Energy Efficiency 1st: reduce demand as we electrify

Energy demand reduction of buildings - lever for energy security, affordability and a swift energy transition.

Across Europe, renovation and electrification must move together.
At building level, reduce the load before you size the supply.

1

FABRIC / DEMAND REDUCTION

Use less energy before it becomes electricity demand

2

CLEAN HEAT / ELECTRIFICATION

Electrify remaining heat demand with a right-sized system

A right-sized energy system:
lower peaks, lower bills, less infrastructure to build

The infrastructure constraint is no longer theoretical

Europe needs more clean electricity - but grids, generation and connections are already under pressure



NETHERLANDS

“No power = no project”

A housing project used the grid constraint itself as the message.



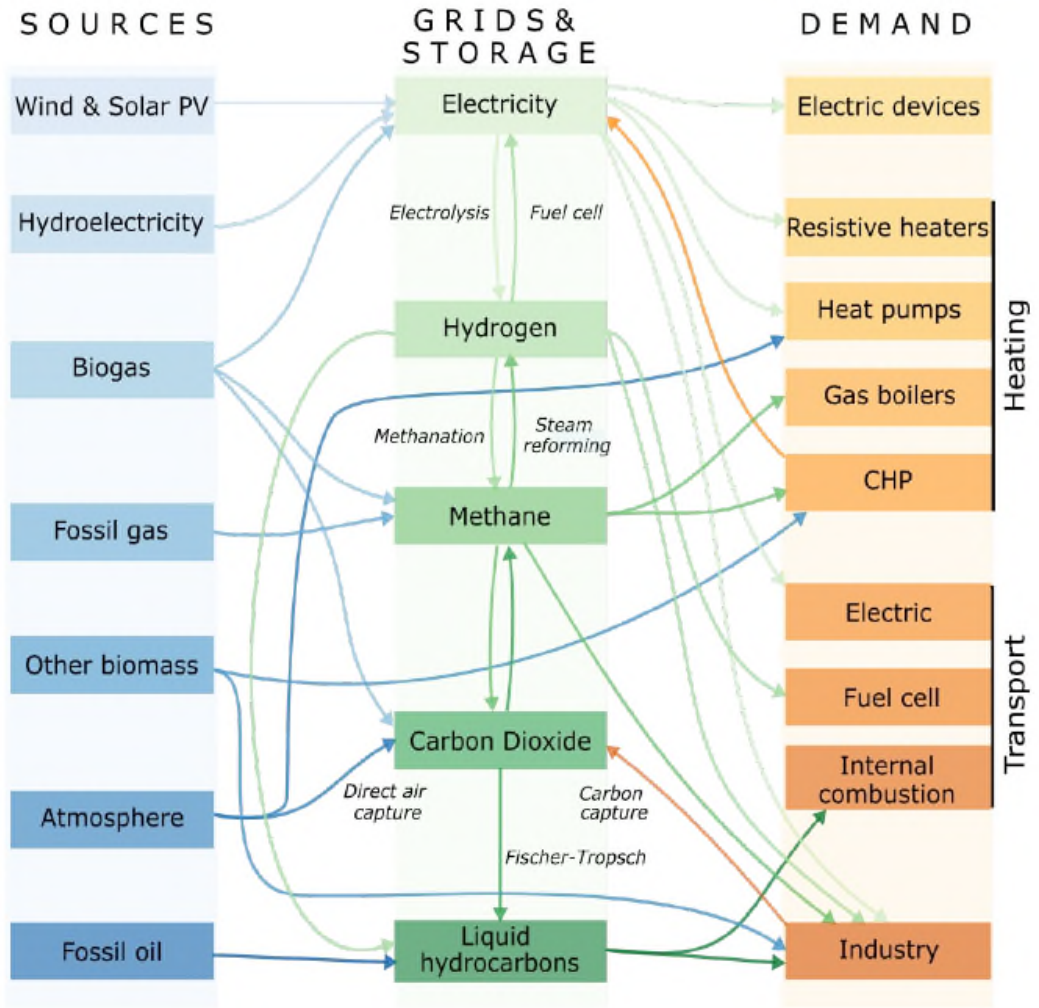
BALKANS - JUNE 2024

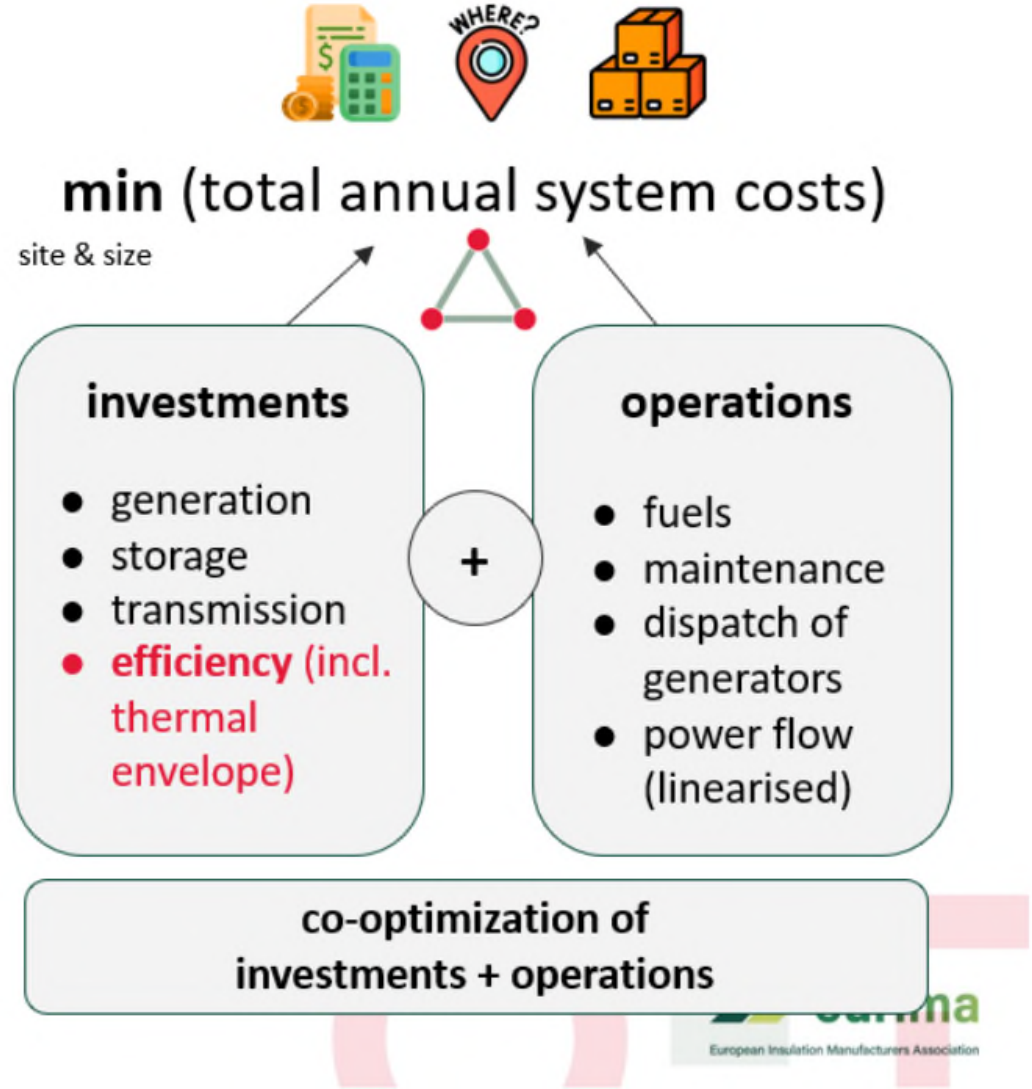
Heat + high demand + system stress

A major regional outage during a heatwave made peak conditions very tangible.

