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The Norwegian EPD Foundation

ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025, ISO 21930 and EN 15804+A2

Owner of the declaration:	Norgesvinduet Kompetanse AS
Program operator:	The Norwegian EPD Foundation
Publisher:	The Norwegian EPD Foundation
Declaration number:	NEPD-2996-1653-EN
Registration number:	NEPD-2996-1653-EN
ECO Platform reference number:	-
Issue date:	13.08.2021
Valid to:	13.08.2026

Fixed Frame Window

Norgesvinduet Kompetanse AS

www.epd-norge.no

General information

Product:
Norgesvinduet Fixed Frame Window with and without aluminium cladding

Owner of the declaration:
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Manufacturer:
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Norgesvinduet Svenningdal ASIndustriveien 1, 8680 Trofors

Declaration number:
NEPD-2996-1653-EN

Place of production:
Norgesvinduet Bjørlo, Nordfjordeid, Norge
Norgesvinduet Svenningdal, Trofors, Norge

ECO Platform registration number

Management system:
NS-EN ISO 9001:2015, NS-EN ISO 14001:2015

This declaration is based on Product Category Rules
The CEN standard EN 15804 serves as the core PCR. In addition, NPCR Part A: Construction products and services, version 2.0 (according to EN15804: 2012 + A2: 2019) + NPCR 014: 2019 Part B for windows and doors, version 3.0

Org. no:
959189412

Declaration of responsibility:
The owner of the declaration shall be responsible for the underlying information and evidence. EPD Norway shall not be responsible with regard to manufacturer information, life cycle data and evidence.

Issue date: 13.08.2021

Valid to: 13.08.2026

Declared unit:

Year of Study:
LCA conducted in 2021. Production data is from 2018

Declared unit with option:

Comparability:
Construction products EPDs may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

Functional unit:
1 triple glazed window measuring 1,23 m × 1,48 m with wood frame and a reference service life of 40/60 years without/with aluminium cladding

The EPD has been worked out by:
Hetal Parekh Udas
(One Click LCA Ltd, Suvilahdenkatu 10 B, 00500 Helsinki, Finland (www.oneclicklca.com)

Verification
(Why does verification transparency matter? Read more online)

The CEN Norm EN 15804 serves as the core PCR.
Independent verification of the declaration and data, according to ISO14025

☐ Internal certification ☒ External verification
Third party verifier:

Elisabet Amat Guasch
(Independent verifier approved by EPD-Norway)

Approved

Håkon Hauan
Managing Director of EPD-Norway

Product

Product Description:
Fixed frame window in laminated pine (FKN) with 3-layer energy glass (4S-18Ar-4-18Ar-S4). All weather exposed parts are made of heartwood as standard.

PRODUCT specification
The weight of the product is 59,88 and 62,18 without and with aluminium cladding. Results are calculated separately for without and with aluminium cladding.

Product Raw Material Composition

	Without Aluminium Cladding		With Aluminium Cladding	
Material	Weight (kg)	%	Weight (kg)	%
Glazing	48	80,16%	48	76,90%
Wooden frame	10,04	16,77%	10,04	16,08%
Rubber gasket	0,368	0,61%	0,368	0,59%
Steel parts	0,188	0,31%	0,188	0,30%
Paint	0,858	1,43%	0,858	1,37%
Aluminium	0,424	0,71%	2,727	4,37%
Plastic parts			0,238	0,38%
Total weight of window	59,88		62,18	
Wood packaging	2,5		2,5	
Steel packaging	0,04		0,04	
Plastic packaging	0,03		0,03	
Paper packaging	0,01		0,01	
Total weight with packaging	62,46		64,76	

Technical Data
The product has SINTEF Technical Approval no. 20447. U-value for the product: 0,72 W / m 2K. The product complies with the requirements of the Norwegian Door and Window control (NDVK). Fire classification= EI 30 and EI 60 according to NS-EN 13501-2, noise reduction= 26-42 dB

Market
Norway, scenarios are calculated for the Norwegian market.

