

Refurbishment guide for schools in Romania

Scoala Gimnaziala Anton Pann
in Râmnicu Vâlcea (Romania)

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Goal and approach of the refurbishment guide



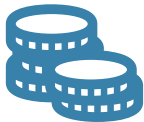
Tackle **wide-spread basic deficiencies in technical building systems** that hamper meaningful implementation of advanced or deep renovation measures in a mid-term to meet climate targets.



Present measures / **solutions that do not create lock-in effects**, i.e. that do not hamper subsequent implementation of deep renovation measures.












Provide an **estimate of savings** (energy, cost, GHG) typically related to these measures.



Link these measures with **available funding** to make the proposed measures eligible for that funding.

Reference school „Scoala Gimnaziala Anton Pann”









	 School	 Gym
 Construction year:	1977	2008
 Total floor space:	4.175 m ²	1628 m ²
 Heating:	District heating (radiators)	Central heating (gas condensing)
 Cooling:	10 air conditioning units	No air conditioning, only ventilation
 Insulation:	Facade renovated in 2017	Windows renovated in 2019
 Renewable energy systems:	Solar heating not available Photovoltaik not available	
 Specific energy consumption:	81 kWh/m ² (heat)*	91 kWh/m ² (heat+HW) 11kWh/m ² (electricity)

* Climate adjusted

Basic deficiencies of reference school



	Heating	<ul style="list-style-type: none">• On/off thermostats only (ground floor)• No thermostats at the second floor• No automatic control system for heating	<ul style="list-style-type: none">• Low indoor temperature• Low efficient heating systems• On/off thermostats only - complicated regulation
	Cooling	<ul style="list-style-type: none">• High indoor temperature (25 degree)• Manual setting of temperature of district heat by care-taker• No solar shading	<ul style="list-style-type: none">• No solar shading
	Ventilation	<ul style="list-style-type: none">• Poor indoor air quality• High CO₂ concentration on 1st and 2nd floor• No ventilation system	<ul style="list-style-type: none">• 2 ventilation system for training rooms, no AC
	Water	<ul style="list-style-type: none">• No hot water available	<ul style="list-style-type: none">• High hot water consumption
	Insulation	<ul style="list-style-type: none">• Heat pipes not insulated• Roof not insulated	<ul style="list-style-type: none">• Heat pipes not insulated• Lightweight construction
	Lighting	<ul style="list-style-type: none">• No presence/daylight control• Illuminant: Old fluorescent tubes• Daylight blocked by curtains	<ul style="list-style-type: none">• No presence/daylight control

Optimization of energy systems and indoor quality

Package 1: Get the basics right

Appropriate dimensioning (of space heating and hot water circulation pumps)

Proper installation (higher insulation level of space heating / hot water pipework)

System adjustments (e.g., night setbacks, installation of modern thermostatic valves)

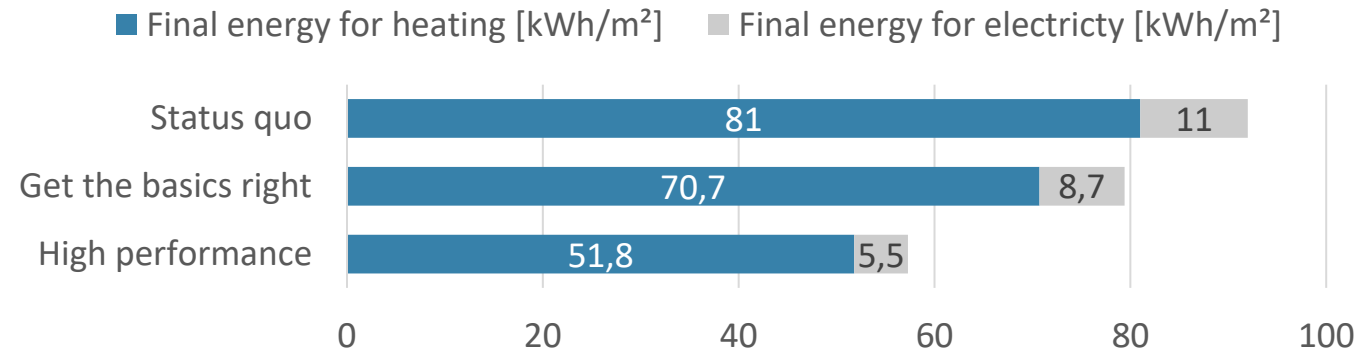
Package 2: High performance

GET THE BASICS RIGHT measures

- + Advanced **Automation and control** and monitoring systems
- + Additional measures to **increase indoor quality**

Potential energy and GHG savings vs. investment

- School building



Optimization packages	Final energy savings [%]	Energy cost savings [EUR/a]	GHG savings [tCO ₂ /a]	Investment [EUR]
Get the basics right	15%	3.351 €	16	25.561 €
High performance	38%	9.730 €	50	50.371 €



The reference school could save up to 15% of energy with basic energy optimizations!

