Welcome to the REHVA Brussels Summit 2023

We are delighted to invite you to the REHVA Brussels Summit 2023, which will be held on 3-5 November 2023. The main event on 4th November, the conference, is open to all and will bring together experts to discuss the EU policy issues and opportunities ahead for the HVAC sector. During the week, on 3-5 November, REHVA invites Member Associations, Supporters and Associate Organisations to the conference, complemented by exclusive EU project sessions.

The Brussels Summit 2023 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 representatives working in the field 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
Demand: achievable reduction?

RES-H&C: achievable growth (and phase-out of fossil fuels)? Technology mix?

How to define renewable cooling?

Policy implications?
Project background


Renewable Cooling
Technology mapping

Taxonomy of cooling technologies

99% of current market of cooling technologies: Vapour compression
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

- Uptake of passive measures?
- Behavioural and life style change?
- Technology mix?
- Renewable cooling?

Sources: EUCO 3232.5, Heat-Roadmap-Europe, SET-Nav, own analyses
How to define Renewable Cooling?
Proposed calculation of renewable cooling quantity:

\[ E_{RES-C} = (Q_{Source} - E_{INPUT}) \times SPF \]

- Share of cooling to be considered as renewable
COMMISSION DELEGATED REGULATION (EU) .../...

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

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

**Modelling framework for comparing different scenarios**

- Energy system modelling (Enertile)
  - Cost effective balance of building insulation and RES-H supply options
- Building stock modelling (Invert/EE-Lab, Invert/Opt)
  - Final energy demand, capacities, district heating grid losses
  - Emission factors, electricity and gas price
- District heating sector modelling (HotMaps District Heating Model)
  - Investment needs, expansion and development of district heating infrastructure, optimal district heating size
  - Energy demand reduction
- Comparative scenario assessment
  - Final energy demand space and water heating by energy carriers, district heating expansion, costs, GHG-emissions, primary and final energy efficiency
  - CHP-generation, hydrogen infrastructure, e-fuel infrastructure, costs, investments, electricity transmission grid deployment, RES-E share, GHG-emissions, primary energy efficiency

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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

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<th>Baseline</th>
<th>Direct-RES</th>
<th>Electrification</th>
<th>E-Fuel</th>
<th>Hydrogen</th>
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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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