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EUROHEAT & POWER

Contribution to a future EU strategy on energy sector integration

1. **What would be the main features of a truly integrated energy system to enable a climate neutral future? Where do you see benefits or synergies? Where do you see the biggest energy efficiency and cost-efficiency potential through system integration?**

   - A truly integrated energy system which enables a climate neutral future should include renewable heat, electricity and gas as well as other renewable energies distributed through the DHC networks and build synergies between those sectors, as well as transport and industrial sectors.
   - Sector integration is already a reality and part of the decarbonisation blueprint of heating and cooling, therefore it should be included in the upcoming strategy by the European Commission. District heating and cooling (DHC) networks, in particular, enable sector integration by creating linkages between different parts of the system and provide flexibility through the means of technologies which are both already technically and commercially available. DHC networks connect the local level with EU level electricity and gas infrastructure. They can also offer energy storage to contribute to balancing supply and demand.
   - In particular, district heating improves energy efficiency and enables to increase the share of local renewable and recycled energies in heating and cooling. DHC also facilitates the integration of multiple renewable and waste heat sources, while coupling points with the electricity and gas systems via power to heat applications (heat pumps, electric boilers coupled to thermal storage), Combined Heat and Power (CHP) plants and renewable gases produced from waste streams, such as municipal sewage water, or renewable electricity. Furthermore district heating connects waste heat sources to buildings and other consumers.
   - District cooling is also key, as it is not only highly energy efficient compared to equivalent conventional systems but also contributes to sector integration. It does so by utilising waste heat, ambient energy and geothermal energy to meet ever-increasing demands for cooling, reduce electricity grid strains and mitigate the heat island effect in cities.
   - The ReUseHeat report shows a potential of approximately 1.2 EJ (or 340 TWh) per year that could be recovered from data centres, metro stations, service sector buildings, and waste water treatment plants. This corresponds to more than 10 percent of the EU's total energy demand for heat and hot water, which is approximately 10.7 EJ (or 2,980 TWh).

2. **What are the main barriers to energy system integration that would require to be addressed in your view?**

Please see below an overview of the main barriers from our sector's perspective:

   - DHC networks require capital intensive infrastructure investment as well as close cooperation between different players including local actors such as cities. However, once installed, they allow the roll-out of renewables in urban areas and can be fed with any locally-available source of energy, including waste heat from nearby industries and biomass. Investing in the development of new heat networks and waste hear recovery will be key to make sector integration a reality, and decarbonise our European cities.
   - Another barrier for sector integration is the lack of a local/district approach to energy planning. Absence of a systematic local energy planning prevents local stakeholders from linking their mapping and planning for available energy supply (in virtue of article 14 of EED) with buildings renovation strategies (according to article 2 of EPBD). This is a missed opportunity to identify

potential synergies that can emerge on the local energy market (for heat, electricity and gas production) with and within the renovated building stock.
- Other barriers to the further deployment of power-to-heat solutions such as taxation, fees and levies. Electricity used in power-to-heat applications is still considered and taxed as end-used electricity, which makes this solution uncompetitive compared in particular to gas.
- There is also no harmonised carbon cost for fossil fuels used in individual heating solutions.
- Finally, fossil fuels used in heating systems below 20 MW have an unjustified advantage as they are not covered by the EU ETS. This is detrimental to the development of efficient and decarbonised solutions such as DHC, which are key for sector integration.

3. More specifically:

- How could electricity drive increased decarbonisation in other sectors? In which other sectors do you see a key role for electricity use? What role should electrification play in the integrated energy system?

  - Electrification will play a growing role for DHC networks, as large-scale heat pumps and electric boilers are suitable to supply heating/cooling or upgrade waste heat to a suitable temperature in a cost-efficient and environmentally friendly manner, providing a decarbonised electricity supply. In the future we see an increasing role for our sector to help integrate intermittent renewable power via power-to-heat solutions with systems combining large-scale heat pumps, electrical peak-load boilers, storage and CHP.
  - Heat-to-power solutions (through Organic Rankine Cycle turbines) are also available and used for instance in combination with waste heat recovered from industrial activities.

- What role should renewable gases play in the integrated energy system?

