



EU DEFINITION OF WASTE HEAT: IS IT REALLY EFFICIENCY-FIRST?

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HEAT HIGHWAY WORKSHOP:
Using decarbonised heat sources via
supra-regional heat networks

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AGENDA

- Renewable Energies Directive 2018 (RED II)
 - Art. 23 (Heat sector) and Art. 24 (District heating sector)
 - Selection options according to Art. 24 para. 4 RED II
- Waste heat definition
 - "Unavoidable" waste heat
 - Waste heat as a "by-product"
 - Chargeability of waste heat
 - Access to district heating network & use of CHP
 - Primary energy use
- Discussion
 - Sustainable Energy System
 - Preference of RED II for RES
 - Art. 24 para 4 lit a RED II
- Results

RENEWABLE ENERGIES DIRECTIVE 2018 (RED II)

Art 23 Heating Sector

- Increase the share of renewable energies (RES) in the heating sector by an average of 1.1/1.3 percentage points/year
- Waste heat can only be credited up to 40% of the annual increase.

Art. 24 District heating

- Enabling fuel switching to renewable energy sources.
- Two options to choose from for the Member States (i) measures to increase the share of energy from renewable sources and waste heat in district heating systems by at least one percentage point

SELECTION OPTIONS ACCORDING TO ART. 24 PARA. 4 RED II

- Two Options

measures to increase the share of energy from renewable sources and waste heat in district heating systems by at least one percentage point

OR

provisions to "open up" district heating networks.

For the district heating sector, member States may set regulation for

- increasing the share of RES and waste heat by at least 1 percentage point/year, or
- the obligation for district heating network operators to connect energies from renewable energy sources and waste heat,

WASTE HEAT DEFINITION

ART. 2 Z 9 RED II

"Waste heat and cold means unavoidable heat or cold generated as a by-product in industrial or power generation installations or in the tertiary sector, which would be dissipated unused in air or water without access to a district heating or cooling system, where a cogeneration process has been used or will be used or where cogeneration is not feasible."

The term "waste heat" used in the Austrian Renewable Energy Expansion Act fully corresponds to the term used in the Directive.

WASTE HEAT DEFINITION

Waste heat and cooling

- is unavoidable heat [...]
- generated as by-product in industrial or power generation installations, or in the tertiary sector,
- which would be dissipated unused in air or water
- without access to a district heating [...] system,
- where a cogeneration process has been used or will be used or where cogeneration is not feasible

NEED FOR A CLEAR AND UNDERSTANDABLE DEFINITION

- Regulatory certainty that heat can be used to meet the overall targets of RED II (Chargeability of waste heat)
 - investment certainty in waste heat recovery projects
 - inconsistencies in the implementation of the Directive across member states
- Guidance on the types of waste heat sources that are eligible for support under RED II is necessary

"UNAVOIDABLE" WASTE HEAT

- First, waste heat is "unavoidable" heat.
- According to Art. 14 para. 5 EED it can be concluded that "unavoidable" means that all other feasible energy efficiency options to reduce waste heat have been exhausted.
- The technical and economic feasibility of applying these energy efficiency options must be analyzed.

WASTE HEAT AS A "BY-PRODUCT"

- The next essential criterion for waste heat is its occurrence as a by-product within a process.
- According to Recital 117 RED II, it can be concluded that by-products are defined by the fact that they are not the primary objective of the production process.
- Accordingly, "by-product" according to Art 2 Z 9 RED II would mean that waste heat was not intentionally generated - the generation of energy in the form of waste heat is not the objective of the process.
- The generation of waste heat must not be the main purpose of the process.
- According to Annex 5 lit C Z 16, heat from a CHP is referred to as "useful heat". This is understood to mean heat that is "generated to satisfy an economical justifiable demand for heat, for heating and cooling purposes". However, the Directive does not assign the term "useful heat" to renewable energy sources or to waste heat, so it is not clear whether this "useful heat" is eligible for the requirements of Article 24 (4) (a) in the district heating sector.

ACCESS TO DISTRICT HEATING NETWORK & USE OF CHP

Heat fulfilling the conditions of being (1) unavoidable, (2) unintended (i.e., by-product) and (3) otherwise disposed, is waste heat by RED II definition, if

- a. there is no access to a DHC system with CHP
- b. there is no access to a DHC system with the future use of CHP
- c. there is no access to a DHC system in which CHP is not possible.

[...] without access to a district heating [...] system, where a cogeneration process has been used or will be used or where cogeneration is not feasible

Heat fulfilling the conditions 1 through 3 is not waste heat by RED II definition, if

- d. there is no access to a DHC system in which no CHP is used (even in the future, although it would be possible)
- e. there is access to a DHC system with CHP
- f. there is access to a DHC system with the future use of CHP
- g. there is access to a DHC system in which CHP is not possible
- h. there is access to a DHC system in which CHP is not used (even in the future, although it would be possible).

