EMP-E

Energy Modelling Platform for Europe

EMP-E 2021: Re-Energising Sustainable Transitions in Europe

Energy System Modelling, Methods & Results to support the European Green Deal

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Efficiency First in the European building sector: Investigating least-cost pathways for net-zero emissions

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Panel Session 06 | De-Carbonising the Building Sector | 27/10/2021

hosted in cooperation with the European Commission

Agenda

01 | Background: What does « Energy Efficiency First » mean?
Conceptual notes on the principle

02 | Objective of model-based assessment
Investigating least-cost pathways for net-zero emissions in the EU building sector

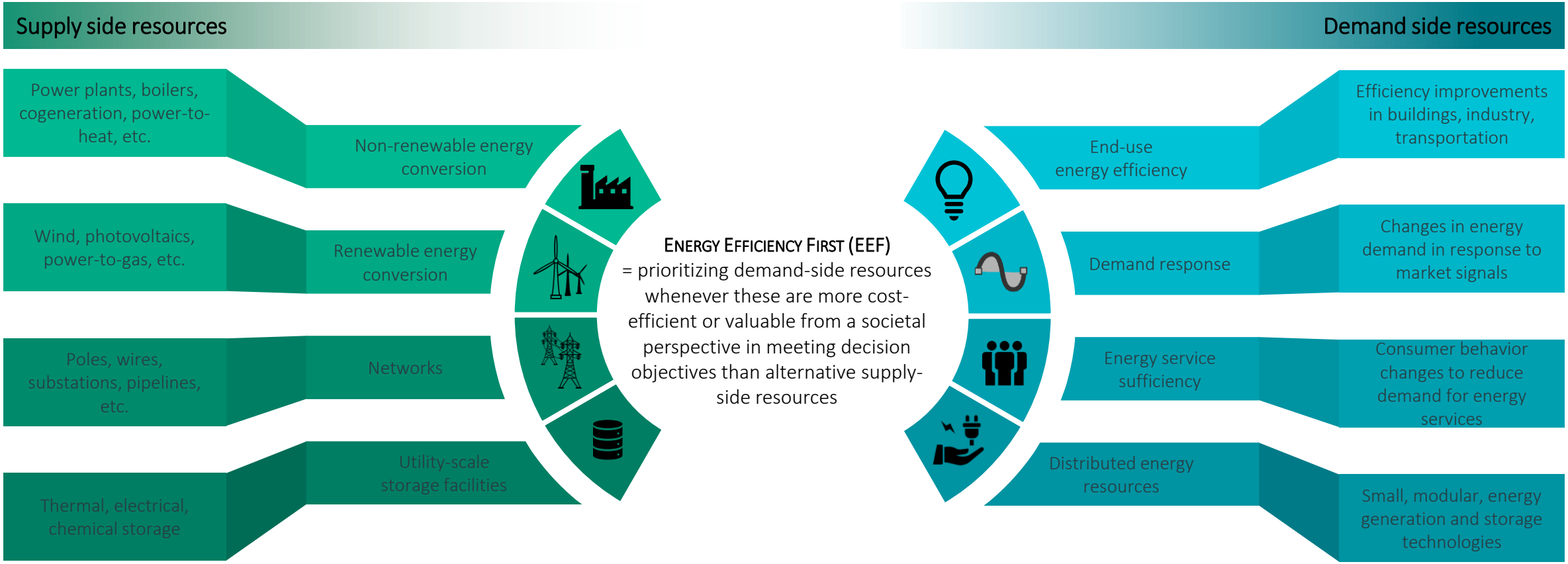
03 | Methodology
Scenarios investigated and coupling of energy models

04 | (Early) results & discussion
Contribution of building sector efficiency to energy system cost until 2050

05 | Conclusion
A look at the activities in the ENEFIRST project

01 | Background: What does « Energy Efficiency First » mean?

At its core, the EEF principle is about solving the **trade-off between demand and supply side resources** in society's best interest.



ENEFIRST (2020): Review and guidance for quantitative assessments of demand and supply side resources in the context of the Efficiency First principle. Deliverable D3.1 of the ENEFIRST project. Brussels: ENEFIRST Project.

