

ENERGY EFFICIENCY MEASURES IN A HOUSE - CASE STUDY

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Generally

EPB in Slovakia

Energy performance of buildings



Directive 2010/31/EU by European parliament and council of May 19, 2010 on the energy efficiency of buildings

Directive 2018/844/EU by European parliament and council of May 30, 2018 on the energy efficiency of buildings
(which amends the Directive 2010/31/EU)

Legislative requirements

EPB in Slovakia

Directive 2018/844/EU

Since January 1, 2020

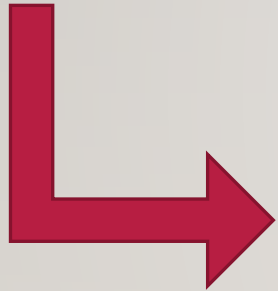


NZEB

Building with high energy efficiency that is connected to public networks, but primary energy consumption is close to zero.

Decree no. 364/2012 on energy efficiency of buildings

Different types of buildings are classified according to:



- Energy need for heating
- Energy need for DHW preparation
- Energy need for cooling and ventilation
- Energy need for lighting
- Total energy needed
- Primary energy

kWh/m².a



EPB in Slovakia

Buildings are classified in classes:

- Heating
- DWH preparation
- Cooling and ventilation
- lighting

A - G

Buildings are classified in classes:

- Total energy needed
- Primary energy (Global indicator)

