Private individual borrowers	Loan	EUR 2,500 to EUR 25,000	The effective interest rate is 5.14%, with up to a 10-year loan tenor.

Energy efficiency entrepreneurial loans	Long-term investment financing loans: A) Long-term loan to finance own solar electricity and thermal energy generation systems: purchase and installation of solar electricity and thermal energy generation systems, other costs involved in putting the system to use. B) Long-term loans for low-energy property purchase or construction C) Long-term loans to improve the energy efficiency of commercial and housing property (managed by the economic operator): façade, window and door replacement; boiler room modernisation; lighting, heating or cooling etc. system improvement; other investments aimed at improving energy efficiency. D) Refund of investments for the purposes mentioned above	To all economic operators and local government and self-government units.	Loan	Depen-ding on the credit-worthiness of the borrower	According to a decision by ZABA, variable, up to 12 months.

4.2.2 PRIVREDNA BANKA

NAME	PURPOSE	BORROWERS	TYPE OF FINANCING	AMOUNT OF FINANCING	TERMS
PBZ energy loans	➢ higher energy class A, A+ and B residential property purchase, residential property purchase and energy efficiency improvement ➢ construction, extension, upgrade, completion of low-energy and passive houses, ➢ building plot purchase and construction of low-energy and passive houses, ➢ energy efficiency improvement of existing buildings; Borrowers under loans issued for the purpose of extension/upgrade/reconstruction/energy efficiency improvement/completion need not own the properties being financed (provided that they are related by blood or marriage to the property owner).	Private individual borrowers	Loans	➢ EUR 10,000.00 to EUR 350,000.00 ➢ EUR 2,000.00 to EUR 70,000.00 (for the purpose of energy efficiency improvement).	Loan tenor ➢ up to 30 years ➢ up to 15 years or 25 years for the purpose of energy efficiency improvement (depending on security instruments) INTEREST RATE ➢ EIR starting from 6.13% 3[sic] with client status ➢ EIR starting from 6.45% 3[sic] without client status

4.2.3 RAIFFEISENBANK

NAME	PURPOSE	BORROWERS	TYPE OF FINANCING	AMOUNT OF FINANCING	TERMS
"Flexi green" housing loans	Energy efficient housing facility purchase, construction, completion, extension or reconstruction, or refinancing of a housing loan granted as a loan aimed at fostering energy efficiency	Private individual borrowers	Loans	EUR 5,000.00 to EUR 200,000.00	Loan tenor: ➢ from 3 to 25 years for loan amounts of up to EUR 25,000.00 ➢ from 3 to 30 years for loan amounts of EUR 25,001.00 to EUR 200,000.00 Interest rate: ➢ 5.75% fixed for the first two years for Bank clients/clients currently redirecting their income payments to RBA
"Flexi green" housing loans	Housing facility modernisation - energy efficiency improvement of a house or a flat	Private individual borrowers	Loans	EUR 5,000.00 to EUR 200,000.00	The loan tenor is 3-20 years, and the interest rate is 6.25% fixed for the first two years for Bank clients/clients currently redirecting their income payments to RBA.

"FLEXI GREEN" housing loan for the purchase of flats in cooperation with property developers				From EUR 5,000.00 to EUR 200,000.00	Loan tenor: ➢ from 3 to 25 years for loan amounts of: up to EUR 25,000.00 ➢ from 3 to 30 years for loan amounts of: EUR 25,001.00 to EUR 200,000.00 Interest rate: ➢ 5.75% fixed for the first two years for Bank clients/clients currently redirecting their income payments to RBA. 6.25% fixed for the first two years for others

4.2.4 BANCO POPOLARE CROATIA

NAME	PURPOSE	BORROWERS	TYPE OF FINANCING	AMOUNT OF FINANCING	TERMS
"Green" housing loan	A form of green loan for the purchase of a flat/house, or for the construction of energy class A+, A and B passive or low-energy house. The loan may also be used for the purpose of reorganisation to make the housing space into low-energy, such as by equipping one's own home with savings systems such as solar panels, collectors or small nominal power wind aggregates, air-conditioning systems, water filters, insulated glass, thermal façades etc.	Private individual borrowers This product is designed for the clients who transfer their permanent monthly income (salary, pension) payments to the Bank.	Loan	➢ HRK 100,000 to HRK 2,000,000 - purchase or construction ➢ HRK 5,000 to HRK 700,000 - housing space decoration	Loan tenor: ➢ 2 to 25 years - for the purchase ➢ 2 to 20 years (up to 7 years for up to HRK 50,000, up to 10 years for up to HRK 100,000 and up to 20 years for more than HRK 100,000 loans) for refurbishment ➢ The interest rate for Bank clients is a regular 2 – 6.62% a year, variable (EIR = 7.00%)

