

sEEnergies webinar, 10th of March 2022

Refurbishment costs in the European building stock

Refurbishment measures and their costs and impact on future energy demand in buildings

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This project has received funding from the European Union's Horizon 2020 Research and Innovation Action under Grant Agreement No 846463

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The current world is in turmoil and certainties which have been considered as stable in the past are turned upside down as of today.

The reality with millions of people in Europe forced to leave their homes and find shelter abroad, uncertain about the well being of their relatives was unforeseeable for most of us.

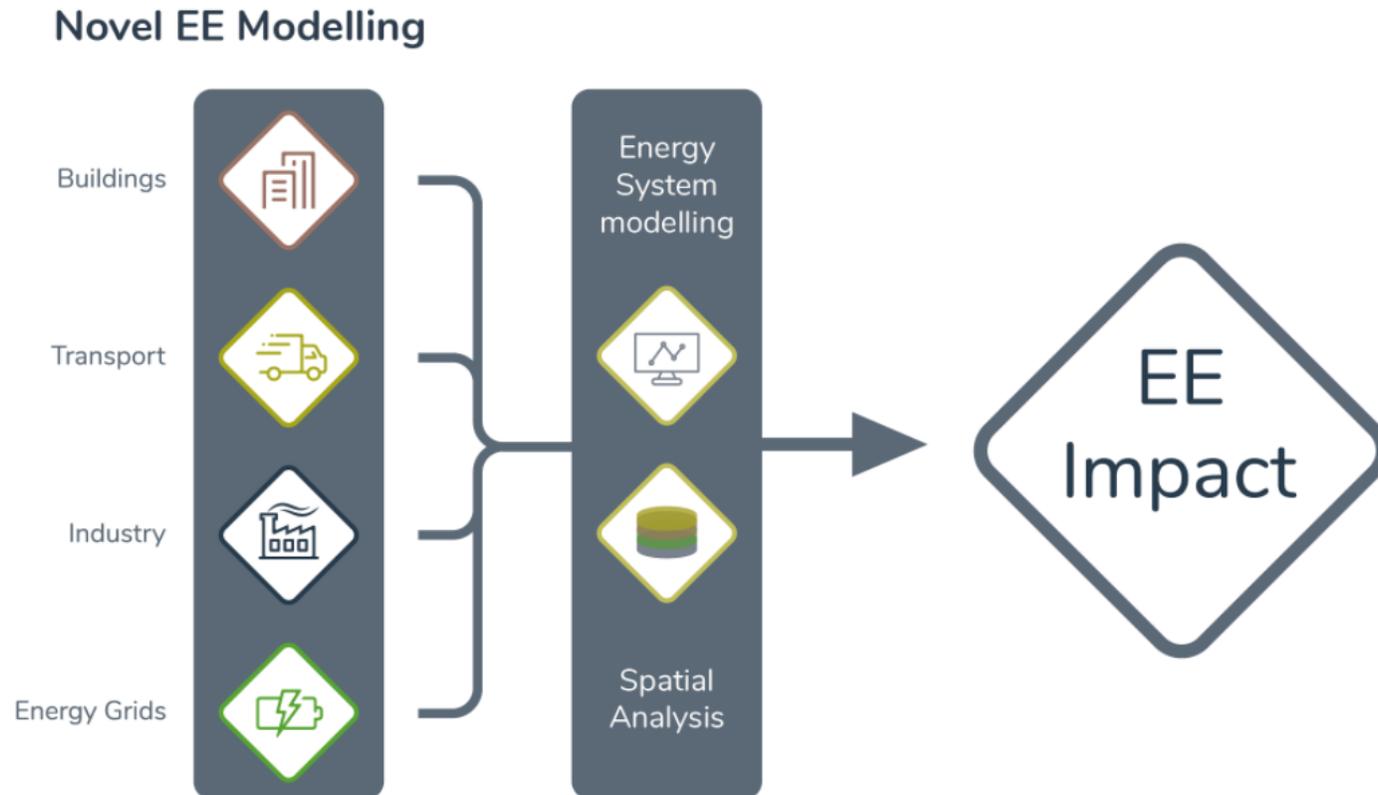
Besides the tremendous impact on personal fates, the war on power and energy will change most of our believes for the coming years as well as it will have a huge impact on European energy policies and efficiency strategies!

In the coming presentation, I will try to briefly assess and contextualize the findings of our results mostly generated in the late months of 2020 and in the first half of 2021 in respect to impacts of the current global situation. The project sEEnergies, and especially the work package 1, analyzing the cost and potentials of energy efficiency and their related impacts was set up in a time where current events were out of thought and the work and results need to be reflected under two major impacts in the recent past.

