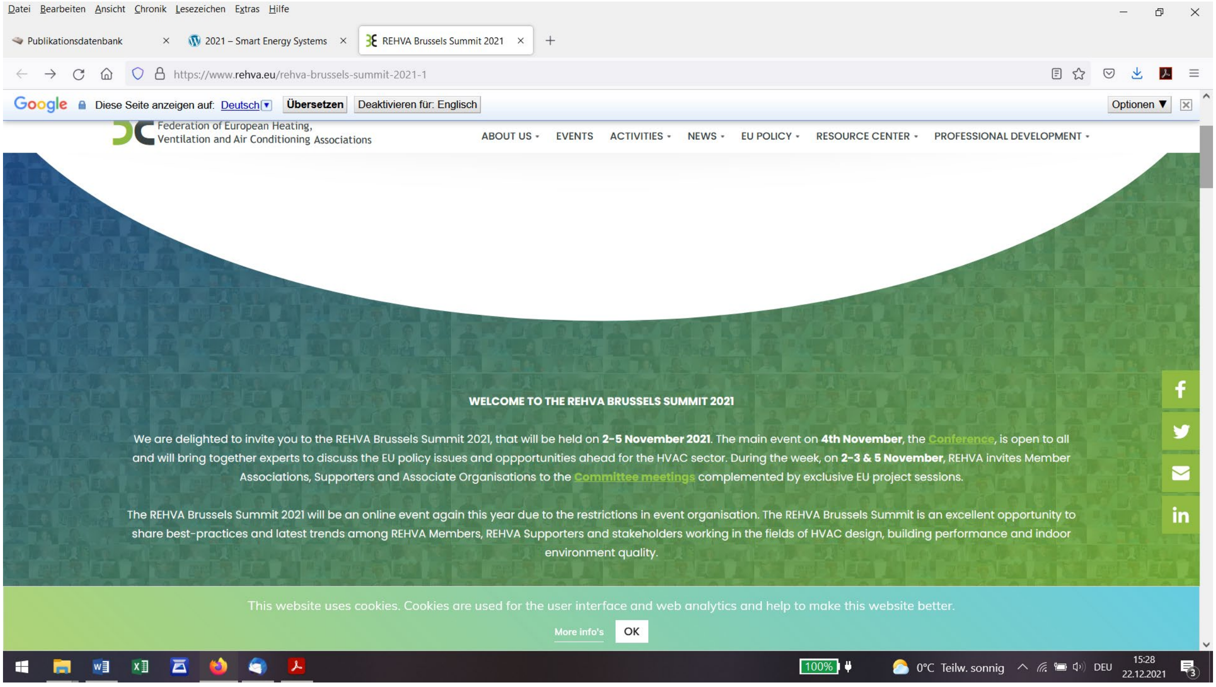
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Federation of European Heating, Ventilation and Air Conditioning Associations
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WELCOME TO THE REHVA BRUSSELS SUMMIT 2021
We are delighted to invite you to the REHVA Brussels Summit 2021, that will be held on 2-5 November 2021. The main event on 4th November, the Conference, is open to all and will bring together experts to discuss the EU policy issues and oppportunities ahead for the HVAC sector. During the week, on 2-3 & 5 November, REHVA invites Member Associations, Supporters and Associate Organisations to the Committee meetings complemented by exclusive EU project sessions.
The REHVA Brussels Summit 2021 will be an online event again this year due to the restrictions in event organisation. The REHVA Brussels Summit is an excellent opportunity to share best-practices and latest trends among REHVA Members, REHVA Supporters and stakeholders working in the fields of HVAC design, building performance and indoor environment quality.
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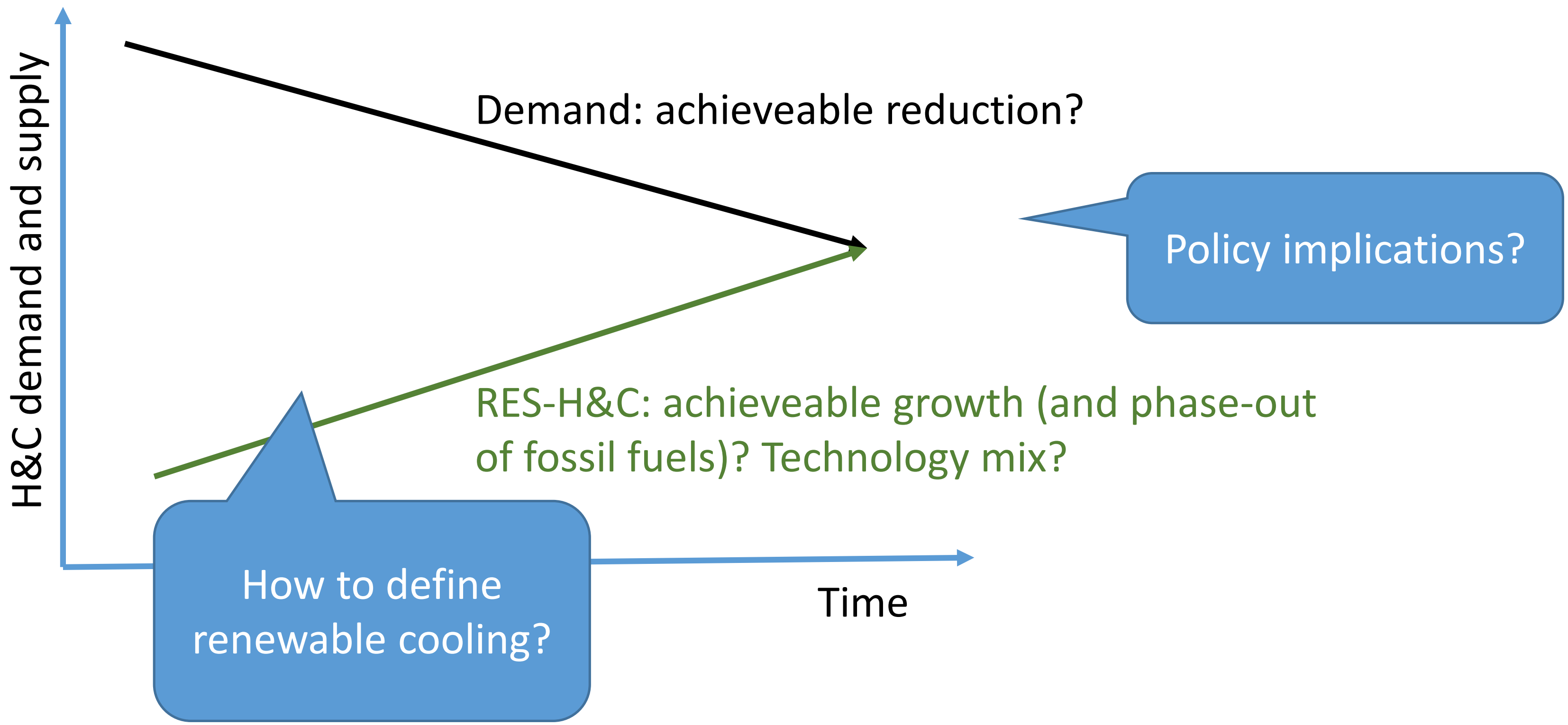
Renewable heating and cooling: technology trends & policy perspectives

