

Reporting instructions for completing the district heating and district cooling template for data reporting under Article 24(6) of Directive 2012/27/EU

--- FINAL VERSION ---

Version 17 November 2017

These reporting instructions were developed by a task force of with Member States' experts under the guidance of the European Commission in cooperation with Ricardo Energy & Environment Ltd.

For questions, please contact Michael Goll, Eurostat unit E5, Tel: 00352 4301 32782, e-mail: Michael.Goll@ec.europa.eu

1 Introduction

Article 24(6) of the Energy Efficiency Directive (EED) states that Member States must, before 30 April of each year, submit to the Commission annual statistics on district heating and cooling (DHC) production and capacities, in relation to total heating and cooling production and capacities. The attached questionnaire aims to collect DHC data for all EU countries based on the same methodology and data definitions to ensure compliance with Article 24(6) of the EED and comparability between Member States.

The questionnaire consists of six tables. Tables 1 and 2 contain obligatory data fields required by Article 24(6) of the EED. They are highlighted in green colour in tables 1 and 2. Tables 3a, 3b, 4a and 4b ask for voluntary data only which add significant value to district heating and district cooling statistics on Member States and EU level.

2 Definition of District Heating and Cooling

Based on the existing definition in Article 2(19) of the Energy Performance of Building Directive 2010/31/EU (EPBD), 2010 *'district heating' or 'district cooling' means the distribution of thermal energy in the form of steam, hot water or chilled liquids, from a central source of production through a network to multiple buildings or sites, for the use of space or process heating or cooling.*¹

This data collection according to Article 24(6) EED shall apply the DHC definition of Article 2(19) EPBD. The following data – which fulfil the below listed criteria – shall be reported to Eurostat:

Thermal energy

- a. which is produced in another building than the one where it is consumed; and
- b. which is sold (as reported in the Annual Electricity and Heat Questionnaire²) to
- c. multiple buildings owned/occupied by at least two different customers or
- d. multiple sites³ owned by at least two different customers.

For this data collection according to Article 24(6) EED, also networks have to be reported which have more than one central source of production.

The Annual Electricity and Heat Questionnaire covers all 'heat sold'. This 'heat sold' may only be reported under this data collection according to Article 24(6) EED if multiple buildings or multiple sites owned by different customers are supplied with thermal energy. Therefore, this data collection is a sub-group of the total 'heat sold' reported under the Annual Electricity and Heat Questionnaire only.

The 'multiple buildings and multiple sites' criteria exclude sites where all thermal energy is solely consumed on-site and where the thermal energy is not sold. The purpose of district heating and cooling networks is to supply thermal energy to more than one building or more than one site. This means that networks which supply heat to one building only are excluded.

Building means a roofed construction having walls, for which energy is used to condition the indoor climate according to Art. 2 (1) EPBD.

Customer shall be understood as 'final customer' which is a natural or legal person who purchases energy for own end use according to Art. 2 (23) EED.

Regarding industrial sites, it shall be noted that the size of industrial sites where heat is distributed to multiple buildings owned by the same company is significant in comparison to the size of the remaining district heating networks delivering heat to different residential customers. Therefore, the national variations from one year to another could be highly dependent on the heat demand requirements for industrial processes. Including industrial sites where thermal energy is consumed solely in one site (the same site as the site of production of the thermal energy) will not allow good understanding of the penetration of national, regional and local heat markets and heat/cooling efficiency policies.

In addition, industrial sites outsource their energy generation often to companies which exclusively supply them with the required energy. For this reason, the 'at least two different customers' criterion is applied to exclude industrial networks which can be considered as 'closed' networks. Networks where only one customer is connected shall not be reported for this reason.

¹ Source: Energy Performance Building Directive, 2010 <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010L0031&from=EN>.