4.2.5 ERSTE BANK

NAME	PURPOSE	BORROWERS	TYPE OF FINANCING	AMOUNT OF FINANCING	TERMS
Environmental housing loans WITHOUT MORTGAGE REGISTRATION	purchase of high energy efficiency (class A+, A and B) housing space; construction, extension and reconstruction of high-energy houses; purchase and installation of equipment using renewable energy sources, property interventions affecting the energy consumption, thermal insulation of housing facilities; refinancing the costs of requisite permits, decisions, approvals and documents, in accordance with regulations governing the field of energy	Private individual borrowers	Loan	Up to EUR 30,000.00 in the kuna equivalent at the Croatian National Bank middle exchange rate on the day of disbursement	➢ client (6.13% effective interest rate) ➢ non-client (6.55% effective interest rate) Up to 10-year loan tenor

Environmental housing loans WITH MORTGAGE REGISTRATION	purchase of high energy efficiency (class A+, A and B) housing space; construction, extension and reconstruction of high-energy houses; purchase and installation of the equipment which uses renewable energy sources, property interventions affecting the energy consumption, thermal insulation of housing facilities; refinancing the costs of requisite permits, decisions, approvals and documents, in accordance with regulations governing the field of energy	Private individual borrowers	Loan	EUR 15,000.00 to EUR 500,000.00 in the kuna equivalent at the Croatian National Bank middle exchange rate on the day of disbursement	➢ client (5.99% effective interest rate) ➢ non-client (6.42% effective interest rate) Loan tenor from 36 to 360 months

4.2.6 CROATIAN POSTAL BANK

NAME	PURPOSE	BORROWERS	TYPE OF FINANCING	AMOUNT OF FINANCING	TERMS
"Green" housing loan in kuna	➢ purchase of higher energy class A+, A and B housing property ➢ construction, extension, upgrade or completion of energy class A+, A and B low-energy and passive houses ➢ improving the energy efficiency of existing buildings	Private individual borrowers	Loan	**At least HRK 75,000.00 for the following:** ➢ purchase of energy class A+, A and B house of flat, ➢ construction, extension, upgrade or completion of energy class A+, A and B low-energy and passive houses **From at least HRK 75,000.00 up to a maximum of HRK 500,000.00 for the following:** improving the energy efficiency of existing buildings (thermal façade, roof replacement, air-conditioning systems, water filtering systems, external carpentry, solar collector installation etc.)	The regular interest rate is 6.95% a year, and 5.95% for bank clients. The loan tenor is from 13 to 360 months.

„Green“ housing loan with foreign currency indexation	➢ purchase of higher energy class A+, A and B housing property ➢ construction, extension, upgrade or completion of energy class A+, A and B low-energy and passive houses ➢ improving the energy efficiency of existing buildings	Private individual borrowers	Loan	**At least EUR 10,000.00** ➢ purchase of energy class A+, A and B house of flat ➢ construction, extension, upgrade or completion of energy class A+, A and B low-energy and passive houses **At least EUR 10,000.00** ➢ improving the energy efficiency of existing buildings (thermal façade, roof replacement, air-conditioning systems, water filtering systems, external carpentry, solar collector installation etc.)	The regular interest rate is 6.41% a year, and 5.41% for bank clients. The loan tenor is from 13 to 360 months.

4.2.7 HYPO ALPE ADRIA BANK

NAME	PURPOSE	BORROWERS	TYPE OF FINANCING	AMOUNT OF FINANCING	TERMS
	➢ purchase of higher energy class A+ , A or B residential property (low-energy house, ➢ flat, low-energy holiday apartment, accompanying garage or parking slot); ➢ down payment refinancing (additional purpose when buying property); ➢ refinancing a housing loan, granted as a housing loan aimed at fostering energy efficiency; ➢ construction of low-energy residential property; ➢ renovation of residential property for the purpose of improving energy efficiency; ➢ reconstruction / extension / completion of low-energy housing property construction; ➢ building plot purchase (and communal development of land) and low-energy house construction; ➢ purchase and installation of equipment to improve the energy efficiency of residential property (possibility of purchase and ➢ installation of solar collectors for one's own purposes or for the purpose of electricity sale to HROTE - the Croatian Energy Market Operator); ➢ re/financing the costs of documents required under the regulations governing the field of energy.	Private individual borrowers	Loan	➢ EUR 10,000 to EUR 250,000 for the purpose of purchase / construction / housing loan refinancing. ➢ EUR 5,000 to EUR 75,000 for the purpose of renovation / reconstruction / extension / completion of property construction / purchase and installation of equipment / financing the costs of documents	Interest rate: ➢ 5.55% for Bank clients, effective interest rate (EIR) = 5.72% ➢ 6.30% for other clients, effective interest rate (EIR) = 6.74% Loan tenor from 1 to 30 years.