Starting in autumn 2019, the project team and the project setup could not foresee neither the Covid crises, starting in 2020, nor the current war on European ground. However, these two events do impact the understanding and lessons we have to learn from the project in important aspects.

Objective of sEEnergies and WP1

Quantification and operationalization of the potentials for energy efficiency in buildings, transport, and industry.



The project combines sectorial bottom-up knowledge with hour-by-hour modeling of the energy systems and spatial analysis in the EU.

The project includes analysis of non-energy benefits of the energy efficiency first principle in the different demand sectors

Objectives

Work package 1, sEEnergies project



To assess the energy efficiency potentials and their related costs in both residential and non-residential buildings:

- Collecting and developing data from the EU28 countries on energy efficiency potentials in the building sector, which are required for an overall assessment of the efficiency potentials in integrated energy systems.
- To shed light on the cost aspects of different refurbishment measures and their contribution to reduce energy demand. The cost and efficiency assessment is a base for the comparison with the costs of using renewable energies for building related energy services.

Recent impacts

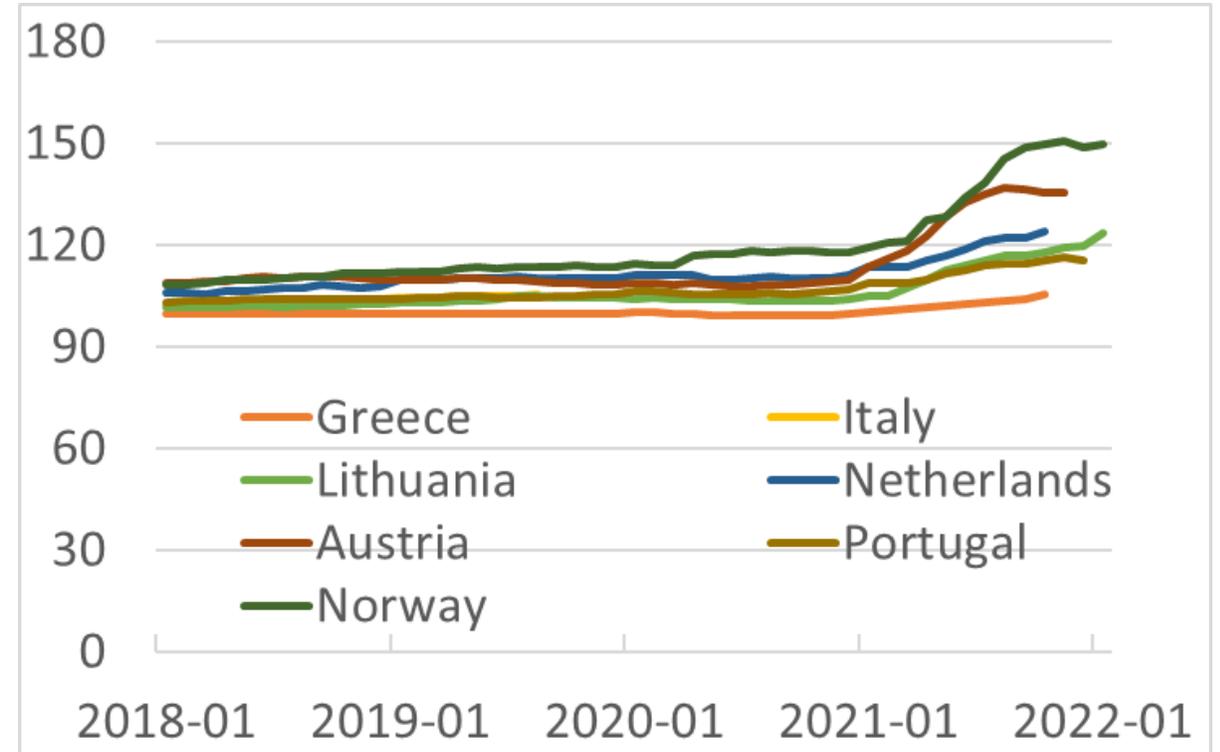
- With the Covid pandemic fading in the last months of 2021 and in the beginning of 2022, we saw relevant increases in material prices for construction and a partial interruption of supply chains. The shift in construction pricing is likely to influence in the short to mid-term the development of the refurbishment sector.
- Energy carrier prices soaring in the last months of 2021 and in the beginning of 2022 could shift the equilibrium towards energy efficiency
 - Policy interventions to be addressed which are currently under discussion

Price trends

Price indices for construction sector

German construction material price index in the last year + 39% for expanded polystyrene insulation material. For other materials similar price trends.

