

# IMPROVING ENERGY EFFICIENCY IN RESIDENTIAL HOUSES IN KOSOVO



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## ABSTRACT:

Buildings with poor insulation and infiltration in doors, windows, and other openings have very high heating and cooling demands. Due to lack of maintenance, building materials, and standard they are whopping consumers. The necessity to save energy is enormous, especially with newly environmental constrains. Moreover, this would not only save our natural resources, but it would cut large sums that households spend on electricity, gas, or coal. Thermodynamic calculation of heat gain and loss gave us a lucid picture of benefits respecting nearly zero-energy buildings standards while comparing same building prior and after improving its envelope. The consumption after renovating the envelope is 40 – 74% depending on buildings previous condition. The amount of CO2 released in the environment was cut to 65 – 75%.

## INTRODUCTION:

- 26.1% of total energy in Europe is spend in residential houses. (Eurostat, 2018)
- 73.9% of total energy in Kosovo is spend in heating/cooling. (Eurostat, 2018)
- Biomass (60.6%) and Electricity (35.3%) are main sources used for heating.
- Low quality of insulation and building materials = high heat demand.
- Improving energy efficiency in residential buildings reduces energy consumption which is directly related to environmental problems.

## METHODS:

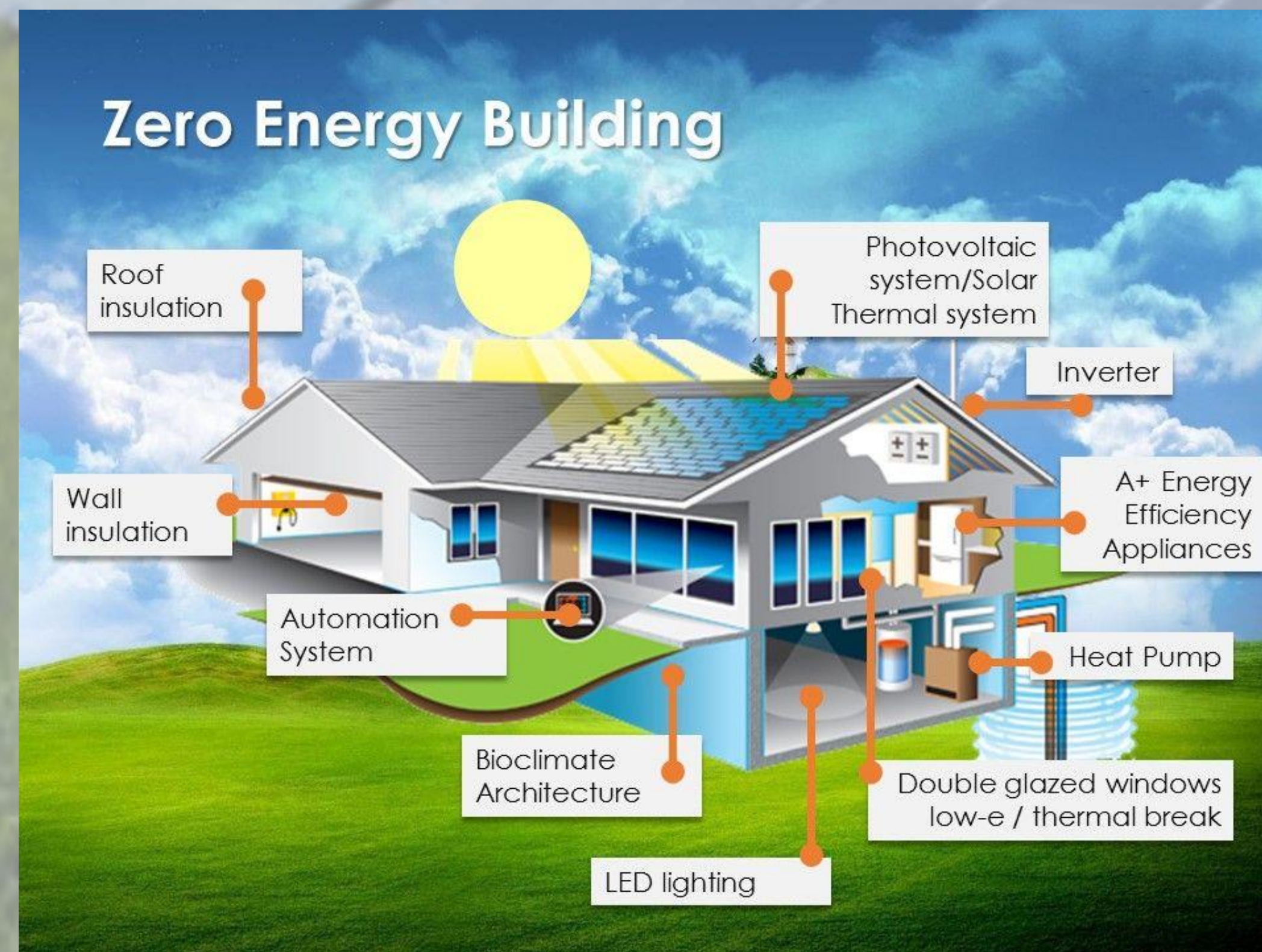


Fig.1. (Energy in time)

## RESULTS:

Construction year	Area	Floors	Refurbished	Installed power	System
1994	182	2	2017	35 kW	Underfloor heating
<b>Domestic Hot Water</b>	<b>Installed Equipment</b>	<b>Wood consumption</b>	<b>Installed solar collector</b>	<b>Installed photovoltaic</b>	
250 L	Wood fired Boiler	18 m <sup>3</sup> /year	N/A	N/A	



House 1

