Environmental Product Declaration

In accordance with ISO 14025

Owner of the declaration:
Oslofjord Varme AS

Program holder and publisher:
The Norwegian EPD foundation

Declaration number:
NEPD-3068-1731-EN

Registration Number:
NEPD-3068-1731-EN

Issue date: 12.01.2022
Valid to: 12.01.2027

The Norwegian
EPD Foundation

Product name:

District heating/cooling
Fornebu/Lilleaker/
Lysaker

Manufacturer:
Oslofjord Varme AS

General information

Product
District heating/cooling Fornebu/Lilleaker/Lysaker

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Manufacturer:
Oslofjord Varme AS
Brynsveien 2, 1338 Sandvika

Declaration number:
NEPD-3068-1731-EN

Place of production:
Fornebu/Lilleaker/Lysaker

ECO Platform reference number:

Management system:
ISO 9001, 1400, GRESB (https://gresb.com/)

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.

Organisation no:
979 994 265

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.

Issue date
12.01.2022

Valid to
12.01.2027

Declared unit:
1 kWh net of heat/cold generated, and thereafter distributed to Fornebu/Lilleaker/Lysaker.

Year of study:
Consumption data from 2018, 2019 og 2020. LCA spring 2021.

Declared unit with option:
1 kWh net of heat/cold generated, and thereafter distributed to Fornebu/Lilleaker/Lysaker.

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

Functional unit:

The EPD has been worked out by:
Oddbjørn Dahlstrøm Andvik
Asplan Viak AS

Verification:

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

☐ internal ☑ external

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

Approved
Håkon Hauan
Managing Director of EPD-Norway

Product

Product description:
The district heating and district cooling network at Lysaker and Fornebu includes an area from Stabekk in the west to Lilleaker in the east. Oslofjord Varme has a license for the entire area, which is located in both Bærum and Oslo municipality.

The district heating and district cooling network consists of 3 power plants. The production of heat at Lysaker and Fornebu is mainly based on heat pumps. All heat pumps use seawater as a heat source in winter and heat dissipation in summer. Oil boilers are used as a reserve, with bio-oil (HVO100) as energy source.

Reference service life:
40 years oil boiler(PCR)
30 years electrical boiler (PCR)
20 years heat pump (PCR)
50 years distribution net for heat and cold
60 years energy central (building)

Market:
Fornebu/Lilleaker/Lysaker

Technical data:

Mølla power plant
Seawater heat pump
- Heating: 8 700 kW
- Cooling: 9 400 kW
- Bio-oil boiler: 10 000 kW

Fornebu Nord power plant
Seawater heat pump
- Heating: 13 700 kW
- Cooling: 14 200 kW
- Bio-oil boiler: 20 000 kW

Rolfsbukta power plant
Seawater heat pump
- Heating: 16 000 kW
- Cooling: 20 000 kW
- Bio-oil boiler: 20 000 kW

For additional information, see
www.oslofjordvarme.no

LCA: Calculation rules

Declared unit:
1 kWh net of heat/cold generated, and thereafter distributed to Fornebu/Lilleaker/Lysaker.

There are losses in the distribution network. This means that with the declared unit of 1 kWh net of heat/cold generated, 0.90 kWh of heat/cold will be available at the final customer. These distribution losses will differ with different energy carriers and one should be aware of this when comparing the environmental impact of energy supplied through different energy carriers (like steam, heat or electricity).

