

**5th Scenario  
Guideline workshop  
–Efficiency,  
electrification and  
other sectors in  
scenario  
development**

**05 August 2022**

**ehi**

*association of the*  
European Heating Industry

# About EHI – European Heating Industry

**EHI represents  
the European Market:**

**Our companies are market leaders in heating technologies**

SPACE  
HEATING



WATER  
HEATING



CONTROLS



EMITTERS

UNDERFLOOR  
HEATING



RADIATORS



**120 000**

people employed directly  
throughout Europe

**700 million €**

yearly investment in  
energy efficiency

**90%** Heating & hot water

**90%** Controls & heat emitters

**80%** Biomass central heating

**75%** Hydronic heat pumps

**70%** Solar thermal

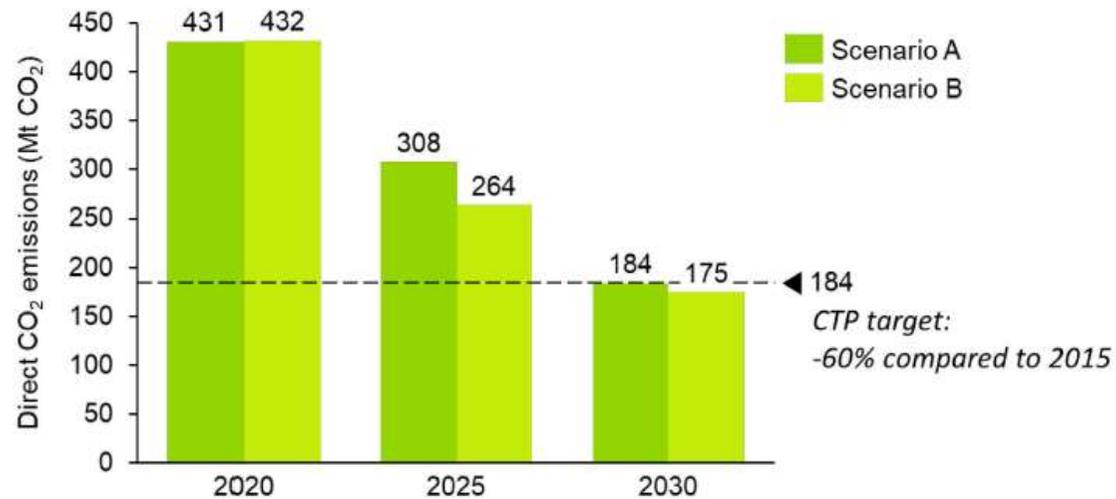
# EHI advocates for solutions to reach the European Climate Law objectives



- ▶ **EHI stands behind Europe's ambition to become carbon-neutral by 2050**
- ▶ **EHI commissioned Guidehouse** to conduct a study to identify the **most cost-effective and efficient decarbonisation pathway** for Europe's buildings
- ▶ **Why Guidehouse?** Because their **BEAM<sup>2</sup> model** – also used by the European Commission for the EPBD IA – **is able to capture the complexity of the challenge to decarbonise buildings and provide pathways to address such challenges**
- ▶ **Guidehouse modelled two alternative pathways – both complying with CTP by 2030 and reaching zero emission buildings by 2050**