Increase indoor quality



Temperature

External sun protection systems to provide adequate glare protection and to keep away unwanted heat radiation

- Automatically controlled **external blinds** should serve as sun and overheating protection
- Overheating of central rooms should be avoided through **natural night ventilation**



Air quality

CO₂ concentration in classrooms: learning ability and concentration decrease above 1,000 ppm

- **Exhaust fans** can support the exchange of air or
- **decentralized individual devices with heat recovery** of approx. 85% steered via demand-based control



Lighting

A **daylight-dependent and occupancy-dependent control** of the lighting in classrooms is recommended



Automation

Building management systems (BMS) can link ventilation, regulation of the exhaust fans and the electromotive radiator valves with each other

- The building services should be controlled by a building management system

Available funding program



Name:

Program for Increasing Energy Efficiency and Intelligent Energy Management in Public Buildings for Schools (managed by Environmental Fund Administration)



Fund volume:

- The financing is granted **up to 90%** of the eligible expenditure of an investment objective



Eligibility criteria:

- Energy and GHG savings must be proved by expertise report / energy audit
- **At least 10% reduction of the total final energy consumption**
- No public funding from the state budget or European funds in the last 5 years



Eligible measures:

TYPE I

Measures to increase energy efficiency (ensuring interior comfort conditions)

- Thermal rehabilitation works of the **building's envelope** elements
- Ensuring the **heating system / hot water supply** system
- Rehabilitation / modernization works of **lighting** installations
- Installation / rehabilitation / modernization works for **air conditioning** and / or mechanical **ventilation** systems to ensure indoor air quality
- Installation of **alternative systems for the production of electricity** and / or heat for own consumption
- **Integrated energy management systems** for buildings and other activities leading to the achievement of the project objective

TYPE II

Related measures

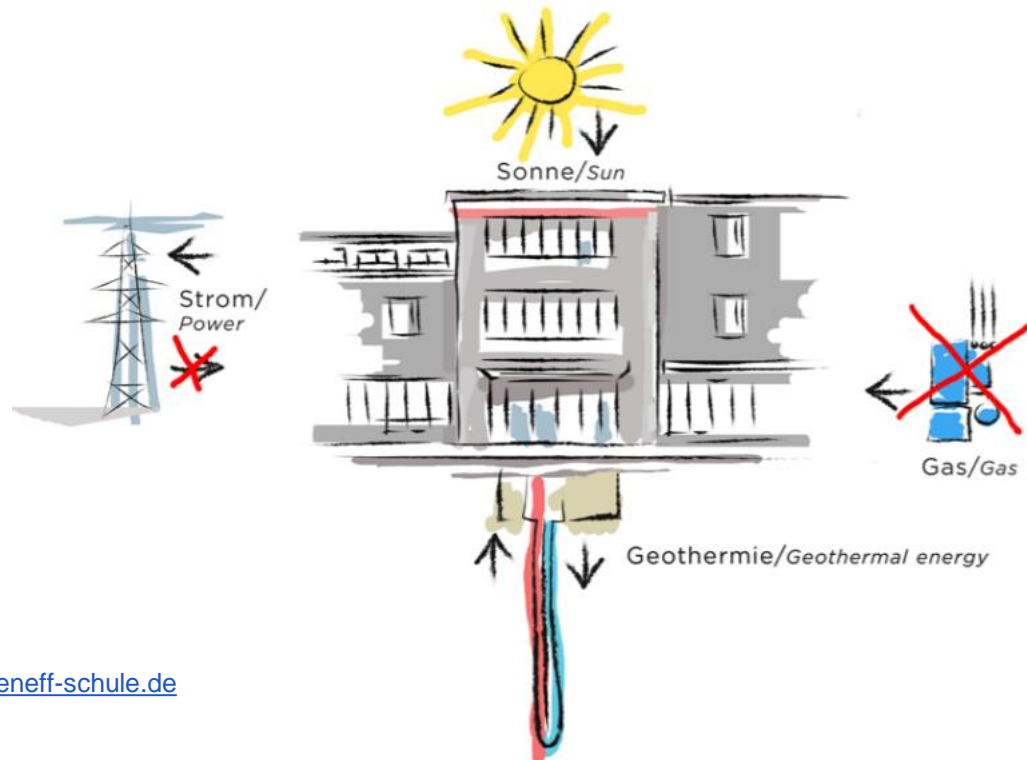
- **Various measures contributing to the implementation** of the project for which funding is requested and which do not lead to increased energy efficiency, but include intervention works / activities related to the basic investment

Outlook: energy neutral schools



Exemplary renovation project: Uhland Schule - Stuttgart Germany

The ambitious goal was to renovate the existing school into a plus energy school:
The school will produce more energy than the building consumes over the course of the year.



- Renovation of complete building and exchange of technical systems
- PV system of 220 kWp with 180 MWh/a of solar power
- Heat supply via geothermal heat pumps
- Construction costs: approx. 20 million euros

A monitoring will show whether the calculated expected plus of around 11,000 kWh will materialize.

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