Eurostat monthly index for input prices for materials (national currency, 2015 = 100)



Energy carrier prices

Source trading economics



Crude oil (brent)



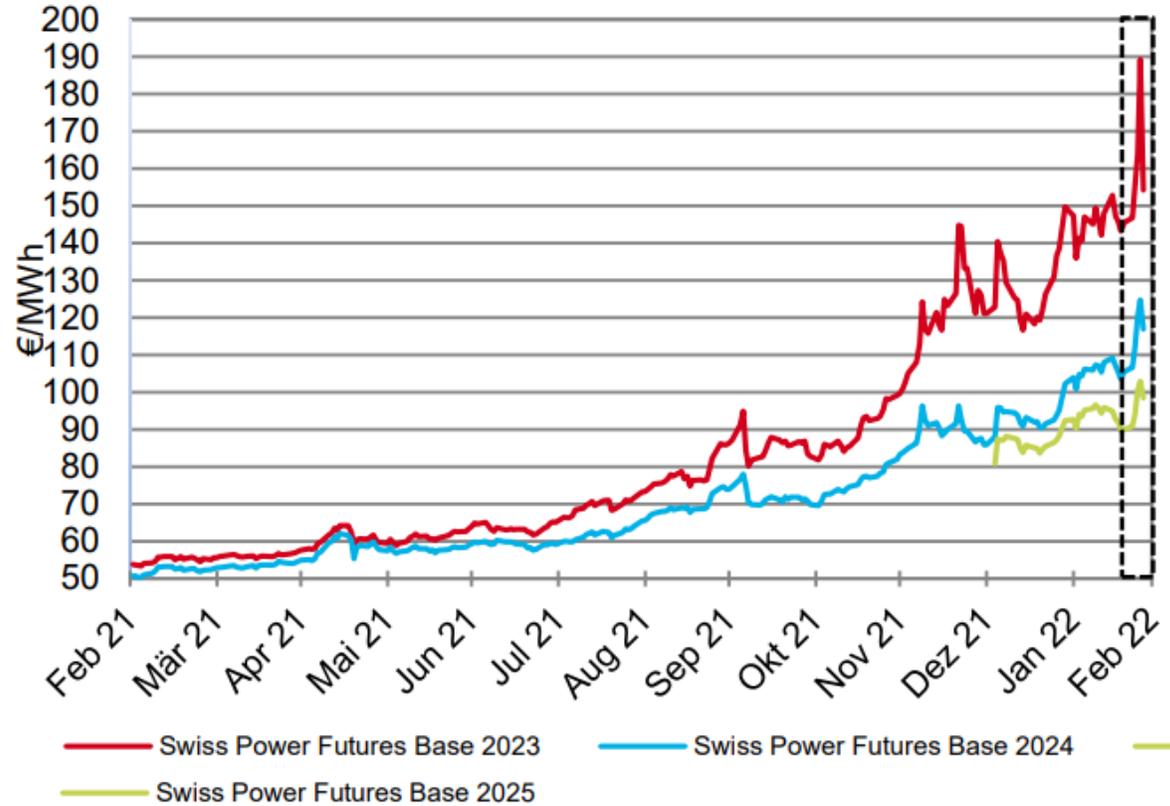
Additional relevance for construction material as input for insulation material such as expanded polystyrene (EPS)