02 | Objective of model-based assessment

With a particular focus on the building sector, the ENEFIRST project investigates the societal value of end-use energy efficiency and demand response at **two levels of analysis**

Level 1: Energy system analysis for EU-27

- **Research question:** What level of end-use energy efficiency should be pursued for the EU building sector to provide the greatest societal value in transitioning to net-zero GHG emissions?
- **Spatial scope:** Member States
- **Timeframe:** 2020 – 2050

Level 2: Local case studies for 3 Member States

- **Research question:** What level of end-use energy efficiency should be pursued for buildings in European municipalities to achieve local planning targets and substantial GHG emission reductions?
- **Spatial scope:** Urban areas (cities, neighborhoods)
- **Timeframe:** 2020 – 2050

03 | Methodology

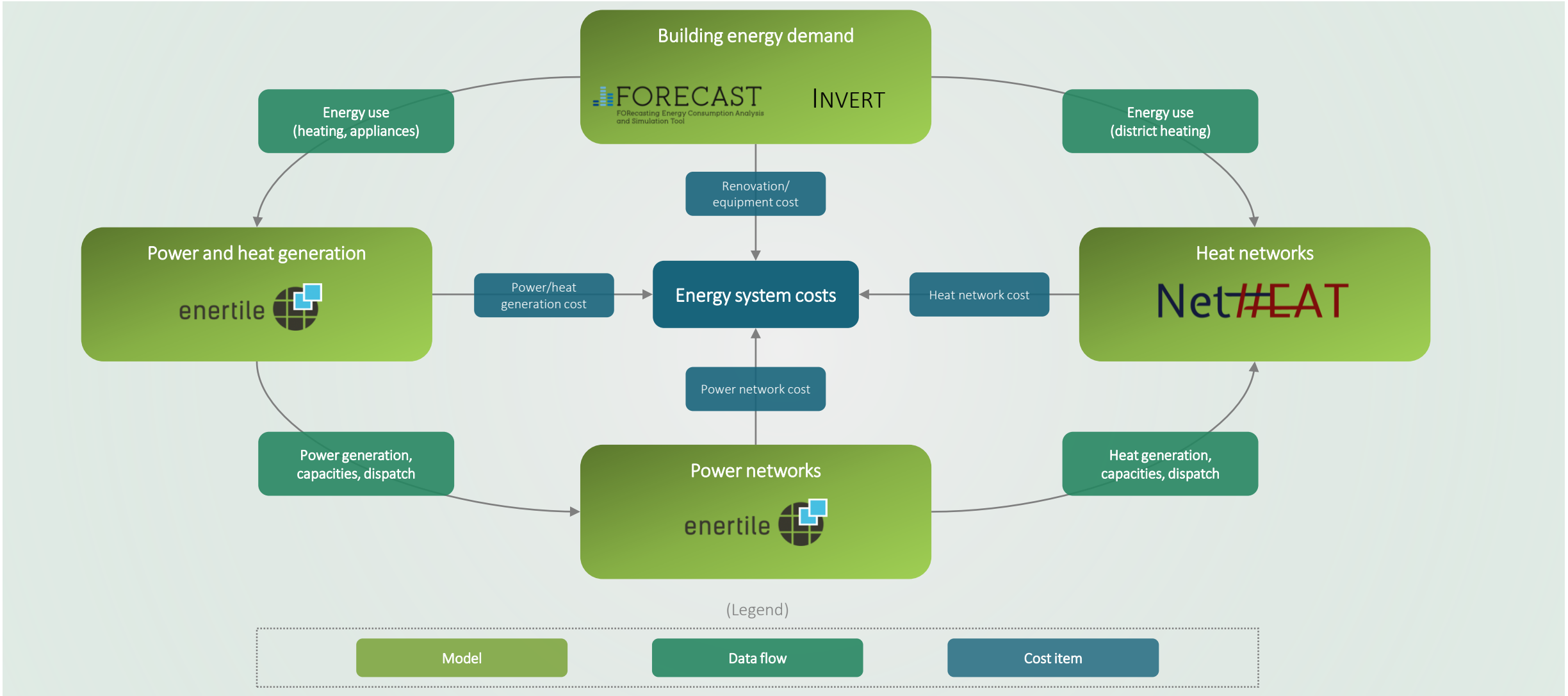
The energy system analysis for the EU-27 investigates three scenarios: each of them is geared to reach **net-zero emissions** by 2050, however with different emphases on **end-use energy efficiency in buildings**

SCENARIOS

SCENARIO NARRATIVES	Low efficiency in buildings (LOWEFF)	Medium efficiency in buildings (MEDIUMEFF)	High efficiency in buildings (HIGHEFF)
Planning objective	2030 ▪ ≥55% reduction GHG emissions (1990) ▪ ≥32% share for renewable energy ▪ ≥32.5% improvement in energy efficiency	2050 Climate neutral economy – net-zero GHG emissions	
Thermal efficiency	Low component requirements; low renovation rate	Moderate component requirements; moderate renovation rate	Strict component requirements; ambitious renovation rate
Appliance efficiency	Low minimum energy performance standards	Medium minimum energy performance standards	Strict minimum energy performance standards
Building H&C equipment	Large installed capacities; balanced technology deployment	Medium installed capacities; balanced technology deployment	Small installed capacities; balanced technology deployment
Power supply	Large installed capacities; balanced technology deployment	Medium installed capacities; balanced technology deployment	Small installed capacities; balanced technology deployment
District heating supply	Large installed capacities; balanced technology deployment	Medium installed capacities; balanced technology deployment	Small installed capacities; balanced technology deployment
Network expansion	Large installed capacities	Medium installed capacities	Small installed capacities
Hydrogen/ e-fuel use	Limited deployment		