  - The share of RES gases available in the future should be used in the most efficient way, in those sectors difficult to decarbonise. On the heating market, the energy efficiency first principle should prioritise the use of RES gases in areas where they are used in the most efficient way, in district heating systems prior to building-bound individual boilers in the merit order.
  - An energy transition relying on multiple energy carriers, including renewable methane and hydrogen, is the most resilient and cost-effective pathway to carbon-neutrality.

- What measures should be taken to promote decarbonised gases?

  - A definition of renewable gases should be established to ensure full coherence with the climate neutrality objective. And these gases should be used in those sectors 'difficult' to decarbonise. (see Response above)

- What role should hydrogen play and how its development and deployment could be supported by the EU?

  - Green hydrogen should only play a role in sectors that are difficult to decarbonise in particular in the industrial sector. In current circumstances hydrogen is way too precious to be used to supply single household boilers - and in reality, such applications are not commercially available.
  - More Research and Development would be required to accelerate the deployment and improve competitiveness of renewable gases, including renewable hydrogen.

- How could circular economy and the use of waste heat and other waste resources play a greater role in the integrated energy system? What concrete actions would you suggest to achieve this?

- Waste heat (WH) recovery is a prime example of a circular and integrated approach, as resources that would otherwise be lost are used, enabling primary energy and CO_2 savings, as well as connecting sectors and stakeholders.
- According to the Heat Roadmap Europe 4th study, waste heat sources could cover at least 25% of the district heat production considering their location. DHC systems provide the infrastructure to capture waste heat potential. The recognition of the sustainability of waste heat projects in the EU taxonomy is a positive and encouraging signal. Waste Heat recovery projects have high CAPEX and financial risks. They require a long-term commitment, sometimes not compatible with the constraints associated with the development and operation of industrial sites.
- How to unlock waste heat recovery at larger scale?
  - Identification and removal of barriers in the Member states for the uptake of waste heat
  - Enhance the recognition of waste heat as part of national decarbonisation strategies: The identification and access to information on WH recovery potential and sources is key, for instance the work carried out by Member States under the EED article 14 Comprehensive Assessment or EU funded project creating open source WH sources databases. These analyses will need to translate into national strategies and concrete measures to support waste heat recovery as an integral part of decarbonisation.
  - A better dialogue between governance levels and stakeholders is necessary to ensure the planning and implementation of waste heat recovery projects and provide the possibility to the local level to showcase best practices.
  - Through subsidies for research programs - fostering the emergence of the technologies of tomorrow; Financial support for infrastructure project : consideration should also be given for the development of risks insurance schemes, as well as business models and standard contracts to further help WH recovery projects;
  - The recovery of industrial waste heat is an opportunity to develop new infrastructure, for instance in industrial areas where heat can be supplied to/shared by different users. Such developments will represent a new source of revenue for producers while providing affordable and sustainable heat for users. Also, the increased use of waste heat in DHC network will contribute to the decarbonisation of the heating and cooling markets.
  - Support for thermal storage investments: Seasonal storage capacity should be developed to store waste heat and electricity generated in the summer, to be used during wintertime.

- How can energy markets contribute to a more integrated energy system?

  - Barriers should be identified and dismantled. The implementation of the Directive and Regulation on Market Design will help move towards a smarter energy system.
  - However barriers remain for example regarding energy taxation. Taxation of electricity makes it difficult for operators to consider investment into power-to-heat facilities. More broadly speaking, the Energy Taxation Directive must be reviewed and fully updated with the Green Deal ambitions. Please see the EHP Position Paper on Taxation.
  - Energy market can contribute to the integration of energy system by acknowledging the flexibility that DH systems entail. DH systems through power-to-heat installations can help stabilise the electricity grid, avoid excess electricity and through CHP plans, an existing and proven example of sector integration, generate electricity. Art. 24 (8) RED II is an example.
  - The flexibility, which is offered by the CHP plants, must be taken into consideration as well, as the plants can adjust the production to the market conditions. Electricity market design must

be adjusted to the continuously growing share of volatile resources and the increasingly needed flexibility, which must be given a price.

