

Plenary Lecture 2

On the path to carbon neutrality: Opportunities for sustainable heating and cooling technologies

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Andrea Voigt was appointed Director General of EPEE, the voice of the refrigeration, air-conditioning and heat pump industry (HVACR) in Europe, in 2009. Headquartered in Brussels and dedicated to creating favourable framework conditions for the development and deployment of sustainable technologies, EPEE represents leading manufacturers as well as associations from Europe, Asia and North America.

Voigt's experience in the HVACR industry spans over two decades with a strong focus on energy efficiency, renewable energies and climate related topics. Under her leadership, EPEE has become one of the leading HVACR industry trade associations on a European and global level, partnering with UN Environment (UNEP) on several projects, working with international initiatives such as the Cool Coalition and the Climate and Clean Air Coalition (CCAC) and leading the CountOnCooling Campaign for sustainable cooling.

She is a member of ASHRAE, the German engineers' society DKV and is currently chairing the EU Coalition for Energy Savings, a leading cross-sectoral association advocating for a stronger focus on energy efficiency.

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ABSTRACT

Several major economies around the world have committed to carbon neutrality by the middle of the century. To achieve this goal, two major avenues, both related to energy, will be crucial: significantly reducing energy demand and moving towards renewable energies. Why energy? Because CO₂ emissions represent roughly 80% of total global greenhouse gas emissions with most of them being related to the production and consumption of energy. The good news: solutions are available with electrification being the number one priority.

Three sectors play a crucial role: Heating and cooling which represent half of the total final energy demand in the world, followed by transport and power generation. In all of these sectors, burning fossil fuels still broadly dominates, transport being the most worrying with only a bit more than 3% being based on renewable energy, followed by heating and cooling with 10%. Best in class is the power sector, where renewables already stand for more than 25% of the energy used for electricity production. To reach net zero emissions by 2050, the IEA calculates that the share of renewables in global electricity supply needs to rise to 60% in 2030. These facts inevitably lead to the global megatrend of electrification which, literally speaking, has the power to drive change towards decarbonising these critical sectors. Electrically driven heat pumps will be crucial in this context, providing heating and cooling in buildings and in industry. They are highly energy efficient and can also significantly contribute to power system flexibility which is increasingly important with the move to variable renewable energies in the power generation. Moving to renewable power generation and electrifying major end-use sectors – also known as sector-coupling – such as heating and transport will also positively impact air quality, and by doing so, human health, as polluting NO_x, SO₂, PM_{2.5} will decrease drastically. Finally, methane emissions, which are known to be the second largest contributor to total greenhouse gas emissions with roughly 10% will also benefit from the transition away from fossil fuels. Indeed, while the largest source of anthropogenic methane emissions is agriculture, an important share is also related to oil and gas operations.

As opposed to CO₂ and to methane, emissions from fluorinated gases only represent less than 3% of total greenhouse gas emissions on a global level. Nevertheless, addressing them is extremely important. If not, they would grow significantly due to countries phasing out ozone-depleting substances which need to be replaced by alternatives and due to increased demand for heating, cooling and refrigeration equipment. This is the goal of the Kigali Amendment to the Montreal Protocol. It entered into force in 2019 after years of negotiation, has meanwhile already been ratified by over 110 countries, and will reduce the consumption of HFCs in the coming two decades by at least 80%. UNEP estimates that thanks to such action on HFCs, global warming can be reduced by up to 0.4°C by the end of the century.

Challenges differ significantly between the developing and the developed world, for example the need for simple access to electricity to power a refrigerator versus the need for broad electrification to decarbonise heating. However, this does not change the simple fact that heating, cooling and refrigeration are essential for life, everywhere in the world. There is no room for compromise when it comes to cooling medicine, to keep food safe and fresh, to maintain a healthy indoor climate even in case of extreme outdoor temperatures. But equally, there is no room for compromise when it comes to addressing the climate challenge. Countries around the globe will have to reconcile the energy imperative with the phase-down of HFCs, where none of the two can be sacrificed if carbon neutrality is to be achieved by 2050. All types of solutions and refrigerants will be needed to do so and they will have to be measured against the criteria of energy efficiency, emissions, and – last but not least – total cost of ownership.

EPEE's latest modelling work, carried out in partnership with UNEP and Gluckman Consulting can support governments in identifying the best way forward in order to create adequate framework conditions for the uptake of sustainable heating and cooling solutions. EPEE's #CountOnCooling White Paper provides the underlying narrative with five major steps to facilitate carbon neutrality. The total cost of ownership is an essential part of the puzzle required to ensure the broad uptake of sustainable solutions and the role of sustainable finance mechanisms must not be underestimated in this context. As long as fossil fuels continue to be subsidised directly or indirectly, without factoring in externalities, the energy transition will simply not take off. Governments need to keep in mind this broad picture, when devising policy measures which will determine the pathway towards 2050.