² In case heat is considered as "heat sold" in the Annual Electricity and Heat Questionnaire for simplification reasons even if is not sold officially to a customer, the same should apply in this data collection (e.g. municipalities which are running DHC networks and supplying the thermal energy to their own buildings via the DHC networks) to ensure consistency between the two data collections.

³ 'Site' is not defined in European legislation. However, as explained on p. 2 of this document, the exact boundaries of the site are of no importance for this data collection. The main criterion is if the heat/cold is sold to at least two different customers or not.

Examples⁴:

- A heat plant selling heat to different customers within **one building** is **not** considered as a district heating network.
- A heat plant selling heat to different customers in at least **two buildings** is considered as a district heating network (e.g. social housing).
- Hospitals or Universities with multiple buildings where heat is used in multiple buildings but there is only one customer is not considered a district heating network. **At least two customers need to be supplied with heat through the district heating network to fall under the definition above.**
- An industrial site selling heat to its **own** multiple buildings/installations/processes is **not** considered as a district heating network.
- An industrial site selling heat to **more than one** building/installations/processes of **one other** customer is **not** considered as a district heating network (only **one** customer).
- An industrial site selling heat to **more than one** building/installations/processes of **at least two customers** is considered as a district heating network.

Article 2 (41) EED defines efficient district heating as 'district heating systems using at least 50% renewable energy, 50% waste heat, 75% cogenerated heat or 50% of a combination of such energy and heat'.

The compliance of district heating systems with this definition shall be evaluated on the basis of the net heat output of each generation unit. The same approach used for the Annual Electricity and Heat Questionnaire to calculate renewable heat for multi input boilers shall be applied. The net heat output of each generation unit has to be set in relation to the total net heat provided to the district heating network. Therefore, the 'efficiency' criteria refer to the average of all connected generation units, not to each generation unit itself. Networks fulfilling these criteria shall be reported in table 3a. All other networks are considered as inefficient according to the EED. They shall be reported in table 3b. If Member States decide not to differentiate efficient from inefficient networks, all data shall be reported under inefficient networks in table 3b. The same applies to 'district cooling systems to be reported in tables 4a and 4b.

Networks should be differentiated based on the fluid which is distributed through the network. The differentiation is to be made between hot water and steam systems.

Network losses are calculated in a simple way by reporting Member States: heat output delivered to the network minus heat output delivered to the customer. For cooling the same principle is applied.

Remarks on district cooling

It should be kept in mind that cooling (providing cold) is not an energy carrier but rather a useful energy category or energy service.

Only very few of the listed cooling technologies in table 2 require an energy input (absorption units and vapour compression chillers) in form of heat or electricity/gas.

Like with district heating the energy extracted from the building is measured by comparing the temperature level between the supply pipe and the return pipe in the central (cooling) plant of the network and at the point of handover in or in front of the customer's building. The aim of using a cooling network is to extract heat (= energy) from the customer's building.

Cooling is nothing else than transferring heat (= energy) from the inside to the outside of the building. It could also be called heat extraction / heat absorption / heat removal e.g. by the district cooling network or a decentralised absorption chiller attached to a district heating network.

⁴ The examples apply to heat and cold.