03 | Methodology

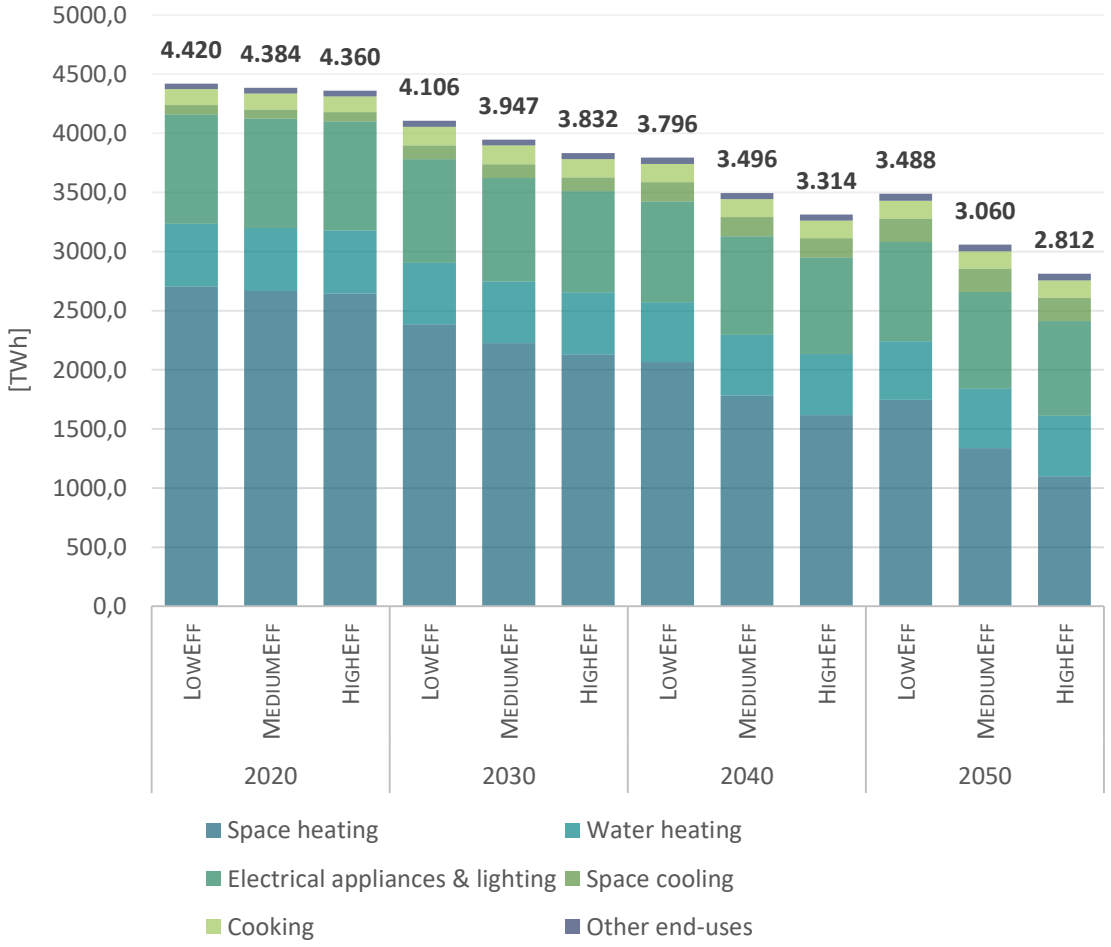
We use four soft-coupled energy models to calculate **energy system costs** and associated indicators.



