Position Paper on Key Texts of the European Commission's Fit for 55 Package.

Renewable and Waste Heat Recovery for Competitive District Heating and Cooling Networks

REWARDHeat

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Introduction

Heating and cooling accounts for around half of the energy consumed in the European Union (EU). Despite significant measures to reduce demand, residential and tertiary buildings, as well as industry still need heat and cold. Greater flexibility through energy system integration and the deployment of renewables and waste heat used in district heating and cooling (DHC) networks contribute to delivering sustainable heating and cooling and achieving carbon neutrality by 2050.

On the 14th of July 2021, the European Commission published its fit-for-55 package, to make the EU's climate, energy, land use, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels. With these proposals, the Commission presents the legislative tools to deliver the targets agreed in the European Climate Law. The heating and cooling (H&C) sector will be significantly impacted by this legislation and will be required to make a major contribution to the achievement of the decarbonisation target.

The proposals that will have the biggest impact on DHC, and the wider H&C sector, are the revision of the Energy Efficiency Directive (EED), the revision of the Renewable Energy Directive (RED) and the revision and extension of the EU Emissions Trading System Directive (EU ETS). Therefore, REWARDHeat is giving an overview of the most important aspects of these proposals for the H&C sector. Currently the proposals are going through the ordinary legislative procedure. The modern, highly-efficient demonstrator networks deployed in the project embody the energy efficiency first principle, integrating locally-available heat sources and operating at low temperatures to reduce heat losses from the network. Additionally, the networks are supplied by at least 80% renewable and waste heat sources. The energy efficiency first principle is also applied in sister project ReUseHeat, focusing on urban waste heat recovery as a means to efficiently phase out gas and electricity. The two projects provide important knowledge and can give input to the ongoing policy discussion and the revision of the chosen directives.

Energy Efficiency Directive

Applying the energy efficiency first principle (EE1st)

The inclusion of the energy efficiency first principle in the proposal to revise the EED, in article 3, granting it a more solid basis in EU legislation is important. It is a guiding principle that should underpin all climate and energy policies and be applied to major planning and investment decisions. Energy efficiency should always be considered before building additional heating and cooling capacity. For the REWARDHeat and ReUseHeat projects, applying the EE1st principle involves reducing the consumption of fossil energy for heating and cooling by lowering the operating temperature of DHC networks, thereby reducing heat losses and enabling both the recovery of waste heat from industrial and unconventional urban sources, and the integration of locally available, renewable heat sources, thus reducing emissions of CO_2 and other harmful pollutants.

The proposed new EED article 8 on energy savings obligations excludes energy savings achieved in energy distribution, (i.e. district heating) from counting towards the target of obligatory energy savings as from 2024 (Article 8 paragraph 8. (c)). Some Member States have used this provision as an effective mechanism to incentivise energy efficiency in distribution. Based on project experience, energy savings are possible in the network and therefore energy savings "achieved in

the energy transformation, distribution and transmission sectors, including efficient district heating and cooling infrastructure", should be reintroduced into the text, to count towards the energy saving obligation target in the period from 1 January 2024 to 31 December 2030.

The current EED incentivises a switch to efficient heating without considering whether the concerned heating device is fueled by fossil fuels or renewable energy. To align with the RED II and with the Renovation Wave Communication, the Commission's proposal to exclude measures that promote fossil fuel technologies and the energy savings deriving from the use of direct fossil fuel combustion towards the fulfilment of the Energy Savings Obligation from 2024 onwards (Annex V of the EED recast proposal) is valuable. Annex V: "Energy savings as a result of policy measures regarding the use of direct fossil fuel combustion in products, equipment, transport systems, vehicles, buildings or works shall not count towards the fulfilment of energy savings obligation from 1 January 2024". Low-temperature district heating systems are fueled by sustainable heat sources, available locally at low-temperature, thus providing an alternative to the consumption of combustible fuels.

A circular approach: Recovering heat that would otherwise go to waste

There is huge potential for waste heat to be used as a resource for heating and cooling, avoiding additional energy generation. Studies within the Heat Roadmap Europe (HRE) project estimate that there is the potential to expand district heating and cooling to supply 50% of the European heat demand, including 25–30% using large-scale electric heat pumps. At the same time, the EU produces more waste heat than the demand of its entire building stock as underlined in HRE, as well as in the 2016 EU Heating and Cooling Strategy. Indeed, there is more waste heat in Europe than can be cost-efficiently used (ReUseHeat, deliverable 1.5). Studies conservatively estimate that waste heat could cover at least 25% of district heating supply. Moreover, as identified in ReUseHeat (deliverable 1.4), there is significant heat recovery potential from unconventional waste heat sources. Approximately 1.2 EJ (or 340 TWh) per year are possible to recover from data centers, metro stations, hospitals and similar service sector buildings, and waste-water treatment plants, which corresponds to more than 10% of the EU's total energy demand for heat and hot water. Without adequate recovery solutions, this waste heat is released into the atmosphere and the potential of this circular energy is lost.

