Interreg - IPA CBC
Italy - Albania - Montenegro
REEHUB PLUS

Date: Friday **10th of December 2021**

Time range: **09^{00}-16^{55}**

REEHUB PLUS / 1ST CROSS BORDER EVENT

"SMART CITY OPEN INNOVATION FORUM"

ORGANIZED BY: **BARLETI INSTITUTE FOR RESEARCH AND DEVELOPMENT**

SUPPORTED BY: BRIDGE

Speaker:

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Barleti University

Relation:

An Approach for the Retrofit of a Public-School Building

MINISTRIA E INFRASTRUKTURËS DHE ENERGJISË

DiTNE

UCG Univerzitet Crne Gore

Città di Agnone


>75 %
Natural resource
60 – 80 %
Energy
75 %
CO_2 emissions
30 – 40 % Energy

#nearlyZeroEnergyBuilding

#nearlyZeroEnergyBuilding; #refurbishment; #existingbuildings;

"…has a very high energy performance. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby.." Recast EPBD 2010 (2010/31/EU)

	2020	2030	2050
GHG emissions	- 20%	- 40 %	- 95 %
Clean energy	+20%	+32 %	+75 %
Energy efficiency	+20%	+32.5 %	+41 %

Climate & energy framework (from 1990 levels)

	●	○
Energy production	+69 % +31 %	+54 % +46 %
Power production	+71.1 % +28.9 %	+7 % +93 %

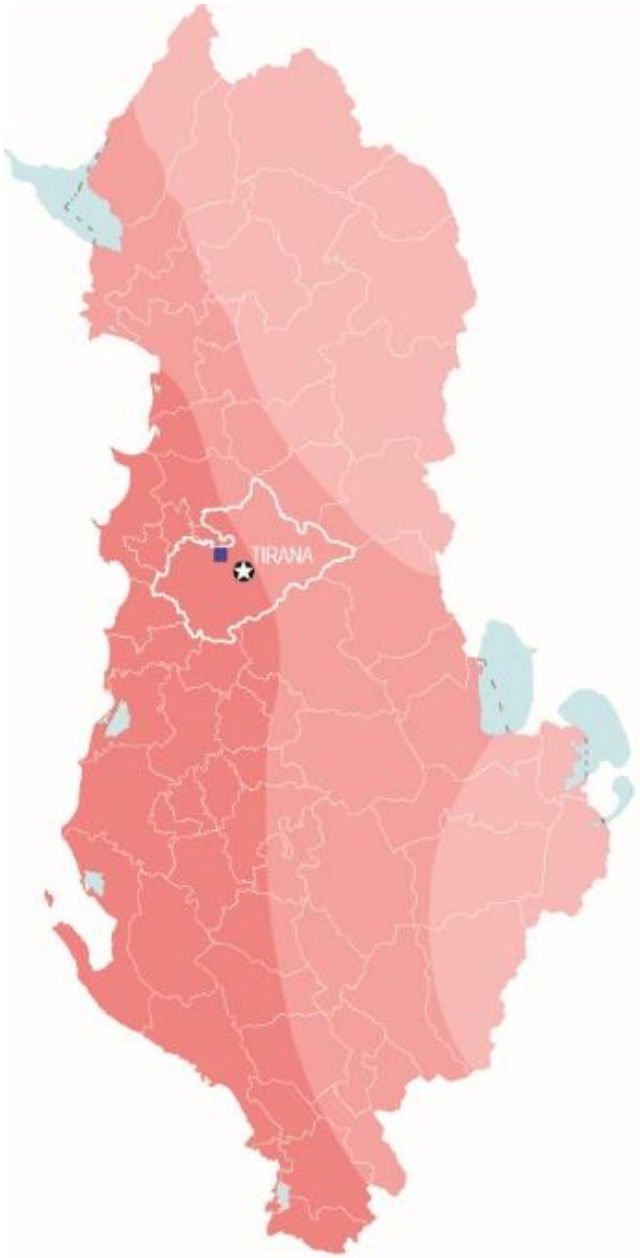
Source: Eurostat (2019) and Eurostat. (2018)