- **How can cost-efficient use and development of energy infrastructure and digitalisation enable an integration of the energy system?**

    - Data and digital solutions are at the core of smart, green, decentralised and integrated energy systems. The digitalisation of the district energy value chain enables the optimisation of production, network operations while empowering consumers. It contributes delivering greater energy efficiency and integrating an ever-greater share of renewables and waste heat.
    - Digitalisation will also be key to use the flexibility offered by thermal networks to the electricity grid. It will allow the smooth integration and management of various energy sources and grids.
    - Energy management ensures the balancing of energy demand and optimises the use of renewable and waste heat available in DHC networks. Energy management enables the impacts of digitalisation and it is taken into account by the taxonomy.

4. **Are there any best practices or concrete projects for an integrated energy system you would like to highlight?**

    - Use of Waste Heat from Aurubis Copper Plant (Hamburg): https://decarbeurope.org/2019/05/14/aurubis-industrial-heat-hamburg/
    - The project Real-World Laboratory "Large heat pumps in DH networks" - Reallabor Großwärmepumpen in Fernwärmenetzen, https://www.agfw.de/energie-klimakonzepte-f-e/forschung-innovation targets the analysis of integration of large heat pumps in DH systems. Research is carries out on the barriers in the technical, legal, regulative, market and economic framework;
    - There are several utilities in Germany, which implement projects where large heat pumps are connected to DH systems (e.g. Stadtwerke Lemgo, https://www.stadtwerke-lemgo.de/privatkundenbereich/ueber-uns/presse-und-medien/pressemeldungen/detailseite/news/meilenstein-erreicht-beim-lemgoer-leuchtturmprojekt/?L=0&cHash=2062dfddc0b69b85e2a62abd2d3d3e13 ; Stadtwerke Halle – EVH, https://evh.de/privatkunden/unternehmen/evh-gmbh/pressemitteilungen?id=43638);
    - Ringkøbing District Heating includes a natural gas fired CHP, an electric boiler, solar collectors, gas fired boilers and a thermal storage. These units must at all times cover the city's heat demand. Produced and consumed electricity is traded on the Day-Ahead spot market in West Denmark. It is possible to monitor daily operation online here: http://www.energyweb.dk//rfvv/?english&history
    - Use of Waste Heat from a Facebook Data centre (Odense): Data centre opportunities in Finland: Wind-powered data centres could feed waste heat to district heating network in Helsinki metropolitan area. Potential to displace up to 10 TWh of coal fuel use. https://www.fortum.com/about-us/blog-podcast/forthedoers-blog/recycling-energy-data-centres-helps-abolish-coal
    - Kilpilahti waste heat project: Excess waste heat from industrial area of Kilpilahti, where currently 1.1 GW of low value waste heat ends up in sea. The project could produce up to 3-5 TWh of heat to capital region and would cost approximately 700 – 1000 MEUR. https://www.helen.fi/en/news/2020/kilpilahti2