Lukas Kranzl, TU Wien

REHVA Brussels Summit, 4 November 2021, online conference

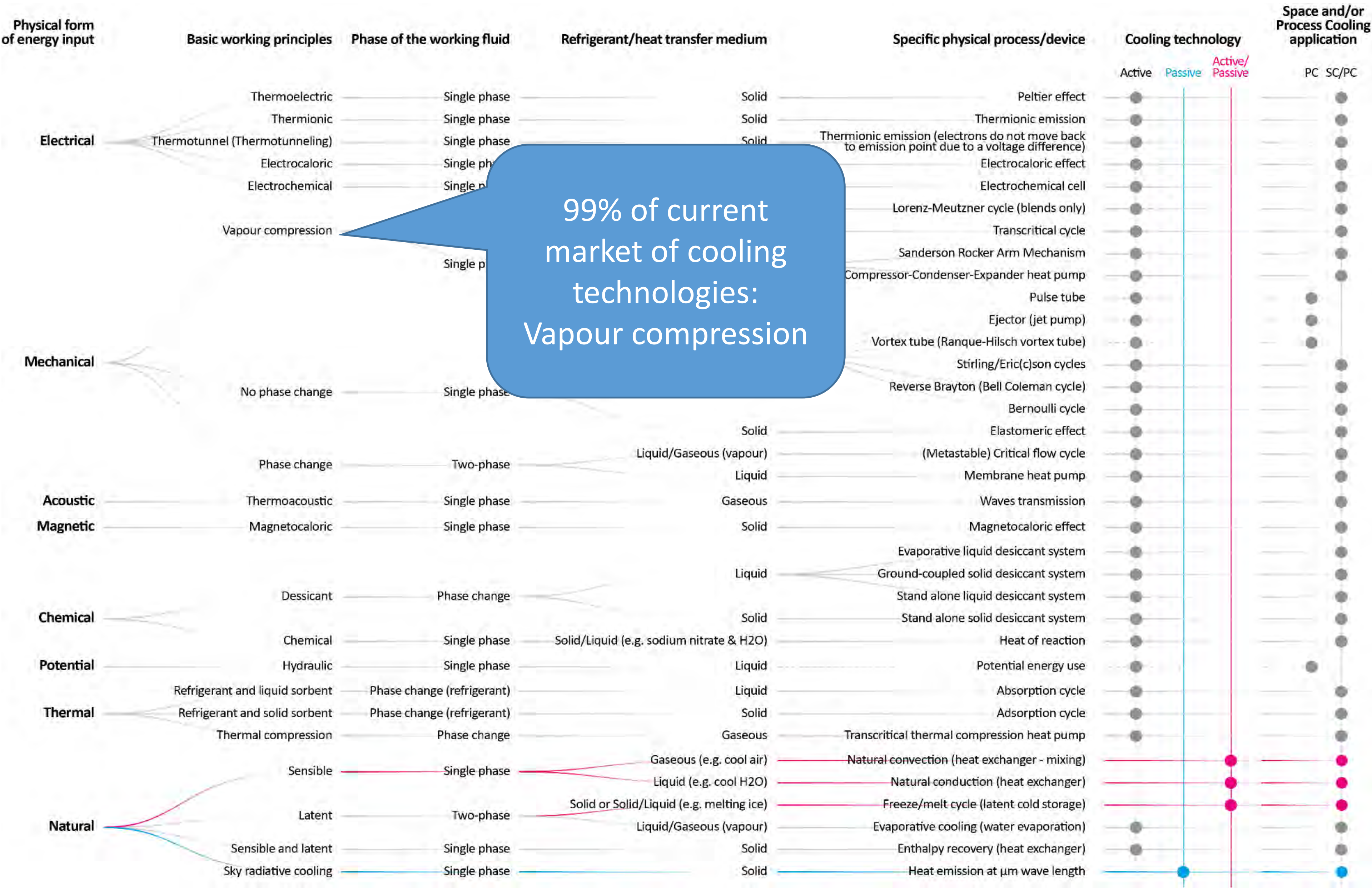

H&C demand and supply
Demand: achieveable reduction?
Policy implications?
RES-H&C: achieveable growth (and phase-out of fossil fuels)? Technology mix?
How to define renewable cooling?
Time

Project background

- Renewable Cooling under the Revised Renewable Energy Directive. ENER/C1/2018-493, December 2019 – October 2021
- Renewable Space Heating under the Revised Renewable Energy Directive. ENER/C1/2018-494, December 2019 – August 2021
- Overview of District Heating and Cooling Markets and Regulatory Frameworks under the Revised Renewable Energy Directive. ENER/C1/2018-496; January 2020 – October 2021. Lead: Tilia
- Potentials and levels for the electrification of space heating in buildings. ENER/C1/2019-481, November 2020 – June 2022. Lead: Consentec
- Renewable Heating and Cooling Pathways, Measures and Milestones for the implementation of the recast Renewable Energy Directive and full decarbonisation by 2050. ENER/C1/2019-482, November 2020 – June 2022. Lead: Öko-Institut