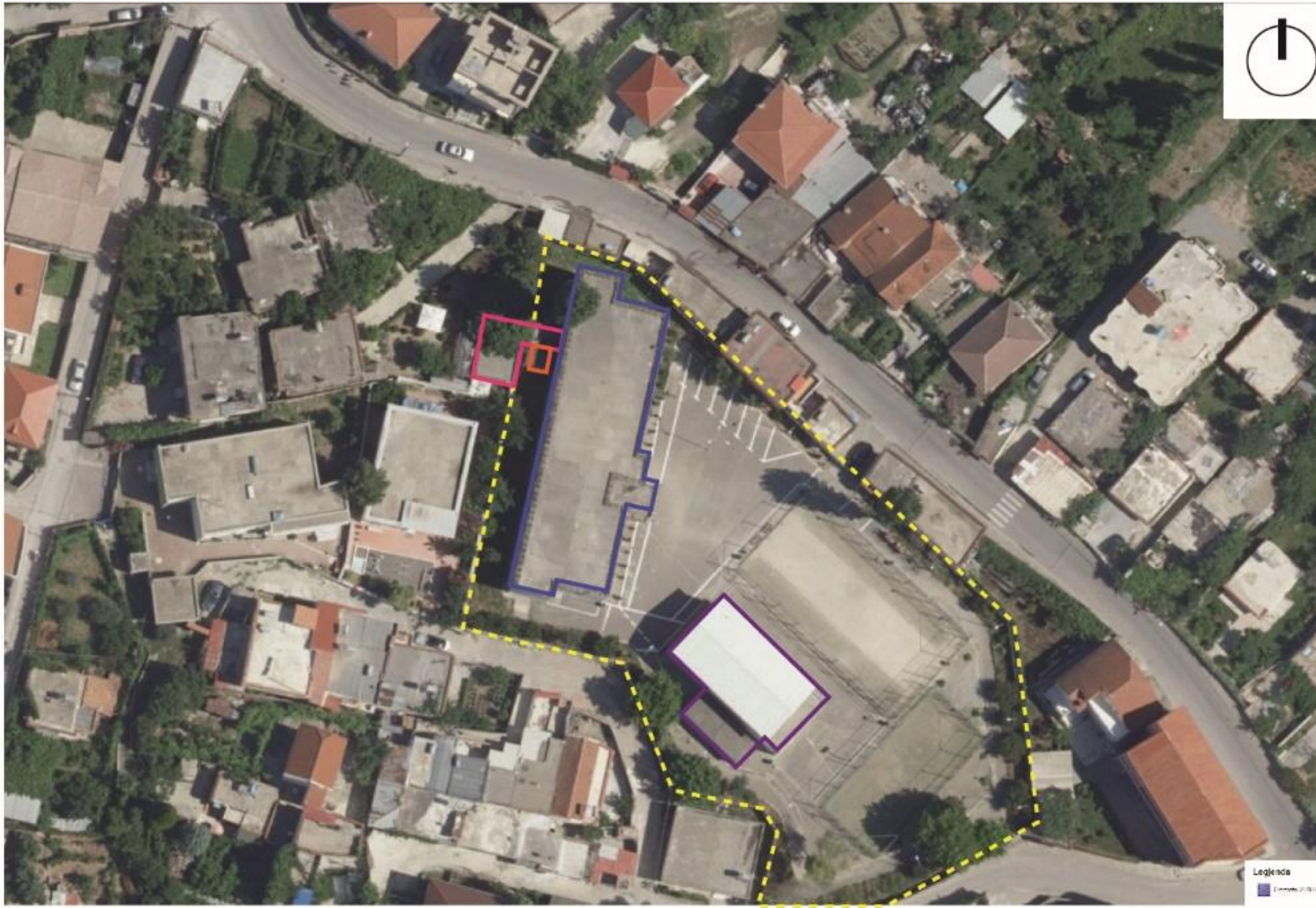
It is not:

- Urgent - different energetic and environmental situation
- Impossible- no necessity to avoid the grid or establish low U-values for building envelope elements

An opportunity:

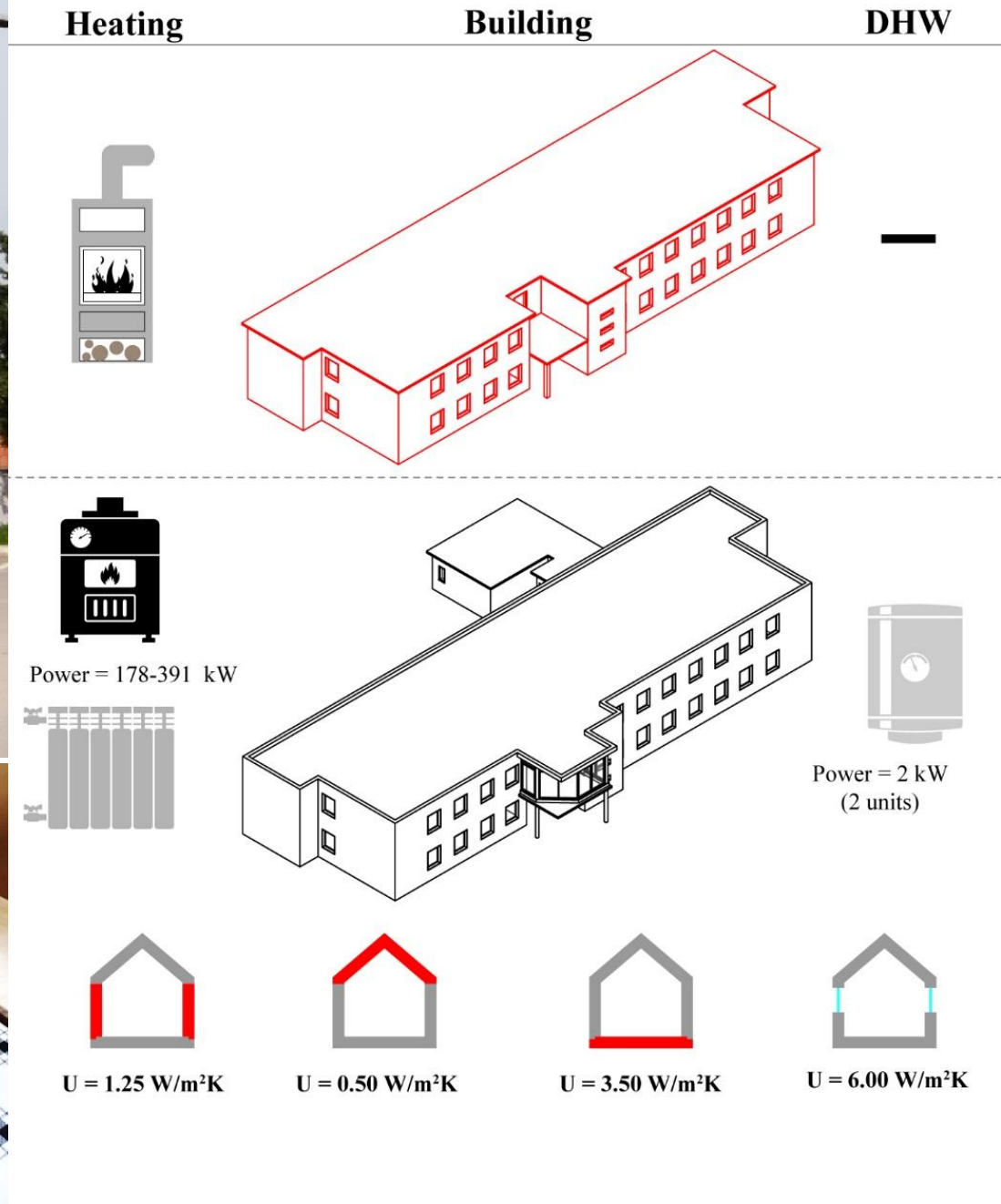
- to increase energy performance of the building stock;
- Faster decarbonization < 2030 and 2050.