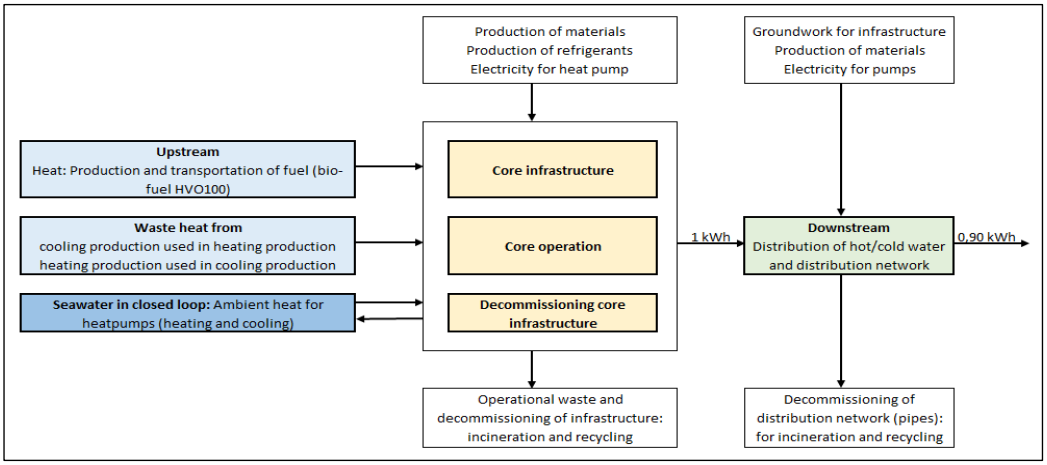
Cut-off criteria:
All major raw materials and all the essential energy is included. The production process for raw materials and energy flows that are included with very small amounts (<1%) are not included. This cut-off rule does not apply for hazardous materials and substances.

System boundary:
The system is divided in thee modules (upstream, core and downstream), according to the PCR. See technical flowchart of the system in figure. The upstream module includes production and transport of fuel oil (HVO100), only for heating.

The core infrastructure includes production and decommissioning of power plants, oil- and electricboilers, heat pumps (incl. refrigerants)

The core operation includes direct emissions from the combustion of bio-oil, consumption of electricity for heat pumps and electric boilers, leakage and new production of refrigerants, consumption of water and lubricating oil and waste handling. For recycled products, transport to recycling is included.

Downstream includes electricity for pumps and construction and decommissioning of district heating and cooling networks.



Data quality:
Inventory data has been collected for 2018, 2019 og 2020, average consumption data over 3 years is used. Generic data is from Ecoinvent v3.6 (December 2019), cut-off by classification and SimaPro v 9.1.1.1. Characterization factors according to PCR. All generic data <10 years old

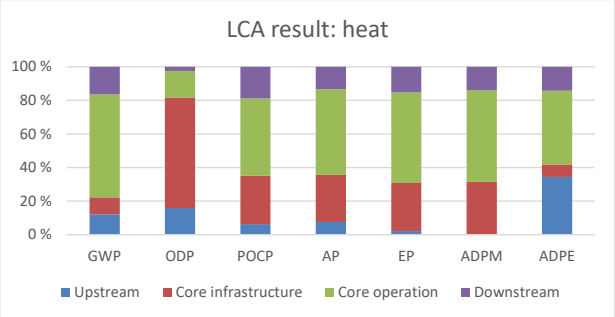
Allocation:
Allocation is in accordance with the PCR. Incoming energy, materials, leakage of refrigerants, water and waste that is not specified for the production of heat or cold are allocated between heating and cooling according to the amount of energy produced per year (MWh). This gives 70% allocation for heat and 30% allocation for cold. Impact on the primary production of recycled materials is allocated to the main product where the material was used.