Every avoided peak reduces the amount of infrastructure the transition has to finance, permit and build.

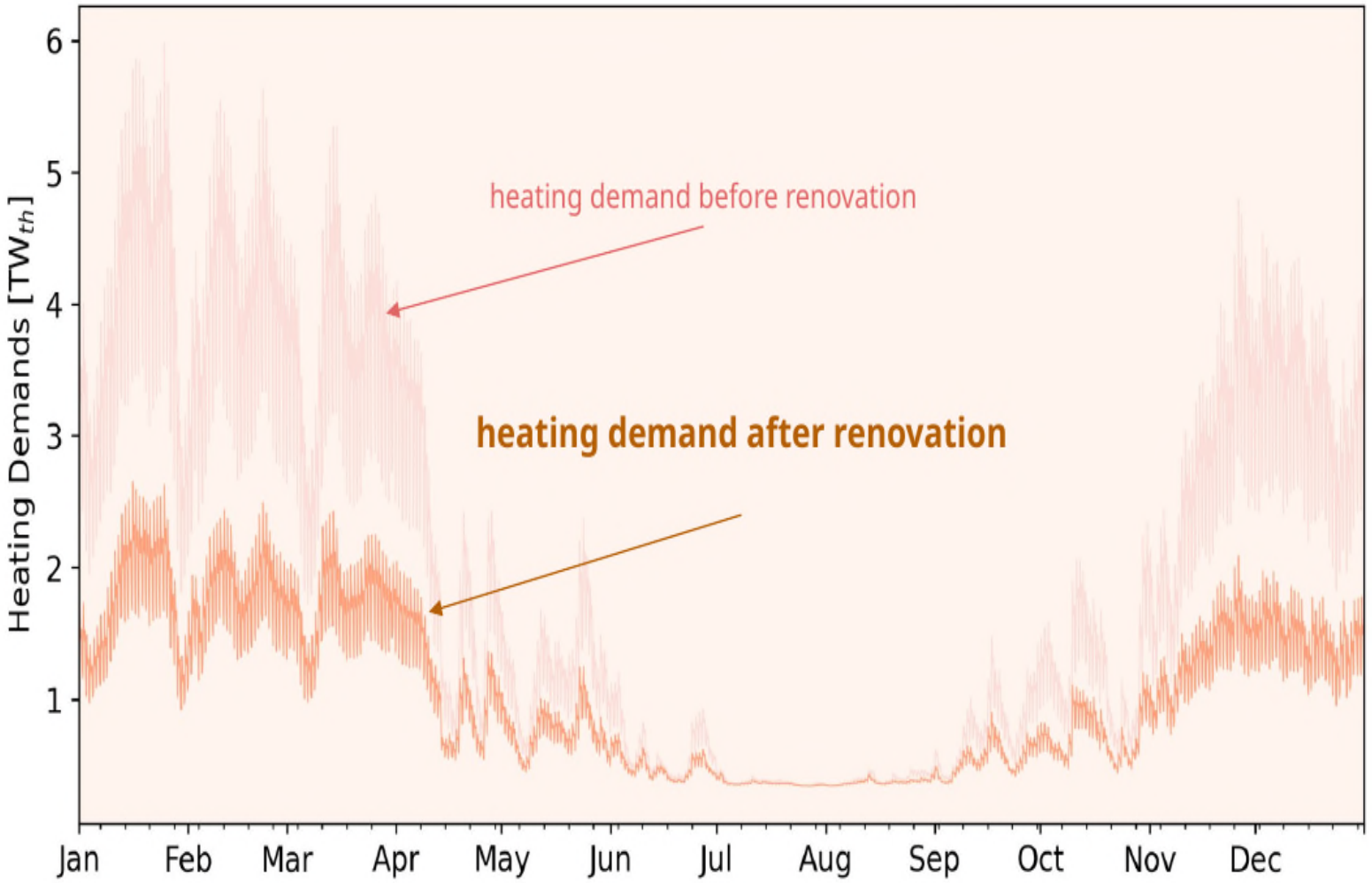
Energy Infrastructure planning in PyPSA as an optimisation problem





Source: PyPSA-Eur, https://pypsa-eur-sec.readthedocs.io/en/latest/

How much heating demands can be reduced, and what implication does it have on the system?