Zone A Zone B Zone C

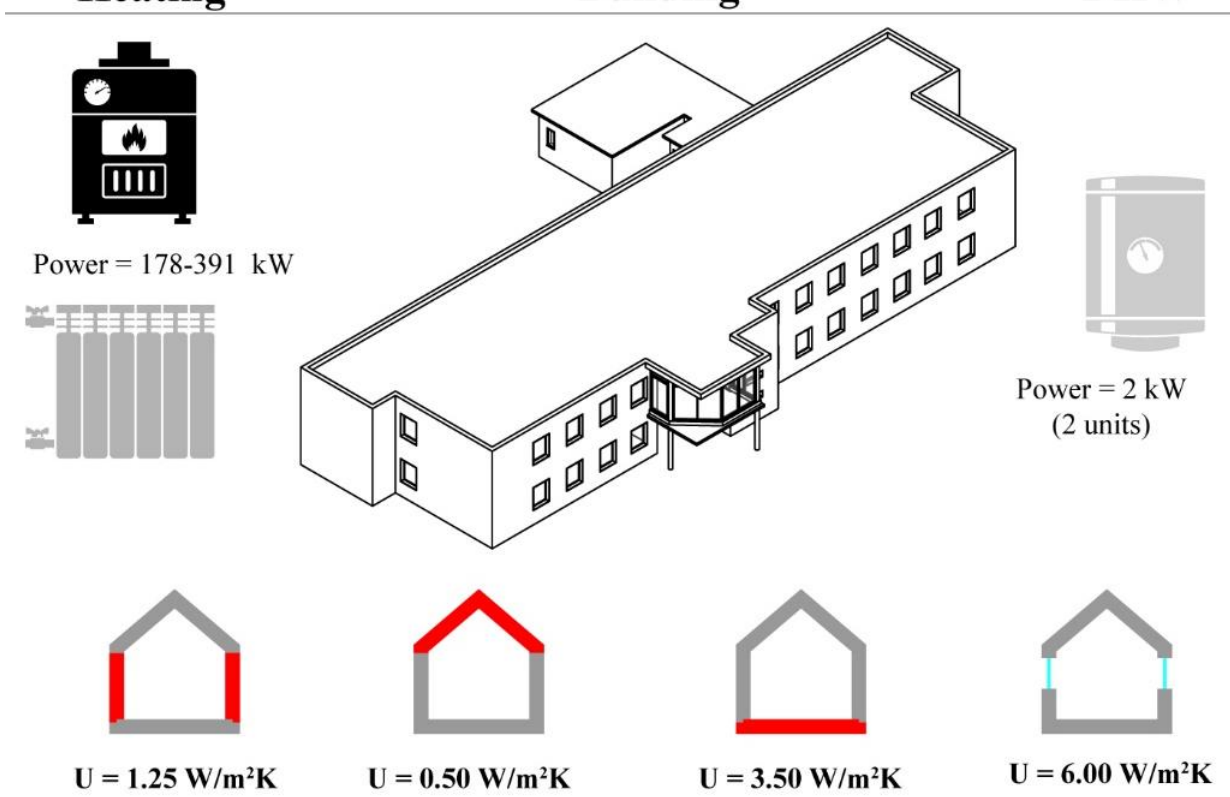
Reference building Addition. Hygienic services Addition. Plant Gym