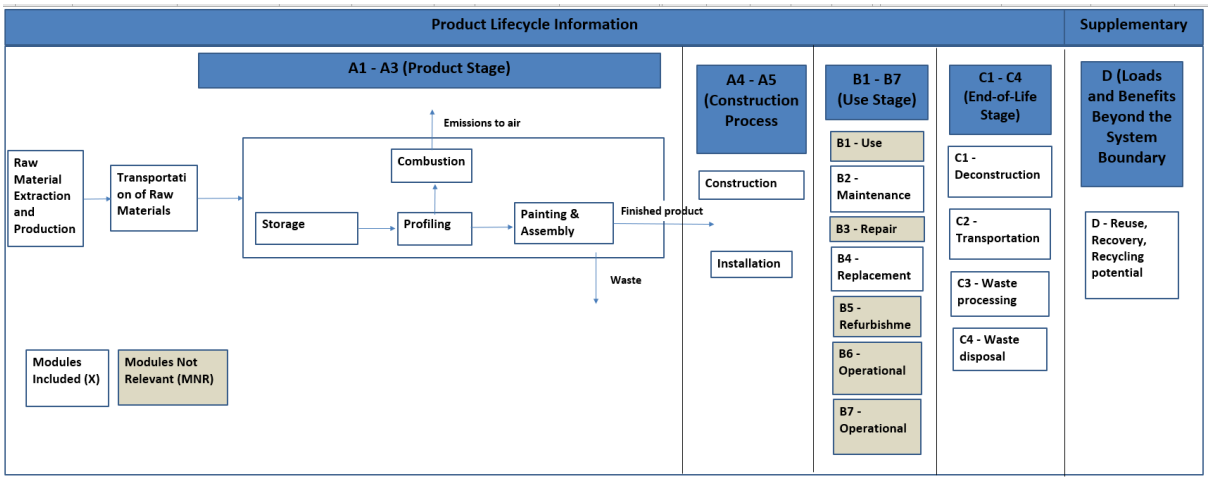
Reference Service Lifetime:
40 years without aluminium cladding, 60 years with aluminium cladding

LCA: Calculation Rules

Functional unit:
1 triple glazed window measuring 1,23 m × 1,48 m with wood frame and a reference service life of 40/60 years without/with aluminium cladding

System boundary:
This EPD covers the cradle to grave scope with following modules; A1 (Raw material supply), A2 (Transport) and A3 (Manufacturing), A4 (Transport), A5 (Assembly), B1 – B7 (use phase) as well as C1 (Deconstruction), C2 (Transport at end-of-life), C3 (Waste processing) and C4 (Disposal). In addition, module D - benefits and loads beyond the system boundary is included.B1, B3, B5, B6, B7 are however not relevant for the product system under study.

Below is the flow chart for the manufacturing process.



Data quality:
According to EN 15804+A2 Section 6.3.8.3 data quality of the life cycle inventory data should be assessed using one of the of the schemes in Annex E of the standard. The life cycle inventory was analysed for geographical, technological and time representativeness for a data quality rating as defined in Product Environmental Footprint Guide; CONSOLIDATED VERSION 2012 using the formula provided in the same document. The DQR calculated was then studied for the datasets that contribute to more than 70% of the impacts and the data quality level was analysed as "good quality".

Allocations:
Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. The factory is a producer of windows, doors and utforings. These products are produced in various sizes and types. Economic allocation was calculated based on the revenue of the company from doors and windows compared to the utforing. Following that the production volumes at the Bjorlo and Svenningdal sites were used to allocate energy use for production, internal transport, waste produced during manufacturing, and the water use per window. Additionally, an assumption used is that the inputs and outputs for the doors and windows are the same. The windows in this study can be considered as close to an average sized window, and therefore the energy use, outgoing waste from production and consumption of packaging materials in production are allocated to the declared unit based on the number of windows produced.
All other assumptions are listed in their respective sections under Product Life Cycle. Allocation for generic data used from Ecoinvent 3.6 environmental data sources follows the methodology 'allocation, cut-off by classification'. This methodology is in line with the requirements of the EN 15804 -standard.