A0 - NZEB

A I, B – G

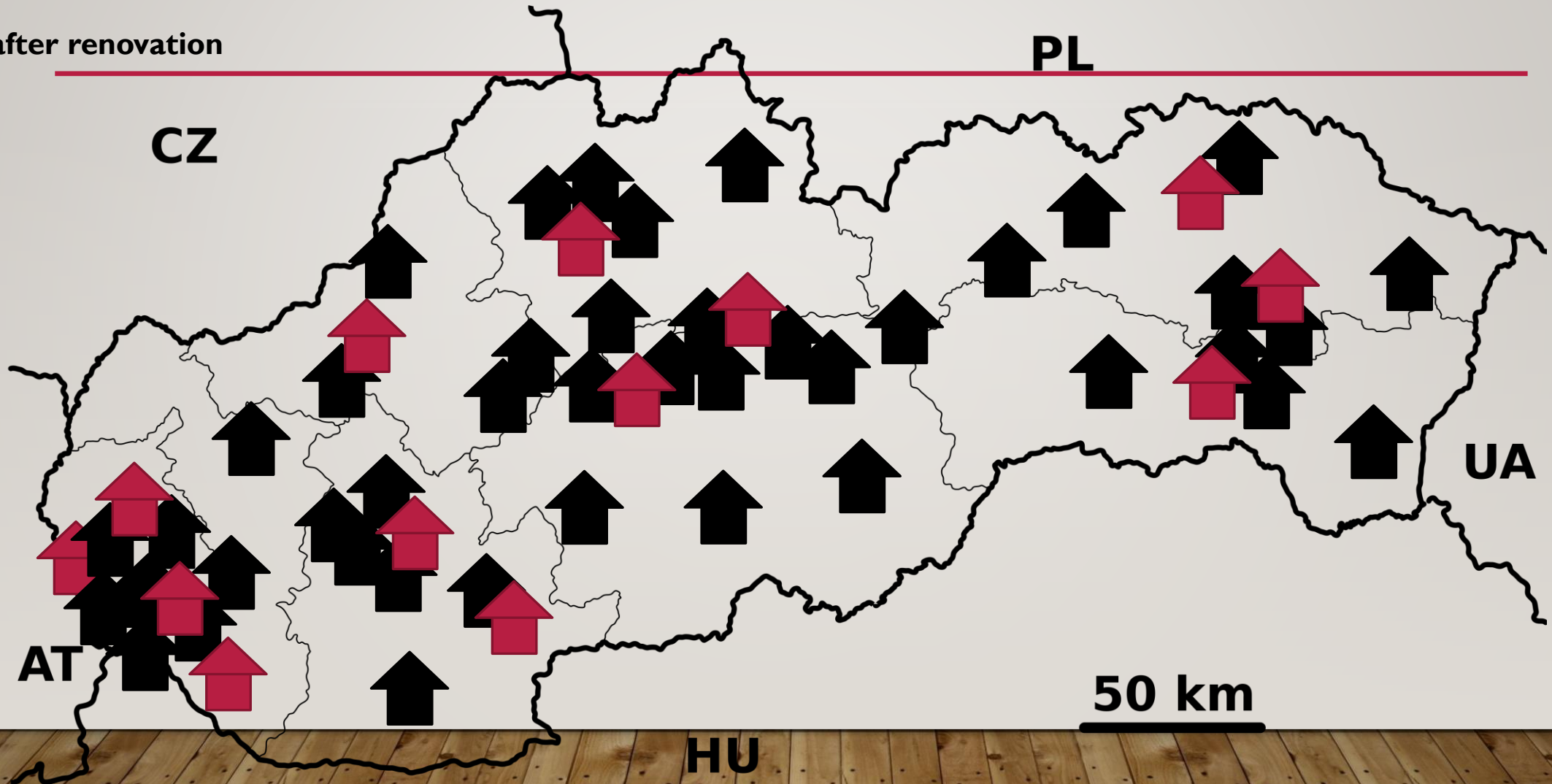
Family houses in Slovakia

5,42 mill population

950 000 family houses

100 000 after renovation

Introduction



Introduction

Typical family houses

Historical picture from the past?

No... Current reality.



Typical family houses

Introduction



Chosen family house description



Šaľa, 1956

Typical square layout.

One floor without residential attic.



Hip roof.

Degraded external structures by time and weather.

Wooden windows with single glazing.