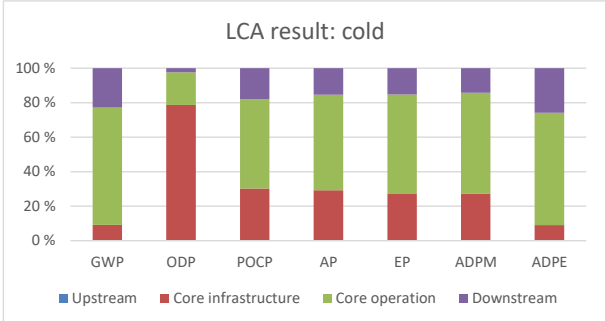
Bio-fuel oil and biogenic carbon content:
Bio-fuel oil Hydrogenated Vegetable Oil (HVO100) is used. The product can be produced from waste (incl. Used Cooking Oil (UCO), slaughter waste and agricultural waste) and / or selected vegetable oils. Palm oil has not been used as a raw material.
According to PCR, biogenic carbon from biofuels must be reported separately. B100 is purchased on a market from various manufacturers, and there are no LCA assessments available that include biogenic carbon for the used biofuel. A standardised calculation method for biogenic carbon for biofuels that also includes indirect land use changes (ILUC) is not available.
It is therefore assumed that a carbon-neutral system for biogenic carbon, where the amount of carbon dioxide emitted during combustion is equal to the amount of carbon dioxide taken up during the growth phase.

The GWP factor for biofuel used is 0.909 kg CO2 eq / liter (70% reduction from fossil fuel oil).

LCA: Results

Results are presented for heat and cold separately. LCA results are shown in the figures below. For most categories, including GWP, the largest share of environmental impact comes from core operation.





Environmental impact - heat

Parameter	Unit	Upstream	Core infrastructure	Core operation	1 kWh heat at plant	Downstream	0,90 kWh heat at customer
GWP	kg CO_2 -ekv	1,20E-03	9,97E-04	6,08E-03	**8,28E-03**	1,63E-03	**9,90E-03**
ODP	kg CFC11-ekv	9,13E-10	3,80E-09	9,12E-10	**5,62E-09**	1,39E-10	**5,76E-09**
POCP	kg C_2H_4 -ekv	2,28E-07	1,05E-06	1,67E-06	**2,95E-06**	6,83E-07	**3,63E-06**
AP	kg SO_2 -ekv	5,58E-06	2,07E-05	3,77E-05	**6,40E-05**	9,83E-06	**7,38E-05**
EP	kg PO_4^{3-}-ekv	6,62E-07	8,98E-06	1,69E-05	**2,65E-05**	4,78E-06	**3,13E-05**
ADPM	kg Sb-ekv	1,57E-09	2,23E-07	3,90E-07	**6,14E-07**	1,00E-07	**7,14E-07**
ADPE	MJ	5,61E-02	1,20E-02	7,17E-02	**1,40E-01**	2,32E-02	**1,63E-01**

Environmental impact - cold

Parameter	Unit	Upstream	Core infrastructure	Core operation	1 kWh cold at plant	Downstream	0,90 kWh cold at customer
GWP	kg CO_2 -ekv	0	8,33E-04	6,16E-03	**7,00E-03**	2,08E-03	**9,08E-03**
ODP	kg CFC11-ekv	0	3,85E-09	9,27E-10	**4,78E-09**	1,14E-10	**4,89E-09**
POCP	kg C_2H_4 -ekv	0	9,22E-07	1,58E-06	**2,50E-06**	5,50E-07	**3,05E-06**
AP	kg SO_2 -ekv	0	1,85E-05	3,50E-05	**5,35E-05**	9,77E-06	**6,33E-05**
EP	kg PO_4^{3-}-ekv	0	7,95E-06	1,69E-05	**2,49E-05**	4,50E-06	**2,94E-05**
ADPM	kg Sb-ekv	0	1,84E-07	3,95E-07	**5,79E-07**	9,61E-08	**6,75E-07**
ADPE	MJ	0	1,00E-02	7,27E-02	**8,27E-02**	2,88E-02	**1,11E-01**

GWP Global warming potential; **ODP** Depletion potential of the stratospheric ozone layer; **POCP** Formation potential of tropospheric photochemical oxidants; **AP** Acidification potential of land and water; **EP** Eutrophication potential; **ADPM** Abiotic depletion potential for non fossil resources; **ADPE** Abiotic depletion potential for fossil resources