Cut-off criteria:
The study does not exclude any modules or processes which are stated mandatory in the EN 15804:2012+A2:2019 and the applied PCR. The study does not exclude any hazardous materials or substances.
The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

Calculations of biogenic carbon:
Product's biogenic carbon content at the factory gate:

Biogenic carbon content in product, kg C	5,02
Biogenic carbon content in packaging, kg C	1,25

LCA: Scenarios and additional technical information

The following information describe the scenarios in the different modules of the EPD

Transport from production place to assembly/user (A4)

Type	Capacity Utilization	Type of vehicle	Distance (km)	Fuel /Energy Consumption per t-km	Fuel/Energy Consumption per km
Truck	95%	EURO5>32 ton	300	0,022 l/t-km	0,31 l/km
Truck	95%	EURO5, 16-32 ton	30	0,045 l/t-km	0,25 l/km

Transport from production to the building site is assumed to be carried out by truck and a total distance of 330 km. It is assumed 300 km on a large truck and 30 km on a medium size truck. Norgesvinduet has its own truck that is used to transport windows to the building sites.

Installation (A5)

	Unit	Value
Auxiliary	kg	-
Water consumption	m3	-
Electricity consumption	kWh	-
Other energy carriers	MJ	-
Material loss	kg	-
Output materials from waste treatment	kg	2,58
Dust in the air	kg	-

According to the report from EPD-Norge 'Harmonizing the documentation of scenarios beyond cradle to gate, EN 15804' Section 5.2 Table 3 there is no loss on site during construction activities. The window products in this EPD are painted and surface treated in the production and not at the building site. Therefore, there is only 2 items left in this module. 1) Waste treatment of packaging which is considered in the EPD calculations. 1) Energy use during installation. This can be varied depending on the floor, type of building and several other unknown parameters, and therefore ignored in the calculation.

Maintenance (B2)

Material or energy	Quantity per functional unit		
	Without Al cladding	With Al cladding	
Paint	1,045	0,077	kg
Water	120	180	l
Lubricating oil	0,2	0,3	kg
Detergent	6,3	9,45	kg

Maintenance – The scenario includes cleaning and painting. Cleaning is performed three times per year. It is calculated with 1,5 dl of detergent and 3 litres of water each year. The products are assumed to be painted and cleaned during their lifetime. The windows without aluminium cladding are painted exterior after ten years and every sixth year until its ended lifetime. Interior, it is assumed to be painted once during its lifetime of 40 years. It is assumed that 5 gr of lubricating oil is used every year for fittings and moving parts. A previous EPD for the Norgesvinduet Fixed Window was referred to for this data and confirmed with the manufacturer. There is no need for repair during the product lifetime.

Replacement (B4)

Material or energy	Quantity per functional unit		
	Without Al cladding	With Al cladding	
Glazing	48	48	kg
Gasket	0,368	0,368	kg

Replacement – EN17213 6.3.4.4.2 states that "The IGU shall always be calculated with a maximum of 30 years, unless otherwise indicated in the product standard EN 1279-5 or specified by the manufacturer for specific in-use conditions." The window has a RSL of 40 and 60 years respectively for without and with aluminium cladding, so the insulated glass unit must be replaced after 30 years. This is included in Module B4, along with the packaging and waste treatment for original glazing in product. There is no need for refurbishment during the product lifetime.

The transport of window as waste is calculated based on a scenario with 50 km distance.

Transport to waste processing (C2)

Type	Capacity Utilization	Type of vehicle	Distance (km)	Fuel /Energy Consumption	Fuel/Energy Consumption
Truck	95%	Unspecified	50	0,033 l/t-km	0,28 l/km

End of Life (C1, C3, C4)

The EOL waste treatment scenario has been created based on two references. The first one is EN17213 Annex B, which gives generic scenarios for different types of windows and door sets. Additionally, Statistics Norway was referred to in order to get reference numbers for treatment of construction waste in Norway (https://www.ssb.no/en) in 2019. At the end of the RSL of the window, it is assumed that it will be dismantled and transported as mixed waste to the scrap recycling centre, where the wood, metal, glass and plastics will be separated and treated for recycling, energy recovery or will go to landfill per % calculated from Statistics Norway 2019 for Construction Waste. The only deviation from this scenario is that for glass where energy by incineration has been assumed instead of material recovery. This is in accordance with NPCR-014-Part-B Section 6.3.8.4, the most conservative scenario should be included if there are several relevant common practices