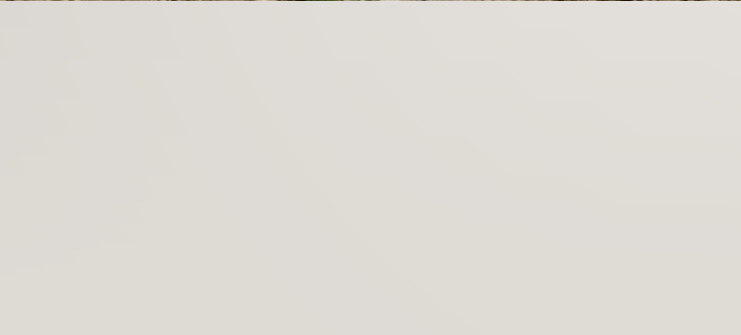
Demolition works



External works



External works – thermal insulation



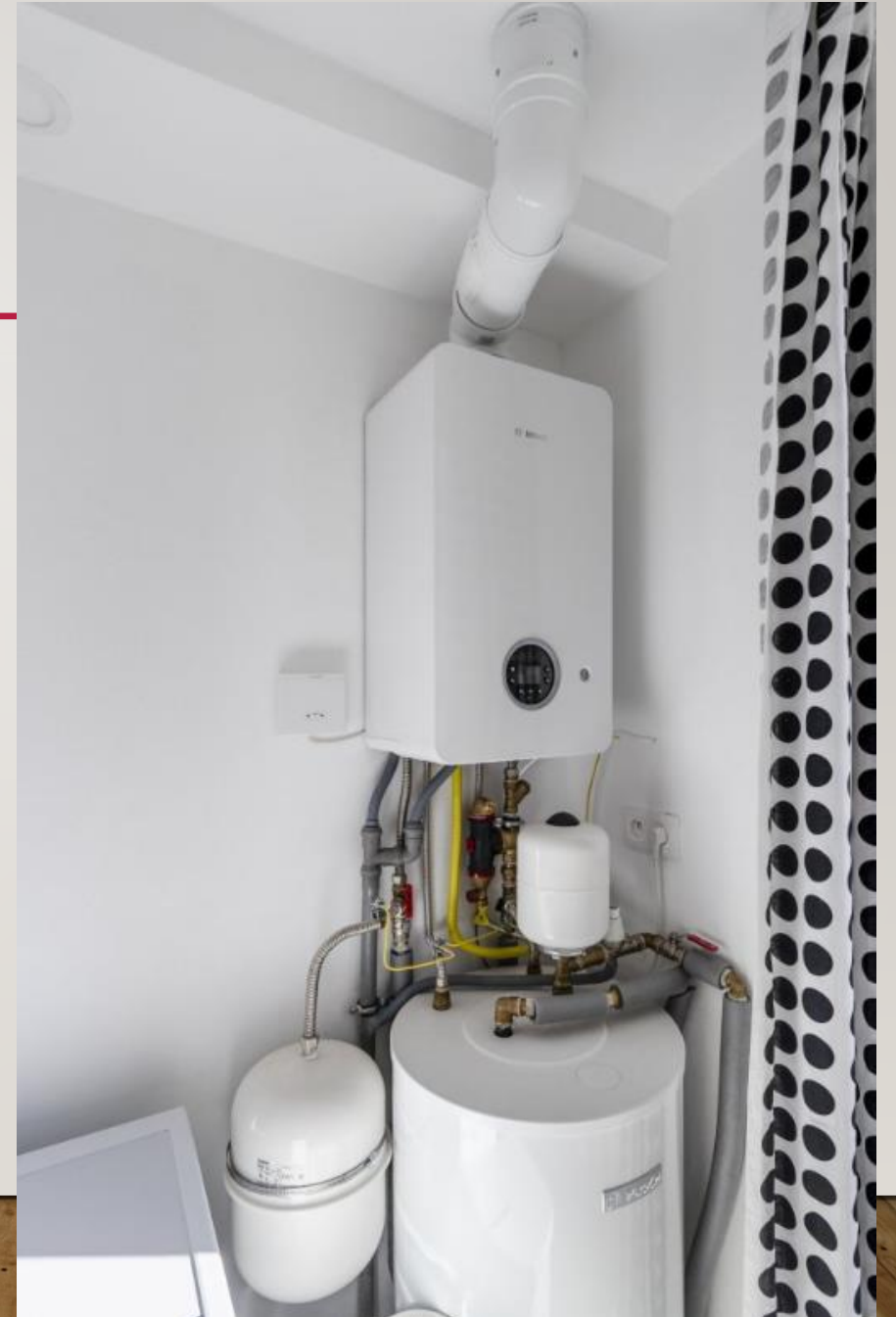
Roof construction



Windows replacing



Heat source



From 50-years old family house...



... to modern family house.

From 50-years old family house...



... to modern family house.

Energy saving measures application

I. Building structures

- Additional thermal insulation
- Sealing of joints in the facade
- Repair of doors
- Replace of windows
- New windows
- Additional thermal insulation of roof
- Additional thermal thermal insulation of floor



Energy saving measures application

I. Heating system

- Hydraulic regulation of heating system
- Installation of thermostatic valves
- Replacement of non-functioning thermostatic valves
- Thermal insulation of pipe system, fittings
- Automatic control system



Energy saving measures application

I. DHW Preparation system

- Energy saving shower heads
 - Thermostatic mixers
 - Thermal insulation of piping and fittings
- Heat pump installation
 - Heat recovery from waste water
 - Time control for hot water circulation pumps

