epd-norway
Global Program Operator

# Environmental Product Declaration

## In accordance with ISO 14025

## District heating in Bergen Eviny Termo

**Owner of the declaration:**
Eviny Termo AS

**Product name:**
District heating in Bergen area

**Declared unit:**
1 kWh

**Product category /PCR:**
PCR for electricity, steam and hot/cold water generation and distribution

**Program holder and publisher:**
The Norwegian EPD foundation

**Declaration number:**
NEPD-6640-5887-EN

**Registration Number:**
NEPD-6640-5887-EN

**Issue date:** 21.05.2024

**Valid to:** 21.05.2029

The Norwegian
EPD Foundation

# General information

## Product:
District heating Bergen

## Program holder:
The Norwegian EPD Foundation
Post Box 5250 Majorstuen, 0303 Oslo, Norway
Phone: +47 23 08 80 00
E-mail: post@epd-norge.no

## Declaration Number:
NEPD-6640-5887-EN

## This declaration is based on Product Category Rules:
PCR for electricity, steam and hot/cold water generation and distribution. PCR 2007:08, version 4.2, dated 2021-04-26.

## Statements:
The owner of the declaration shall be liable for the underlying information and evidence. EPD Norway shall not be liable with respect to manufacturer, life cycle assessment data and evidences.

## Declared unit:
-

## Declared unit with option:
-

## Functional unit:
1 kWh district heat produced and delivered at customer unit.

## Verification:
Independent verification of the declaration and data, according to ISO14025:2010

internal ☐ external ☒

Ellen Soldal
Independent verifier approved by EPD Norway

## Owner of the declaration:
Eviny Termo AS
Contact person: Håkon Hammer Eikefet
Phone: +47 93 00 90 52
e-mail: hakon.eikefet@eviny.no

## Manufacturer:
Eviny Termo AS

## Place of production:
Bergen, Vestland, Norway

## Management system:
ISO 14001

## Organisation no:
979 427 697

## Issue date:
21.05.2024

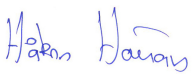
## Valid to:
21.05.2029

## Year of study:
2024

## Comparability:
EPDs from other programmes than The Norwegian EPD Foundation may not be comparable.

## The EPD has been worked out by:
Kaja Daviknes Sørgard, Tora Eidsmoen and Oddbjørn Dahlstrøm Andvik

Approved



Manager of EPD Norway

# Product

## Product description:

Eviny's district heating is mainly produced at the waste incinerator located in the southern part of Bergen, Rådal. The network route covers over 100 km, and the system also includes three energy centrals. The heat is mainly produced from waste incineration (89 %), and the peak load is covered by biofuels and flexible electricity.

## Technical data:

The table below shows average produced heat for the years 2021, 2022 and 2023 in Eviny's district heating system. The table also contains information on heat produced and heat delivered to customers unit, hence the loss in the distribution system.

*Table 1: Energy production per energy carrier in Eviny's district heating system in Bergen.*

| Energy carrier | Unit | Amount |
|---|---|---|
| Waste incineration | MWh | 297 433 |
| Biooil | MWh | 16 690 |
| Flexible electricity | MWh | 9 064 |
| | | |
| Heat delivered to distribution network | MWh | 323 187 |
| Heat delivered to customer | MWh | 281 589 |
| Loss of heat in distribution | % | 13 |

## Market:

The Eviny district heating system serves customers in the Bergen area who are connected to the district heating network operated by Eviny Termo, from the south-west to the city centre further north as shown in the map below.

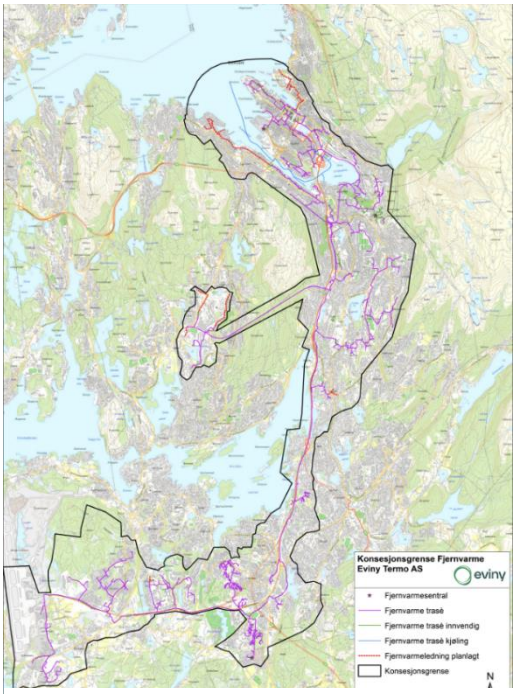



*Figure 1: Map of Eviny's district heating system, with borders marked in black.*