# Zero emission buildings are achievable under multiple scenarios

Direct CO<sub>2</sub> emissions in the EU buildings sector



Source: Guidehouse, 2022

Achieving  
REPowerEU & CTP  
goals 2030



- 45%  
Gas  
consumption



- 60%  
Direct  
emissions



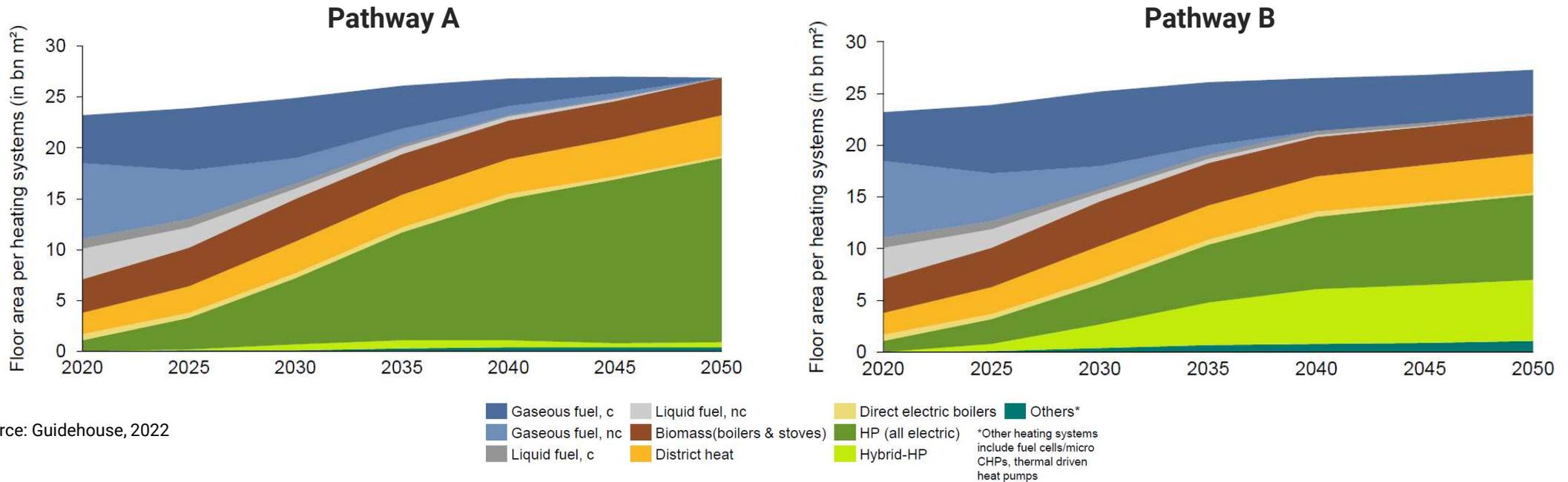
30 Mio.  
Heat  
pumps

Zero energy  
building stock by  
2050



100%  
ZEB

# Resulting heating mix in the two Pathways

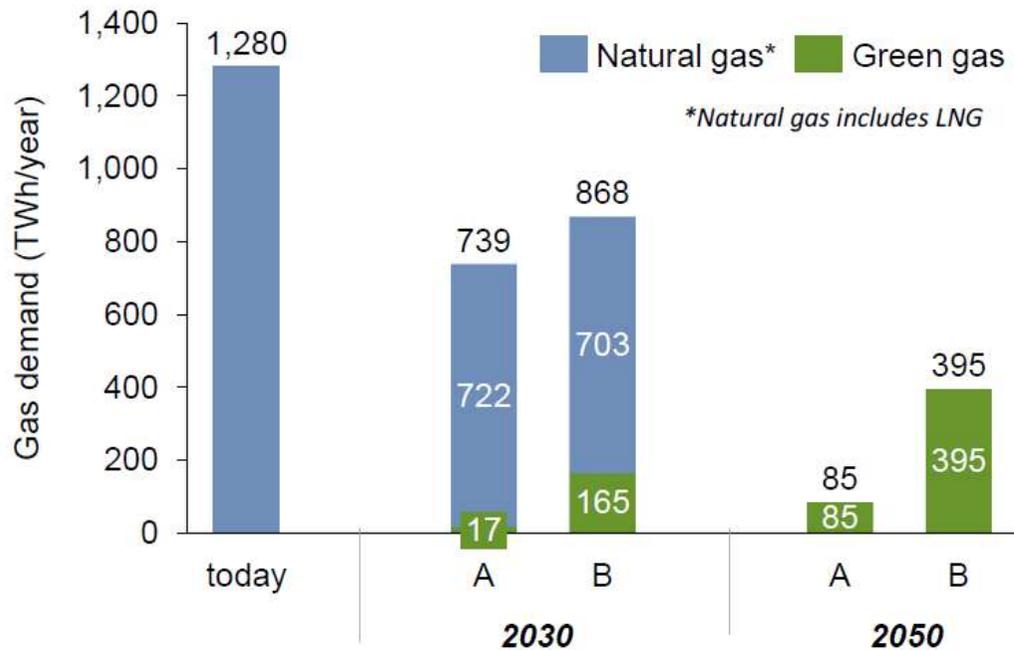


Source: Guidehouse, 2022

- ▶ **Pathway A has practically no gas used in buildings in 2050 and a massive share of heat pumps, strongly increasing from 2025 onwards**
- ▶ **Pathway B relies more heavily on hybrid systems and on green gases and has a faster phase out of old and inefficient heaters**