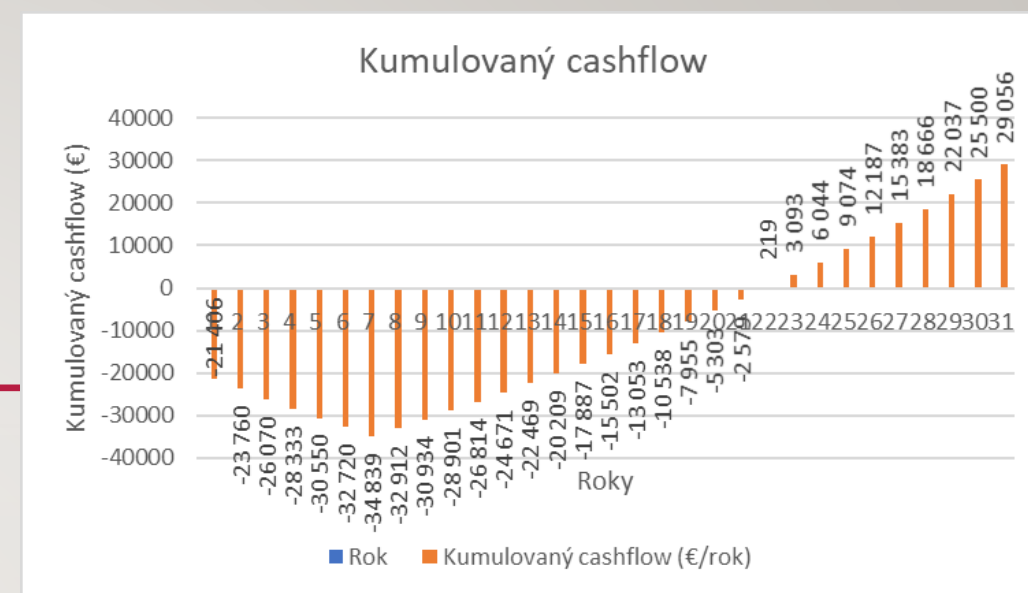


Renovations of solved family house

Renovation	Renovation 1	Renovation 2	Renovation 3
Thermal-Technical Evaluation in Accordance with The Coefficient of Thermal Resistance Valid Since	2016	2016	2021
Windows	Plastic Windows with Triple Insulating Glazing	Plastic Windows with Triple Insulating Glazing	Plastic Windows with Triple Insulating Glazing
Thermal Insulation Thickness External Walls	140 mm	160 mm	250 mm
Thermal Insulation Thickness Roof	300 mm	320 mm	400 mm
Thermal Insulation Thickness Floor	0 mm	120 mm	120 mm
Heat Source and DHW Preparation	Condensing Gas Boiler and Storage Heater	Condensing Gas Boiler and Storage Heater	Heat Pump Air-Air, Photovoltaic and Solar Panels
Ventilation	Natural	Natural	Hybrid
Recuperation Units	No	No	Yes

Renovations of solved family house

Investment costs & Return



Renovation 1

52 000 €

30% own capital, 70% loan

RETURN 17 years

Renovation 2

60 000 €

30% own capital, 70% loan

RETURN 18 years

Renovation 2

75 000 €

30% own capital, 70% loan

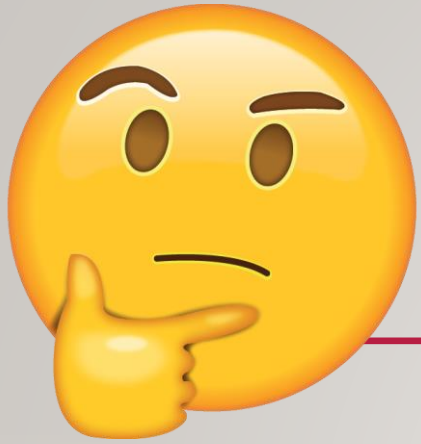
RETURN 21 years

Energy evaluation

Variant	Energy need for heating	Energy need for DHW preparation	Energy need for ventilation	Total needed energy	Primary energy	Emission CO ₂
	kWh/(m ² .a)	kWh/(m ² .a)	kWh/(m ² .a)	kWh/(m ² .a)	kWh/(m ² .a)	kg/(m ² .a)
Original state	353,0	34,0	0	387,0	425,7	117,92
	G (>258)	C (25-36)	Not evaluated	G (>258)	D (325-432)	-
Renovation 1	63,9	28,1	0	92,0	101,2	28,03
	B (43-86)	C (25-36)	Not evaluated	B (55-110)	A1 (55-108)	-
Renovation 2	53,7	15,4	0	69,1	76,01	21,05
	B (43-86)	B (13-24)	Not evaluated	B (55-110)	A1 (55-108)	-
Renovation 3	40,8	12,2	0	53,0	33,17	6,37
	A (<42)	A (<13)	Not evaluated	A (<54)	A0 (<54)	-
Current state	53,7	15,4	0	69,1	76,01	18,36
	B (43-86)	B (13-24)	Not evaluated	B (<54)	A1 (55-108)	-

→ A1

→ A0 (NZEB)



Question...

IS IT PROFITABLE TO **RENOVATE** A FAMILY HOUSE?

ISN'T IS MORE PROFITABLE TO **DEMOLISH** THE HOUSE
AND BUILD A NEW ONE?