Open Energy Transition
from the creators of PyPSA meets Earth

- Lower total system cost
- Lower infrastructure investments
- Lower bills for end consumers

Peak demand study: Renovation helps cut fossil fuels

Table 8: Total installed capacity of heat pumps (in GW_{el}).

	2030	2040	2050
WIDE	34.21	132.92	157.55
WIDE+ELEC	94.81	142.20	168.11
LIMIT	39.39	-	-
LIMIT+ELEC	-	214.81	249.06
BAU+ELEC	331.68	430.17	492.67

- **Finding 1:** Widespread renovation in a completely electrified system reduces the average required size of a heat pump by an **average of 3 times.**

- **Finding 2:** Optimized heat pump deployment also means reducing manufacturing and installation cost. Accelerating Europe's renovation rate can help achieve the EU's heat pump deployment goals more competitively and with less of an environmental impact, while remaining affordable for consumers.

Efficiency reduces curtailment - and the renewable capacity needed

The same climate objective can be reached with a more manageable clean-power build-out

PDS RESULT

Curtailment is reduced

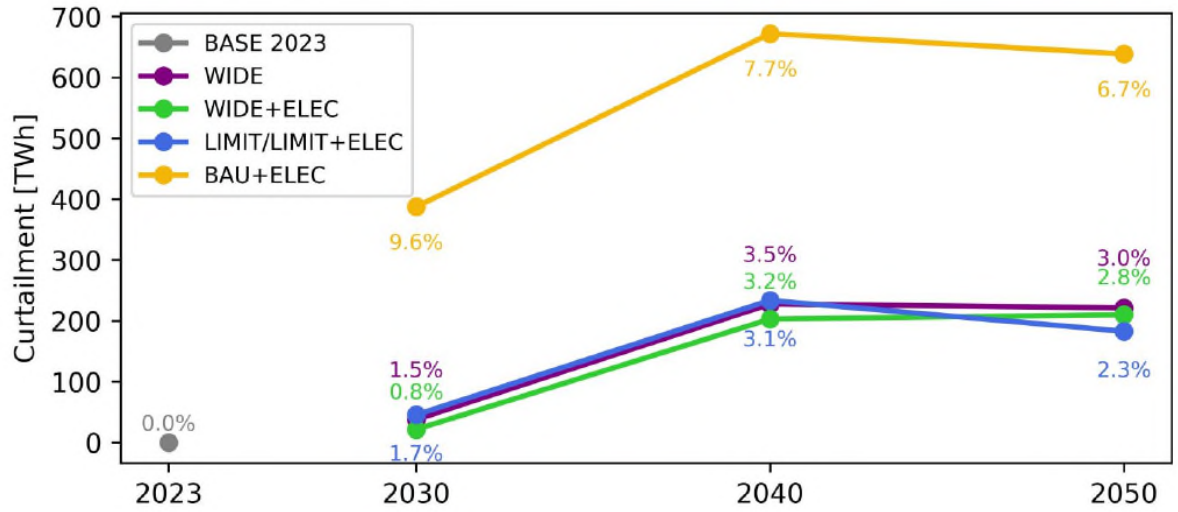
~600 GW

less wind capacity

~872 GW

less solar capacity

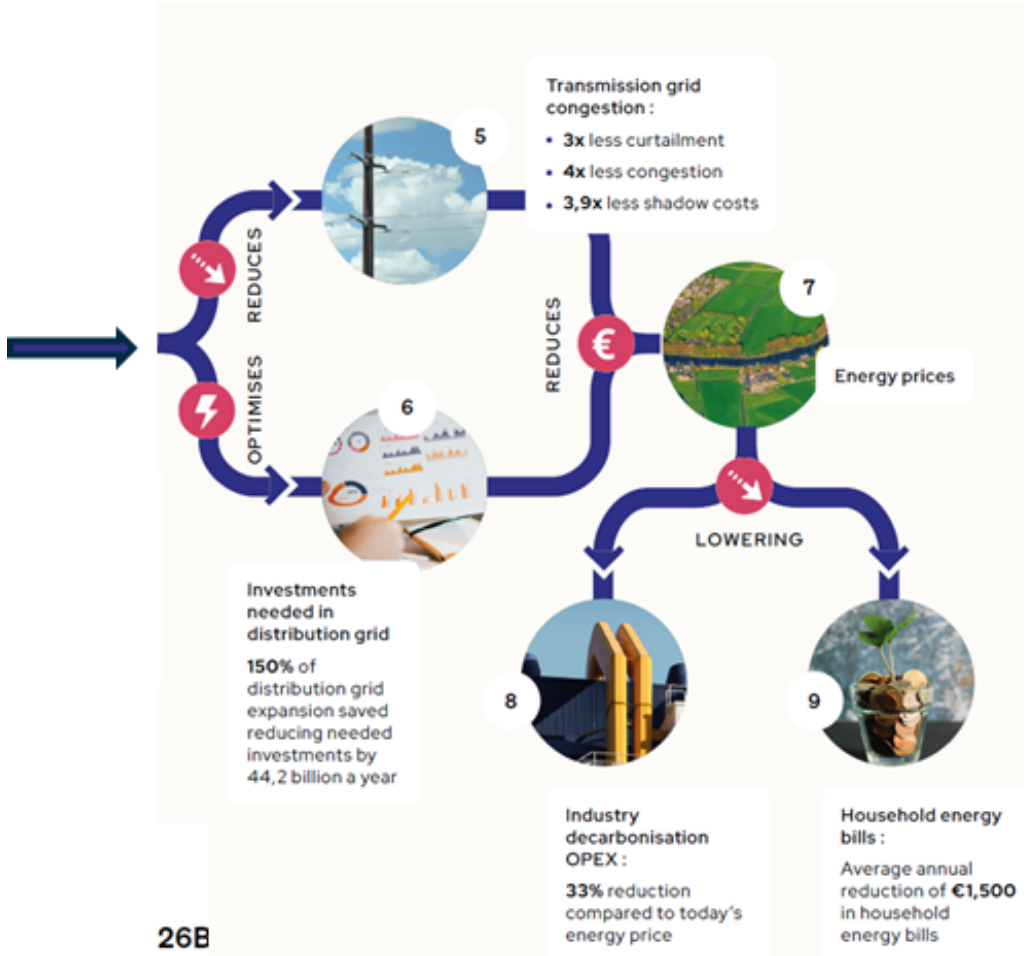
in the PDS comparison of efficient pathways with BAU + electrification

