Position Paper

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EPEE Position Paper on heating & cooling in the Strategy for Energy System Integration

Heating and cooling represent approximately 50% of the total final energy consumption in the EU. One fifth of the final energy consumed by heating and cooling is based on renewable energies – most of it is renewable heat and a little more than 10% are heat pumps. However, 80% of the final energy consumption related to heating and cooling is still based on burning fossil fuels[1]. To ensure a move away from fossil fuels, it is crucial to reduce the energy consumption for heating and cooling and to further increase the share of renewables. Moreover, the share of renewable energy used for electricity generation already amounts to approximately one third and is growing. Again, this represents an important opportunity to decarbonise heating and cooling.

The Strategy for Energy System Integration can contribute to this process by creating an overall framework that maximises the cost-effective uptake of renewable energy. To achieve this, the strategy should integrate the design of energy supply systems (supply side) with the design of energy using systems (demand side). Such an approach recognises buildings as a key element of the energy infrastructure with heating and cooling being at the core of long-term energy system planning.

In order to decarbonise the heating and cooling sector, the Strategy for Energy System Integration should:

1. Promote an integrated approach based on renewable and energy efficient electrification
2. Optimise the need for heating and cooling through holistic energy efficiency, control and monitoring measures
3. Enhance grid flexibility through demand side management, thermal storage solutions and end-user engagement

1. Promote an integrated approach based on renewable and energy efficient electrification

As the share of renewable electricity increases, **an integrated approach to heating and cooling based on energy efficient electrification** can help to reduce the dominance of fossil fuel-based solutions in the heating sector: first, because the share of renewables in the electricity mix is increasing and second, because it will reduce energy consumption for heating purposes.

This is particularly evident with electric heat pumps which use renewable energy, are energy efficient and can provide both heating and cooling. Heat pump can be used in a variety of applications from residential use through to tertiary and industrial applications such as integration in district heating and cooling networks or waste heat recovery from industry (e.g. data centres). Due to this wide range

[1] Eurostat: Summary results SHARES 2018

of potential applications, heat pumps should be recognised as a key technology for accelerating the transition to renewables and thereby reducing energy costs for the consumers.

The equipment sizes of heat pumps vary from a few kilowatts to megawatts i.e. 2kW – 20+MW, with current temperature ranges of 35°C – 85°C. Heat pumps represent a mature solution, provided by a range of manufacturers in most EU markets. However, urban and collective heating applications remain underutilised in most Member States.

A recent study shows that heat pumps have the potential to provide over 25% of EU heating needs in 2050, whilst supermarkets can save 100 mill T CO2 per year by utilising heat pumps in combination with smart store solutions.

2. Optimise the need for heating and cooling through holistic energy efficiency, control and monitoring measures

Electrification on its own is not enough to decarbonise heating and cooling. **It is equally important to reduce energy consumption** in order to address the societal cost for renewable energy production capacity and to minimize any rebound effects caused by the "peace of mind" provided by the higher share of renewables. This can be achieved with an enhanced use of smart control systems, regular service and maintenance, systematic monitoring, optimizing control systems and energy efficient design – all of which contribute to delivering energy savings of typically 30% and more.

Waste energy is one area where the Strategy for Energy System Integration can play a key role in promoting solutions that are already mature and commercially available. As demonstrated in this Material Flow Diagram, there is considerable potential for energy savings even if only a fraction of the energy generated for industrial processes can be recovered. Energy recovery systems can also be used at a residential level, where household appliances produce energy that can be recovered to provide heating or cooling for the household. Such solutions are already mandated for non-residential ventilation systems under EU Regulation 1253/2014, but this could be extended to residential ventilation systems as well as to other appliances.

These benefits can be further exploited by developing a policy framework that supports responsible consumption via smart appliances (Internet of Things) and digital technologies such as building automation and control systems (BACS). BACS can make a major contribution to energy savings by adapting the operation of heating and cooling systems to the actual requirements and enabling systematic monitoring and immediate intervention in case of failures or other problems.