Energy carrier prices

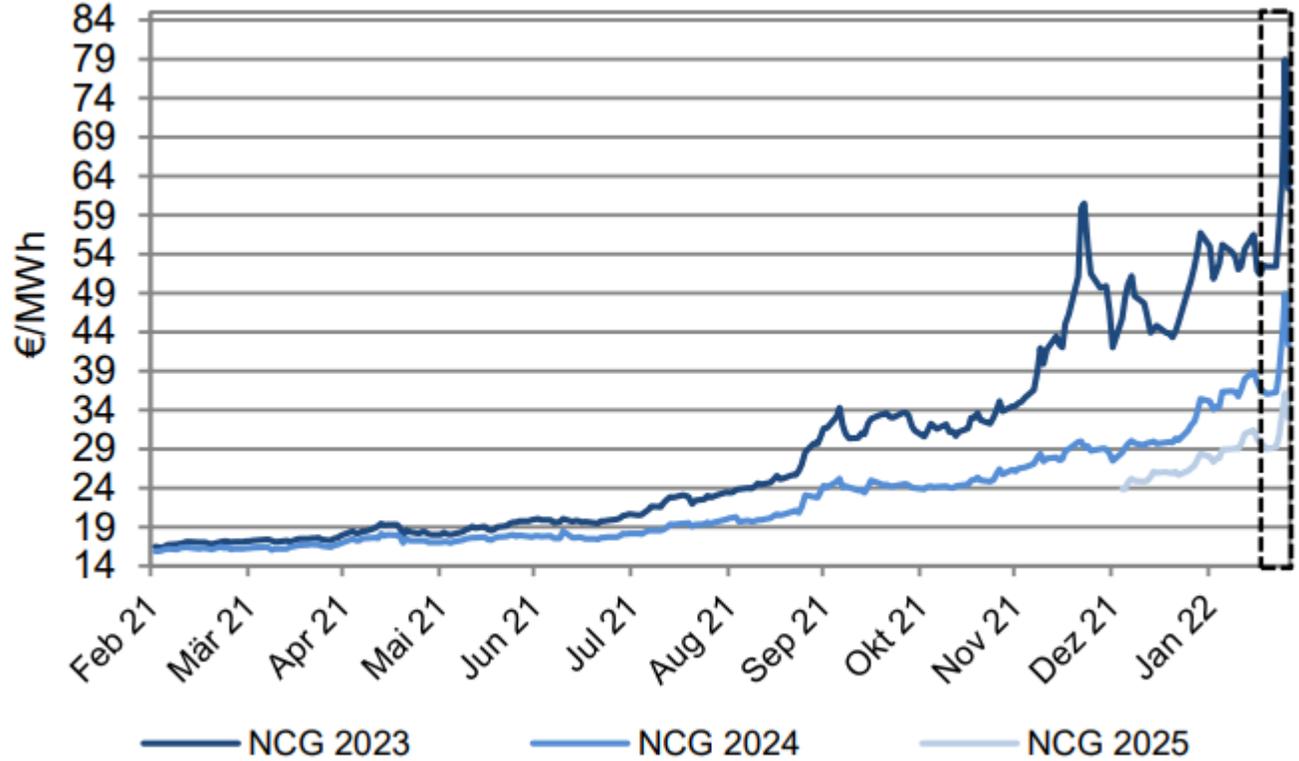
Source EEX, Swiss market



Electricity



Natural gas



Cost aspects of refurbishment measures

Single building level

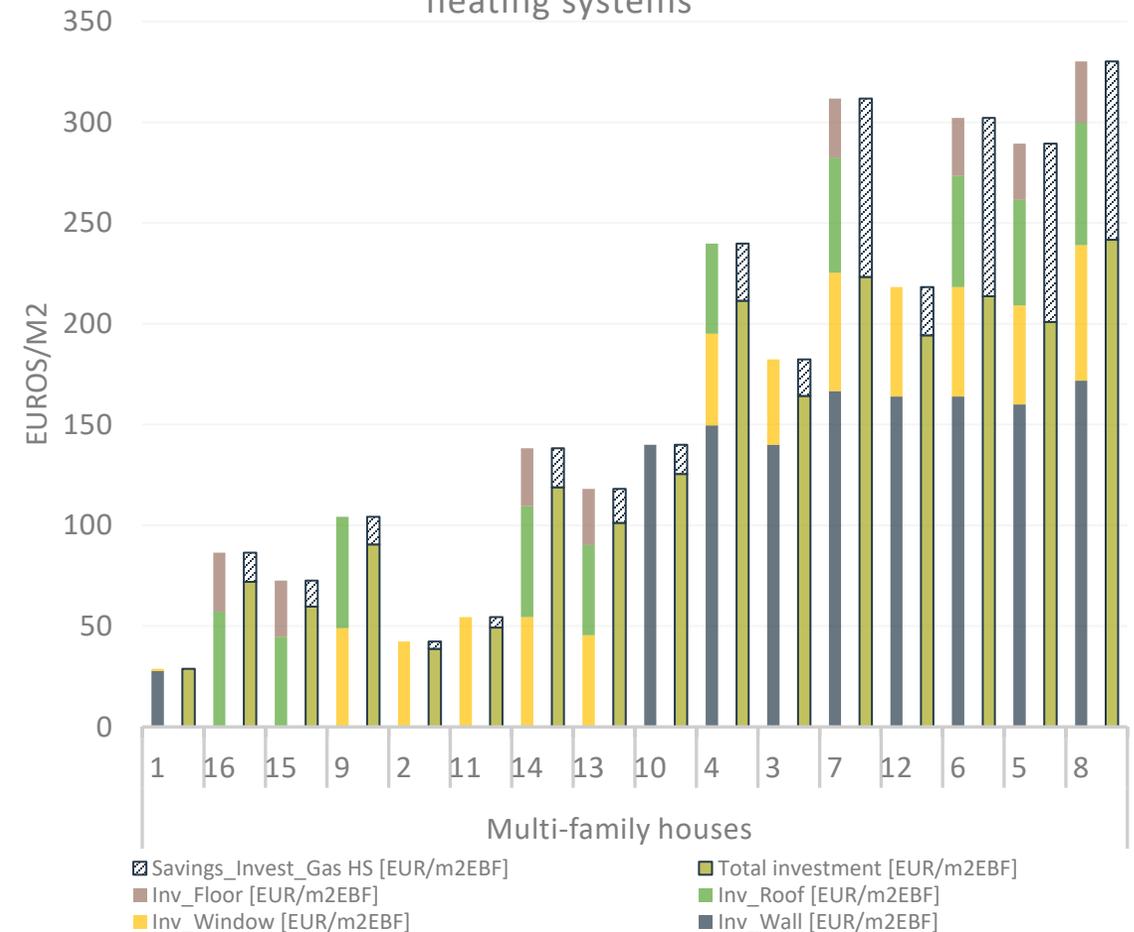
Investment in the building envelope

- Per building type
 - Single and multi family houses
- Building age depending
 - 5 different age classes
- Measures for 4 different building elements in building packages (1 to 16, mutually exclusive)
 - Wall
 - Window
 - Roof
 - Basement
- Per EU country

Investment in the heating system

- Savings on the heating system investment
- Energy savings
 - Depending on energy carrier price

Investment for different efficiency measures in the envelope and investment savings related to the heating systems