4.2.8 OTP BANKA

NAME	PURPOSE	BORRO-WERS	TYPE OF FINANCING	AMOUNT OF FINANCING	TERMS
	➢ remodelling of the flat to improve its energy efficiency and house construction, completion or remodelling to improve its energy efficiency; ➢ purchase of energy class B, A and A+ flat or house; ➢ improving the energy efficiency by financing project design costs, installation of household gas, water filtering systems, financing property interventions leading to a reduced energy consumption, purchase or installation of solar collectors for one's own purpose or for the purchase of electricity sale to HROTE, air-conditioning systems, installation of external carpentry with insulated glass, thermal façade, roof renovation, wind turbines etc.; ➢ refinancing an outstanding loan of the same type at another bank.	Private individual borrowers	Loan	➢ flat remodelling to improve its energy efficiency worth between EUR 5,000 and EUR 50,000; ➢ purchase of energy class B, A and A+ flat or house; construction, completion or remodelling of a house to improve its energy efficiency, improving the energy efficiency or refinancing an existing housing loan of the same type equivalent to between EUR 5,000 and EUR 250,000 raised from another bank; ➢ granted loan amount to the estimated property value is 1:1	➢ Interest rate for loans equivalent to between EUR 5,000 and EUR 15,000: effective: 7.05% ➢ Interest rate for loans equivalent to between EUR 15,001 and EUR 250,000: effective: 6.12%

4.3 ENVIRONMENTAL PROTECTION AND ENERGY EFFICIENCY FUND

Appropriations of the Fund may be granted to legal and natural persons for financing the purposes stipulated in the Environmental Protection and Energy Efficiency Fund Act on the basis of tenders to be called by the Fund. The Fund will not issue a public tender when, as a contracting party, it directly co-finances and participates in the implementation of projects, programmes and similar activities stipulated by the Environmental Protection and Energy Efficiency Fund Act. The conditions to be met by beneficiaries of Fund appropriations, the conditions and the method of granting such appropriations, as well as the criteria and measures applying to the evaluation of applications for the award of Fund appropriations are defined by general acts of the Fund. The Fund cooperates with banks and other financial institutions in the financing of the said programmes, projects and similar activities. The Fund awards appropriations to legal and natural persons for the purpose of financing programmes, projects and similar activities defined in accordance with the provisions of the Act on the Environmental Protection and Energy Efficiency Fund, by means of:

- loans,
- subsidies,
- financial assistance,
- donations.

The funds are awarded on the basis of conducted public tenders. Appropriations of the Fund are aimed primarily at financing the programmes, projects and similar activities defined by the National Environmental Strategy and the National Environmental Action Plan, the Energy Strategy of the Republic of Croatia and the Energy Strategy Implementation Programme, as well as national energy programmes. Fund appropriations may be used solely for the purposes for which they were granted. A beneficiary which does not employ the awarded funds in the manner or for the purposes defined by an agreement is required to remunerate any amount spent for other than intended purposes to the Fund, and is liable for the damage caused to the Fund in the manner defined in the agreement on the use of such funds.

4.4 COUNTY BUDGETS

In cooperation with the Environmental Protection and Energy Efficiency Fund, a number of counties, cities and municipalities issue tenders for co-financing the installation of household renewable energy sources and the implementation of energy efficiency measures. Corresponding incentives include:

- Incentives for household solar collectors, heat pumps and other renewable energy sources (In a tender for the award of Fund appropriations for the programmes to co-finance the installation of renewable energy sources in Croatia in 2013, applications were submitted by 50 county administrations and local self-governments, of which 47 counties, cities and municipalities received Fund appropriations totalling slightly more than HRK 23.7 million. All these counties, cities and municipalities should issue tenders for the promotion of household renewable energy sources in the course of 2013).
- Incentives for the installation of heat [cost] allocator systems and thermostatic radiator valves for buildings connected to a central heating system in 2013. (In a tender for the award of Fund appropriations to co-finance the programmes of heat cost allocator systems and thermostatic radiator valve installation in buildings connected to a central heating system in Croatia in 2013, applications were submitted by 7 cities, of which 6 received Fund appropriations totalling slightly more than HRK 7 million; a list of these cities is enclosed. All these cities should implement the programme of heat cost allocator systems and thermostatic radiator valve installation in the course of 2013.)
- Incentives for energy efficiency in building construction: façade restoration, carpentry installation and construction of low-energy and passive buildings (The right to use Fund appropriations to finance the projects fostering sustainable construction for the purpose of joint financing of the energy efficiency programmes in building construction, worth a total of HRK 107 million in financial assistance and more HRK 2.5 million in interest subsidies, was exercised by 141 bidders. Of these, a large number of counties, cities and municipalities will use the funds for incentives to foster energy efficiency [by subsidising] household interest expenses. Of these, a large number of counties, cities and municipalities will use the funds to promote energy efficiency [by subsidising] household interest expenses.)

PURPOSE	BENEFICIARIES	TYPE OF FINANCING	AMOUNT OF FINANCING TERMS
➢ RES, EE	Private individual borrowers	Grants	Co-financing ranges from 20% to 55% of the investment, depending on the county, i.e. from HRK 4,000.00 to HRK 37,500.00.

4.5 EUROPEAN BANK FOR RECONSTRUCTION AND DEVELOPMENT

NAME	PURPOSE	BORROWERS	TYPE OF FINANCING	AMOUNT OF FINANCING TERMS
EBDR's Western Balkans Sustainable Energy Direct Financing Facility (WeBSEDFF)	The EBDR's Western Balkans Sustainable Energy Direct Financing Facility is an investment programme established by the EBRD to provide loans for renewable energy and industrial energy efficiency projects to local enterprises in the Western Balkans countries.	The programme is aimed at local private companies, including foreign-owned ones (only the enterprises meeting the criteria for small and medium-sized enterprises are entitled to receive incentives). In the case of renewable energy projects operated under a concession arrangement, the company needs to have acquired the concession in a competitive tender.	Loan and grant funds	Individual loans under the WeBSEDFF may range from a minimum of EUR 1 million to a maximum of EUR 6 million, and may not exceed 65% of total investment costs. Loan tenor may be up to 15 years, including an appropriate grace period. Interest rates will be market-based. Collateral (loan security) is required and depends on the type of the financing provided.

4.6 GREEN FOR GROWTH

Initiated in December 2009 by the KfW *Entwicklungsbank* (the German Development Bank) and the European Investment Bank (EIB) with the financial support of the European Commission and the European Bank for Reconstruction and Development (EBRD), the Green for Growth Fund, Southeast Europe (GGF) is dedicated to enhancing energy efficiency and fostering the use of renewable energy sources in Southeast Europe, including Albania, Bosnia and Herzegovina, Croatia, Macedonia, Kosovo, Montenegro, Serbia and Turkey, as well as in Europe's neighbouring region comprising Armenia, Azerbaijan, Georgia, Moldova and Ukraine.

The GGF provides funds to financial institutions for on-lending to enterprises and private households for energy efficiency projects. The GGF also invests directly in specialist energy service companies (ESCOs), as well as in energy service and supply companies, and renewable energy projects.

The activities of the GGF are supported by a technical assistance facility. The GGF is a public-private partnership with a wide base of investors, such as donor agencies, international financial institutions and institutional private investors. The GGF is registered under Luxembourg law as a SICAV (variable capital investment company). The GGF is managed by Oppenheim Asset Management Services S.à r.l., Luxembourg, in cooperation with Finance in Motion GmbH, Frankfurt/Main, Germany as a fund adviser, and MACS Management & Consulting Services GmbH, Frankfurt/Main, German as a technical adviser.

The Green for Growth Fund, Southeast Europe (GGF) and Privredna Banka Zagreb d.d. (PBZ) signed a Loan Agreement to the amount of EUR 25 million in 2012. The line of credit is structured so as to provide financing for projects involving renewable energy sources (RES) and energy efficiency (EE) in Croatia, with the aim of improving energy independence and diversity of energy supply. The investments will also contribute to reducing greenhouse gas emissions. PBZ was the first partner of the GGF in Croatia.