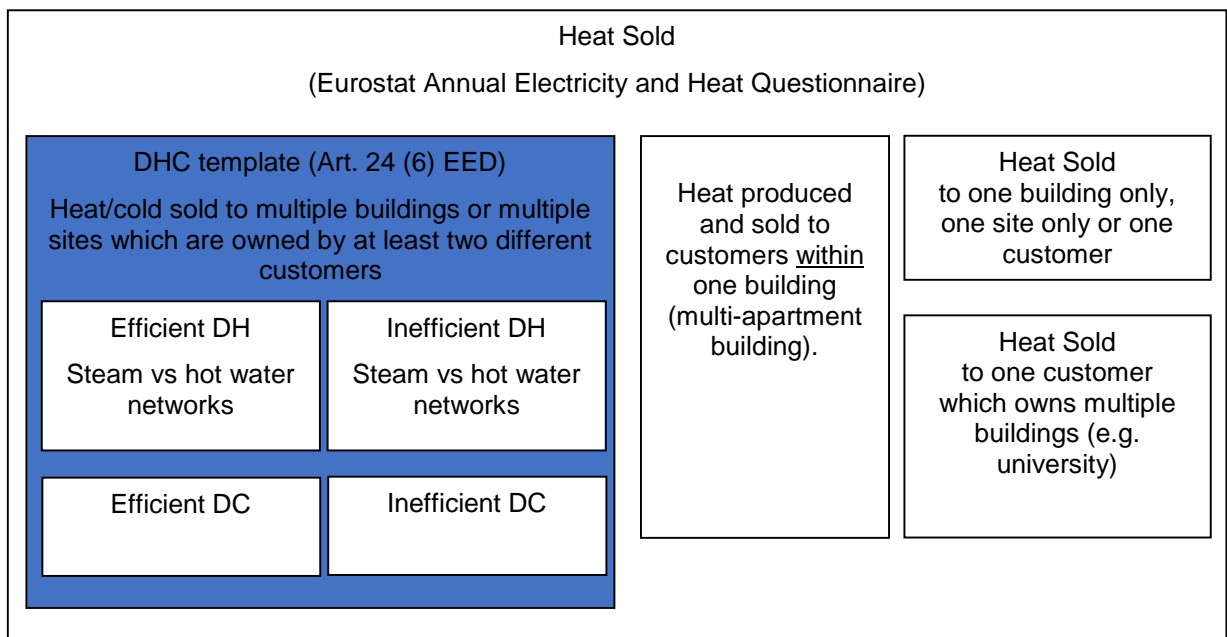
The setup of district cooling networks can vary of course. However, two different schemes dominate for the moment:

1. (Independent) district cooling networks separate from other systems (e.g. district heating) with a network consisting of two closed pipe circuits (supply pipe circuit and return pipe circuit) and the district cooling (only) plant. The temperature in the supply pipe (typical temperature 6-7°C)⁵ is of course lower than in the return pipe (typical temperature 12-17°C)⁵. The water/fluid in the return pipe is cooled down in district cooling plant and then entered into the supply pipe again. The equipment used in the district cooling plant can vary and depends a lot from the available energy source(s). There are many different possible energy sources which can be used to cool down the return water (free cooling, use of waste heat etc.).
2. The cooling service is attached to a district heating network. The cold is produced very near to the customer (decentral) in an absorption chiller, which needs heat as energy input. This heat is provided by a district heating network.

The aim of any technology used for DC is to remove excess heat (= energy) from a customer's building.

The wording 'cooling energy' is misleading as it refers in fact to heat extraction or heat removal.

Cooling is not an energy supply but rather an energy (= heat) removal.



⁵ Euroheat and Power, district cooling check this link <http://seedengr.com/Cooling%20More%20with%20Less.pdf> page 11

3 Instructions for completing table 1

Technologies covered:

Rows 1, 2, 3 and 4 cover combined heat and power units (CHP, sometimes referred to as cogeneration). They refer to plants which simultaneously generate electricity and/or mechanical energy as well as heat. The technologies covered under this category include:

1. Combined cycle gas turbine with heat recovery
2. Gas turbine with heat recovery
3. Internal combustion engine
4. Steam backpressure turbine
5. Steam condensing extraction turbine
6. others (includes microturbines, stirling engines, fuel cells, steam engines, organic Rankine cycles and any other type of technology or combination thereof falling under the above definition of CHP)

The CHP template for the CHP data collection under Art. 24(6) EED will collect data on CHP electrical (MW_{el}) and thermal capacities (MW_{th}) as well as electricity (MW) and heat outputs (TJ) for CHP plants delivering heat into a District Heating (DH) network.