Renewable Cooling

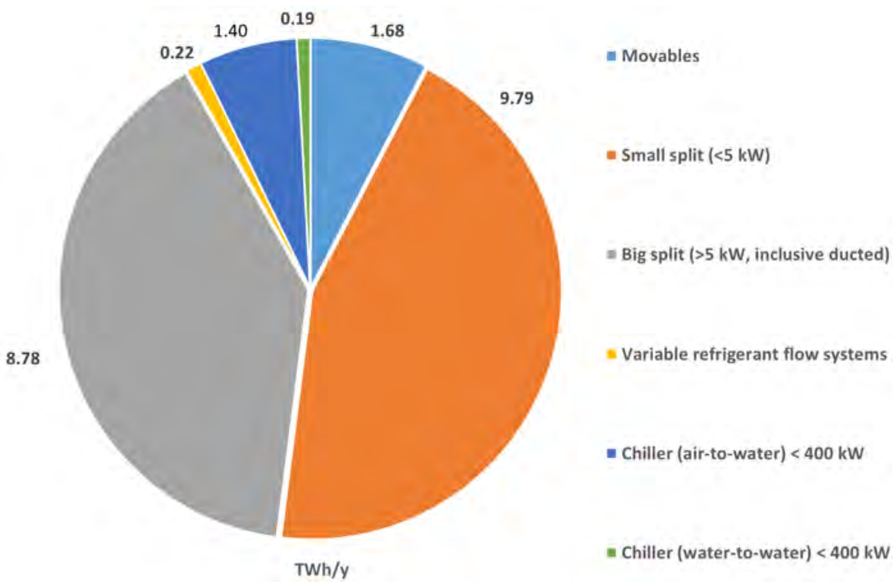
Technology mapping



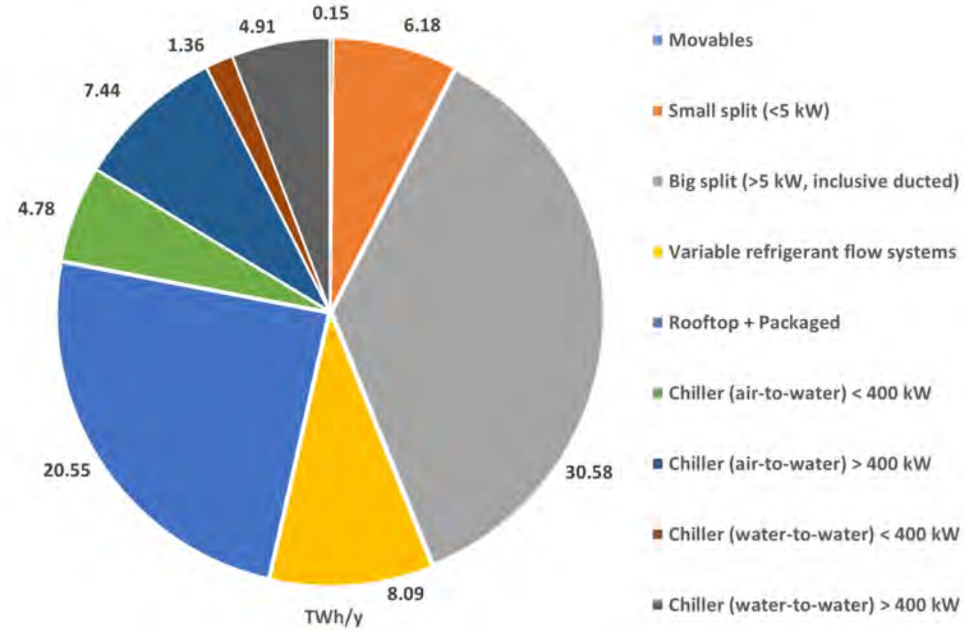
Taxonomy of cooling technologies

Final energy consumption space cooling, EU27+UK, 2016

Residential



Service sector



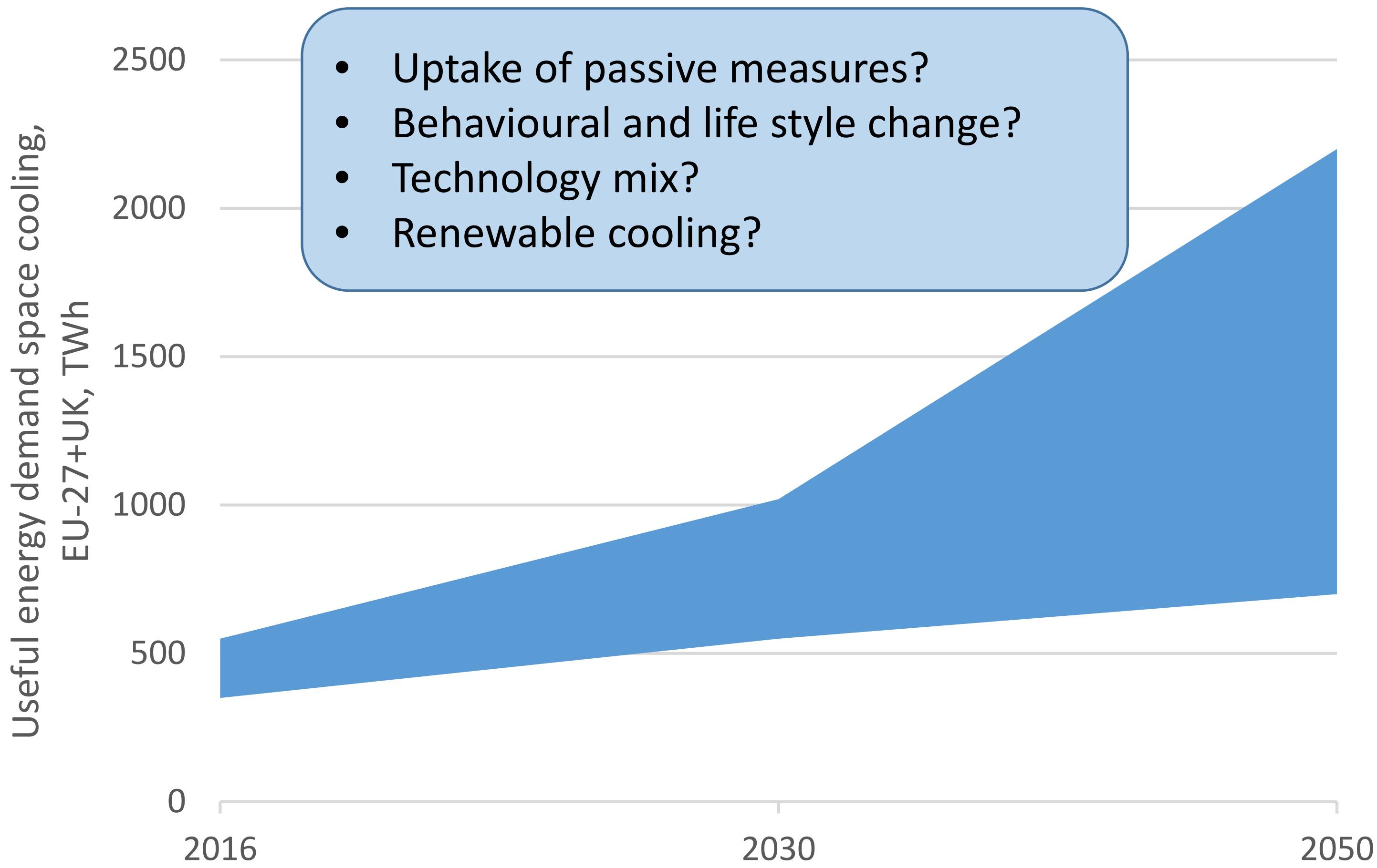
Residential:

- Room air conditioners account for the majority of final space cooling consumption: ~ 90%
- Total amount of final energy consumption for space cooling in EU’s residential sector: > 20 TWh/y

Service sector:

- Central air conditioning prevails: ~ 60%
- Total amount of final energy consumption for space cooling in EU’s service sector: > 80 TWh/y