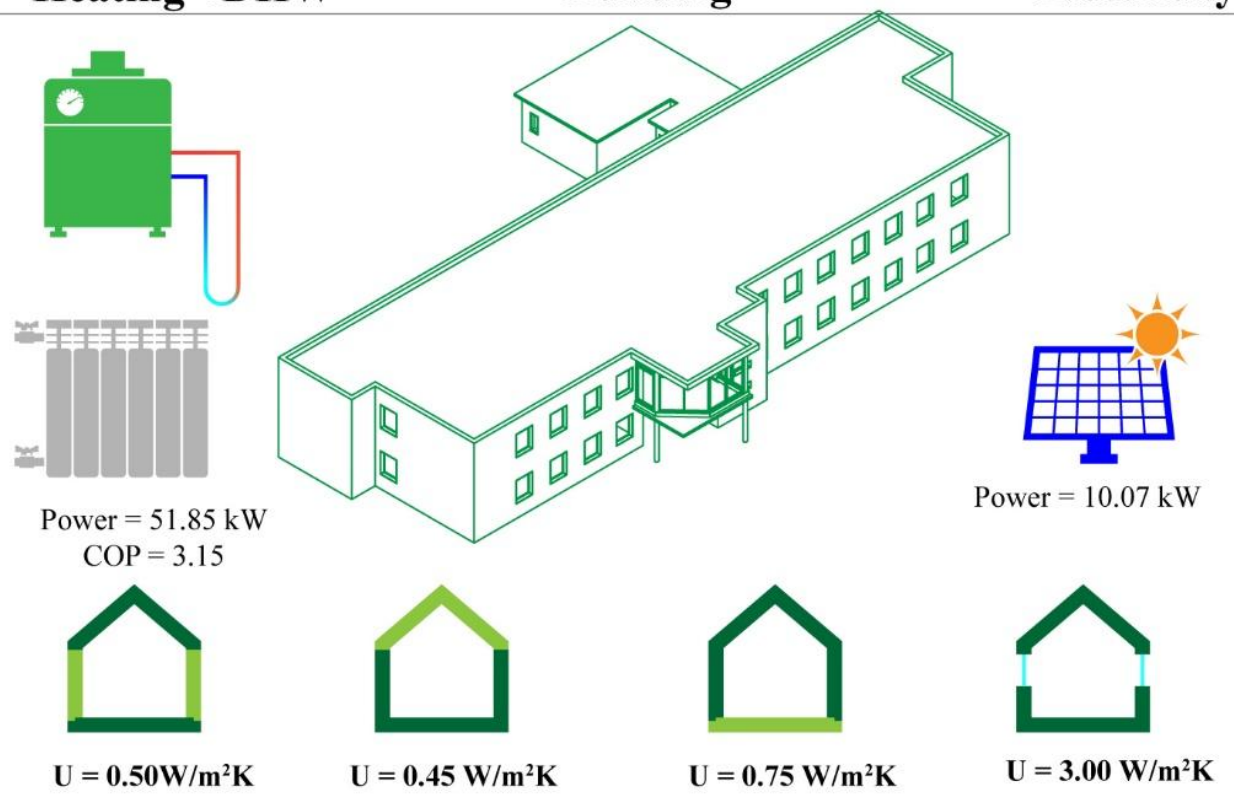

Heating
Building
DHW
Power = 178-391 kW
Power = 2 kW
(2 units)
U = 1.25 W/m²K
U = 0.50 W/m²K
U = 3.50 W/m²K
U = 6.00 W/m²K