The DHC template collects aggregated CHP data only. Data should be reported in the DHC template on a unit-by-unit basis (i.e. only for the CHP units on site rather than including the whole plant which may also include auxiliary boilers for example).

Rows 5 to 8 cover units which produce heat only. Reduction heat is included in **rows 5 and 6**. Reduction heat is described in annex I of the reporting instructions of Combined Heat and Power (CHP) generation (page 27).

Row 9 covers heat recovery units recovering heat from chemical processes and other processes (e.g. surplus heat from industrial processes, manufacturing processes, data centres, metro systems or any other process). Only units are to be reported here which recover the heat after chemical or other processes took place in order to use it for a district heating system and if this surplus heat would have been otherwise dissipated unused into the air or water. Heat produced by CHP plants are not to be reported here.

Heat produced by CHP plants are to be reported in **rows 1, 2, 3 and 4**. Heat from municipal and industrial waste (renewable and non-renewable) if burned for heat production is to be reported in **rows 1, 2, 5 and 6**.

Technologies shown in **rows 4 and 9** are not comparable and are only considered as passive energy systems. Energy consumed by technologies in **rows 1 to 3** is included in the national energy balance.

Units which can produce heat and cold at the same time should be reported twice. Once in table 1 (for heat production capacity and production) and another time in table 2 (for cold production capacity and cold production/heat extraction).

Fuels used by generation units:

Rows 1 and 5 cover all units using the following non-renewable fuel input (as defined in energy statistics):

1. Hard coal and patent fuels
2. Sub-bituminous coal
3. Lignite/brown coal and BKB
4. Peat
5. Coke-oven gas
6. Blast furnace and oxygen steel furnace gas
7. Other solid coal products
8. Residual fuel oil
9. Refinery gas
10. Other liquid fossil fuels
11. Natural gas and gas works gas
12. Nuclear heat
13. Industrial waste: Wastes of industrial non-renewable origin (solids or liquids).
14. Municipal solid waste (non-renewable): Wastes produced by households, industry, hospitals and the tertiary sector which are non-biodegradable materials incinerated at specific installations.

Rows 2 and 6 cover all units using the following renewable fuel input (as defined in energy statistics):

1. Solid biomass
2. Municipal solid waste (renewable): Wastes produced by households, industry, hospitals and the tertiary sector which are biodegradable materials incinerated at specific installations.
3. Biogas
4. Liquid biofuels
5. Other renewables: Any other renewables not mentioned explicitly.

Row 3 covers all units using the following input (as defined in energy statistics):

1. Geothermal energy
2. Solar energy.

Row 4 covers CHP units which use heat as the main input which is recovered from chemical processes and other processes (e.g. surplus heat from industrial processes, manufacturing processes, data centres, metro systems or any other process) e.g. to run the steam turbine. If recovered heat from chemical processes and other processes is not the main fuel input, the data of this CHP unit should be reported following the current method of the Annual Electricity and Heat Questionnaire in **rows 1, 2 or 3**.

Row 7 covers all units using electricity as an input. This contains e.g. electric boilers. These are boilers using the Joule effect in electric resistance heating elements.

Row 8 covers all units using the following input (as defined in energy statistics):

1. Geothermal energy
2. Ambient heat
3. Solar energy.

Row 9 covers heat recovery units recovering heat from chemical processes and other processes (e.g. surplus heat from industrial processes, manufacturing processes, data centres, metro systems or any other process). Only units are to be reported here which recover the heat after chemical or other processes took place in order to use it for a district heating system and if this surplus heat would have been otherwise dissipated unused into the air or water. Heat extracted from district cooling return water by means of heat pumps can be reported here. Heat produced by CHP plants is not to be reported here. Heat produced by CHP plants is to be reported in **rows 1, 2, 3 and 4**.

Heat from municipal and industrial waste (renewable and non-renewable) if burned for heat production is to be reported in the **rows 1, 2, 5 and 6**.