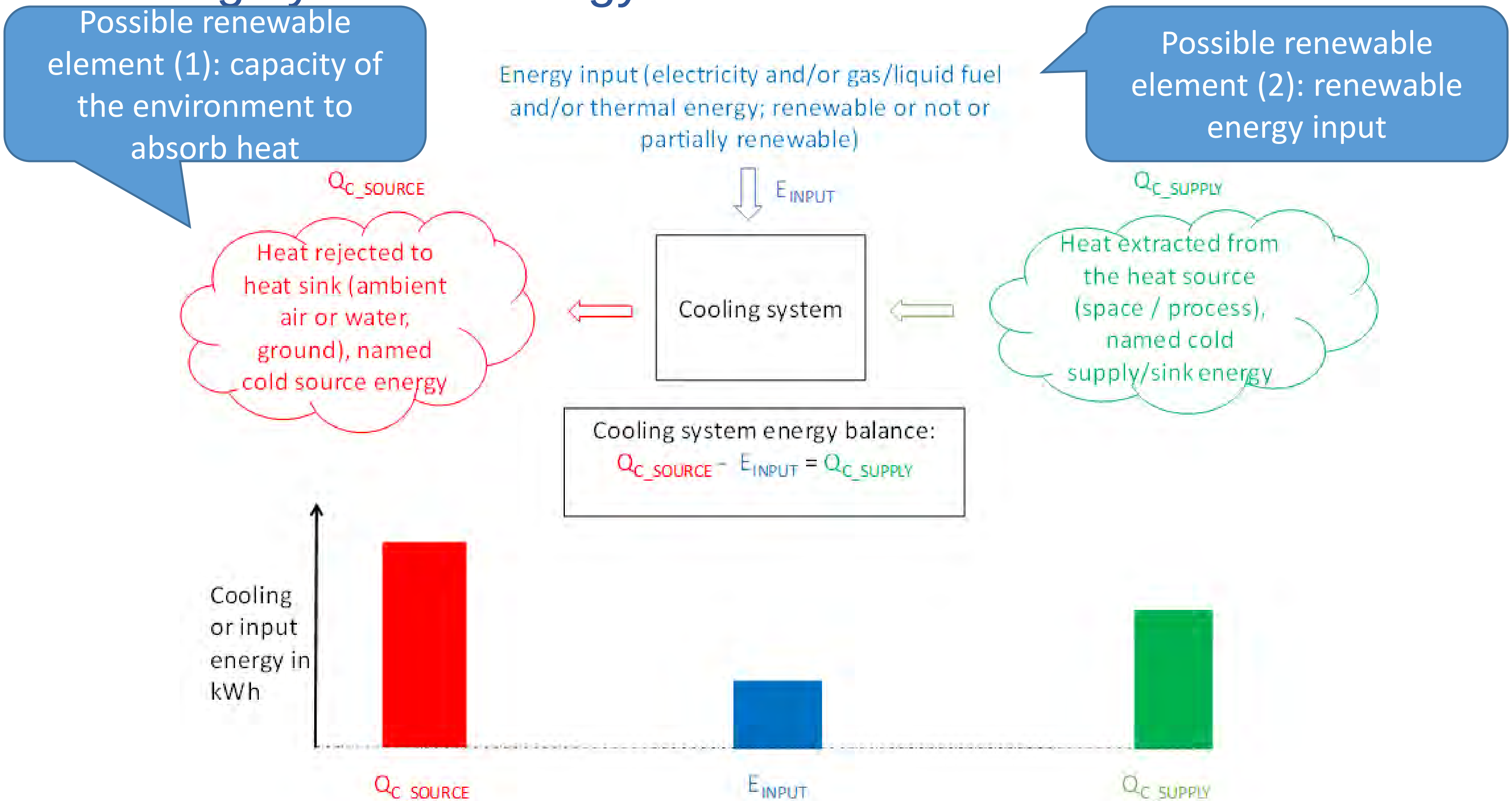
Useful energy demand space cooling, EU-27+UK in different scenarios and according to different sources



Sources: EUCO 3232.5, Heat-Roadmap-Europe, SET-Nav, own analyses

How to define Renewable Cooling?

Cooling systems: energy streams and balance



- Proposed calculation of renewable cooling quantity:

$$E_{RES-C} = (Q_{C_{Source}} - E_{INPUT}) \times s_{SPF}$$

sSPF … Share of cooling to be considered as renewable

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of XXX

amending Annex VII of Directive (EU) 2018/2001 as regards a methodology for calculating the amount of renewable energy used for cooling and district cooling

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ANNEX

ANNEX

to the

Commission Delegated Regulation

amending Annex VII of Directive (EU) 2018/2001 as regards a methodology for calculating the amount of renewable energy used for cooling, including district cooling

