

Policies to drive heating and cooling towards decarbonisation: a model based ex-ante assessment

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Overview

50% of final energy demand in the EU-28 is used for heating and cooling (H/C). Thus, a growing focus of climate policies is put on this sector. While national and EU policies are essential, also local initiatives and instruments are required. Thus, the key question of our paper is: Which policies are needed on the national and local level to drive heating and cooling towards decarbonisation? We analysed this question for six selected countries and local case studies within these countries. The paper covers the whole heating and cooling sector, i.e. space heating and hot water preparation in buildings, process heating in industry and district heating and electricity generation. The paper is based on the Horizon 2020 project progRESsHEAT (www.progressheat.eu).

Methods

We carried out the following steps: (1) A series of meetings with local and national stakeholders and policy makers was carried out. This process was essential to understand local and country specific policy context and identify policy instruments to be analysed in more detail. (2) For the local cases, we first developed technical scenarios until 2030 and 2050 for the uptake of efficiency and different renewable (RES) H/C options. Subsequently, we analysed the impact of various policy measures on costs, RES share and CO₂-emissions. (3) For the national level, we applied the demand models Invert/EE-Lab for the building sector and Forecast-Industry for the industrial demand, which delivered input to the energy system model TIMES covering district heating and electricity generation. These models were used to develop scenarios until 2050: a current policy scenario and an ambitious policy scenario leading to a substantial CO₂ emission reduction. (4) As the last step, we derived policy conclusions based on the cross-country comparison of current policy scenarios and ambitious scenarios on the local and national level. On the local level, we covered the cases of Ansfelden (Austria, Büchele, 2017a), Brasov (Romania, Büchele, 2017b), Helsingoer (Denmark, Ben Amer-Allam et al., 2017), Herten (Germany, Popovski et al., 2017a), Litomerice (Czech Republic, Ben Amer-Allam, 2017), Matosinhos (Portugal, Popovski et al., 2017b). For the six countries of these local cases, we covered also the national analyses (Büchele et al., 2017).

Results

Overall, the results show that high CO₂-reduction potentials can be utilised with moderate additional costs. However, the sectoral results are quite diverse.

Although the current policy framework leads to a remarkable decarbonisation of H/C in particular in buildings in the analysed countries until 2050, more ambitious policies are needed to meet the emission reduction targets as set out in the Paris Agreement. Thus, faster and deeper decarbonisation of H/C in buildings is needed. An important measure to reach this is an intensified RES-H obligation: on the one hand the obligation should not only apply for buildings that are newly constructed, but also for buildings undergoing a major renovation and in case that the heating system is changed. The potential for reducing the heat demand in buildings is remarkable in many EU countries. In order to stimulate the realisation of building retrofit the public budget might be increased, but also could be set mandatory after a certain timeframe. Figure 1 shows as exemplary result the development of the final energy demand in the building sector for heating and cooling in the covered countries by energy carrier. Similar figures will also be provided for the other sectors and country and case study specific results will be shown.

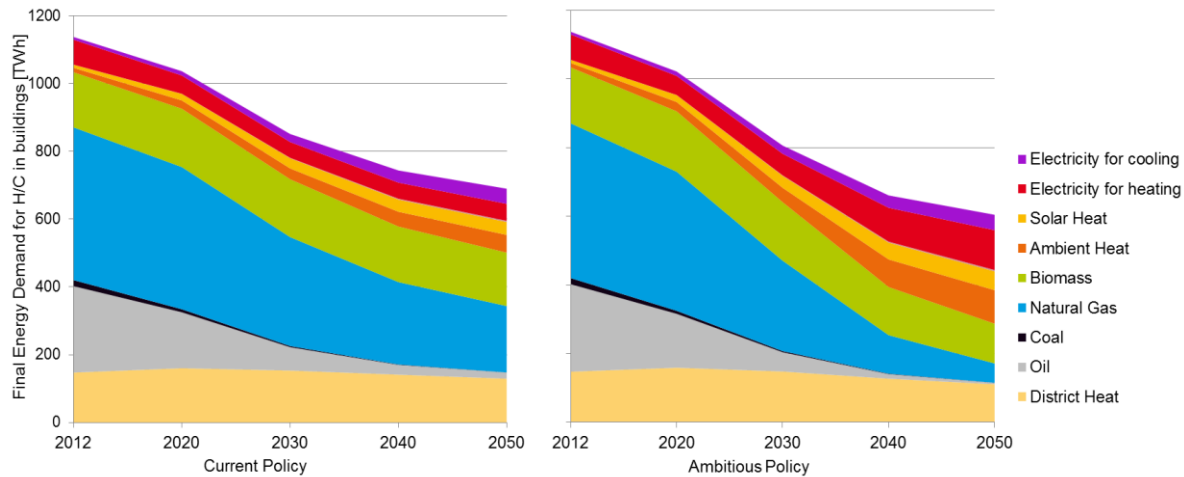


Figure 1: Final energy demand per energy carrier for heating and cooling in buildings as a sum for all target countries (AT, CZ, DE, DK, RO, PT)

In the industry sector, current policies also are not on track towards decarbonisation, though, a slow decrease of industrial CO₂ emissions is expected. Although, the ambitious policy scenario achieves substantial additional emission cuts, also this scenario is not in line with the Paris agreement. Deep emission cuts require substantial changes in the iron and steel, cement and chemicals industries, but also support for RES and energy efficiency in other sectors. Excess heat potentials from industrial activity are available and should be exploited. Biomass is the most important RES in industry, particularly in the medium term. OPEX support of RES seems more effective than CAPEX support for steam and hot water generation. Finally, improved material efficiency and circular economy provide a huge mitigation potential, e.g. via the substitution of oxygen steel by electric steel. Although the ambitious policy scenario achieves substantial emission cuts, even this scenario is not in line with the Paris agreement. More mitigation options will be required in the long-term. These include a more intense use of electricity for process heat generation (P2H), P2G, new production processes and products and maybe CCS.

Even though some countries can achieve renewable electricity and district heating generation only because of decreasing costs of technologies using renewable energy and taxes on fossil fuels, higher CO₂-prices and support for renewable electricity generation is often needed. High shares of renewable district heating can be achieved by measures implemented in the ambitious policy scenario, but higher CO₂ prices and more favourable financing for renewables is needed to reach 100% renewable district heating generation. Additionally, a strong link between electricity and district heating generation through large-scale heat pumps can be utilised to integrate variable renewable electricity and indirectly support renewable district heating generation.

Conclusions

A broad package of policy instruments is required to move the heating and cooling sector from the reference scenario towards stronger decarbonisation. Besides conclusions regarding the design of economic and regulatory instruments, in particular CO₂-prices and the role of awareness raising and skills, we identified the need to put heating and cooling planning in the focus of municipalities and regions. The different pillars of policy recommendations need different focus on the local, national and European level, which will be further emphasized in the long version of the paper.

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