Reporting for CHP units:

The **installed heat capacity**⁶ of a CHP unit is the **net** capacity of the heat exchanger which is located at the handover from the CHP unit to a DH network. This should be reported in MW_{th} in **fields A1 to A4**.

Net heat output⁷ includes all useful heat generated by a CHP plant that is delivered to a district heating network. It is the proportion of heat generated in a CHP plant which is delivered to a DH network to be consumed by other customers connected to the network. It excludes the proportion of heat generated in a CHP plant consumed on site by the plant owner. The net heat output should be reported in TJ in **fields B1 to B4, C1 to C4 and D1 to D4**.

Reporting for heat-only units:

The **installed heat capacity** for the heat-only unit is the capacity of the heat exchanger which is located at the handover from the **heat-only units** connected to a DH network and should be entered in MW_{th} in **fields A5 to A7** of table 1. **Heat pumps are not to be reported here**. Heat pumps shall be reported depending on their heat source in **rows 8 or 9** by indicating the capacity of the heat exchanger.

Heat from ground (geothermal) or solar resources (solar collectors) can be recovered via a **heat exchanger** and delivered to a district heating network. The capacity from heat only units using geothermal energy, ambient heat or solar energy (solar collectors) shall be reported in MW in **field A8**. If geothermal energy, ambient heat or solar energy heat is upgraded with a heat pump it should be covered by reporting the capacity of the heat exchanger only.

Net Heat output⁷ includes all heat generated from the heat-only plant that is connected to a district heating network, and should be entered in TJ in **fields B5 to B8, C5 to C8 and D5 to D8** of table 1. It is the proportion of heat generated in a heat-only plant which is delivered to a DH network to be consumed by other customers connected to the network. It excludes the proportion of heat generated in a heat-only plant which is consumed on site by the plant owner.

Reporting for heat recovery units recovering heat from chemical processes or other processes (e.g. surplus heat from industrial or other processes):

Heat from chemical processes and other processes (e.g. surplus heat from industrial processes, manufacturing processes, data centres, metro systems or any other process) can be recovered via a **heat exchanger** and delivered to a district heating network. The capacity of the **heat exchanger** shall be reported which is located at the handover after the chemical or other processes to a DH network. If the heat from chemical or other processes is upgraded with a heat pump it should be covered by reporting the capacity of the heat exchanger only in **field A9**.

Net Heat output⁷ includes all heat recovered from chemical processes and other processes injected into a district heating network. The net heat output is to be reported in TJ in **fields B9, CP and D9**. In case of chemical and industrial waste heat direct recovery it is referred to the heat injected into the DH network. It excludes the proportion of heat which is consumed on site.

If you cannot provide data for steam (**column D**), please inform about this in the remarks page.

⁶ If the unit uses different fuel inputs, the installed heat capacity should be reported following the current method for electrical capacity of the Annual Electricity and Heat Questionnaire. For municipal waste, the Annual Electricity and Heat Questionnaire does not break down into renewable and non-renewable capacity, For this data collection, the capacity should be broken down according to the heat output.

⁷ Net heat output (TJ) is the heat supplied to the distribution system as determined by measurements of the outgoing and return flows. It is the gross heat produced by the installation excluding the heat used by the installation's auxiliaries which use a hot fluid (space heating, liquid fuel heating etc.) and losses in the installation/network heat exchangers.

4 Instructions for completing table 2

Technologies covered:

Rows 1 and 2 cover absorption heat pumps (or absorption chillers) that use heat to extract heat from the cooling medium (liquid) and consume electrical energy to run the cycle. Thermally-driven cooling (absorption cooling), can be used for cooling the liquid in the return pipe using hot water/steam with relatively high temperatures (best above 120 °C) as the energy driving the process. The heat used in absorption chillers can be provided by solar thermal energy, waste heat from power production (CHP), geothermal heat.

