epd-norway
Global Program Operator

Environmental Product Declaration

In accordance with ISO 14025

Hafslund Oslo Celsio

The Norwegian
EPD Foundation

Owner of the declaration:
Hafslund Oslo Celsio

Program holder and publisher:
The Norwegian EPD foundation

Declaration number:
NEPD-3786-2721-EN

Registration Number:
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Issue date: 10.10.2022
Valid to: 22.10.2027

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Product name

District cooling

Name
Hafslund Oslo Celsio

General information

Product:
District cooling

Program Holder:
The Norwegian EPD Foundation
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Email: post@epd-norge.no

Declaration Number:
NEPD-3786-2721-EN

This declaration is based on Product Category Rules:
PCR for electricity, steam and hot/cold water generation and distribution. PCR 2007:08, v.4.2 (Environdec 2021)

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

Declared unit:
-

Declared unit with option:
-

Functional unit:
1 kWh of district cooling produced and delivered to customers.

Verification:
Independent verification of the declaration and data, according to ISO14025:2010, 8.1.3 and 8.1.4.

internal ☐ external ☒

Sign

Ole M. K. Iversen
(Independent verifier approved by EPD Norway)

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Place of production:
Oslo

Management system:
ISO 14001 and ISO 9001

Organisation no:
977296919

Issue date:
10.10.2022

Valid to:
10.10.2027

Year of study:
2022

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

The EPD has been worked out by:
Maciej Biedacha and Ellen Soldal

Approved (Manager of EPD Norway)

Product

Product description:

Cold water is produced by cooling machines at Ulven in Oslo. The cold water is distributed to customers located at Økern/Ulven through Celsio's district cooling network. Surplus heat from the cooling production is utilized to heating purposes to the extent possible, and the remaing heat is dumped through various technologies.

Market:

District cooling customers that are connected to the network operated by Celsio at Økern/Ulven.

Reference service life:

Infrastructure component	Expected life-time
Buildings	60 years
Distribution network	50 years
Heat pumps	20 years

LCA: Calculation rules

Functional unit:

1 kWh of district cooling produced and delivered to customers.

Data quality:

Celsio has provided specific data on energy goods, infrastructure and produced cooling. Generic data is from ecoinvent v. 3.8, cut-off by classification (Wernet, Bauer et al. 2016). No data is older than 10 years.

Allocation:

Allocation procedures follow the PCR 2007:08, v.4.2.

System boundary:

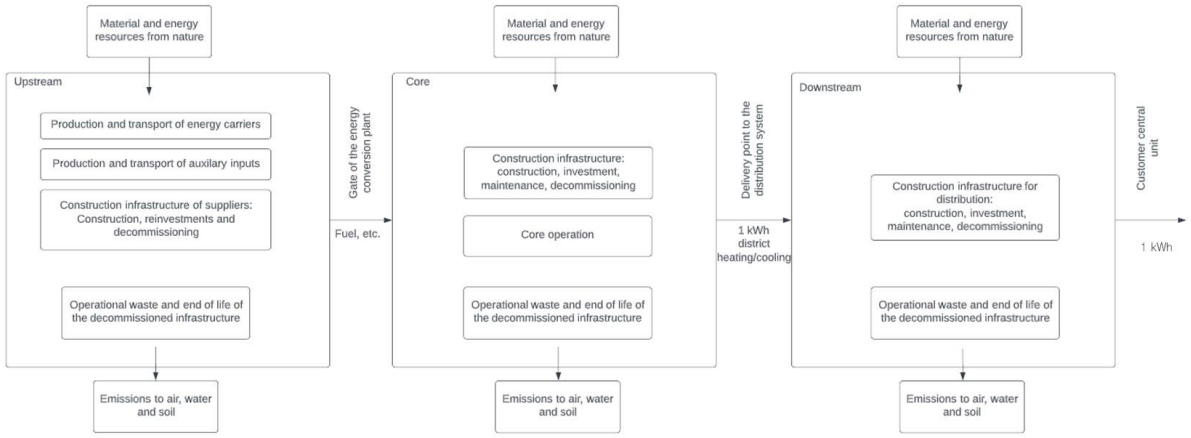

Figure 1: Technical flow chart of the system

Upstream, core and downstream modules are included. The upstream module includes the production and distribution of electricity used as an energy carrier. The core module includes construction, annual investment and waste management of the energy conversion plant's infrastructure. The downstream module includes construction, annual investment and waste management of distribution networks and customer centrals.

Cut-off criteria:

All major raw materials and energy are included. Materials and energy used in small amounts (<1%) may be excluded. This cut-off rule does not apply to hazardous materials and substances. Energy consumed in office activities is excluded.

LCA: Scenarios and additional technical information

The following information describes the scenarios in the different modules of the EPD.

Downstream distribution of cooling is included. This module includes infrastructure for distribution and customer centrals.

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

LCA: Results

For the production and distribution of district cooling, the core module has the highest contribution to the GWP-total (50% of the total impact). This is followed by the upstream module (27%) and lastly the downstream module (24%). Production of black steel is the most important input. Fossile greenhouse gas emissions (GWP-fossil) per kWh district cooling delivered to the customer, is 18.2 g CO_2-eq./kWh