Resource use - heat

Parameter	Unit	Upstream	Core infrastructure	Core operation	1 kWh heat at plant	Downstream	0,90 kWh heat at customer
RPEE	MJ	1,11E-04	2,03E-03	9,23E-01	**9,25E-01**	1,89E-01	**1,11E+00**
RPEM	MJ	0	0	0	**0**	0	**0**
TPE	MJ	1,11E-04	2,03E-03	9,23E-01	**9,25E-01**	1,89E-01	**1,11E+00**
NRPE	MJ	5,61E-02	1,20E-02	7,17E-02	**1,40E-01**	2,32E-02	**1,63E-01**
NRPM	MJ	0	0	0	**0**	0	**0**
TRPE	MJ	5,61E-02	1,20E-02	7,17E-02	**1,40E-01**	2,32E-02	**1,63E-01**
SM	kg	0	0	0	**0**	0	**0**
RSF	MJ	0	0	0	**0**	0	**0**
NRSF	MJ	0	0	0	**0**	0	**0**
W	m^3	3,63E-07	1,31E-05	6,90E-03	**6,91E-03**	1,42E-03	**8,33E-03**

Resource use - cold

Parameter	Unit	Upstream	Core infrastructure	Core operation	1 kWh cold at plant	Downstream	0,90 kWh cold at customer
RPEE	MJ	0	1,69E-03	9,35E-01	**9,37E-01**	1,92E-01	**1,13E+00**
RPEM	MJ	0	0	0	**0**	0	**0**
TPE	MJ	0	1,69E-03	9,35E-01	**9,37E-01**	1,92E-01	**1,13E+00**
NRPE	MJ	0	1,00E-02	7,26E-02	**8,27E-02**	2,87E-02	**1,11E-01**
NRPM	MJ	0	0	0	**0**	0	**0**
TRPE	MJ	0	1,00E-02	7,26E-02	**8,27E-02**	2,87E-02	**1,11E-01**
SM	kg	0	0	0	**0**	0	**0**
RSF	MJ	0	0	0	**0**	0	**0**
NRSF	MJ	0	0	0	**0**	0	**0**
W	m^3	0	1,10E-05	6,99E-03	**7,00E-03**	1,44E-03	**8,44E-03**

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 - heat

Parameter	Unit	Upstream	Core infrastructure	Core operation	1 kWh heat at plant	Downstream	0,90 kWh heat at customer
HW	kg	9,85E-07	9,34E-06	6,48E-05	**7,51E-05**	1,12E-05	**8,63E-05**
NHW	kg	2,62E-05	2,80E-04	5,50E-03	**5,80E-03**	1,27E-03	**7,07E-03**
RW	kg	4,04E-07	3,91E-08	6,39E-07	**1,08E-06**	1,53E-07	**1,23E-06**

End of life - Waste - cold

Parameter	Unit	Upstream	Core infrastructure	Core operation	1 kWh cold at plant	Downstream	0,90 kWh cold at customer
HW	kg	0	7,88E-06	6,58E-05	**7,36E-05**	1,40E-05	**8,76E-05**
NHW	kg	0	1,98E-04	5,57E-03	**5,77E-03**	1,24E-03	**7,01E-03**
RW	kg	0	3,31E-08	6,48E-07	**6,81E-07**	1,51E-07	**8,32E-07**

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

End of life - Output flow - heat

Parameter	Unit	Upstream	Core infrastructure	Core operation	1 kWh heat at plant	Downstream	0,90 kWh heat at customer
CR	kg	0	0	0	**0**	0	**0**
MR	kg	0	0	1,92E-06	**1,92E-06**	0	**1,92E-06**
MER	kg	0	0	8,61E-05	**8,61E-05**	0	**8,61E-05**

End of life - Output flow - cold

Parameter	Unit	Upstream	Core infrastructure	Core operation	1 kWh cold at plant	Downstream	0,90 kWh cold at customer
CR	kg	0	0	0	**0**	0	**0**
MR	kg	0	0	1,92E-06	**1,92E-06**	0	**1,92E-06**
MER	kg	0	0	8,61E-05	**8,61E-05**	0	**8,61E-05**

CR Components for reuse; **MR** Materials for recycling; **MER** Materials for energy recovery

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

Additional Norwegian requirements

Greenhous gas emission from the use of electricity in the manufacturing phase
National production mix from Norway, from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process (core and downstream module).