Row 3 refers to plants – often fed by electricity – that remove heat from a liquid via a vapour-compression cycle. This liquid can then be circulated through a heat exchanger to cool air or equipment as required.

Row 4 refers to cold recovery technologies which extract freely-available cold water (free cooling) from, for example, oceans, lakes, rivers or aquifers (groundwater, seasonal storage). Free cooling sources are used to lower the temperature in the return pipe of the network (i.e. heat is extracted) which results in a low temperature cooling medium in the supply pipe.

Row 5 refers to any other technology for cooling (e.g. absorption chillers using surplus heat from industrial processes, manufacturing processes, data centres, metro systems or any other process). This includes also heat recovered from industrial processes and other processes.

Fuels used by generation units:

Row 1 covers all units using the following non-renewable energy input (as defined in energy statistics):

1. Hard coal and peat fuels
2. Sub-bituminous coal
3. Lignite/brown coal and BKB
4. Peat
5. Coke-oven gas
6. Blast furnace and oxygen steel furnace gas
7. Other solid coal products
8. Residual fuel oil
9. Refinery gas
10. Other liquid fossil fuels
11. Natural gas and gas works gas
12. Nuclear heat
13. Industrial waste: Wastes of industrial non-renewable origin (solids or liquids).
14. Municipal solid waste (non-renewable): Wastes produced by households, industry, hospitals and the tertiary sector which are non-biodegradable materials incinerated at specific installations.

Row 2 covers all units using the following renewable energy input (as defined in energy statistics):

1. Solid biomass
2. Municipal solid waste (renewable): Wastes produced by households, industry, hospitals and the tertiary sector which are biodegradable materials incinerated at specific installations.
3. Biogas
4. Liquid biofuels
5. Other renewables: Any other renewables not mentioned explicitly.
6. Geothermal energy
7. Solar energy

Row 3 covers all units using vapour compression cycles, often with electricity as energy input.

Row 4 covers all units using the following input (as defined in energy statistics): Free cooling (cold water from lakes, rivers, seasonal storage below surface etc.).

Row 5 covers all other technologies used for cooling (e.g. using surplus heat from industrial processes, manufacturing processes, data centres, metro systems or any other process)

Also chemical processes and other processes are reported here if the following condition is fulfilled:

- Only units are to be reported here which recover the cold after chemical or other processes took place in order to use it for a district cooling system and if this surplus cold would have been otherwise dissipated unused into the air or water.

Reporting for absorption units:

The **installed net cooling capacity** is the maximum rated cooling supply capacity of an absorption chiller that is connected to a DC network in MW_{th} and should be provided in **fields A1 and A2 of table 2**.

Net heat removal¹⁰ includes all heat removed from the return pipe in an absorption chiller that is connected to a district cooling network⁸. It should be entered in TJ in **fields B1 and B2**. It is the proportion of energy removed by the plant from the DC network (or the DC customer, in case the system is set up according to option 2 on page 5) which received the heat from customers connected to the network. It excludes the proportion of heat removed from the plant itself in order to cool it down (own use).

Reporting for vapour compression chiller units (electric or gas chillers):

The **installed net cooling capacity** is the nameplate capacity in MW_{th} of the electric chiller that is connected to a DC network. It should be entered in **field A3**.

Net heat removal¹⁰ includes all heat removed from the return pipe in an absorption chiller that is connected to a district cooling network⁹. It should be entered in TJ in **field B3**. It is the proportion of energy removed by the plant from the DC network which received the heat from customers connected to the network. It excludes the proportion of heat removed from the plant itself in order to cool it down (own use).

Reporting for free cooling units (lakes, rivers....) and chemical and other processes:

The **installed net cooling capacity** is the nameplate capacity of the heat exchanger that delivers cooling recovered from lakes, rivers and seasonal storage below the surface and cold from chemical processes and other processes to the DC network in MW_{th} . It should be reported in **field A4**.