# Natural gas gives way to renewable gases over time

Total gas demand in buildings (EU)

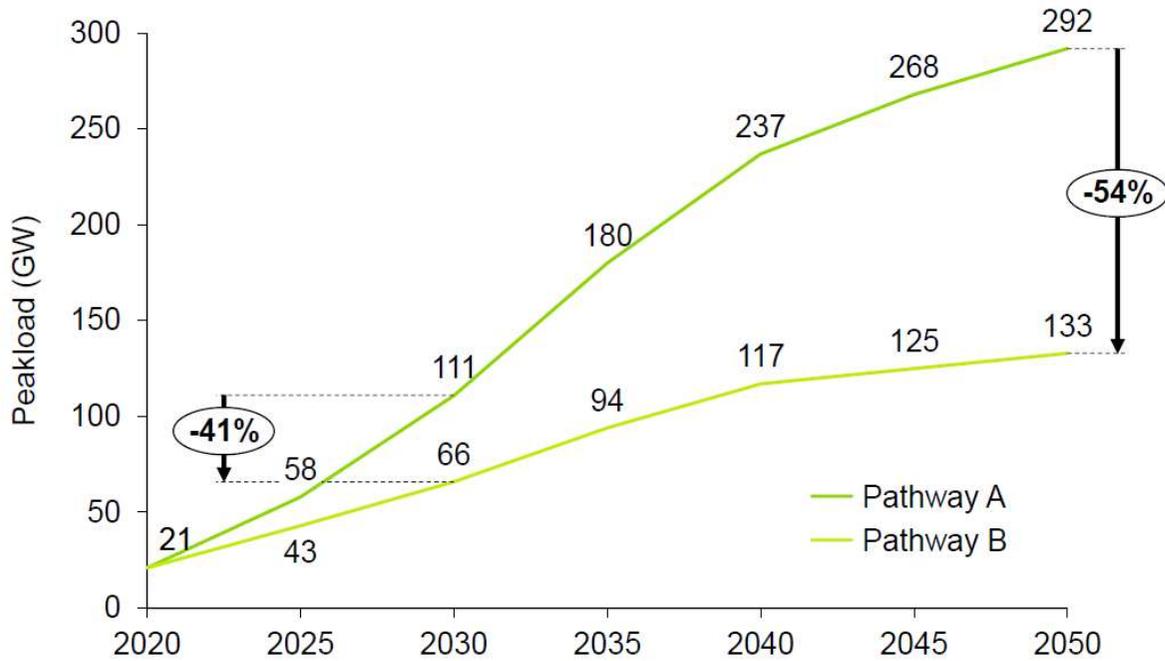


Source: Guidehouse, 2022

- ▶ Gas consumption is significantly reduced thanks to energy efficiency measures, fuel-switching towards electricity and a heightened role of hybrids and hybridisation
- ▶ By 2050 natural gas is completely phased-out
- ▶ Repartition of renewable gases:
  - ▶ 2030
    - ▶ Biomethane: 80%
    - ▶ Hydrogen: 20%
  - ▶ 2050
    - ▶ Biomethane: 40%
    - ▶ Hydrogen: 60%