### Reference service life infrastructure:

*Table 2: Reference service lifetime for infrastructure included in the system.*

| | Reference service life | Power (total) |
|---|---|---|
| Energy central | 60 years | |
| Distribution network | 50 years | |
| Oil boiler | 40 years | 48 000 kW |
| Heat exchanger | 30 years | 90 MW |
| Oil tank | 60 years | |
| Electrical boiler | 30 years | 43 000 kW |

# LCA: Calculation rules

### Functional unit:

1 kWh of district heat delivered to customer unit. As shown in Table X there is a loss in the distribution network and therefore Eviny Termo has to produce 1,15 kWh to deliver 1 kWh of district heating to the customer.

### Cut-off criteria:

All important raw materials and significant energy use is included. The production of raw materials and energy streams that contribute with small amounts (<1 %) is not included. The cut-off criterias does not apply for hazardous materials.

### Allocation:

The allocation follows PCR 2007:08, v.4.2. The PCR practice the “Polluter Pays”- principle, and therefore the emissions from collection, transport and incineration of waste is allocated to the waste producer. Emissions related to necessary equipment to recover the heat is allocated to the district heat.

### Data quality:

Specific data about energy, operation and infrastructure from 2021, 2022 and 2023 is gathered by Eviny for this EPD and the results are based on a three year average of operating the district heating system in Bergen. Generic data is from ecoinvent v.3.9.1, “cut-off by classification”. No data is older than 10 years old.

### System boundary:

The system is divided into three modules in accordance with the PCR: Upstream, Core and Downstream. The flow chart below represents the system. The input with dotted lines is not included in the main analysis in accordance with the PCR allocation rules.

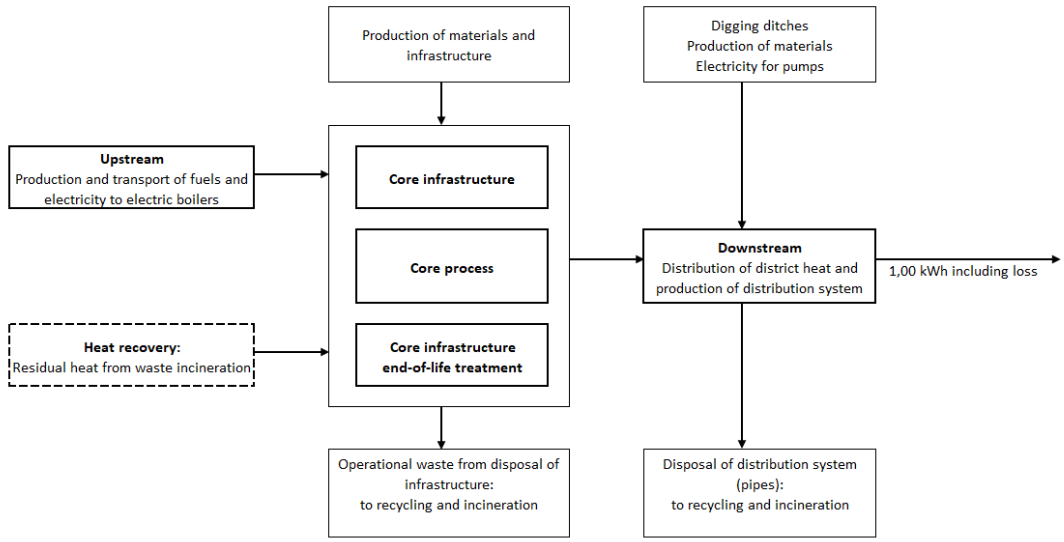



*Figure 2: Flow chart of the system boundaries for the district heating system.*

The upstream module includes production and transport of fuels and electricity used as energy source in the core process. The core module consists of the production and decommissioning of energy centrals, boilers, heat exchangers, consumption of water and handling of operational waste. The downstream module includes the construction and decommissioning of the distribution network, in addition to the operation of the pumps in the network.

# LCA: Scenarios and additional technical information

The following information describe the scenarios in the different modules of the EPD. Downstream heat distribution is included. This module includes infrastructure for the heat distribution network and heat loss across the distribution network.

There are no emissions related to the use of the product.