EBF = energy reference area

Aggregated cost curves

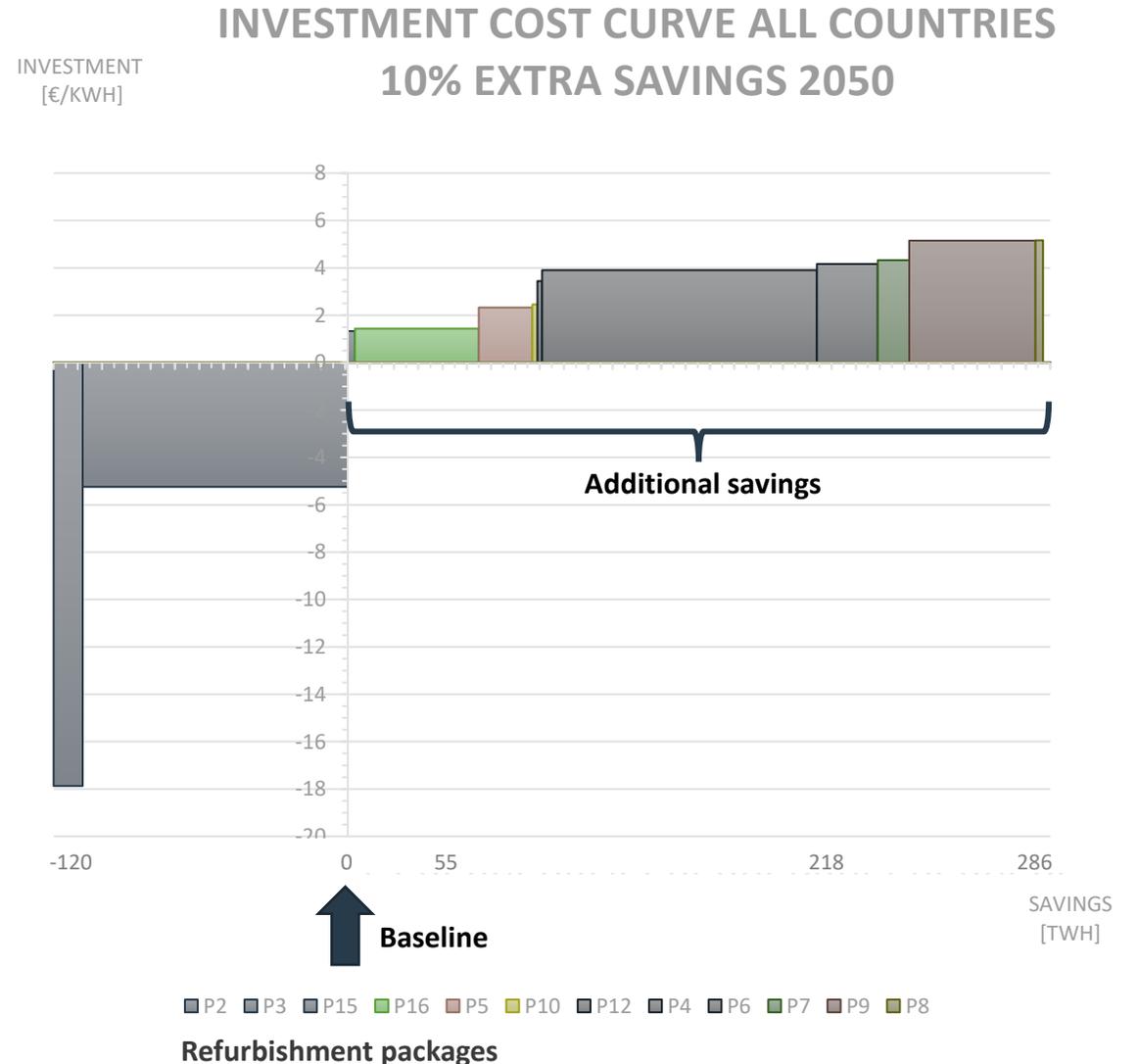
On the building stock

Connection to other WPs

- We provide aggregated cost curves for building envelope measures per country for additional savings beyond the baseline
- We provide energy reference area and average useful energy demand per m² and building type

Investment in the building envelope

- Based on approach for single building