Country	Climate zone and Heating Degree Days (HDD)	External walls (W/m^2K)	Ground floor (W/m^2K)	Roof (W/m^2K)	Openings (W/m^2K)
Greece	Zone A (< 1000)	0.60	1.20	0.50	3.20
	Zone B (1000 - 1500)	0.50	0.90	0.45	3.00
	Zone C (1500 - 2000)	0.45	0.75	0.40	2.80
	Zone D (> 2000)	0.40	0.70	0.35	2.60
Italy	Zone A (< 600)	0.40	0.42	0.32	3.00
	Zone B (600 - 900)	0.40	0.42	0.32	3.00
	Zone C (901 - 1400)	0.36	0.38	0.32	2.00
	Zone D (1401- 2100)	0.32	0.32	0.26	1.80
	Zone E (2101-3000)	0.28	0.28	0.24	1.40
	Zone F (> 3000)	0.26	0.26	0.22	1.00
Albania	Zone A (< 1500)	0.50	0.75	0.45	3.00
	Zone B (1501 - 2500)	0.45	0.70	0.40	2.80
	Zone C (>2500)	0.40	0.65	0.35	2.60

1. Interministerial Decree of 26.06.2015: “Applicazione delle metodologie di calcolo delle prestazioni energetiche e definizione delle prescrizioni e dei requisiti minimi degli edifici”

2. Law nr.2367 of 12.07.2017: “Εγκριση Κανονισμού Ενεργειακής Απόδοσης Κτι- ρίων”. Οι υπουργοι οικονομικων - περιβαλλοντοσ και ενεργειασ





Technical solution	Layer	Thickness cm	Conductivity W/mK	U-Value W/m^{2}K
External wall	External plaster	3	0.90	1.25
	Brick	25	0.44	
	Internal plaster	2	0.90	
Ground floor	Tiles ceramic tiles	2	1.00	3.09
	Concrete substrate	2	0.90	
	Waterproof	1	0.35	
	Reinforced Concrete	8	2.00	
	Gravel/Stone	15	1.70	
Roof	Waterproof membrane	1	0.26	0.50
	Polystyrene insulation	5	0.04	
	Concrete floor foundation	11.5	0.9	
	Reinforced concrete and hollow tiles mixed floor	24	0.46	