## System boundaries (X=included, MNR=module not relevant)

*Table 3: Overview of the included and not relevant live cycle stages related to the modules as stated in the PCR.*

| | Product stage | | | Assembly stage | | Use stage | | | | | | | End of life stage | | | | Beyond system boundaries |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| According to NS 3720 life cycle modules | Raw materials | Transport | Manufacturing | Transport | Assembly | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | De-construction and demolition | Transport | Waste processing | Disposal | Reuse-Recovery-Recycling-potential |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| | X | X | X | X | X | X | X | X | X | X | X | X | MNR | MNR | MNR | MNR | MNR |
| PCR | Upstream | | Core | | | Downstream | | | | | | | Not relevant for the product | | | | |

# LCA: Results

Eviny's district heating system is mainly based on the recovery of heat from waste incineration (89 %) and thus the main environmental burden found in this analysis occurs in the downstream module with the construction and decommissioning of the distribution network.

In the following tables the LCA results are presented per module in accordance with the PCR. The results include the losses between heat production and customer units (in the distribution network).

## Environmental impact

*Table 4: Results for environmental impact categories per module.*

| Parameter | Unit | Upstream | Core | Downstream | 1 kWh heating, delivered to the customer |
|---|---|---|---|---|---|
| GWP – total | kg CO2 -eq. | -5,17E-06 | 2,69E-04 | 2,28E-03 | 2,55E-03 |
| GWP - fossil | kg CO2 -eq. | 1,08E-05 | 2,27E-04 | 2,20E-03 | 2,44E-03 |
| GWP - biogenic | kg CO2 -eq. | -1,60E-05 | 4,16E-05 | 7,60E-05 | 1,02E-04 |
| GWP - LULUC | kg CO2 -eq. | 1,79E-08 | 8,11E-07 | 7,75E-06 | 8,58E-06 |
| ODP | kg CFC11-eq. | 4,91E-13 | 3,62E-12 | 4,99E-11 | 5,40E-11 |
| POCP | kg NMVOC-eq. | 4,58E-08 | 1,30E-06 | 9,06E-06 | 1,04E-05 |
| AP | kg mol H+eq. | 1,23E-07 | 2,36E-06 | 1,05E-05 | 1,30E-05 |
| EP – fresh water | kg P-eq. | 1,65E-09 | 1,68E-08 | 1,43E-07 | 1,62E-07 |
| EP – marine | kg N-eq. | 1,84E-07 | 3,18E-07 | 2,29E-06 | 2,80E-06 |
| EP - terrestrial | Mol N-eq. | 8,52E-07 | 4,53E-06 | 2,42E-05 | 2,96E-05 |
| ADPM | kg Sb-eq. | 1,67E-10 | 2,38E-08 | 6,81E-08 | 9,21E-08 |
| ADPE | MJ | 1,14E-04 | 2,52E-03 | 3,16E-02 | 3,43E-02 |
| WDP | M3 | 6,41E-06 | 1,80E-04 | 9,64E-04 | 1,15E-03 |

***GWP-total**: Global Warming Potential; **GWP-fossil**: Global Warming Potential fossil fuels; **GWP-biogenic**: Global Warming Potential biogenic; **GWP-LULUC**: Global Warming Potential land use and land use change; **ODP**: Depletion potential of the stratospheric ozone layer; **POCP**: Formation potential of tropospheric photochemical oxidants; **AP** Acidification potential of land and water; **EP-freshwater:** Eutrophication potential, fraction of nutrients reaching freshwater end compartment; **EP-marine:** Eutrophication potential, fraction of nutrients reaching the sea end compartment; **EP-terrestrial:** Eutrophication potential, Accumulated Exceedance; **ADPM:** Abiotic depletion potential for non fossil resources; **ADPE**: Abiotic depletion potential for fossil resources; **WDP:** Water depletion potential*

Reading example: 9,0 E-03 = $9{,}0*10^{-3}$ = 0,009

## Resource use

*Table 5: Results for resource use categories per module.*

| Parameter | Unit | Upstream | Core | Downstream | 1 kWh heating, delivered to the customer |
|---|---|---|---|---|---|
| RPEE | MJ | 3,46E-04 | 1,16E-03 | 6,42E-02 | 6,57E-02 |
| RPEM | MJ | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| TPE | MJ | 3,46E-04 | 1,16E-03 | 6,42E-02 | 6,57E-02 |
| NRPE | MJ | 1,14E-04 | 2,52E-03 | 3,16E-02 | 3,43E-02 |
| NRPM | MJ | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |

| | | | | | |
|---|---|---|---|---|---|
| TRPE | MJ | 1,14E-04 | 2,52E-03 | 3,16E-02 | 3,43E-02 |
| SM | kg | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| RSF | MJ | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| NRSF | MJ | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| W | m3 | 1,33E-06 | 9,69E-06 | 4,60E-04 | 4,71E-04 |