3. Enhance grid flexibility through demand side management, thermal storage solutions and end-user engagement

The increasing share of variable renewables in the electricity mix requires flexibility on the demand side while saving energy and maintaining the ability to cope with peak demand. Cooling and heat pumps can contribute significantly to both of these requirements via **demand side management and thermal heat and cold storage.**

Residential buildings with heat pumps can help to reduce peak demand on the electricity grid, as the building structure and domestic hot water tank can be used as thermal energy storage. This way, the time when thermal comfort is provided is decoupled from the time when electricity is taken from the

grid. This allows consumers to shift their electricity consumption to a time period most suitable for the grid, provided that financial incentives are in place to reward such behaviour. Consumers could also sell any surplus electricity they generate locally to the grid, where it could be distributed to other users or stored as heat or cold. Similar benefits can be obtained from district heating and cooling systems, particularly with heat pumps available to foster sector coupling by linking up the electricity sector with the thermal energy sector.

Beyond storing the energy needed for an individual household, heat pumps combined with thermal heat and cold storage can also serve to provide intermediate storage for excess electricity on the grid. Thermal heat and cold storage technologies are widely available and represent the most economical storage method but remain underutilised in most EU markets.

Large heat pumps can be appropriately distributed in the energy network in order to reduce grid capacity requirements. At the moment, the benefits of such an approach are not always evident to distribution system operators, because aggregator platforms are not yet implemented in most EU markets. Once these measures are adopted, the entire energy system will benefit from reduced grid capacity investment needs.

Barriers that prevent greater market uptake:

- ☒ **Price competitiveness of electricity** remains weak when compared to other energy sources, therefore disincentivising consumers from switching to electric heat pumps. Due to the higher equipment cost of heat pumps, and despite the significant energy savings made, return on investment (ROI) timeframes often exceed three years, which can be an issue in some commercial planning, and a disincentive for private consumers. For this to change, an increase in the competitiveness of electricity prices is required to raise market uptake. To this end, fixed electricity charges should at least be minimised, as such tariffs diminish the benefits of variable pay-per-use charges (see next bullet). Once that is achieved, increased manufacturing volumes will deliver further savings through economies of scale.

- ☒ **Lack of incentives for end-users** to purchase and sell electricity in a flexible way impedes the growth of solutions that allow for demand side management. Changes in electricity use can be motivated by establishing tariffs that reward end-users for lowering their electricity consumption during peak hours or when they sell the electricity they generate. This way, the greater initial investment of heat pumps and thermal storage tanks could be partially offset by future income from grid providers that appropriately remunerate end-users for purchasing or selling electricity in this manner. The lack of incentives for demand side management is hindering the uptake of heat pumps in multi-family dwellings, where short-term economic considerations are prevailing, because developers are not yet able to account for future savings stemming from demand flexibility.

- ☒ **The skills of installers and maintenance professionals** are often geared towards conventional heating systems**,** thereby reducing consumer confidence in switching to new, more efficient alternatives and increasing the burden on consumers to secure appropriate installation and maintenance work.

- ☒ **Lack of infrastructure** such as thermal grids limits the potential of Member States to adopt district heating and district cooling solutions, whilst the lack of smart electric grids and smart thermal grids limits the potential to exploit demand side flexibility and storage solutions.
- ☒ **Regulatory barriers** prevent the efficiency gains that can be achieved through sector coupling, as the mixing of heating and cooling infrastructure is still prohibited by national regulations in several Member States.

Recommendations to policy makers:

- As the share of renewable electricity increases, **an integrated approach to heating and cooling based on energy efficient electrification** can help to reduce the dominance of fossil fuel-based solutions in the heating sector.
- **Mandate an integrated approach to heating and cooling as part of the Strategy for Energy System Integration,** including systematic consideration of efficient, renewable technologies that can deliver both, heating and cooling, such as heat pumps and smart control and monitoring systems. This is particularly important in public buildings such as schools and hospitals where adequate Indoor Air Quality (IAQ) is not only crucial for comfort but even more so for productivity, health and well-being.
- **Promote the recovery of waste energy** to reduce energy consumption for heating and cooling purposes.
- **Incentivise the use** of smart control and monitoring systems, regular service and maintenance as well as holistic energy efficient design.
- **Boost incentives for adopting demand side management, thermal storage solutions and engaging end-users** in order to enhance grid flexibility and make full use of smart grid technology.

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