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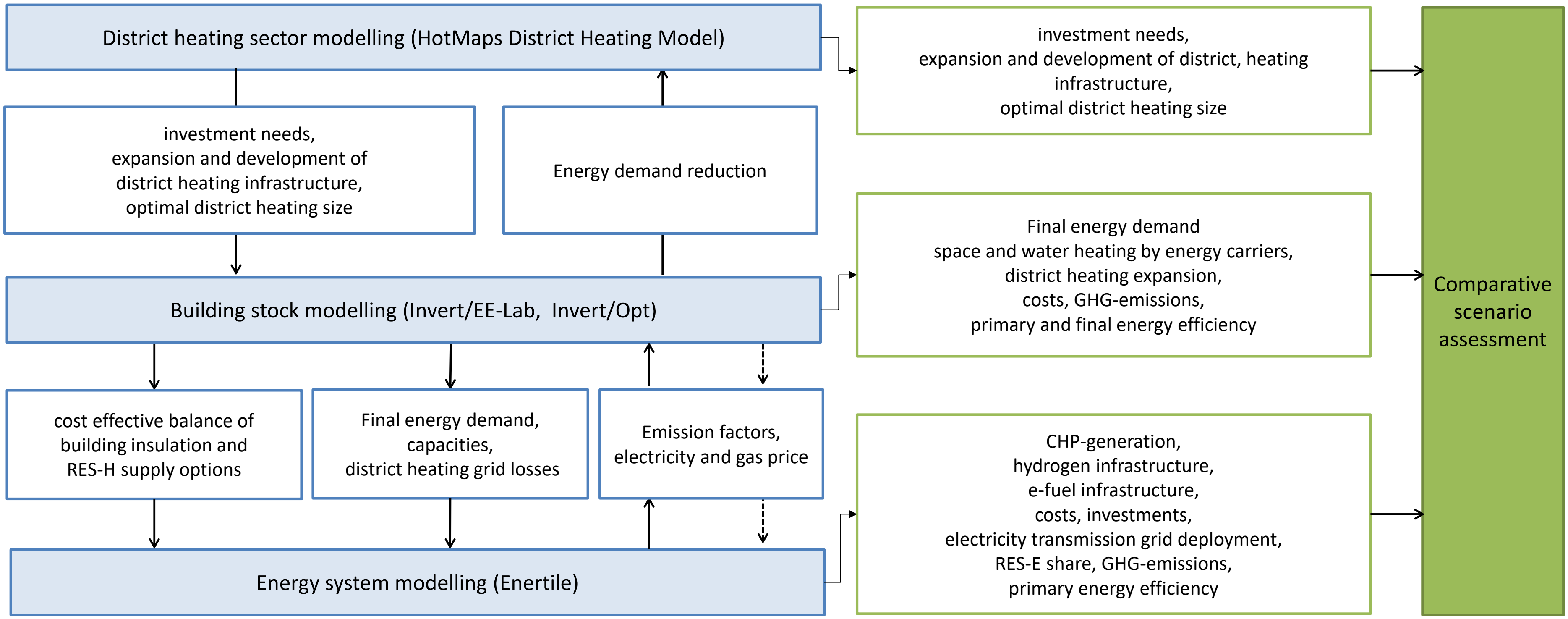
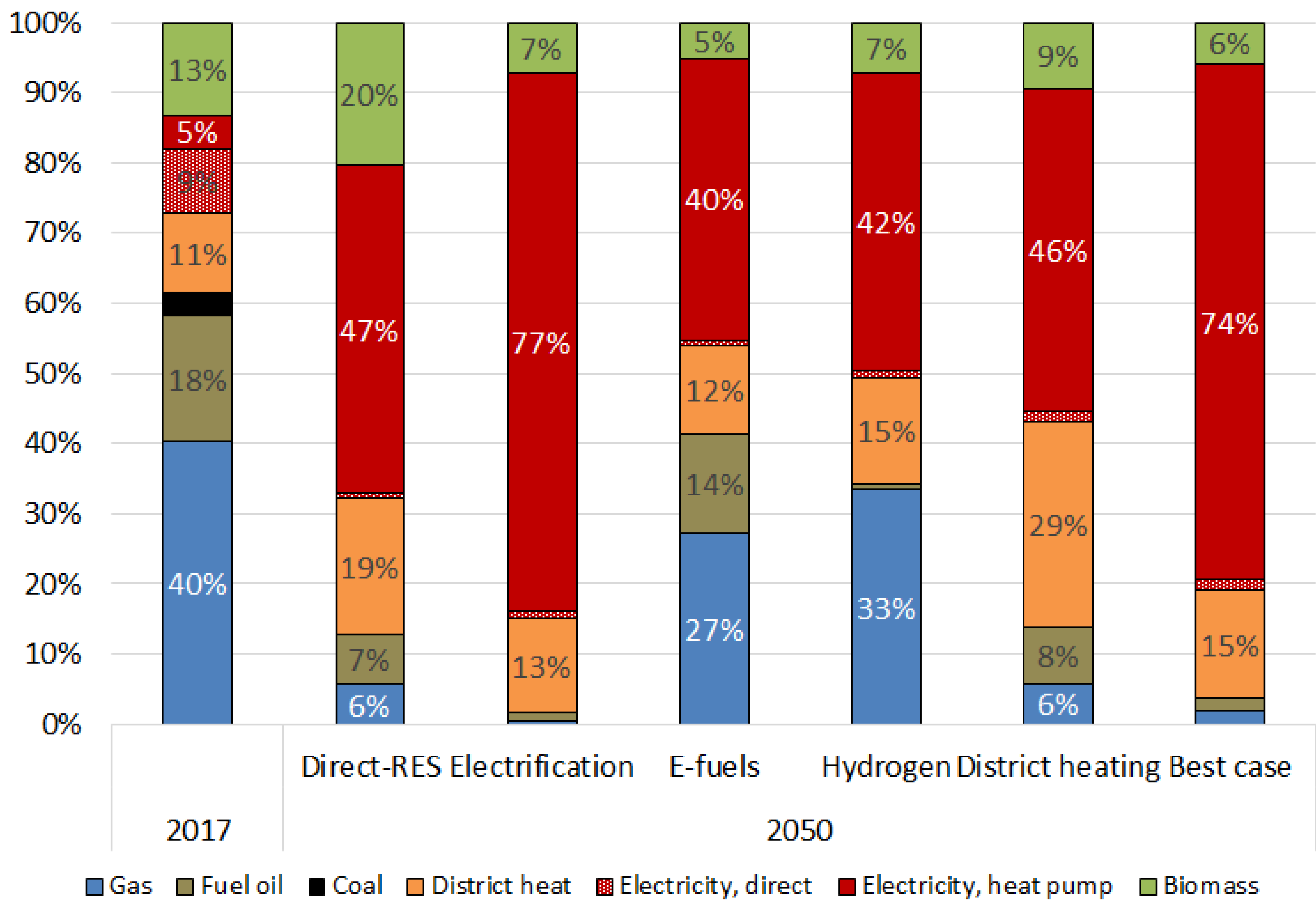
Renewable Space Heating and Hot Water Preparation: comparing different technology focus scenarios