Core environmental impact indicators

Indicator	Unit	Upstream	Core	Downstream	1 kWh cooling, delivered to the customer
GWP-total	kg CO2 eq.	4,95E-03	9,18E-03	4,38E-03	1,85E-02
GWP-fossil	kg CO2 eq.	4,73E-03	9,12E-03	4,37E-03	1,82E-02
GWP-biogenic	kg CO2 eq.	2,03E-04	4,63E-05	2,51E-06	2,51E-04
GWP-LULUC	kg CO2 eq.	2,56E-05	1,44E-05	2,46E-06	4,24E-05
ODP	kg CFC11 eq.	1,86E-10	4,52E-10	2,59E-10	8,98E-10
AP	mol H^+ eq.	3,48E-05	6,61E-05	2,05E-05	1,21E-04
EP-freshwater	kg P eq.	2,54E-07	4,73E-07	1,90E-07	9,18E-07
EP-marine	kg N eq.	3,94E-06	9,96E-06	4,09E-06	1,80E-05
EP-terrestrial	mol N eq.	4,98E-05	1,19E-04	4,34E-05	2,13E-04
POCP	kg NMVOC eq.	1,37E-05	3,91E-05	1,89E-05	7,16E-05
ADP-M&M	kg Sb eq.	5,51E-07	4,51E-07	9,59E-08	1,10E-06
ADP-fossil	MJ	7,83E-02	9,47E-02	5,78E-02	2,31E-01
WDP	m^3	4,82E-03	2,62E-03	1,80E-03	9,24E-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;* ***AP:*** *Acidification potential. Accumulated Exceedance;* ***EP-freshwater:*** *Eutrophication potential. fraction of nutrients reaching freshwater end compartment;* ***EP-marine:*** *Eutrophication potential. fraction of nutrients reaching freshwater end compartment;* ***EP-terrestrial:*** *Eutrophication potential. Accumulated Exceedance;* ***POCP****: Formation potential of tropospheric ozone;* ***ADP-M&M****: Abiotic depletion potential for non-fossil resources (minerals and metals);* ***ADP-fossil:*** *Abiotic depletion potential for fossil resources;* ***WDP:*** *Water deprivation potential. deprivation weighted water consumption*

Additional environmental impact indicators

Indicator	Unit	Upstream	Core	Downstream	1 kWh cooling. delivered to the customer
PM	Disease incidence	2,87E-10	7,03E-10	2,79E-10	1,27E-09
IRP	kBq U235 eq.	1,65E-03	2,35E-04	1,10E-04	1,99E-03
ETP-fw	CTUe	2,42E-01	5,57E-01	1,50E-01	9,50E-01
HTP-c	CTUh	1,51E-11	6,71E-11	2,49E-11	1,07E-10
HTP-nc	CTUh	3,38E-10	7,01E-10	1,69E-10	1,21E-09
SQP	Dimensionless	3,40E-02	4,04E-02	1,29E-02	8,73E-02

PM: *Particulate matter emissions;* ***IRP:*** *Ionising radiation. human health;* ***ETP-fw:*** *Ecotoxicity (freshwater);* ***ETP-c:*** *Human toxicity. cancer effects;* ***HTP-nc:*** *Human toxicity. non-cancer effects;* ***SQP:*** *Land use related impacts/soil quality*

Classification of disclaimers to the declaration of core and additional environmental impact indicators

ILCD classification	Indicator	Disclaimer
ILCD type / level 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
ILCD type / level 2	Potential incidence of disease due to PM emissions (PM)	None
	Acidification potential. Accumulated Exceedance (AP)	None
	Eutrophication potential. Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential. Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD type / level 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential. deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2

Disclaimer 1 – This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents. occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil. from radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator

Resource use

Parameter	Unit	Upstream	Core	Downstream	1 kWh cooling. delivered to the customer
RPEE	MJ	7,55E-01	1,13E-02	2,93E-03	7,69E-01
RPEM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TPE	MJ	7,55E-01	1,13E-02	2,93E-03	7,69E-01
NRPE	MJ	7,83E-02	9,47E-02	5,79E-02	2,31E-01
NRPM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TRPE	MJ	7,83E-02	9,47E-02	5,79E-02	2,31E-01
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	m^3	5,53E-03	8,08E-05	4,66E-05	5,66E-03

RPEE *Renewable primary energy resources used as an 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 an 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

Parameter	Unit	Upstream	Core	Downstream	1 kWh cooling. delivered to the customer
HW	kg	7,41E-08	3,92E-06	3,01E-07	4,29E-06
NHW	kg	1,31E-02	1,61E-02	8,92E-03	3,81E-02
RW	kg	7,87E-07	2,38E-07	1,11E-07	1,14E-06

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

End of life – output flow

Parameter	Unit	Upstream	Core	Downstream	1 kWh cooling. delivered to the customer
CR	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MR	kg	0,00E+00	1,05E-03	6,24E-04	1,67E-03
MER	kg	0,00E+00	3,41E-06	1,43E-04	1,46E-04
EEE	MJ	0,00E+00	8,20E-06	3,86E-04	3,94E-04
ETE	MJ	0,00E+00	5,66E-05	2,66E-03	2,71E-03

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

Reading example: 9.0 E-03 = 9.0*10-3 = 0.009

Additional environmental information

Impact on climate change given in g CO_2-eq./kWh produced and distributed to customer.

Indicator	Unit	Upstream	Core	Downstream	1 kWh heating, delivered to the customer
GWP-total	g CO2 eq.	4.95	9.18	4.38	18.52
GWP-fossil	g CO2 eq.	4.73	9.12	4.37	18.22
GWP-biogenic	g CO2 eq.	0.20	0.05	0.00	0.25
GWP-LULUC	g CO2 eq.	0.03	0.01	0.00	0.04

Additional Norwegian requirements

Greenhouse gas emissions (GWP) from the use of electricity in the core module

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

Electricity mix	Data source	Unit	Value
Low voltage. NO	ecoinvent 3.8	g CO2 ekv/kWh	26.8

Dangerous substances

The product contains no substances given by the REACH Candidate list or the Norwegian priority list (of 01.01.2013).

Indoor environment

Not relevant.

Bibliography

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