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District level heating could help achieve EU 2020 energy efficiency goals

Recycling of excess heat, via 'district heating', has the potential to improve energy efficiency in Europe. This study mapped excess heat and demands for heat in EU27 Member States to identify regions suitable for the large-scale implementation of district heating. The authors identified 63 'heat synergy regions', generally large urban zones, which generated almost half of all excess heat generated in the EU27.

Under the Energy Efficiency Directive[1], the EU aims to increase its energy efficiency by 20% by 2020[2]. Europe's residential and service sector heat markets will be important participants in achieving this goal. Currently, the structures that supply heat to buildings (e.g. electricity and gas grids) are inefficient; they rely on primary energy sources (such as coal, oil and gas) and produce vast amounts of excess heat.

As this excess heat is often produced within densely populated areas, there is high potential to utilise it. This is the basis for district heating, in which excess heat from one source is recycled and supplied to a district or group of buildings. Heat networks of this kind could reduce Europe's use of primary energy sources and enhance energy efficiency.

To investigate the feasibility of district heating, this study mapped heat resources in EU27 Member States, using data from 2010. The research, which forms part of Heat Roadmap Europe – a research project investigating energy efficiency measures in the EU's heating and cooling sectors – assessed the annual excess heat produced by the energy and industry sectors in Europe using CO_2 emissions data.

The researchers considered 1281 regions within the Member States. They measured total excess heat, which was defined as rejected heat that is not absorbed as electricity or not maintained in industrial products, using data on annual CO_2 emissions from fuel combustion activities. The researchers also calculated total building heat demands accumulated for each region. Geographic information system (GIS) mapping was combined with energy system modelling to determine the regions most suitable for heat synergy collaborations.

Excess heat was identified in 834 regions (defined by Nomenclature of Territorial Units for Statistics (NUTS)-3, the third level of European administrative unit) distributed among the 27 Member States. All Member States, apart from Malta, had industrial activities generating excess heat from fuel combustion, while only 17 Member States had waste-to-energy conversion activities, such as waste incineration plants that generate energy from non-recyclable waste. The countries with the largest volumes of excess heat were Germany, Italy, Poland and the UK.

The researchers wanted to know which regions could supply their excess heat to other regions, thus representing strategic heat synergy regions for future district heating developments. To answer this question, they performed a comparative analysis of heat production, demand and current heat distribution opportunities. Analysis targeted 206 regions, together forming 63 strategic heat synergy regions. The researchers found that almost half (46%) of all excess heat produced in the EU27 (around 1/3 of the total heat demand) was located within these 63 strategic regions, despite representing only 10% (445 484 km^2) of total EU27 land area, and being inhabited by only 28% (140.6 million) of the total study population (496.6 million).

These findings have important policy implications, as they show that there is potential for the EU to improve its sustainability and energy efficiency by using currently available excess heat.

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1. http://ec.europa.eu/energy/en/topics/energy-efficiency/energy-efficiency-directive
2. http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/targets/index_en.htm

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District-level heating could help achieve EU 2020 energy efficiency goals *(continued)*

The authors say that past EU decarbonisation strategies have emphasised heat market solutions involving electricity and gas and individual energy efficiency measures, rather than structural measures like district heating. They say realisation of the opportunities to manage heat at a district level requires greater recognition of the heat sector by energy policymakers.

They say policymakers must consider how they can develop future legislation to support efficiency heating and cooling solutions. While the Energy Efficiency Directive does address district heating and cooling systems, and suggests local and national mapping of heat resources and demands, there are many aspects still missing.

For example, the authors recommend that energy policy uses statistics that record energy recovery, which would make the monitoring of structural efficiency efforts easier. The authors also suggest that future policy incorporates guidelines for establishing mutually beneficial agreements between supply structure actors realising excess heat utilisation in heat networks. In an earlier paper, they calculated that district heating could expand cost-effectiveness by three times compared to current levels in European city centres.

The Energy Union Package[3] has recognised the need for a more focused approach towards the heating and cooling sector. To this end the European Commission is preparing a Heating and Cooling Strategy to address the challenges and potential of half of the energy currently consumed in Europe. The Strategy is scheduled for adoption at the beginning of 2016.

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3. COM (2015) 80 final; Energy Union Package: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2015:80:FIN