Modelling framework for comparing different scenarios

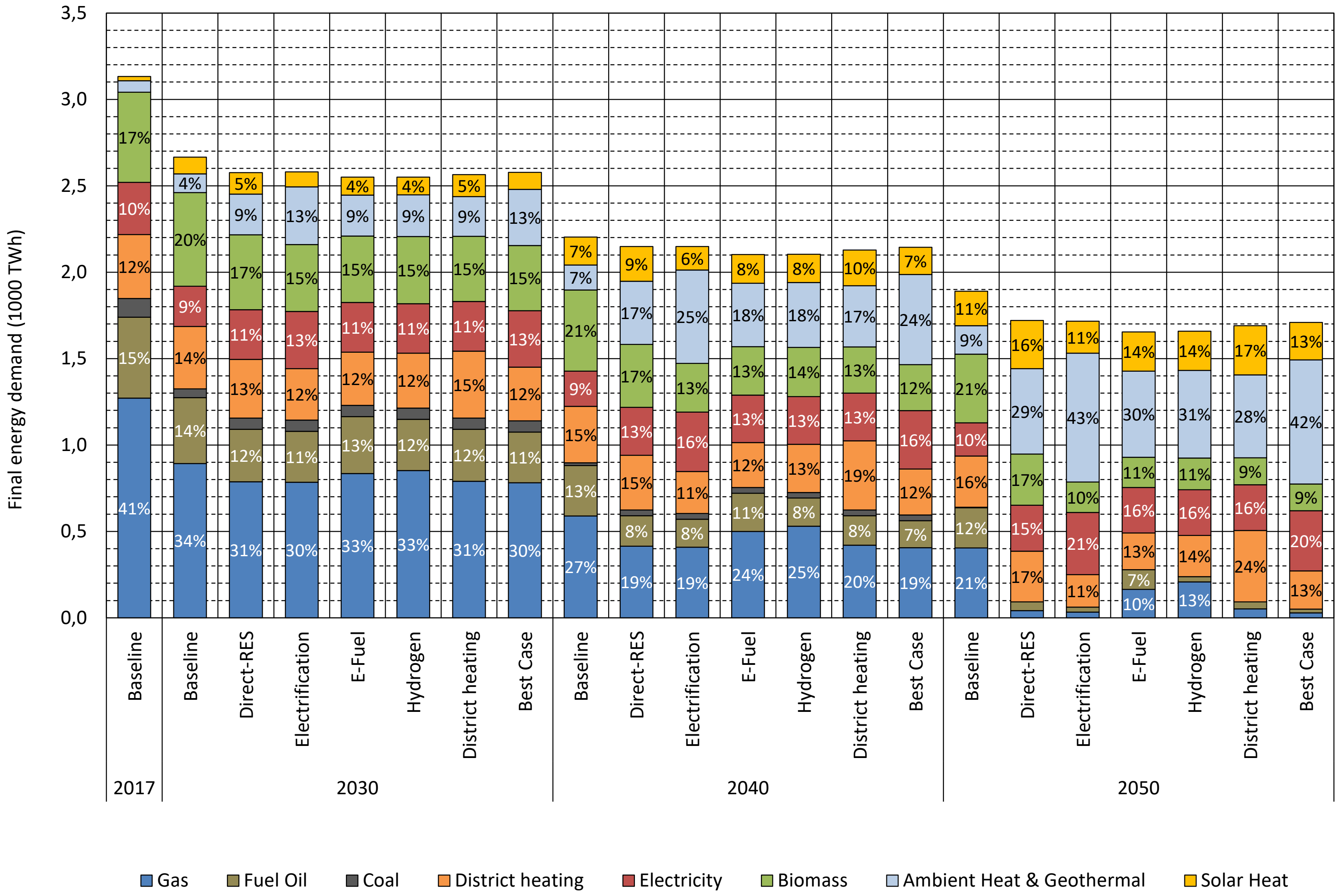
- For each scenario, boundaries for energy carriers in the sector were defined. Within the constraints, the model identifies the cost-minimal constellations.
- This leads to scenarios with a mix of systems in all scenarios, i.e. not to extreme scenarios. Scenarios consider and reflect the suitability of technologies in different buildings as well climatic and regional constellations.



Scenario results: share of heated area by energy carrier, residential and tertiary buildings, EU-27