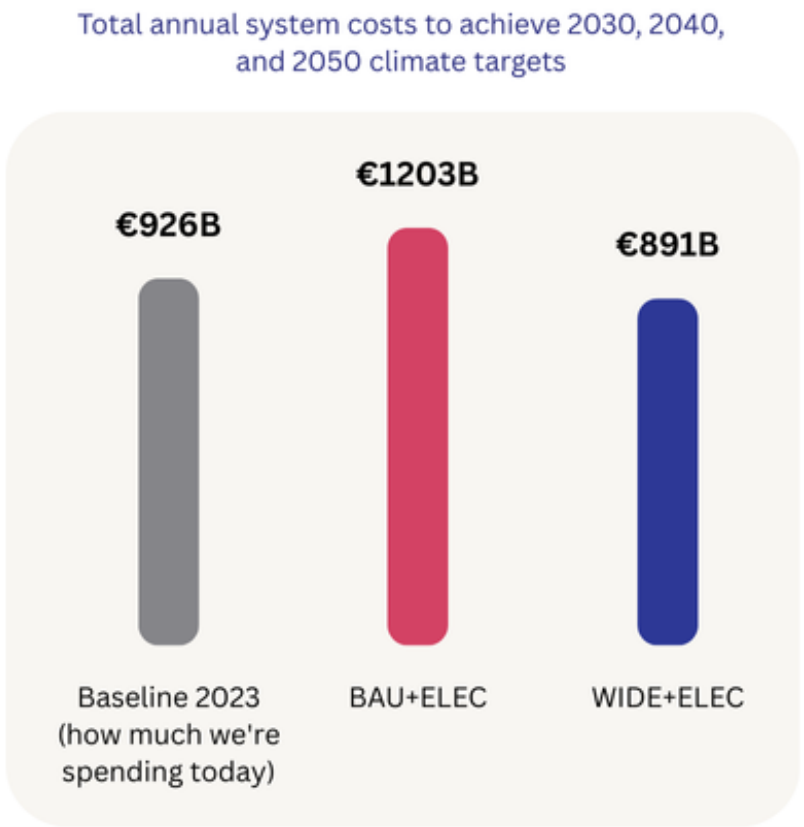


Not fewer renewables as an objective - less infrastructure required for the same decarbonisation outcome.

The benefits propagate across the energy system

Lower building demand changes grids, system costs, industrial energy costs and household bills