- Aggregation on building stock level and country
- Providing additional savings to a baseline
 - Negative savings for packages in the baseline which currently (in the baseline) are not considered
 - Positive savings for additional measures and additional costs
- Cost structure depending on the set of measures and starting point of building stock



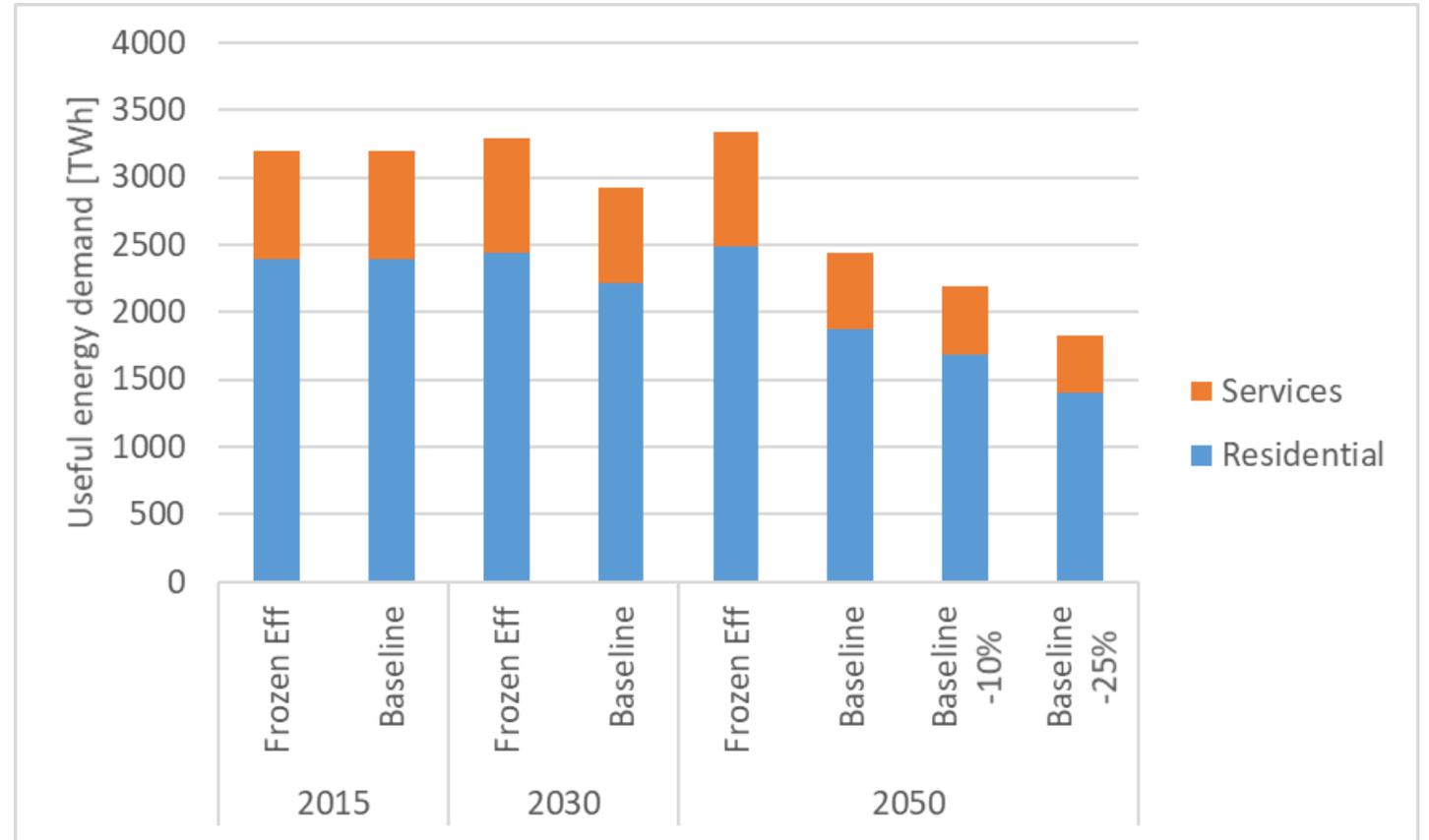
Energy efficiency potentials in the built environment