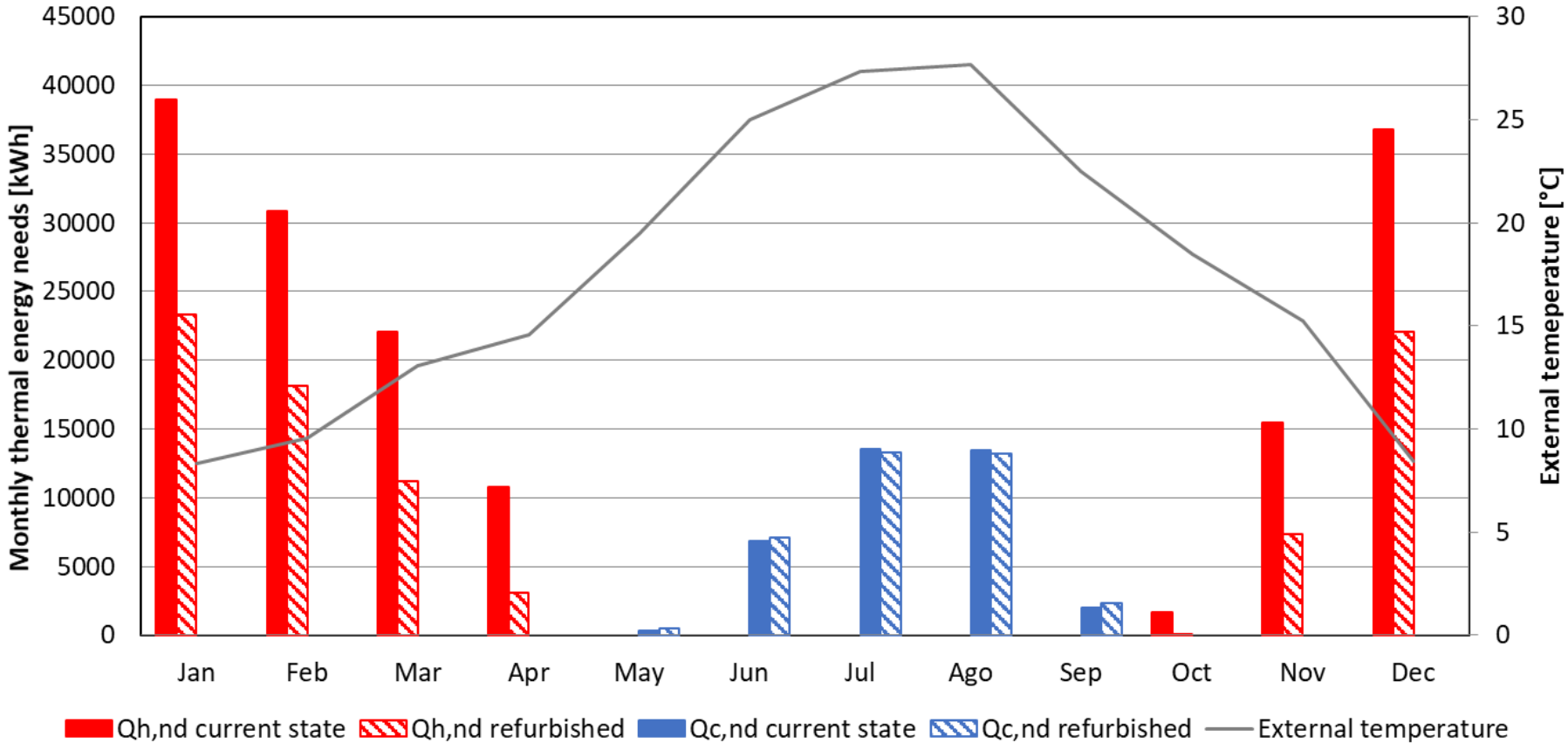
	Components	Description of the intervention
Building envelope	External Walls	6.5 cm thick Expanded polystyrene (EPS) with λ = 0.045 W/mK and 2 cm external plaster finish
	Roofs	6.5 cm thick Expanded polystyrene (EPS) with λ = 0.045 W/mK and 7 cm gravel finish
	Ground floor	5 cm thick Cellular glass foam with λ = 0,045 W/mK and 2 cm tiles finish
	Windows	Double glazed with 9 mm gap in between (Ug = 3.00 W/m^{2}K)
Heating and DHW	Ground source heat pump	Power = 51.85 kW and COP = 3.15
Solar energy	PV panels	Installation of south-oriented poly-crystalline photovoltaic (K_{PV}=0.13 kW/m^2) solar panels with peak power equal to 10.07 kW

Heating demand (kWh/m^2 y)

150.40 ⟶ 82.21 (-45 %)

Cooling demand (kWh/m^2 y)