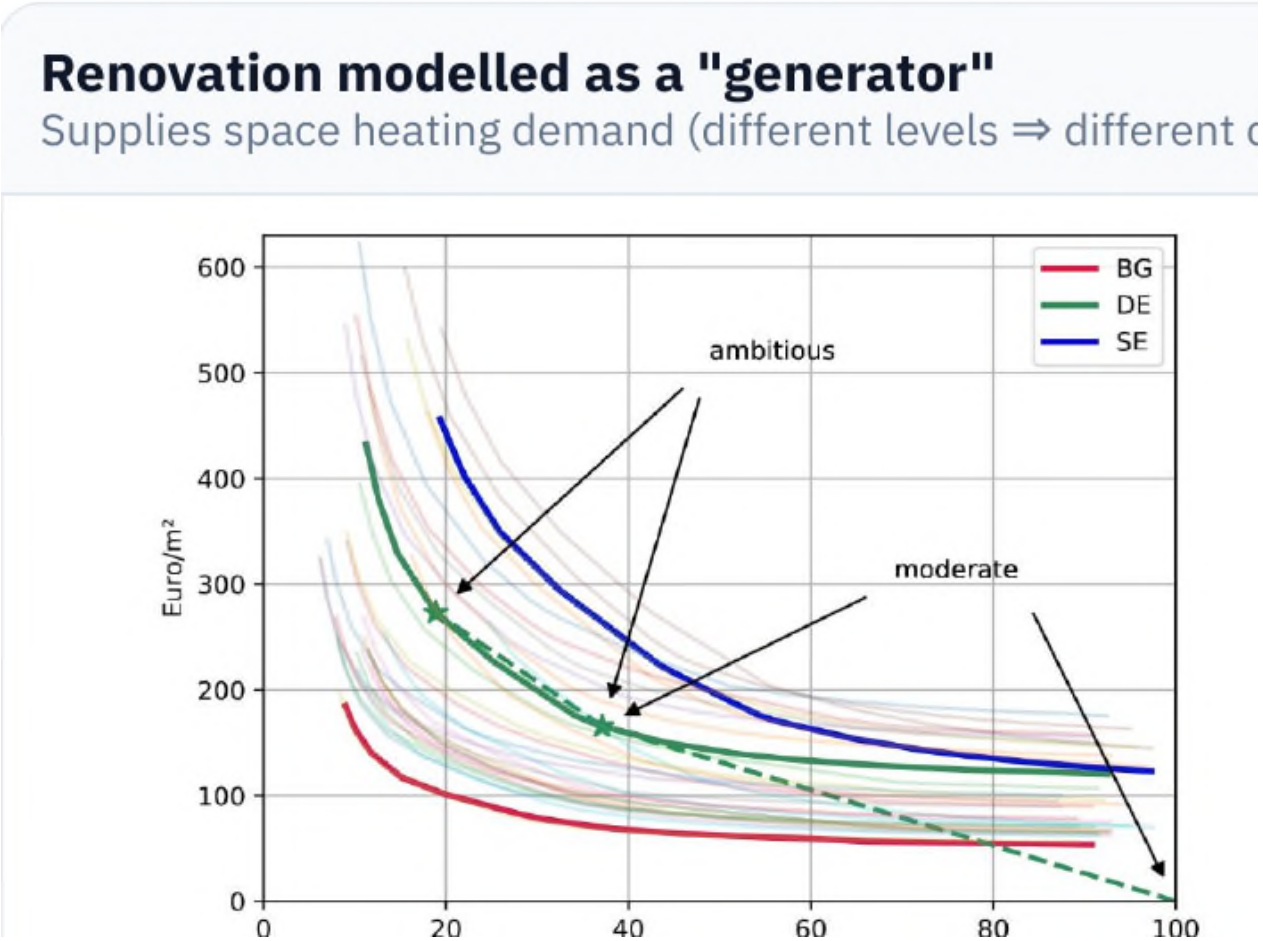




PDS synthesis: efficiency changes the quantity of infrastructure the system needs - and the costs that flow through to homes and industry.

EPBD implementation: do not lock in a high-demand building stock

Use the cost-optimal framework to combine envelope, heating systems and flexibility intelligently



PDS does not assume "maximum renovation". It lets different renovation depths compete on cost and system value.

NBRPs

Final plans are due by 31 December 2026

This is where Member States set the renovation pipeline, measures and financing framework for the building stock.

COST-OPTIMALITY

The EPBD already recognises economic optimisation

The aim is not the technically deepest package everywhere; it is a cost-optimal performance pathway over the building life cycle.

SYSTEM VALUE

Implementation should value demand reduction, not only fuel switching

Envelope upgrades can reduce heat-pump sizing, winter peaks, grid needs and the amount of clean generation required.

The implementation test: does the pathway structurally lower demand?

ETS2: turn the price signal into permanent energy savings

Carbon pricing is easier to sustain when households have a realistic way to reduce their exposure

MAKE THE SIGNAL INVESTABLE

Give households the means to act

- Direct Social Climate Fund and ETS2 revenues to durable energy-efficiency improvements and clean heating.
- Prioritise worst-performing buildings and vulnerable households.
- Reduce the energy need so the carbon-price exposure falls permanently.

THE RISK TO MANAGE

Do not price inefficient homes before people can improve them

- ETS2 becomes fully operational in 2028.
- A price signal alone does not insulate a roof, wall or facade.
- If households experience decarbonisation mainly as higher bills, political support for the wider transition becomes harder to sustain.

The objective is not merely to change the fuel - it is to lower the household energy bill structurally.

Affordability is the licence to operate for the transition

Efficient buildings connect housing affordability, industrial electrification and public support

HOUSING

Affordable to live in

Lower structural demand means lower running costs. An affordable home must also be affordable to heat.

ETS1 / INDUSTRY

Headroom to electrify

Lower building peaks reduce pressure on clean-power and grid capacity that industry also needs to decarbonise.

ENERGY-EFFICIENT BUILDINGS

PUBLIC SUPPORT

Visible benefits before - or alongside - higher carbon costs

Lower bills, better comfort and a more manageable infrastructure build-out make the transition easier to finance and easier to accept.

The solutions already exist. The EAE Awards show what is possible. The challenge is scale.