Recovering and using waste heat from industrial and tertiary sources closes the energy loop, applying the EE1st principle. For example, the exhaust heat from the refrigeration system of a supermarket is normally dissipated on the roof of the supermarket. Using a heat pump, this heat could be recovered indirectly and used in nearby buildings. The average medium-sized supermarket in Europe produces enough waste heat from its refrigeration units in one year to meet the thermal energy needs of 200 homes over the same period. District heating networks and heat pumps are complementary solutions that can be used synergically to enable the recovery and use of heat that would otherwise be wasted. The role and location of the heat pump in the system, is determined by the operating temperature of the network. For a low temperature network (30°C-70°C), a heat pump is needed to raise the temperature of the waste heat to the network's level. In the case of a neutral temperature network (up to 30°C), heat recovery can be performed directly, but heat pumps are needed at consumers' sites to raise the temperature to the level required by the user.

Enabling heating & cooling planning

Useful additions are made, aimed at strengthening the Comprehensive Assessment instrument and heating and cooling plans in municipalities with a population above 50,000 inhabitants (EED article 23).

On point 2 of EED article 23, only "the public" is allowed to participate in the preparation of heating and cooling plans, comprehensive assessments and the policies and measures. Open-access technical tools are needed to this extent. Most likely, with the futures envisaged in ReUseHeat and REWARDHeat, heating and cooling plans will be standard in all municipalities (regardless of size and with the involvement of other relevant stakeholders alongside the public).

Currently, the proposal laid out in article 23 of the EED proposes that "Member States shall encourage regional and local authorities to prepare local heating and cooling plans at least in municipalities having a total population higher than 50,000". In a future where local energy plans (comprising electricity and heat planning) are carried out in municipalities with a population smaller than 50,000 on a voluntary basis. This should be facilitated through financial and technical support from Member States and from the EU financing instruments (including the recovery funds, regional and cohesion funding and revenues from the EU ETS2).

The Renewable Energy Directive (RED III)

Fostering greater ambition in renewables in heating & cooling

Mature, market-ready technologies are available to contribute to the faster growth of renewables in heating and cooling. REDIII sets a 'binding baseline' of RES growth by making the indicative annual increase target of 1.1 percentage points (p.p.) the minimum required effort calculated as an annual increase over 2021-2025 and 2026-2030 (1.5 p.p. in case waste heat/cold is used, up to 40%). The mandatory annual increase of renewable energy in heating and cooling is 1.1%. It is likely a target that could be more ambitious. The annual growth of 1.3 p.p. per year (including waste heat) as stated by the current REDII would lead to 13 p.p. on top of 20% renewables, meaning 33% in 2030. However, the real growth is around 0.5 p.p. per year according to Eurostat. Hence, the current growth rate as stated in REDII is not being met. The target should be doubled, with at least a 2% annual increase, so that it contributes to putting the EU on track to achieve the 40% renewable target, as proposed in REDIII.

The specific target for DHC in article 24 increases from 1 p.p. indicative annual increase to at least 2.1 p.p., calculated as annual increase over 2021-2025 and 2026-2030, starting from the share of RES and waste heat and cold in 2020. This target increase sends a strong signal that while DHC will play a significant role in the future integrated energy system, network operators and EU Member States (MS) must act quickly to decarbonise the sector.

Article 15a on mainstreaming renewable energy in buildings introduces a new indicative share of at least 49% renewables in buildings by 2030 and encourages MS to introduce measures in their national frameworks to promote RES in the building sector. The retention of efficient DHC is a valid means to satisfy the renewable share. However, the target of article 15a should cover both renewable and waste heat in buildings. Waste Heat from industrial and tertiary sources has the potential to meet the demand of decarbonised heat for buildings, together with renewables. In line with the energy efficiency first principle and the definition of efficient district heating and cooling

set out in the Energy Efficiency Directive, waste heat should be mentioned to achieve building decarbonisation.

To achieve the renewable H&C targets, article 23 lists a broad range of measures: including renewable heat planning, capacity building for national and local authorities, inclusion of waste heat recovery and risk mitigation schemes. Member States can choose the most appropriate measures according to national and local circumstances.

Enabling sector integration

To unlock the potential of waste heat recovery and use, frameworks to facilitate coordination and cooperation among waste heat actors (Article 24(6)) are promoted by ReUseHeat and REWARDHeat. There is significant potential for sector integration, including via the reinforced frameworks to facilitate coordination between DHC operators and electricity transmission system operators (TSO) and distribution network operators (DSO) (RED Article 24 (8)), by means of digitalisation and utilisation of AI-enabled management.

New adjacent ETS for heating & cooling in buildings

Fossil fuel heating systems below 20 MW

Fossil fuels used in individual heating systems have an unjustified advantage as they are not covered by the EU ETS – this is detrimental to the development of efficient, low-carbon solutions. The current ETS has proven to be an efficient instrument in the fight against climate change and the improvement of this system is undoubtedly useful for achieving the EU energy and climate targets. The REWARDHeat project welcomes the new adjacent ETS for buildings and transport to bring a level playing field across the heating and cooling sector. The application of a CO_2 price on emissions in the building sector should be an important tool to implement the polluter pays principle while providing funds to accelerate the energy transition.