Starting from frozen efficiency (FE) demand (i.e., buildings not undergoing energetic refurbishment until 2050; incl. new buildings)

Baseline scenario includes moderate energy refurbishment of the building stock

- Per building type and building age class
- Does not include ambitious energy efficiency improvements (e.g., further changes in building codes)
- Does not include the targets of the renovation wave

Savings beyond the baseline for different additional saving targets (-10% and -25%)



Aggregated cost curves

On the building stock

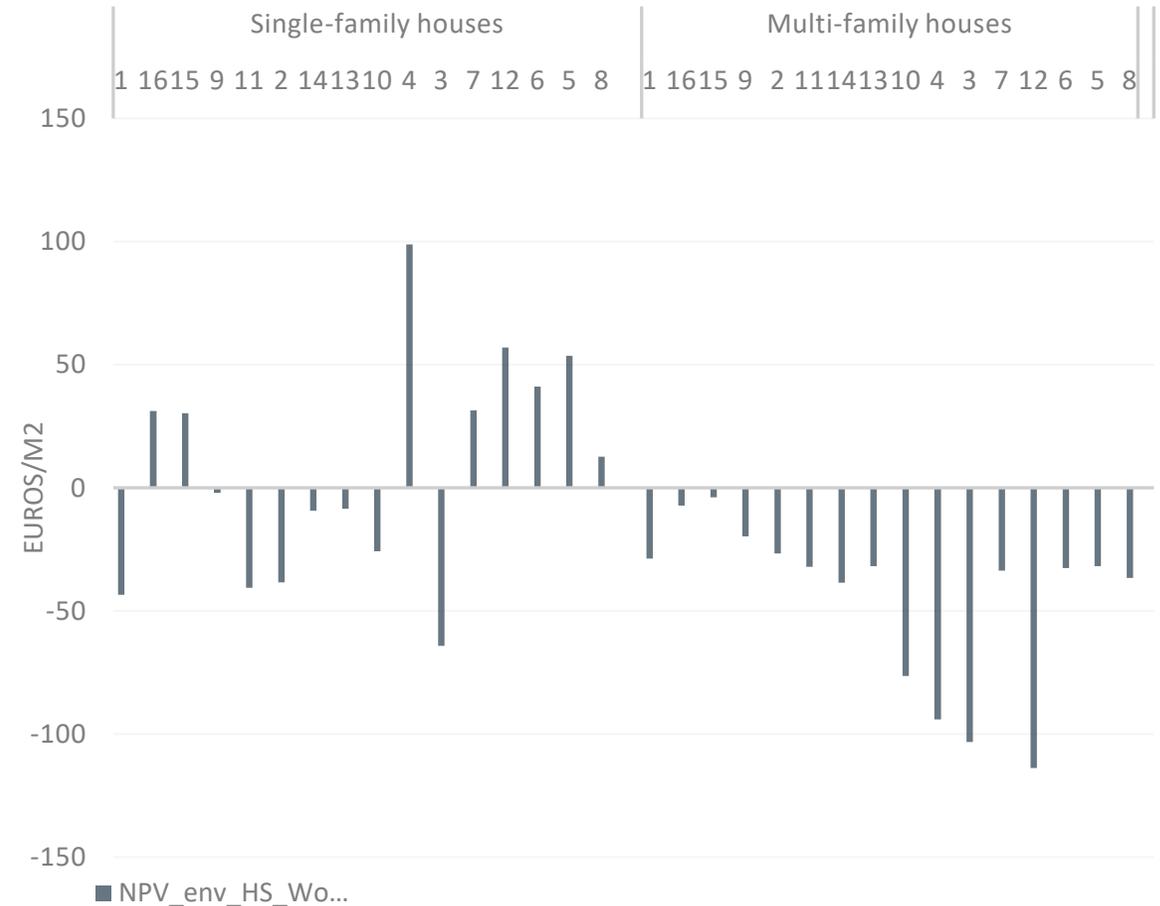
Connection to WP6

- Depending on energy carrier price and marginal heat generation cost, the NPV of the measures can be positive or negative for identical buildings
- **In WP1 we provide cost curves for building envelope measures only**