- Suomenoja waste water heat pumps utilize the waste water heat from treated waste water as well as sea water in the summer. This will increase the carbon neutral share of Espoo's district heat production to 50% in 2022. https://www.fortum.com/media/2019/05/new-heat-pump-unit-fortum-suomenoja-share-carbon-neutral-district-heating-production-will-increase-over-50-cent-2022
- CHP from solid biomass and geothermal: https://www.turboden.com/case-histories/1247/swm-stadtwerke-munchen
- Fossile Free Energy District (FED) in Gothenburg, establishing a local market-place for prosumers of electricity, heating and cooling: https://www.uia-initiative.eu/en/uia-cities/gothenburg
- In Mälarenergi, Sweden, biofuel-fired cogeneration plants supply heat to a District Heating network and inject electricity in the grid. The heat circulating in the DH network is also used to supply a District Cooling network through absorption chillers. Thermal storage allows for optimized heat production from the CHP plants. https://www.magnitude-project.eu/wp-content/uploads/2019/07/MAGNITUDE_D1.2_EIFER_Final_Submitted.pdf
- At Mondi Neusiedler paper mill in Austria, steam turbines, supplied by gas-fired steam boilers, provide steam and electricity for the paper production process. Additional electricity is taken from the grid and excess steam is either stored in a steam storage or, in another production line, condensed and recovered in a DH network. https://www.magnitude-project.eu/wp-content/uploads/2019/07/MAGNITUDE_D1.2_EIFER_Final_Submitted.pdf
- In Nordhaven, Denmark, a district heating network is connected to the city's heat distribution network. Booster heat pumps are used in substations to produce domestic hot water (with storage tanks) and water heaters in townhouses to provide fuel shift flexibility to the DH network, compatible with the DH demand. https://www.magnitude-project.eu/wp-content/uploads/2019/07/MAGNITUDE_D1.2_EIFER_Final_Submitted.pdf
- At the A2A DH network in Milan, a gas fired CHP is run during night hours to fill thermal storages, to smooth the morning demand peak. During the day, the heat is supplied by the gas CHPs (engines) and the thermal storage and, during the heating season, by a base-load heat pump. The operations are always heat driven. https://www.magnitude-project.eu/wp-content/uploads/2019/07/MAGNITUDE_D1.2_EIFER_Final_Submitted.pdf
- At Neath Port Talbot, in the UK, an industrial park operates a gas and biomass combined cycle gas turbine, together with solar and wind power generation, with electricity being supplied to several industrial and tertiary sites. https://www.magnitude-project.eu/wp-content/uploads/2019/07/MAGNITUDE_D1.2_EIFER_Final_Submitted.pdf
- At EMUASA waste water treatment plant in Spain, biogas engines cogenerate the heat and the electricity required for the wastewater treatment processes. Additional heat, when required, is produced by a gas boiler and electricity is supplied by the grid. The biogas is produced in fermenters and a part of it is upgraded for biofuels production. https://www.magnitude-project.eu/wp-content/uploads/2019/07/MAGNITUDE_D1.2_EIFER_Final_Submitted.pdf
- ADEME, Facts and figures: Excess heat, 2017: ADEME, a French environmental agency, shows that 51TWh of industrial waste heat are available in France and can be recovered. https://www.ademe.fr/excess-heat
- Marine geothermal production plant - Thassalia in Marseille uses geothermal energy from the sea to supply linked buildings with power for heating and cooling, over an area of 500 000m2. The use of geothermal energy represents here a reduction of 70% of GHG. https://innovation.engie.com/en/news/news/smart-buildings/thassalia-the-first-marine-geothermal-plant-1/1448

- Climespace – Parisian district cooling network - supplies 486 GWh exploiting free cooling from the River Seine to chill buildings. It supplies https://innovation.engie.com/en/news/news/smart-buildings/thassalia-the-first-marine-geothermal-plant-1/1448
- In Toulouse, France, Dalkia is developing a district heating network using the heat given off by supercomputers. This network will prevent the emission of 19.000 metric tons of CO2 each year. https://www.dalkia.fr/en/toulouse-metropole-new-plaine-campus-heating-and-cooling-network
- Recovered heat from steel plants fuels a 25 miles district heating network in Dunkirk. Each year, 20.000 metric tons of COE emissions are avoided. https://www.dalkia.fr/en/references/recovery-heating

5. What policy actions and legislative measures could the Commission take to foster an integration of the energy system?

- Investment policies and funding instruments for EU infrastructure need to reflect the broader concept of sector integration and fully address the development of DHC networks, while also increasing the efficiency of already existing ones
- Where appropriate, DHC should be eligible for support under TEN-E in a way that reflects the specific features of the sector.
- Moreover, H&C infrastructure, power-to-heat applications, thermal storage and waste heat recovery - more broadly speaking: the interactions between electricity and heat networks - should be taken into account when developing the joint Ten-Year Network Development Plan between ENTSO-E and ENTSO-G.
- EHP welcomes the steps taken by the European Commission towards supporting sustainable finance. DHC infrastructure is at the heart of the available solutions for decarbonisation and thus fully deserves to be considered as sustainable investment.
- The forthcoming review of the Guidelines on State Aid for Environment and Energy should enable sustainable investments through a supportive framework to reform the heating and cooling market.
- A sector integrated regulatory framework addressing the existing barriers – network tariffs, levies and taxes on electricity or accountability of RES-based electricity via the GoO system - to cross-sectoral RES electricity utilization to replace fossil fuels.
- A district approach should be applied in sector integration opportunity to identify potential synergies that can emerge on the local energy market among heat, electricity and gas production. In order to facilitate this, the national obligations under article 14 of the EED should be applied at local level as well in order to fully integrate the energy system.
- Finally, EHP calls for a uniform CO_2 price across the heating sector to ensure a level-playing field and drive the decarbonisation of the entire heating and cooling sector.