Construction year	Area	Floors	Refurbished	Installed power	System
2015	220	2	N/A	18 kW	Radiators
<b>Domestic Hot Water</b>	<b>Installed Equipment</b>	<b>Biomass consumption</b>	<b>Installed solar collector</b>	<b>Installed photovoltaic</b>	
200 L	Biomass fired Boiler	5 ton/year	N/A	N/A	



House 2

House 1 after renovation:

- Emits 7560 kg CO2 less
- Heating demand cut by 72.74%
- 6.5 m<sup>2</sup> solar collector

House 2 after renovation:

- Emits 5250 kg CO2 less
- Heating demand cut by 40%
- 5.25 m<sup>2</sup> solar collector

- According to table 1, houses between 1960-1998 consume 633% more energy than nZEB standard.
- Houses after 2002 have heating demand 400% more than nZEB standard.

## CONCLUSION:

- Strict rules shall be applied in order to meet local and European building standards.
- 2.3 kW/day per person is saved if houses install solar heating collectors.
- Houses shall install environmentally friendly heating equipment like electrical boilers and heat pumps in order to cut CO2 emission up to 70%.
- Kosovo shall build legal framework and logistics to apply new nearly zero energy buildings (recommended by EU).

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	Construction Period							
	1960-1998				2002-			
	Wall	Floor	Ceiling	Window	Wall	Floor	Ceiling	Window
<b>Individual houses</b>	1.47	1.71	1.48	4.18	1.1	0.75	1.22	2.97
<b>BLOCKS up to 3 floors</b>	1.07	1.71	1.21	4.18	0.84	0.95	1.16	2.8
<b>BLOCKS over 3 floors</b>	1.91	1.71	1.48	4.22	0.88	0.92	0.52	2.8

Table 1. U-values for buildings in Kosovo. (Sylejmani A. Milovanovic B. 2018)

Building component	U value [W/m <sup>2</sup> K]		
	Average	Lowest	Highest
<b>Wall</b>	0.29	0.065	1.97
<b>Window</b>	1.16	0.7	4.5
<b>Roof</b>	0.14	0.06	0.55
<b>Ground</b>	0.29	0.07	1.97
<b>Door</b>	0.98	0.68	2.19

Table 2.nZEB U-Values. (Erhorn and Kluting, 2014)