Investment in the building envelope

- Based on approach for single building
- Aggregation on building stock level
- Providing additional savings to a baseline

Net Present Value for different efficiency measures in the envelope and the heating system



Closing remarks

Linking WP1 to other work packages

WP1: Energy efficiency potentials

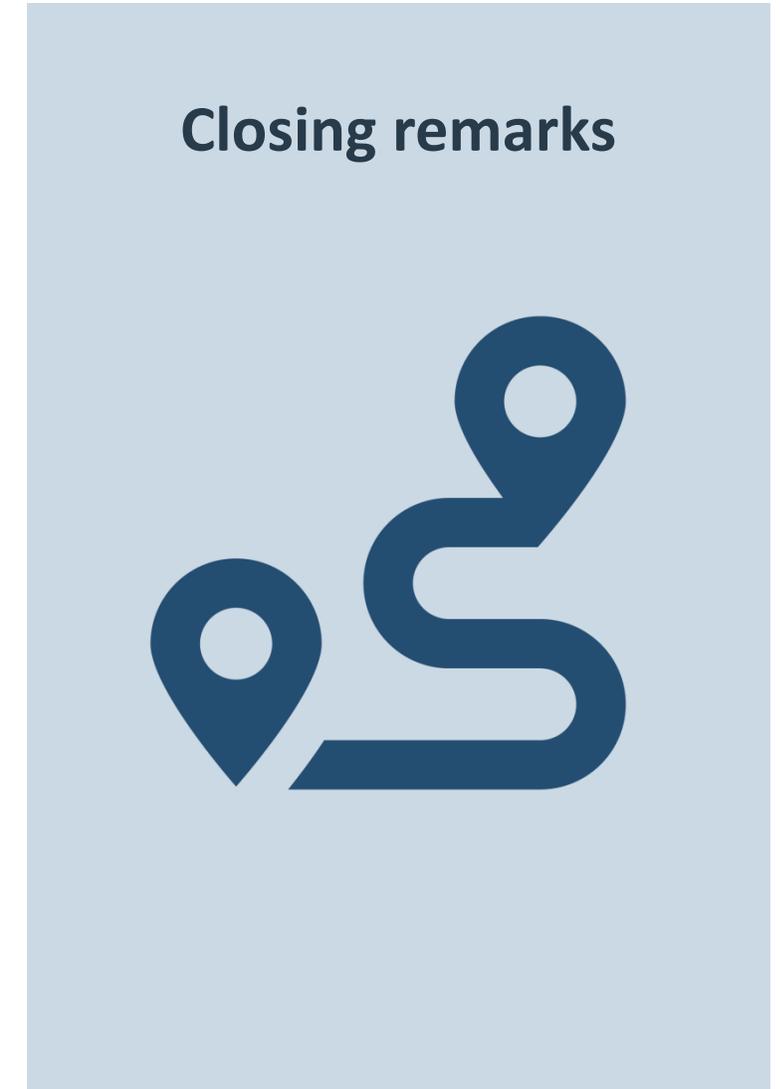
- Further data exchange with WP6 AAU

WP5: Mapping of EE potentials

- Mapping of potentials and costs at a 1-hectare level
- Aggregation of cumulative efficiency and district heat potentials by country

Your contacts

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Backup



ID	Package
1	Façade painting
2	Only windows (low)
3	Window and wall /low)
4	Windows and walls and roof (middle)
5	Windows and walls and roof and floor (high)
6	Building on package 5, windows and walls and roof and floor (higher)
7	Building on package 5, windows and walls and roof and floor (highest)
8	Building on package 5, windows and walls and roof and floor ("passivhouse")
9	Windows (high) and roof (higher)
10	Only walls (low)
11	Windows(higher)
12	Windows and wall (higher)
13	Windows (middle) and roof (middle) and floor (high)
14	Windows and roof and floor (higher)
15	Roof (middle) and floor (high)
16	Roof and floor (highest)