

Repower Heat: Industrial Waste Heat Could Power Millions of Homes in Europe

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The current crisis represents a historic turning point for the energy system and even more for the future of European industry. Diversification in natural gas supplies as an alternative to Russian ones, renewed use of fossil fuels, a push towards renewables, and storage systems are just some of the topics on top of worldwide agendas.

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The European institutions have therefore a fundamental role in designing this decade and the trajectory through 2050 by undertaking a serious discussion on the future of the European economic and social architecture, also evaluating which measures can be implemented to combine the clean energy transition project with a long-term industrial strategy.

The Inflation Reduction Act in US, the Canadian ITC, Japan's green transformation plan, RepowerEU and the "Net-Zero Industry Act" – to name the main ones – are part of a bigger, multi-hundred-billion effort to build an entirely new path in our global fight against climate change.

In particular, the EU's Green Deal industrial plan is perhaps one of the most ambitious ones, planning to make Europe the home of clean technology and industrial innovation on the road to net-zero carbon emissions by 2050 and only a few weeks ago **Ursula von der Leyen (President of the European Commission)** during the Davos Conference in January 2023, said she was aiming "to focus investment on strategic projects along the entire supply chain. ..."

But how to maximize environmental and socioeconomic benefits, energy security, and industrial competitiveness? **Doing more with less, the concept of energy efficiency, is one of the answers. Heat recovery is indeed one of the key solutions.**

Secure energy supplies, energy affordability, and environmental impact are at the centre of EU policy, investment, and increasing consumer concerns. Despite efforts to prioritize energy efficiency, significant potential still remains untapped when it comes to reducing energy waste across the entire energy value chain and making the best use of the energy that we have available.

"I am striving to secure that energy efficiency measures including the utilisation of waste heat are no longer bypassed," said Niels Fuglsang, the European Parliament's rapporteur on the Energy Efficiency Directive, after the recent approval.

The recovery and use of waste heat is the main theme of energy efficiency, which presents important opportunities across many applications.

The white paper "Thermal Energy Harvesting", published by the Knowledge Center Organic Rankine Cycle (KCORC), puts the potential for generating electricity from **currently untapped thermal energy in industrial processes** at a staggering **150 TWh every year**.

This figure is the equivalent of:

- the yearly electricity consumption of more than 20 million households,
- or the annual electricity production of 19 nuclear plants of 1 GW capacity each,
- or the combined annual consumption of electricity of the Netherlands and Denmark.

This is huge, though unused, potential to count on.

Industrial plants in the energy-intensive industries, the so-called hard-to-abate sector, such as cement, glass, petrochemical, and steelmaking, produce huge amounts of waste heat that, if unused, has to be released into the atmosphere. Furthermore, most of the time, these flue gases can't be released as they are and have to be cooled first, introducing additional energy consumption.

Waste heat recovery represents a leading technology to harness such an important energy source, generating energy (electricity and heat) without emissions of additional CO2 and, consequently, it should be treated as a fully renewable source.

Waste heat can, in fact, be used either directly in district heating and cooling, and to convert residual, low-grade heat into useful power for self-consumption, in production processes or delivered to the grid.

Utilizing waste heat and cascading its use can help decarbonize hard-to-abate industries and cities, and deliver systems integration locally and industrial symbiosis. Excess heat can become one of the main sources of clean heat and power generation, thus playing a key role in the global path toward decarbonization.

Many political barriers still remain

Despite the high-level recognition of waste heat across EU legislation though, the definitions and provisions are deemed insufficiently comprehensive to capture the full potential of waste heat recovery and cover the entire range of applications.

EU legislation currently prioritizes the direct use of waste heat from industrial and commercial applications in district heating but this unilateral approach limits unlocking the full potential, as other feasible applications do not get visibility, nor do they receive sufficient support.

Furthermore, the Renewable Energy Directive provides a definition for waste heat utilization in district heating, but it is still unclear on the use of waste heat as a source of power generation, while the Energy Efficiency Directive appears to be more inclusive of waste heat technologies, even though the access to support is not specified for all applications.

To unlock this potential, EU and national policy should integrate the following principles:

- Prioritize the efficient production of power and heat, with a view to minimizing the waste of heat in power generation.
- Recognize all sources of waste heat, including industrial processes, commercial activities, data centres, and gas pressure reduction stations.
- Recognize all waste heat applications, including direct use in District Heating and Cooling (DHC), and use in ORC technology for power (and heat) generation on-site or for grid feed-in.
- Take an integrated approach to energy systems planning and operation, which assesses waste heat recovery potentials for a range of applications.
- Adequately reward waste heat recovery and utilization, ensuring a level playing field with other clean sources of heat and/or power.

We're facing one of the most challenging times in recent history and we have to do our best to achieve the important goal in front of us. Solutions are available as well as expertise and technologies. What we need is a firm political will to embrace all the tools we have at our disposal to rise to the challenge.

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