***RPEE*** *Renewable primary energy resources used as energy carrier;* ***RPEM*** *Renewable primary energy resources used as raw materials;* ***TPE*** *Total use of renewable primary energy resources;* ***NRPE*** *Non renewable primary energy resources used as energy carrier;* ***NRPM*** *Non renewable primary energy resources used as materials;* ***TRPE*** *Total use of non renewable primary energy resources;* ***SM*** *Use of secondary materials;* ***RSF*** *Use of renewable secondary fuels;* ***NRSF*** *Use of non renewable secondary fuels;* ***W*** *Use of net fresh water*

### End of life – Waste

*Table 6: Results for waste disposed per module.*

| Parameter | Unit | Upstream | Core | Downstream | 1 kWh heating, delivered to the customer |
|---|---|---|---|---|---|
| HW | kg | 9,99E-09 | 1,85E-06 | 4,18E-06 | 6,04E-06 |
| NHW | kg | 3,71E-06 | 1,09E-04 | 8,66E-04 | 9,78E-04 |
| RW | kg | 2,79E-10 | 5,03E-09 | 1,13E-07 | 1,18E-07 |

***HW*** *Hazardous waste disposed;* ***NHW*** *Non hazardous waste disposed;* ***RW*** *Radioactive waste disposed*

### End of life – output flow

*Table 7: Results for waste output flows per module.*

| Parameter | Unit | Upstream | Core | Downstream | 1 kWh heating, delivered to the customer |
|---|---|---|---|---|---|
| CR | kg | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| MR | kg | 0,00E+00 | 2,21E-02 | 0,00E+00 | 2,21E-02 |
| MER | kg | 0,00E+00 | 5,55E-02 | 0,00E+00 | 5,55E-02 |
| EEE | MJ | INA | INA | INA | INA |
| ETE | MJ | INA | INA | INA | INA |

***CR*** *Components for reuse;* ***MR*** *Materials for recycling;* ***MER*** *Materials for energy recovery;* ***EEE*** *Exported electric energy;* ***ETE*** *Exported thermal energy.*

*INA: Indicator not assessed.*

Reading example: 9,0E-03 = $9{,}0*10^{-3}$= 0,009

# Additional requirements

### Greenhous gas emission from the use of electricity in the manufacturing phase

National production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process (A3).

| Electricity mix | Data source | Amount | Unit |
|---|---|---|---|
| Low voltage for market, NO | Ecoinvent 3.9.1 | 38,9 | g $CO_2$ eq./kWh |
| Low voltage residual mix for market, NO | Ecoinvent 3.9.1 | 521 | g $CO_2$ eq./kWh |

Emission factor for the NO market mix (Low voltage for market, NO) is used for upstream, core and downstream processes.

| Electricity mix | Upstream [kWh/FU] | Core [kWh/FU] | Downstream [kWh/FU] | $GWP_{Total}$ [g CO2 ekv/ kWh] | SUM [kg CO2 ekv/ FU] |
|---|---|---|---|---|---|
| Low voltage for market, NO | 2,8E-05 | 1,49E-04 | 1,35E-05 | 38,9 | 7,39E-06 |
| Low voltage residual mix for market, NO | 2,8E-05 | 1,49E-04 | 1,35E-05 | 521 | 9,90E-05 |

## Dangerous substances

The product contains no substances given by the REACH Candidate list or the Norwegian priority list.

## Indoor environment

Not relevant.

# Bibliography


| | |
|---|---|
| ISO 14025:2010 | Environmental labels and declarations - Type III environmental declarations - Principles and procedures |
| ISO 14044:2006 | Environmental management - Life cycle assessment - Requirements and guidelines |
| Environdec, 2021 | ELECTRICITY, STEAM AND HOT WATER GENERATION AND DISTRIBUTIONPRODUCT CATEGORY CLASSIFICATION: UN CPC 171, 173, 2007:08, version 4.2. E. International, EPD International |
| Sørgard, Kaja D., 2024 | Eviny district heating LCA report, by Asplan Viak AS, Bergen, Norway 2024. |



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