Net heat removal¹⁰ includes all heat removed from the return pipe in an absorption chiller that is connected to a district cooling network¹⁰. It should be entered in TJ in **field B4**. It is the proportion of energy removed by the plant from the DC network which received the heat from customers connected to the network. It excludes the proportion of heat removed from the plant itself in order to cool it down (own use).

Reporting for other technologies:

Should **row 5** be used please shortly describe the technology used in the remarks page and report the net cooling capacity in **field A5** and the net heat removed according to the examples given above in **field B5**.

Only technologies listed in **rows 1 – 3** require energy input and they are included in the national energy balances of the Member States. In contrast to the technologies in **rows 1 – 3**, **row 4** lists technologies merely recycling heat (ambient) or using heat produced for other purposes (waste heat).

5 Instructions for completing tables 3a, 3b, 4a and 4b

Article 2 (41) EED defines efficient district heating as 'district heating systems using at least 50% renewable energy, 50% waste heat, 75% cogenerated heat or 50% of a combination of such energy and heat'.

The compliance of district heating systems with this definition shall be evaluated on the basis of the net heat output of each generation unit. The same approach used for the Annual Electricity and Heat Questionnaire to calculate renewable heat for multi input boilers shall be applied. The net heat output of each generation unit has to be set in relation to the total net heat provided to the district heating network. Therefore, the 'efficiency' criteria refer to the average of all connected generation units, not to each generation unit itself.

Networks fulfilling these criteria shall be reported in table 3a. All others networks are considered as inefficient according to the EED. They shall be reported in table 3b. If Member States decide not to differentiate efficient from inefficient networks, all data shall be reported under inefficient networks in table 3b. This should be indicated in cell B6.

Concerning 'district cooling systems to be reported in tables 4a and 4b, the compliance with the definition should be evaluated bearing in mind the following principles:

- Renewable energy, in case of cooling is only the energy used to run absorption chillers
- Free cooling is efficient by definition
- Renewable energy, waste heat and cogenerated heat should be compared with the total energy input used to extract heat from the system.

Net heat output delivered to district heating customers in TJ

Row 1 represents the total quantity of heat energy delivered to the heat customers metered at the point of delivery in TJ.

The heat energy delivered shall be differentiated between heat delivered to the industrial sector (row 1a), residential and services sector (row 1b) and the transport, agriculture/forestry, fishing, non-specified (others) sectors (row 1c).

Furthermore a differentiation between the transfer media in the network (water or steam) is asked for in **columns B and C**.

Number of district heating networks

Total number of district heating networks according to the definition of this data collection under Art. 24(6) EED.

As there is no clear definition as to what exactly a district heating network is, Member States are asked to report their national definition in a summarised form in the remarks page.

Length of district heating networks – in km

It is the sum of the length of pipes constituting the distribution line designed for the maximum heat flow. The length of all pipes shall be reported that are used by more than one customer (including the return pipes). Sections which connect the main distribution line to one single consumer shall not be reported.

Number of district heating customers

Total number of customers connected to district heating networks according to the definition of this data collection under Art. 24(6) EED.

Net heat removed from district cooling networks, in TJ

Represents the quantity of energy in form of heat removed from customers of district cooling networks, metered at the point of handover from the customer's building to the district cooling network, in TJ.

Cooling network – Number of networks

Total number of district cooling networks according to the definition of this data collection under Art. 24(6) EED.

As there is no clear definition as to what exactly a district cooling network is, Member States are asked to report their national definition in a summarised form in the remarks page.

Length of district cooling networks - in km

It is the sum of the length of pipes constituting the distribution line designed for the maximum cooling flow. The length of all pipes shall be reported that are used by more than one customer (including the return pipes). Sections which connect the main distribution line to one consumer shall not be reported.

Number of district cooling customers

Total number of customers connected to district cooling networks according to the definition of this data collection under Art. 24(6) EED.