Data source	Amount	Unit
Ecoinvent v3.6 (December 2019): Norway Electricity, low voltage {NO}| market for | Cut-off, U	23,3	g CO_2-ekv/kWh

Dangerous substances

- ☑ The product contains no substances given by the REACH Candidate list or the Norwegian priority list.
- ☐ The product contains substances given by the REACH Candidate list or the Norwegian priority list that are less than 0,1 % by weight.
- ☐ The product contain dangerous substances, more then 0,1% by weight, given by the REACH Candidate List or the Norwegian Priority list, see table.
- ☐ The product contains no substances given by the REACH Candidate list or the Norwegian priority list. The product is classified as hazardous waste (Avfallsforskiften, Annex III), see table.

Name	CAS no.	Amount

Indoor environment
Not applicable as the product does not influence the indoor environment.

Climate declaration
Scenario: Changed GWP factors for electricity according to The Federation of Norwegian Industries (Norsk Industri): Greenhouse gas calculations for district heating 2020.

Data source	Amount	Unit
The Federation of Norwegian Industries (Norsk Industri), Greenhouse gas calculations for district heating 2020. Norwegian consumption mix, NO.	18	g CO_2-ekv/kWh

Global warming potential - heat							
Parameter	Unit	Upstream	Core infrastructure	Core operation	1 kWh heat at plant	Downstream	0,90 kWh heat at customer
GWP	kg CO_2-ekv	1,20E-03	9,97E-04	4,91E-03	**7,11E-03**	1,39E-03	**8,49E-03**

Global warming potential - cold							
Parameter	Unit	Upstream	Core infrastructure	Core operation	1 kWh cold at plant	Downstream	0,90 kWh cold at customer
GWP	kg CO_2-ekv	0	8,33E-04	4,98E-03	**5,81E-03**	1,83E-03	**7,64E-03**

Data source	Amount	Unit
The Federation of Norwegian Industries (Norsk Industri), Greenhouse gas calculations for district heating 2020. European consumption mix, EU28+NO.	136	g CO_2-ekv/kWh

Global warming potential - heat							
Parameter	Unit	Upstream	Core infrastructure	Core operation	1 kWh heat at plant	Downstream	0,90 kWh heat at customer
GWP	kg CO_2-ekv	1,20E-03	9,97E-04	3,10E-02	**3,32E-02**	6,71E-03	**3,99E-02**

Global warming potential - cold							
Parameter	Unit	Upstream	Core infrastructure	Core operation	1 kWh cold at plant	Downstream	0,90 kWh cold at customer
GWP	kg CO_2-ekv	0	8,33E-04	3,14E-02	**3,23E-02**	7,25E-03	**3,95E-02**

Bibliography

Andvik, Oddbjørn Dahlstrøm	*LCA-report for Oslofjord Varme. LCA-report nr 633291-01, from Asplan Viak AS, Sandvika, Norway*
NS-EN ISO 14025:2010	*Environmental labels and declarations - Type III environmental declarations - Principles and procedures.*
NS-EN ISO 14044:2006	*Environmental management - Life cycle assessment - Requirements and guidelines.*
Ecoinvent v3.6	*Swiss Centre of Life Cycle Inventories. www.ecoinvent.ch*
NS 3720:2018	*Method for greenhouse gas calculations for buildings*
The Federation of Norwegian Industries (Norsk Industri)	*Greenhouse gas calculations for district heating 2020.* https://www.fjernkontrollen.no/uploaded/files/2020_06_01_klimaregnskap_for_fjernvarme_2020.pdf

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Global Program Operator

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