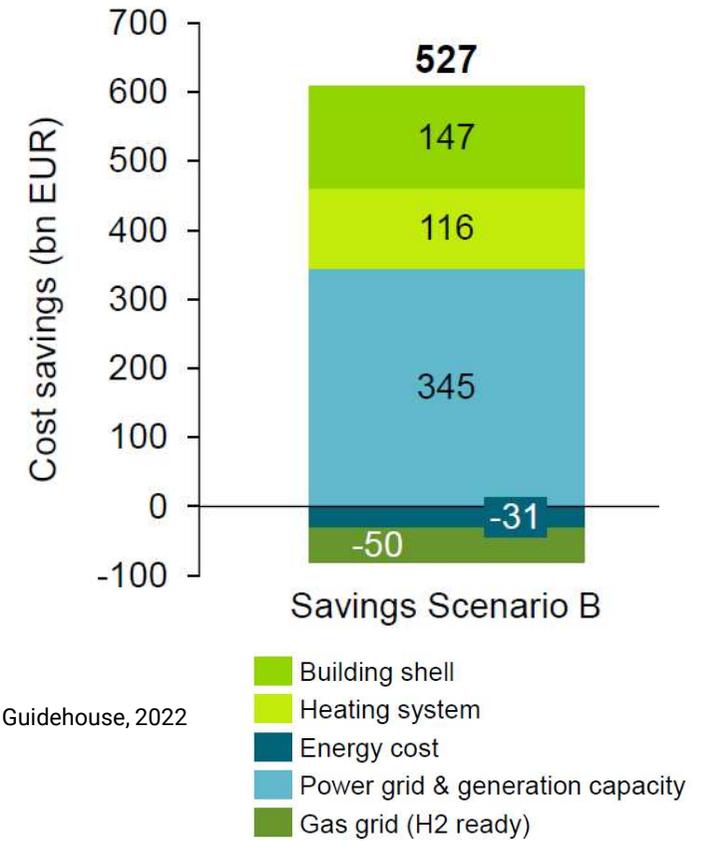
# Pathway B lowers infrastructure costs in the long run

Comparison of resulting peak load demand from heat pumps<sup>1</sup>



Source: Guidehouse, 2022

Cost savings of pathway B compared to A



Source: Guidehouse, 2022

<sup>1</sup> Key assumptions to manage peak demand common to both scenario: in peak times 50% of heat is supplied by heat pumps, albeit at a lower COP (1,5); 15% of heat demand is covered by ground-source HP, with a higher COP (2,8); load shifting of 2 hours/days possible, leading to reduction of peak load of ca. 15%; heat pump oversizing – which is expected to reduce overtime – leads to extra flexibility to the network.



# Back-up

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## **Input parameters / boundary conditions common to both pathways:**

- Building Stock Data as square meter distribution per reference building, age group and heating technology for the start year 2020
- EU Reference Zones dividing Europe's Member States in five Reference Zones (Northern, North-Eastern, Western, South-Eastern and Southern Zone)
- Climate Data showing average monthly temperatures of the five Reference Zones
- Reference Buildings for three residential (SFH, SMFH, LMFH) and five Non-Residential Buildings (Office, Trade and Retail, Education, Touristic and Health, Other)
- Building shell efficiency levels for the Reference Buildings and their original level (not renovated and already renovated) per Reference Zone and Age Group
- Efficiencies of heating systems as system efficiencies per heating and hot water system
- Energy prices per Reference Zone
- GHG- and PE-factor developments from today until 2050
- Building Stock Development, meaning how shares of buildings' different energy performance levels within the total floor area will develop within the total building stock as a result of the chosen pathway
- Investment costs for the measures in building stock and infrastructure (differ between the climate zones)

## **Input parameters / boundary conditions different in the two pathways:**

- Building shell efficiency levels for the Reference Buildings and their retrofit and new-built levels per Reference Zone and Age Group will develop within the total building stock
- Specific pathway Inputs, e.g., renovation rates or target levels for renovation
- GHG factor for gas because of different green gas shares

## Pathway A

In this pathway the heating sector is decarbonised thanks to a very high level of electrification with heat pumps and little space for other technologies or energy carriers. Focus is on the **extension of the electric power network**. **Deeper renovation** is necessary to enable the expected number of heat pump installations.

### Key parameters

- **Heat mix: Focus on heat pumps**
- **Green gas share: 3% in 2030**
- **Heating replacement rate: 4.2% in 2030**
- **Renovation depth: Deeper (high ZEB standard)**

### Pathway independent parameters

- **New construction rate: Equal**
- **Energy performance of new construction: Equal**

## Pathway B

This pathway works with a balanced technology mix. A significant amount of **green gases**, such as **biomethane and hydrogen**, are necessary to decarbonize the building sector (quantities are compatible with REPowerEU). The gas distribution **grid and heating systems will be retrofitted** to enable the blending of **hydrogen**.

### Key parameters

- **Heat mix: Open technology mix**
- **Green gas share: 19% in 2030**
- **Heating replacement rate: 5.8% in 2030**
- **Renovation depth: Lower (ZEB standard)**

- **Heating system efficiencies: Equal**
- **Renovation rate: 2.2%\* in 2030**

*\*following the CTP compliant pathways communicated by the EC*

Distinguishing pathways

Equal