	Value	
Scenario parameter	Without Al cladding	With Al cladding
Collection process – kg collected separately	--	--
Collection process – kg collected with mixed waste	60,82	63,29
Recovery process – kg for re-use	0	0
Recovery process – kg for recycling	0,71	3,22
Recovery process – kg for energy recovery	40,13	39,74
Disposal (total) – kg for final deposition	19,98	20,33
Scenario assumptions, transportation(km)	50	50

Benefits and loads beyond system boundaries (D)

	Quantity per functional unit		
	Without Al cladding	With Al cladding	
Substitution of thermal energy	52,586	52,586	MJ
Substitution of electrical energy	25,7	25,7	MJ
Substitution of raw materials	0,87	3,3	kg

LCA: Results

Raw material extraction and processing contributes to about 42-44% of the life cycle impacts and the top contributors are glazing and paint. The flows that are allocated in the production, like electricity, waste and packaging have a minor contribution. The replacement of glazing after 30 years has close to 35-38% impacts across the life cycle. This is again due to the glazing. Maintenance is the next highest contributor to environmental impacts contributing to about 6-8% of environmental impacts and the top contributors here are the paint and detergent used through the RSL for maintenance. It must be noted that for the product with aluminium cladding the contribution of paint during maintenance to the environmental impacts is much lower than that for the product without the cladding. The % contributions are quoted for GWP total, however similar trend is seen across all impact categories.

X = included; MNR: Module Not Relevant

Product stage			Assembly stage		Use stage							End of life stage				Beyond the system boundaries		
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	D	D
X	X	X	X	X	MNR	X	MNR	X	MNR	MNR	MNR	X	X	X	X	X	X	X
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/Demolition	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

Environmental impact

FIXED FRAME WINDOW WITHOUT ALUMINIUM CLADDING : CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Please note that Modules B1, B3, B5, B6, B7 are not included in the results tables because they have been assigned as MNR

Impact Category	Unit	A1	A2	A3	A1-A3	A4	A5	B2	B4	C1	C2	C3	C4	D
Climate change – total	kg CO2e	9,12E1	6,01E0	1,23E0	9,85E1	1,87E0	6,28E−2	1,74E1	8,19E1	0	4,97E−1	1,95E1	2,74E0	1,45E1
Climate change – fossil	kg CO2e	9,78E1	6,01E0	2,5E0	1,06E2	1,89E0	6,01E−2	1,67E1	8,95E1	0	4,97E−1	1,43E0	2,65E0	−7,58E0
Climate change – biogenic	kg CO2e	−8,39E0	3,23E−3	−1,27E0	−9,65E0	1,37E−3	2,54E−3	−9,09E−1	−7,63E0	0	2,67E−4	1,81E1	8,89E−2	2,21E1
Climate change – LULUC	kg CO2e	1,82E0	2,17E−3	6,81E−3	1,83E0	5,68E−4	8,08E−5	1,64E0	1,1E−1	0	1,79E−4	8,27E−4	4,66E−4	−7E−2
Ozone depletion	kg CFC11e	9,21E−6	1,37E−6	2,1E−7	1,08E−5	4,44E−7	5,29E−9	1,83E−6	8,49E−6	0	1,13E−7	1,04E−7	2,06E−7	−1,14E−6
Acidification	mol H+e	8,6E−1	1,73E−2	1,35E−2	8,91E−1	7,93E−3	3,09E−4	1,23E−1	7,54E−1	0	1,43E−3	7,96E−3	1,04E−2	−5,32E−2