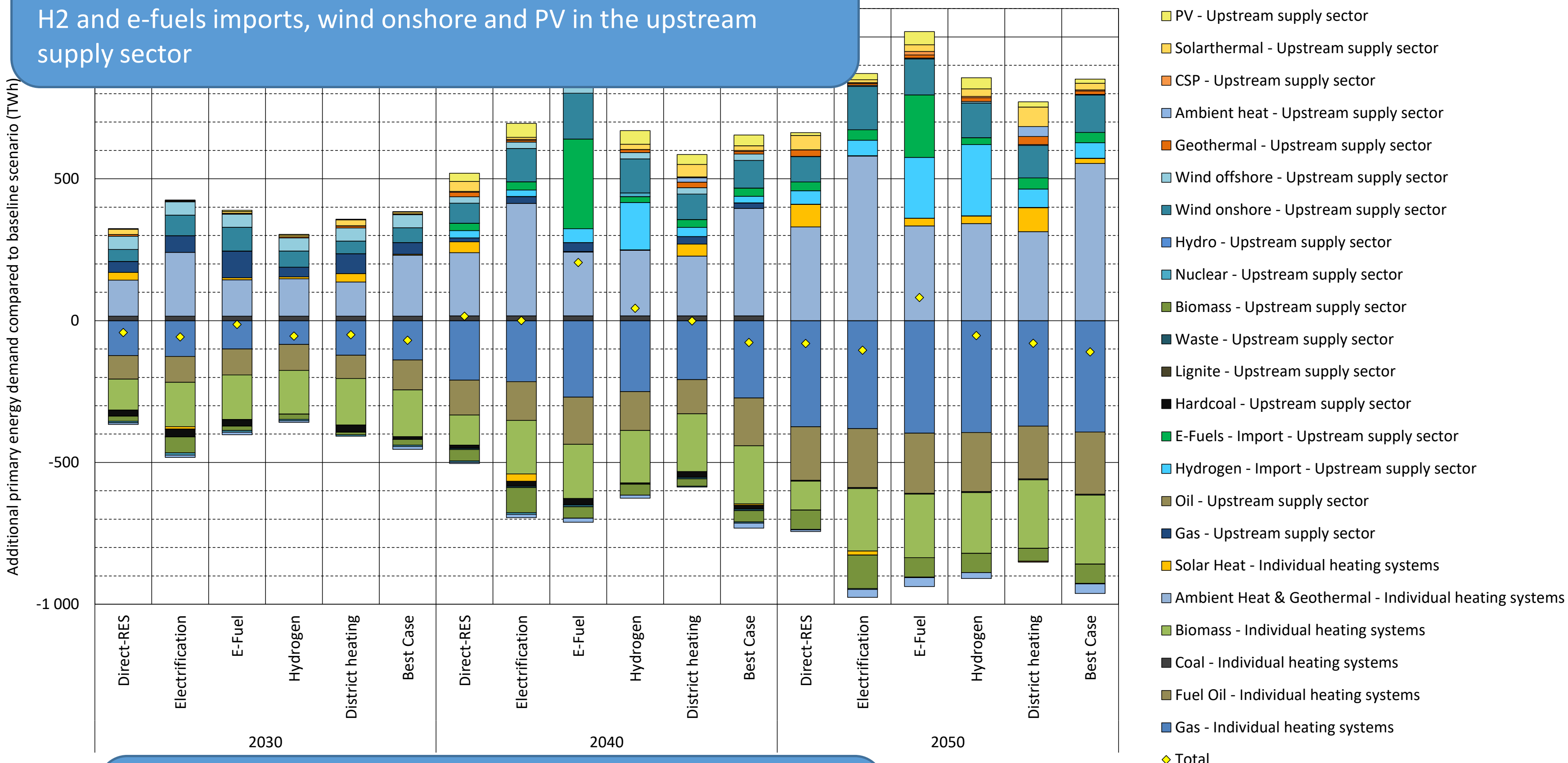


Scenario results: final energy demand space heating and hot water, residential and tertiary buildings, EU-27



Scenario results: additional primary energy demand, compared to baseline scenario, EU-27

Additional primary energy demand (compared to baseline):
Ambient heat (partly solar) in individual heating and district heating
H2 and e-fuels imports, wind onshore and PV in the upstream supply sector



Reduced primary energy demand (compared to baseline):
Fossil gas, oil, biomass in individual heating
Biomass in the upstream supply (mainly district heating)

Conclusions from modelling technology focus scenarios (1)

- E-fuels and H2 need to be pushed into the model. The model tries to minimise the use of these energy carriers due to their high variable costs. The e-fuels scenario leads to the highest primary energy demand.

- Heat pumps tend to be used towards the upper limit, depending also on the building type.

- Biomass heating systems tend to be economically viable. Biomass potentials restrict the use.

- Economic viability of district heating differs between regions. Since district heating was limited to areas with high heat densities and thus lower costs, in these areas district heating is mostly economical.

- Highest renovation activities occur in buildings with H2 and e-fuels, due to their high variable costs. This is in contrast to the current political discussion.

Conclusions from modelling technology focus scenarios (2)

- If measures and the overall system are optimised (according to our modelling approach), the costs do not deliver a clear criteria for a decision, in particular between H2, direct RES and district heating. => Rather, barriers, uncertainties and policy implications should be considered as important additional decision criteria.

- The H2 scenario deemed to be the one with the highest uncertainty and barriers in terms of fuel costs, infrastructure costs and overall market maturity. However, it is not associated with lower costs.
- Best case scenario: exclude H2 and let the models find the economic optimum

- Limitations and uncertainties need to be considered e.g. regarding:
  - Costs and impact of renovation: are assumed as additional costs to renovation measures required for safety and esthetical reasons.
  - Behavioural aspects (some rebound effects are considered, but uncertainties remain)
  - Infrastructure costs, in particular for the H2 scenario

Summary of the RES-space heating project

- Robust strategies across all scenarios:
  - Building renovation
  - Heat pumps
  - District heating in suitable areas
  - At least a partial, if not complete gas phase out (even in e-fuel and H2 scenarios, the amount of gas demand strongly reduces)

- Biomass resource allocation across sectors remains an important policy issue

- Planning of infrastructure is important

Thanks!

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