A uniform CO_2 price across the heating sector

In both REWARDHeat and ReUseHeat, it is identified that the cost of carbon is too low to make the solutions in the project cost efficient. This situation calls for a uniform CO_2 price across the heating sector to ensure a level playing field and drive the decarbonisation of the heating and cooling sector. The ETS reform and extension of scope to cover all GHG emissions from fossil fuels, used in residential and commercial buildings is important. Setting a carbon price on all fossil fuels is an essential part of the decarbonisation of the energy system. For the District Heating and Cooling sector, it will ensure that DHC – which enables greater efficiency and the integration of renewables – can be more competitive, decarbonised and prevalent. At present, the majority of generated district heat is covered by the existing ETS, whereas individual fossil fuel solutions are not.

Similarly, heat pumps are available today and are key for decarbonising the building stock through decentral and central solutions (connecting heat pumps to district heating), as well as industrial processes. They are renewable, energy efficient and a feasible choice for new and renovated buildings. Despite being one of the greenest and most energy efficient solutions for heating, this sustainability is not reflected in the cost.

The extension of the ETS to the building sector is important firstly to reduce emissions by internalising the external effects of fossil fuel use, and also to provide revenues to help accelerate

the energy transition. This will enshrine a fair distribution of cost. Users of electric heat pumps are paying for the related pollution through the ETS1, despite contributing to the decarbonisation of the H&C sector. Fossil heaters are so far exempt from sharing this responsibility and to the contrary, often benefit from lower taxation levels applied on fossil energy, compared to electricity.

Implementation

To tackle all installations below 20 MW that are not subject to the EU ETS, the chosen mechanism should be as easy to implement as possible, with a clear scope to limit the administrative burden. Until a level playing field is established, the DHC sector would continue to need free allocations.

A well-functioning and well-designed combination of an ETS2 and the use of its revenues in the Social Climate Fund will contribute to achieving the decarbonisation target for buildings without risking increased rates of fuel poverty or other negative social impacts. Carbon pricing and the Social Climate Fund (SCF) are essential building blocks of the policy framework of the European Green Deal. Without an adequate and targeted carbon pricing system covering fuels used for heating and cooling, the EU will not be able to achieve its own emissions reduction targets, nor the targets for renewable heating and cooling.

The policy alternatives currently being discussed can be considered complementary, but cannot replace a carbon price, as they do not create their own revenue streams. The remaining skepticism of certain Member States and the European Parliament towards the ETS2 must be addressed, through a comprehensive design of the system, including well-developed income distribution schemes. If executed correctly, the proposed ETS2 will accelerate the green transition and reduce the risk of energy poverty, as our current dependency on fossil energy will be greatly reduced. Fears of social impacts, such as the Yellow Vest movement, should be addressed by introducing support measures for consumers within more vulnerable socio-economic groups, such as financial incentives to switch to clean alternatives. The SCF needs to be structured in such a way that it not only facilitates energy efficiency improvements of buildings and the switch to renewable heating solutions (including through advice), but also supports poorer households in paying for operating costs of heating. Further considerations are needed regarding the income distribution of the ETS2, the equal taxation of energy and the predictability of the ETS2 price.

Conclusions

- **Make use of waste heat**

The EU produces more waste heat than the demand of its entire building stock. The heat which is the by-product of industrial or tertiary activities can be turned into a resource instead of being released into the environment. It could form an essential component of a cost-effective energy transition to a smart integrated energy system, used alongside renewable energy solutions such as geothermal, large scale heat pumps, biomass, or solar thermal in district heating networks.

- **Define waste heat**

To treat waste heat on par with renewables and to avoid limiting the recovery and use of this resource, waste heat must be clearly addressed in the proposed new definition of efficient DHC (EED article 24) and in the sub-targets of the renewable energy directive (REDIII article 15a, article 23 and article 24). This is important to reduce the risk that waste heat is not chosen because it is not defined as a renewable energy source. In the meantime, the principle should be to recover waste heat when available and when it is technically and commercially viable, regardless of its source. The installation of additional capacity should not be prioritised over the consumption of readily available energy sources. The fit-for-55 package must ensure a level playing field for all heat supply technologies, including waste heat recovery solutions.

- **Make waste heat recovery standard**

Policy makers must show that waste heat recovery is important by demanding it. An addition to the revised articles in the mentioned directives could be to make it mandatory for all new construction to recover heat from possible processes (ventilation, cooling, other).

- **Put a price on carbon that reflects the future damage costs**

The ETS is not reflecting the future damage costs of carbon emissions. The externalities are not accounted for. An addition to it could be the introduction of a penalty for all new construction that is heated by carbon-emitting fuels.