4.7 UNDP

The Energy Efficiency Project (EE Project) in Croatia was initiated in July 2005, as a collaborative project of the then Ministry of Economy, Labour and Entrepreneurship and the United Nations Development Programme (UNDP), with financial support of the Global Environment Facility (GEF). After eight years of project running, in September this year project activities have been ceremoniously passed onto the public sector, in accordance with the agreement signed between the United Nations Development Programme (UNDP), the Ministry of Construction and Physical Planning (MCPP), the Agency for Transactions and Mediation in Immovable Properties (ATMIP) and the Environmental Protection and Energy Efficiency Fund (EPEEF).

The EE Project was launched in 2005 with the aim of assisting the public sector in laying the foundations for a systematic and efficient energy management, also providing it with necessary tools, skills and knowledge. In the eight years of project implementation, more than 29,000 public servants were educated and the national Energy Management Information System (EMIS) was developed as a key tool in the monitoring and analysis of energy source consumption which currently covers more than 75% of public buildings. The EE project included three programmes:

- the Systematic Energy Management in Cities and Counties in Croatia (SEM Project), which introduces systematic energy management in the cities and counties, fostering the application of energy efficiency principles in the buildings owned or used by local or regional authorities;

Completed energy efficiency projects	Number of implemented projects	Investment amount (in HRK)
Total number of energy efficiency projects completed by the end of Q1 2012	147	139,911,238
Total number of energy efficiency projects completed by the end of Q1 2012, following performed energy audits	60	44,982,564
Projects completed by years		
2006	7	7,854,402
2007	25	10,113,947
2008	14	17,308,000
2009	36	25,005,399
2010	43	22,431,865
2011	14	43,064,747
2012	1	728,525
Projects implemented over several years	11	13,404,398

- The Croatian Government's House in Order Programme (HIO Programme) introduces systematic energy management into ministries and other state administration bodies, fostering the application of energy efficiency principles in the buildings owned and used by the central state administration.

By October 2012, the implementation of so-called "free measures" yielded cumulative financial savings in excess of HRK 8.6 million. The implementation of the said measures resulted in the cumulative reductions in CO2 emissions by 2,500 tonnes. Cumulative savings achieved by implementing the investment measures so far amount to HRK 29,500,000, implying further reductions in CO2 emissions by 4,900 tonnes.
Total cumulative savings as a result of implemented investment and free EE measures amount to HRK 38.1 million per year.

- A systematic information provision to and education of citizens initiated the transformation of the EE market which involves a combination of originally designed and implemented activities, aimed at achieving a sustainable EE market development.

The EMIS system was implemented in 79 cities, 18 counties, 18 ministries and various other state administration bodies; more than 1,400 user accounts are currently activated in the EMIS application. All users have been educated in the energy management of the buildings they are responsible for, and trained to use the EMIS system.

5..... PROJECTIONS OF POSSIBLE ANNUAL INCREASES IN THE NUMBER OF NEARLY ZERO-ENERGY BUILDINGS, WITH INTERMEDIATE TARGETS FOR ENERGY EFFICIENCY IMPROVEMENTS BY 2015

The specific global cost of single-family buildings with nearly zero-energy consumption and that of reference buildings built after 1987 differs by less than 10% over the building life cycle; the cost of nearly zero-energy single-family buildings is actually lower in case of continental climate. Observed through the specific cost of initial investment in building components and technical systems related to the energy consumption of the building, the differences remain within 5%. In absolute terms, this amount ranges between HRK 35/m² for coastal Croatia and HRK 119/m² for continental Croatia.

Table 5-1 Trends in the total surface of single-family buildings by building permits issued in the 2008-2011 period

2008	2009	2010	2011
711,879	632,578	641,294	626,998

Single-family buildings account for approximately 40% of the new-built residential building stock. The surface covered by the building permits issued for single-family residential buildings is at a level of approximately 630,000 m² per year, which means that the plan to increase the number of nearly zero-energy single-family buildings must encompass 63,000 m² of newly built single-family buildings per year.

Savings under the 2nd NEEAP were calculated taking into account 10% newly built nearly zero-energy buildings and an annual growth by approximately 78,000 m² for all residential buildings, also assuming a decreased activity of the construction sector. According to these assumptions and the share of single-family buildings in the overall housing stock, only the area of 3,120 m² in total would have to be targeted.