PRIMARY ENERGY USE

The definition of waste heat does not differentiate in terms of primary energy input.

- This means that it is not clear under which term heat falls that comes from an industrial process in which only renewable energy is used.
- Such a byproduct "heat" could fall under both the term "energy from renewable sources" and the term "waste heat."

WASTE HEAT

By definition, waste heat is waste heat when it is

- **Unavoidable** – all other feasible energy efficiency options have been exhausted to reduce waste heat/cold, including cogeneration. The technical and economic feasibility to apply these energy efficiency options has to be analysed. Cost-benefit analysis for CHP feasibility for power, industrial and district heating installation 20 MW is mandatory (EED Art.14)
- **By-product** – waste heat/cold has not been produced intentionally; it is not the goal of the energy producer
- Only recognised under RED II, if utilised **via a district heating/cooling systems**

WASTE HEAT DEFINITION

Recommendation

→ Skip the second part of the definition

"Waste heat and cold means unavoidable heat or cold generated as a by-product in industrial or power generation installations or in the tertiary sector, which would be dissipated unused in air or water"

~~*without access to a district heating or cooling system, where a cogeneration process has been used or will be used or where cogeneration is not feasible."*~~

SUSTAINABLE ENERGY SYSTEM

	RENEWABLE ENERGY	FOSSIL ENERGY
NEW ENERGY INPUT	Renewable energy input	Fossil energy input
RECOVERED WASTE HEAT	Waste heat from RES process	Waste heat from fossil process

Darstellung: Energieinstitut an der JKU Linz

A sustainable energy system is defined to use 100% renewable primary energy sources and use them in a resource-efficient manner.

The eligibility of waste heat does not depend on the original fuel used at the source process.

Upper right box: to be avoided
Lower left box: ist the optimum

- Transformation of the heat supply in a district heating system from the upper right box to the lower left box is needed
- For now: preference for Waste Heat or RES in DH Systems?

PREFERENCE OF RED II FOR RES

- Waste Heat may be counted towards the requirements of Art. 23 and 24 RED II
 - But it does not count towards the overall EU renewables target or national renewable energy contributions. 210
 - Furthermore, there are percentage requirements in the RED II, defining a minimum share of the targets to be achieved with RES (and not with waste heat).
 - While waste heat from RES is probably not affected, there are significant uncertainties for the use of waste heat from fossil processes.
 - The use of waste heat from fossil processes is not only subject to the “usual” risk of
 - (i) process modification (e.g., when switching to RES) but now also to
 - (ii) non-eligibility for meeting the national targets of RED II or subsequent directives.
- result for a waste heat user who is able to decide whether to use one MWh from waste heat or RES, to **decide in favor of RES**,

PREFERENCE OF RED II FOR RES

→ Result: Waste Heat will remain unused

- There are industrial sites that are not connected to district heating or do not provide waste heat to other local companies that can use the waste heat.
 - In some cases, industrial process modification will be simple and will not affect waste heat amounts,
 - In other cases process modification will be complicated, but companies will remain on-site and will still show waste heat flows (maybe other volumes, temperatures, profiles).
- However, as these companies are not connected today – due to the risks derived from RED II – companies or district heating systems that could be supplied from waste heat will then rely on RES plants, i.e., district heating companies will have invested in RES solutions to comply with the directive.
- Then, the integration of waste heat (then: “RES waste heat”) will not happen due to economic reasons – the same ones as today (economic feasibility, trust, backup issues, etc.).

ART. 24 PARA 4 LIT A RED II

measures to increase the share of
energy from renewable sources
and waste heat in district heating
systems by at least one
percentage point

- not clear whether direct renewable energy input or waste heat from existing fossil processes should be given preference.
- Juxtaposition of RES and Waste Heat

RESULTS

	RENEWABLE ENERGY	FOSSIL ENERGY
NEW ENERGY INPUT	Renewable energy input	Fossil energy input
RECOVERED WASTE HEAT	Waste heat from RES process	Waste heat from fossil process

Darstellung: Energieinstitut an der JKU Linz

- Approach of Art. 24 (4) RED II is appropriate
- Definition of Waste heat has urgent need to be clarified
- When DHC systems only switch from fossil to renewable energy input, processes' waste heat is likely to remain unused, and it is likely that also the waste heat from processes with RES as original energy input remains unused.
- If waste heat from a process with fossil energy input is connected to a DHC system, it is likely that waste heat will also be used after a decarbonizing process modification.
- Waste heat from fossil input energy should be politically accepted in order to increase investment certainty for use in DHC systems.
- Equally important, at the same time, the switch of industrial processes and power plants to RES must be politically enforced.

THANK YOU FOR YOUR ATTENTION

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