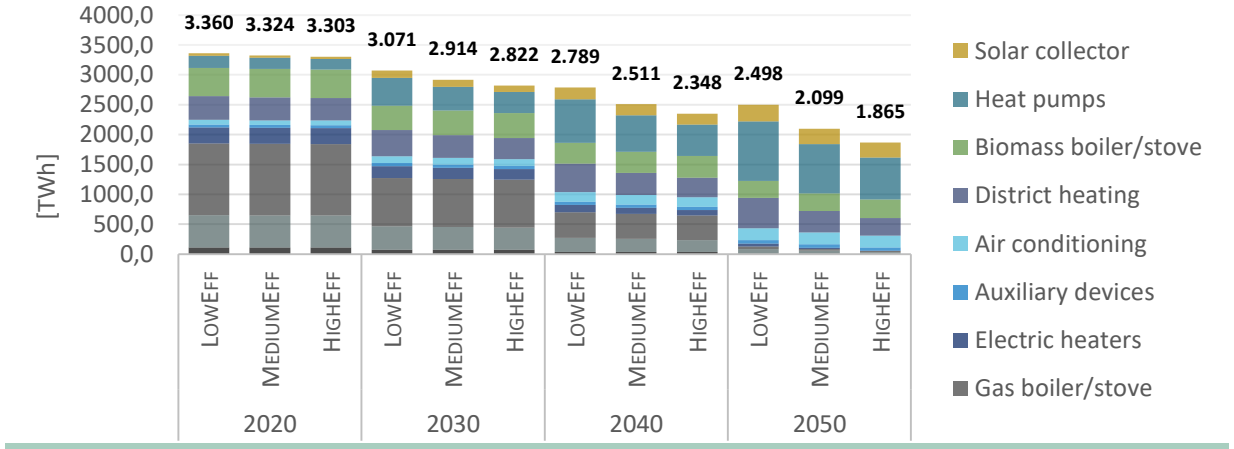
04 | (Early) results & discussion

The difference between HighEff and LowEff is 676.0 TWh or 24.0% by 2050. Note that all scenarios require **substantial reductions in final energy demand** to contribute to net-zero emissions in the long run.

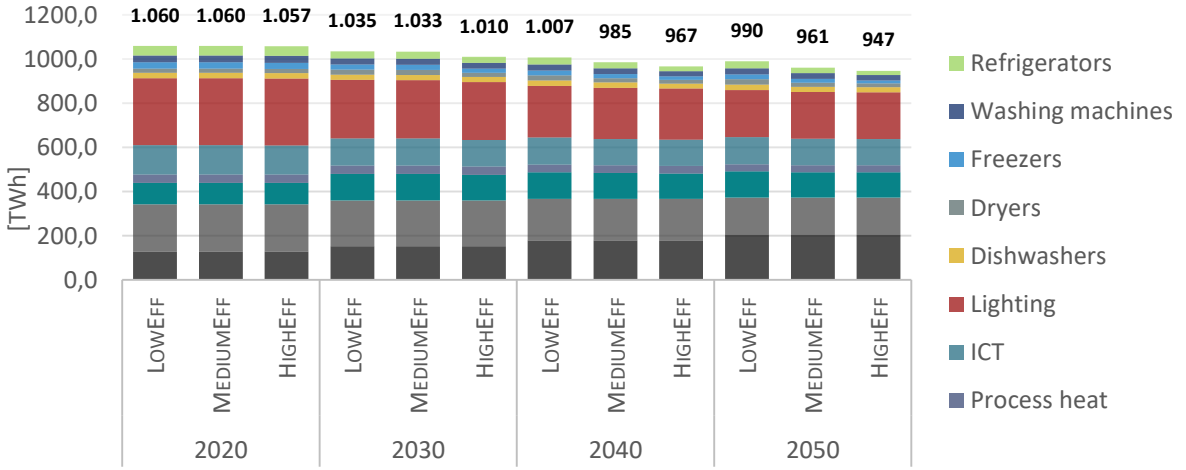
Final energy demand by end-use in EU-27 [TWh]



Final energy demand for heating and cooling by technology in EU-27 [TWh]



Final energy demand for electrical appliances and lighting by technology in EU-27 [TWh]



04 | (Early) results & discussion

The HighEff scenario may turn out to be the **least-cost scenario**. Final data is pending.

04 | (Early) results & discussion

The model-based assessment has a number of **methodological limitations**. Three particular sets of **open questions** are highlighted here.

- Societal perspective | How to make sure that the analysis takes a consistent societal perspective? For example, how to get rid off all **transfer payments**? What **multiple impacts** must be considered to truly reflect society‘s viewpoint?

- Scope of demand-side resources | What‘s the isolated effect of **demand response** in the building sector on energy system cost? How to quantify and monetize **energy service sufficiency** as a dedicated resource?

- Economy-wide rebound effects | How severe are **indirect rebounds** and **macroeconomic rebounds** in counteracting energy savings? How can these effects be represented without the use of general equilibrium modelling?

05 | Conclusion

The ENEFIRST projects investigates the conceptual background to EEF, models its effects for the EU energy system, and develops policy guidelines for its implementation in different policy areas.

- *Horizon 2020*
- Duration: 10/2019 – 06/2022
- www.enefirst.eu