Table 5-2 Global cost of single-family buildings

	initial investment[4]	annual maintenance and operation cost	energy source cost	residual value at the end of period	global cost	A_k	specific global cost[5]	specific initial investment
post-1987 building - continental	292,265	11,948	116,007	61,107	393,965	104.03	3787	2809
post-1987 building - coastal	229,401	11,948	72,726	78,026	274,823	95.39	2881	2404
nearly zero-energy building - continental	451,568	11,948	87,025	59,660	548,558	154.21	3,557	2,928q
nearly zero-energy building - coastal	374,102	14,337	92,943	58,297	466,578	153.37	3,042	2,439

In view of the real difference in the initial investment of HRK 119/m² and the overall nearly zero-energy single-family residential building stock of 63,000 m² per year, additional investment required stands at HRK 7,497,000 per year in the form of incentives or exemptions for builders. Taking into account a decrease in the number of new buildings under the 2nd NEEAP, this would affect as much as 80% of the residential building stock of new single-family buildings.

Implementing a combination of financial and political instruments which would involve improving energy efficiency and promoting the usage of renewable energy sources as part of a single incentive measure, with an emphasis on defining and applying a model for nearly zero-energy buildings, may be expected to lead to an increase in the number of nearly zero-energy buildings of the planned volume of 63,000 m² a year, and maintaining the trend until 2020:

By distributing the burden between the state and local self-government budgets, the total amount may be reduced further, as demonstrated by the examples of local self-governments presented in Chapter 6. The use of incentives in the form of reduced public utility fees shows that this instrument is not used in the majority of cases, and that its overall effect is insufficient to meet the required target. To achieve these targets, fund transfers to local self-governments are necessary to compensate for their loss of public utility contributions payable on construction projects, thereby expanding the plan to all local self-government units.

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[4] refers to all systems and building envelope components directly related to heat losses

[5] specific global cost for a period of 30 years, at a 6.60% discount rate and a 5.50% real interest rate, and an average growth rate of energy source prices

6..... LOCAL SELF-GOVERNMENT

At the local self-government level, models fostering energy efficient construction are being established on the basis of reduced public utility contributions payable on the construction of such buildings which achieve a lower level of energy required for heating in relation to the legal minimum.

So far, such models have taken root in the cities of Koprivnica, Samobor, Jastrebarsko, Požega, Križevci and the Municipality of Križ, with the reduction of public utility fee amounts ranging from 20% to 100%.

city	type of building	public utility fee reduction	public utility contribution price range	price reduction for a nearly zero-energy reference building
Koprivnica	low-energy building ($Q_{H,nd}$ < 50 kWh/m²a)	50%	HRK 20 – 80/m³	HRK 36.78 – HRK 147.13/m²
Koprivnica	passive building ($Q_{H,nd}$ < 15 kWh/m²a)	100%	HRK 20 – 80/m³	HRK 73.56 – 294.26/m²
Križevci	low-energy building ($Q_{H,nd}$ < 40 kWh/m²a)	25%	HRK 10 – 40/m³	HRK 9.19 – 36.78 m²
Križevci	passive building ($Q_{H,nd}$ < 15 kWh/m²a)	50%	HRK 10 – 40/m³	HRK 18.39 – 73.57/m²
Samobor	low-energy apartment building ($Q_{H,nd}$ < 40 kWh/m²a)	25%	HRK 20 – 138/m³	HRK 18.39 – 126.90/m²
Samobor	passive apartment building ($Q_{H,nd}$ < 15 kWh/m²a)	50%	HRK 20 – 138/m³	HRK 36.78 – 253.80/m²
Jastrebarsko	low-energy and passive residential building	100%	HRK 15 – 28.50/m³	HRK 55.17 – 104.83/m²

Jastrebarsko	low-energy commercial building	20%	HRK 30 – 57/m³	HRK 22.07 – 41.93/m²
Požega	low-energy building ($Q_{H,nd}$ < 40 kWh/m²a)	20%	HRK 10 - 40/m³	HRK 7.36 – 29.43/m²
Požega	passive building ($Q_{H,nd}$ < 15 kWh/m²a)	35%	HRK 10 – 40/m³	HRK 12.87 – 51.50/m²
Municipality of Križ	low-energy building ($Q_{H,nd}$ < 40 kWh/m²a)	20%	HRK 10 – 60/m³	HRK 7.36 – 44.14/m²

The price reduction for a nearly zero-energy reference building in continental Croatia on the basis of reduced public utility fees reaches the level of initial investment only in the central city areas of the cities Koprivnica and Samobor, whereas in most other cities it remains at 25-50% of the value.

A number of cities encourage the household use of renewable energy sources (installation of solar collector systems, pellet heating systems...) They typically subsidise about 50% of the investment value through the programmes relying on the Environmental Protection and Energy Efficiency Fund as the source of financing, and are included in the review though EPEEF activities.