Eutrophication, aquatic	kg Pe	3,9E−3	5,11E−5	1,45E−4	4,09E−3	1,54E−5	2,5E−6	8,58E−4	3,25E−3	0	4,22E−6	5,95E−5	5,86E−5	−1,83E−4
Eutrophication, aquatic marine	kg Ne	1,35E−1	3,43E−3	3,3E−3	1,42E−1	2,39E−3	7,61E−5	2,22E−2	1,21E−1	0	2,83E−4	1,18E−3	1,5E−3	−2,55E−3
Eutrophication, terrestrial	mol Ne	1,54E0	3,83E−2	3,23E−2	1,61E0	2,64E−2	8,51E−4	1,97E−1	1,44E0	0	3,16E−3	1,39E−2	1,88E−2	−2,87E−2
Photochemical ozone	kg NMVOCe	4,01E−1	1,47E−2	1,22E−2	4,28E−1	8,48E−3	2,39E−4	8,09E−2	3,7E−1	0	1,21E−3	4,33E−3	8,31E−3	−1,36E−2
Abiotic depletion, minerals	kg Sbe	2,76E−3	1,66E−4	6,42E−5	2,99E−3	3,22E−5	7,45E−7	6,9E−4	2,5E−3	0	1,37E−5	3,06E−5	1,22E−5	−2,26E−6
Abiotic depletion of fossil	MJ	1,22E3	9,08E1	3,5E1	1,34E3	2,94E1	7,85E−1	4,28E2	1,11E3	0	7,51E0	1,2E1	1,76E1	−1,06E2
Water use1)	m3e depr.	2,91E1	2,97E−1	6,93E−1	3,01E1	1,09E−1	7,12E−3	1,06E1	2,26E1	0	2,46E−2	5,83E−1	4,42E−1	−1,26E0

1) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator. 2) Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e.

FIXED FRAME WINDOW WITHOUT ALUMINIUM CLADDING : ADDITIONAL (OPTIONAL) INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B2	B4	C1	C2	C3	C4	D
Particulate matter	Incidence	7,99E−6	3,83E−7	2,18E−7	8,59E−6	1,71E−7	3,54E−9	1,19E−6	7,22E−6	0	3,16E−8	6,48E−8	1,08E−7	−3,43E−7
Ionizing radiation, human health3)	kBq U235e	4,3E0	3,97E−1	2,02E−1	4,9E0	1,28E−1	3,6E−3	3,91E−1	4,01E0	0	3,28E−2	4,86E−2	4,47E−2	−5,22E−1
Eco-toxicity (freshwater)	CTUe	2,62E3	7,05E1	8,7E1	2,78E3	2,24E1	9,15E−1	4,47E2	2,28E3	0	5,83E0	5,8E1	6,68E1	−8E1
Human toxicity, cancer effects	CTUh	6,44E−8	2,03E−9	5,94E−9	7,24E−8	5,74E−10	4,73E−11	4,08E−8	5,45E−8	0	1,68E−10	1,09E−9	1,03E−9	−1,12E−8
Human toxicity, non-cancer effects	CTUh	1,41E−6	7,71E−8	8,48E−8	1,57E−6	2,66E−8	7,85E−10	6,22E−7	1,15E−6	0	6,37E−9	6,04E−8	1,02E−7	−1,14E−7
Land use related impacts/ soil quality	-	2,66E2	7,7E1	8,1E0	3,51E2	4,43E1	2,73E−1	8,3E1	2,25E2	0	6,36E0	8,96E0	2,06E1	3,76E1

3) EN 15804+A2 disclaimer for Ionizing radiation, human health. 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

FIXED FRAME WINDOW WITHOUT ALUMINIUM CLADDING: USE OF NATURAL RESOURCES

Impact Category	Unit	A1	A2	A3	A1-A3	A4	A5	B2	B4	C1	C2	C3	C4	D
RPEE	MJ	1,28E2	1,3E0	1,14E2	2,43E2	3,7E−1	9,49E−3	2,89E1	1,12E2	0	1,08E−1	9,05E−1	5,55E−1	−4,57E1
RPEM	MJ	1,04E2	0E0	7,85E1	1,82E2	0E0	5,83E−2	0E0	7,85E1	0	0E0	2,34E−1	0E0	0E0
TPE	MJ	2,32E2	1,3E0	1,92E2	4,26E2	3,7E−1	6,78E−2	2,89E1	1,91E2	0	1,08E−1	1,14E0	5,55E−1	−4,57E1
NRPE	MJ	1,22E3	9,08E1	3,31E1	1,34E3	2,94E1	7,85E−1	4,28E2	1,11E3	0	7,51E0	1,2E1	1,76E1	−9,6E1
NRPM	MJ	0E0	0E0	1,91E0	1,91E0	0E0	0E0	0E0	0E0	0	0E0	0E0	0E0	−1,03E1
TRPE	MJ	1,22E3	9,08E1	3,5E1	1,34E3	2,94E1	7,85E−1	4,28E2	1,11E3	0	7,51E0	1,2E1	1,76E1	−1,06E2
SM	kg	3,2E−1	0E0	2,24E−2	3,43E−1	0E0	0E0	1,63E−1	1,63E−2	0	0E0	0E0	0E0	−6,02E−2
RSF	MJ	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0	0E0	0E0	0E0	0E0
NRSP	MJ	0E0	0E0	6,05E1	6,05E1	0E0	0E0	0E0	0E0	0	0E0	0E0	0E0	0E0
W	m3	7,46E−1	1,57E−2	1,74E−2	7,8E−1	6,11E−3	2,42E−4	2,95E−1	5,5E−1	0	1,3E−3	1,24E−2	1,32E−2	−5,01E−3