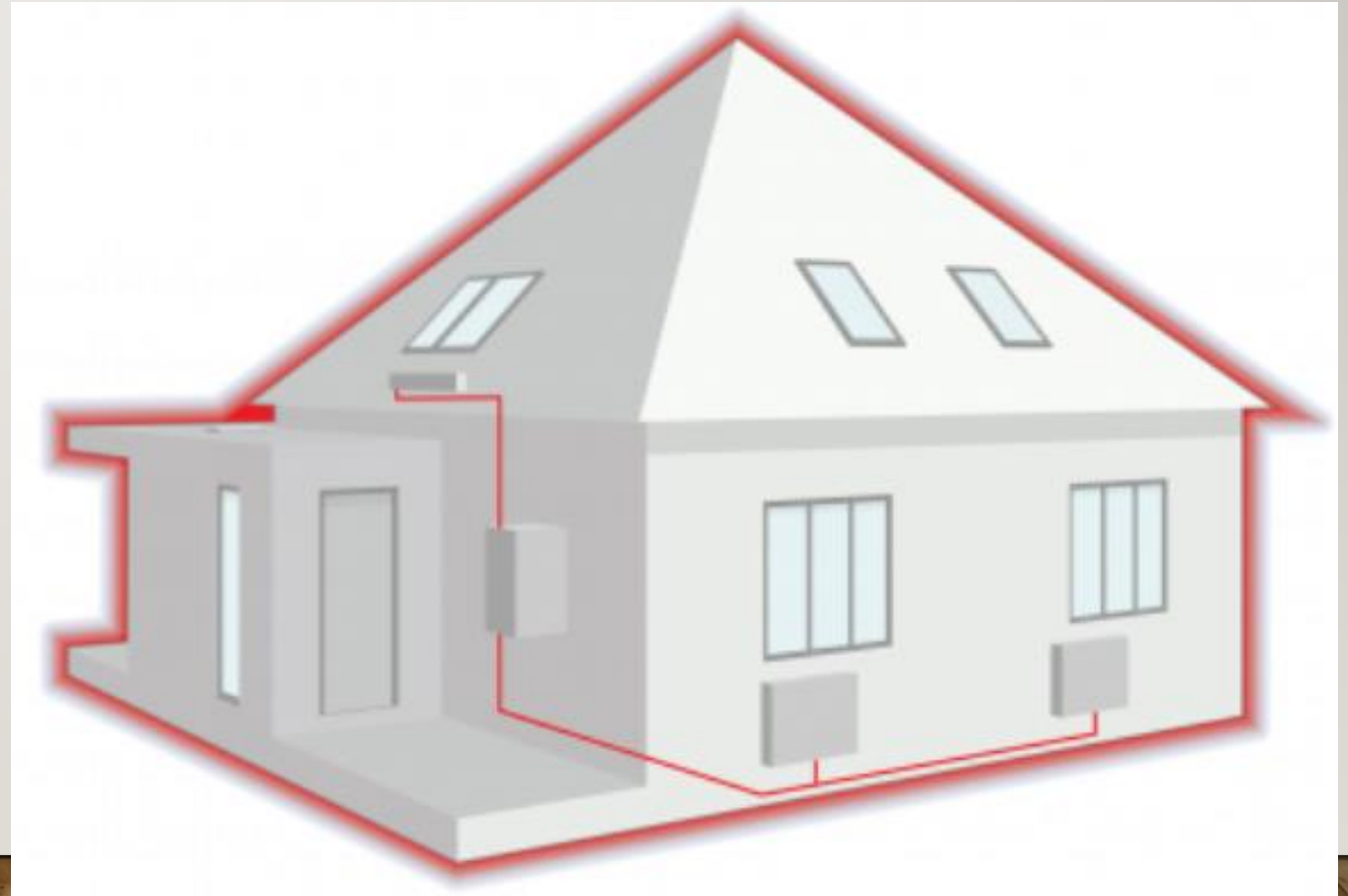
MY OPINION IS THAT AT **TODAY'S PRICES** OF BUILDINGS
MATERIALS IT IS MORE PROFITABLE TO **RENOVATE**...



6 principles of reconstruction

Conclusion

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- RESIDENTIAL ATTIC
 - LARGER WINDOW AREA
 - A STAIRWELL PROVIDING DAYLIGHT AND VENTILATION
 - DYNAMIC SUN PROTECTION
 - HYBRID VENTILATION SYSTEM
 - BETTER ENERGY EFFICIENCY



THANK YOU FOR YOUR ATTENTION

