CO\textsubscript{2} emission intensity of Estonian district heating sector

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The EU aims to be climate-neutral by 2050 – an economy with net-zero greenhouse gas emissions.

To track changes in district heating sector the CO₂ specific emission factor can be used.

Factor indicates the energy efficiency and renewable energy intensity of a given network and the CO₂ reduction potential.
The main objectives of this article are to:
- perform CO₂ specific emission factor calculations for the Estonian district heating sector based on real data from district heating systems in 2020 (calculations for each DH area and DH sector).
- analyse calculation limitations, to provide guidance on improving the transparency and accuracy of the calculation methodology,
- analyse the results.
In previous studies “power bonus“ method was used. Calculations based on data from Statistics Estonia.

In this study:
Two methods have been applied/analysed:
- "power bonus" method,
- proportional allocation of CO₂ emissions between electricity and heat.

Real data from DH companies as a basis.
The weighting factors (specific emission factors) of fuels and energies have a major role in calculations.

The values of specific emission factors for most fuels proposed in the Regulation "Methods for the calculation of carbon dioxide emissions into the atmosphere".

Exceptions that are not directly covered by the legislation and need to be dealt with separately are:
- shale gas, manufactures gas and coke oven gas,
- municipal and industrial waste,
- electricity,
- waste heat.
INPUTS AND OUTPUTS

MAINLY WOODCHIPS AND NATURAL GAS (PEAK LOAD) USED

INPUTS:

1. Fuels used for heat production, MWh
2. CO₂ emission factors for used fuels
3. Heat consumed in DH area

The scheme is applied when the useful energy produced in the cogeneration plant is sold outside the district heating network and part of the energy is not produced in the cogeneration process.

(data needed marked with white circles).

According to EN 15316-4-5:2017, the assessment of the electricity generation mode (whether the CHP plant is operating in CHP mode or not at certain times) is based on a comparison of the total efficiency of a real CHP plant with reference values. This approach is in line with the solution proposed in Directive 2008/952/EC.
DH SECTOR IN ESTONIA. 2020

COGENERATED HEAT

42%
**Results 2/3**

<table>
<thead>
<tr>
<th>CALCULATION METHOD</th>
<th>According to 2020 data</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>DH heat delivered, MWh</td>
</tr>
<tr>
<td>&quot;power bonus&quot;</td>
<td>3,673,820</td>
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<tr>
<td>proportional allocation</td>
<td>85.9</td>
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</tbody>
</table>

Local heat production with natural gas boiler about 200 kgCO₂/MWh<sub>heat</sub>
Results 3/3

Heat consumption in DH area, MWh

CO₂ emission factor, kgCO₂/MWhₜₚₑₜ
Discussion and conclusions

There is no consistent and clear definition of waste energy (waste heat and waste cooling) in the Estonian regulatory documents.

The overall efficiencies of some cogeneration CHP units in district heating areas with cogeneration were below the reference values from standard EN 15316-4-5:2017. Reasonable to improve the way of accounting.

It is reasonable to select one method for calculations to avoid unclear/misunderstanding results.
THANK YOU

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