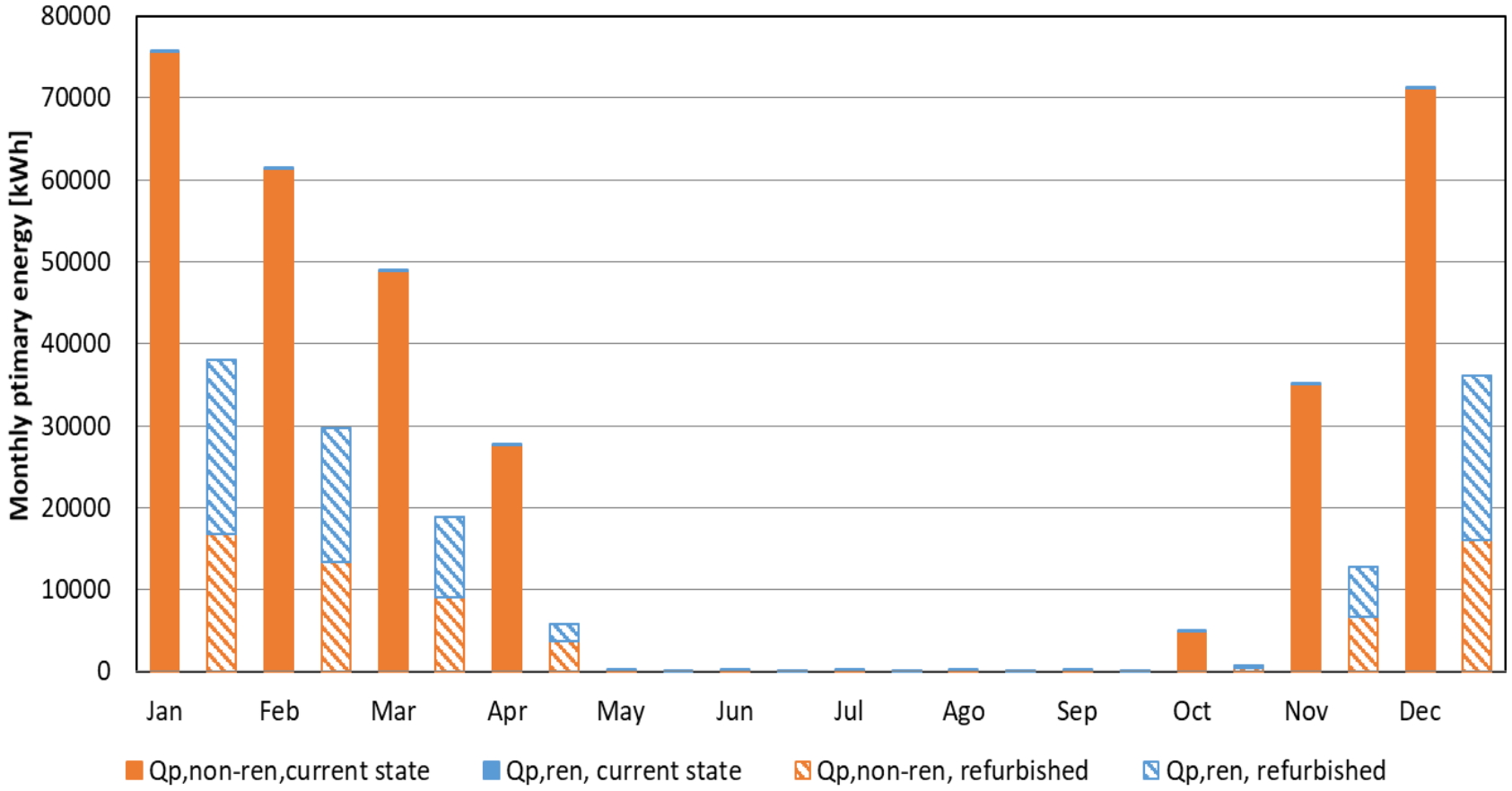
37.67 ⟶ 36.38 (-3.4 %)



Energy needs for heating and cooling comparison

EP (kWh/m^2 y)

	323.83	→	**140.26** (-56 %)
non-ren	322.70	→	65.67 (-80 %)
ren	0.66	→	75.59



Primary energy – comparison current/refurbished state

CONCLUSIONS

1. Refurbishment in an nZEB perspective of the school buildings because it can lead towards the decarbonisation of the school building stock in shorter time than those expected in the 2030 and 2050 climate and energy frameworks, due to the sustainability of the country's grid.

1. The interventions in the building envelope result with a reduction of the energy demand for heating by 45%, whereas the technical systems and the installation of photovoltaic panels reduce the non-renewable primary energy consumption by about 80%.

2. Considering split of the didactic activity related to the capacity issues, totally uncommon (or inexistent) in EU countries, but with the potential to trigger a debate in the future on the strategy to pursue in Albania for the refurbishment and increase of capacity of the existing school buildings.

Thank you