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

FIXED FRAME WINDOW WITHOUT ALUMINIUM CLADDING: END OF LIFE-WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B2	B4	C1	C2	C3	C4	D
HW	Kg	7,1E0	9,35E−2	2,38E0	9,57E0	2,85E−2	4,1E−3	1,92E0	5,5E0	0	7,73E−3	0E0	4,18E−1	−7,67E−1
NHW	Kg	1,55E2	6,44E0	5,71E0	1,67E2	3,16E0	1,29E−1	2,81E1	1,62E2	0	5,32E−1	0E0	2,03E1	6,43E1
RW	Kg	4,17E−3	6,22E−4	1,41E−4	4,93E−3	2,02E−4	3,38E−6	4,26E−4	3,9E−3	0	5,14E−5	0E0	6,06E−5	−6,1E−4

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

FIXED FRAME WINDOW WITHOUT ALUMINIUM CLADDING: END OF LIFE-OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B2	B4	C1	C2	C3	C4	D
CR	Kg	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0
MR	Kg	0E0	0E0	1,41E−1	1,41E−1	0E0	0E0	0E0	0E0	0E0	0E0	8E−1	0E0	0E0
MER	Kg	0E0	0E0	1,22E−1	1,22E−1	0E0	0E0	0E0	0E0	0E0	0E0	4,12E1	0E0	0E0
EEE	MJ	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0
ETE	MJ	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0

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

Environmental impact

FIXED FRAME WINDOW WITH ALUMINIUM CLADDING : CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Please note that Modules B1, B3, B5, B6, B7 are not included in the results tables because they have been assigned as MNR

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B2	B4	C1	C2	C3	C4	D
Climate change – total	kg CO2e	9,66E1	6,37E0	1,23E0	1,04E2	1,97E0	6,28E−2	1,69E1	8,19E1	0	5,17E−1	1,91E1	5,02E−1	−2,44E0
Climate change – fossil	kg CO2e	1,03E2	6,37E0	2,5E0	1,12E2	1,99E0	6,01E−2	1,68E1	8,95E1	0	5,17E−1	9,66E−1	4,9E−1	−2,4E1
Climate change – biogenic	kg CO2e	−8,5E0	3,43E−3	−1,27E0	−9,77E0	1,44E−3	2,54E−3	−5,25E−2	−7,63E0	0	2,78E−4	1,81E1	1,2E−2	2,2E1
Climate change – LULUC	kg CO2e	1,83E0	2,3E−3	6,81E−3	1,84E0	5,98E−4	8,08E−5	1,31E−1	1,1E−1	0	1,87E−4	8,48E−4	1,08E−4	−4,54E−1
Ozone depletion	kg CFC11e	9,58E−6	1,45E−6	2,1E−7	1,12E−5	4,67E−7	5,29E−9	1,95E−6	8,49E−6	0	1,18E−7	9,34E−8	7,94E−8	−3,18E−6
Acidification	mol H+e	8,95E−1	1,83E−2	1,35E−2	9,26E−1	8,35E−3	3,09E−4	1,24E−1	7,54E−1	0	1,48E−3	7,36E−3	2,68E−3	−1,61E−1
Eutrophication, aquatic freshwater2)	kg Pe	4,12E−3	5,42E−5	1,45E−4	4,32E−3	1,62E−5	2,5E−6	6,62E−4	3,25E−3	0	4,4E−6	5,56E−5	9,03E−6	−1,08E−3
Eutrophication, aquatic marine	kg Ne	1,41E−1	3,64E−3	3,3E−3	1,48E−1	2,52E−3	7,61E−5	1,81E−2	1,21E−1	0	2,95E−4	1,13E−3	6,85E−4	−1,46E−2
Eutrophication, terrestrial	mol Ne	1,61E0	4,06E−2	3,23E−2	1,68E0	2,78E−2	8,51E−4	1,98E−1	1,44E0	0	3,29E−3	1,33E−2	7,81E−3	−1,63E−1
Photochemical ozone formation	kg NMVOCe	4,24E−1	1,55E−2	1,22E−2	4,51E−1	8,94E−3	2,39E−4	8,55E−2	3,7E−1	0	1,26E−3	3,86E−3	2,59E−3	−6,35E−2
Abiotic depletion, minerals & metals	kg Sbe	3,21E−3	1,76E−4	6,42E−5	3,45E−3	3,39E−5	7,45E−7	5,49E−4	2,5E−3	0	1,43E−5	2,88E−5	3,23E−6	−8,62E−5
Abiotic depletion of fossil resources	MJ	1,29E3	9,63E1	3,5E1	1,42E3	3,09E1	7,85E−1	5,35E2	1,11E3	0	7,82E0	1,17E1	6,06E0	−3,63E2
Water use1)	m3e depr.	3,12E1	3,15E−1	6,93E−1	3,22E1	1,15E−1	7,12E−3	1,04E1	2,26E1	0	2,56E−2	3,97E−1	2,38E−1	−2,92E0

1) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator. 2) Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e.

FIXED FRAME WINDOW WITH ALUMINIUM CLADDING: ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B4	C1	C2	C3	C4	D
Particulate matter	Incidence	8,4E−6	4,06E−7	2,18E−7	9,02E−6	1,8E−7	3,54E−9	MNR	1,23E−6	7,22E−6	0	3,29E−8	5,86E−8	4,17E−8	−1,44E−6
Ionizing radiation, human health3)	kBq U235e	4,45E0	4,21E−1	2,02E−1	5,08E0	1,35E−1	3,6E−3	MNR	3,36E−1	4,01E0	0	3,42E−2	4,85E−2	2,09E−2	−2,22E0
Eco-toxicity (freshwater)	CTUe	2,76E3	7,48E1	8,7E1	2,92E3	2,36E1	9,15E−1	MNR	4,14E2	2,28E3	0	6,07E0	4,53E1	1,1E1	−3,76E2
Human toxicity, cancer effects	CTUh	7,95E−8	2,15E−9	5,94E−9	8,76E−8	6,05E−10	4,73E−11	MNR	5,56E−8	5,45E−8	0	1,75E−10	1,13E−9	2,21E−10	−6,26E−8
Human toxicity, non-cancer effects	CTUh	1,57E−6	8,17E−8	8,48E−8	1,74E−6	2,8E−8	7,85E−10	MNR	6,4E−7	1,15E−6	0	6,63E−9	5,05E−8	1,39E−8	−8,22E−7
Land use related impacts/soil quality	-	2,83E2	8,16E1	8,1E0	3,72E2	4,67E1	2,73E−1	MNR	3,52E1	2,25E2	0	6,62E0	8,32E0	1,76E1	2,37E1

3) EN 15804+A2 disclaimer for Ionizing radiation, human health. 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

FIXED FRAME WINDOW WITH ALUMINIUM CLADDING: USE OF NATURAL RESOURCES

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B2	B4	C1	C2	C3	C4	D
RPEE	MJ	1,35E2	1,38E0	1,14E2	2,5E2	3,89E−1	9,49E−3	1,28E1	1,12E2	0	1,12E−1	8,83E−1	1,1E−1	−1,46E2
RPEM	MJ	1,04E2	0E0	7,85E1	1,82E2	0E0	5,83E−2	0E0	7,85E1	0	0E0	2,34E−1	0E0	0E0
TPE	MJ	2,39E2	1,38E0	1,92E2	4,33E2	3,89E−1	6,78E−2	1,28E1	1,91E2	0	1,12E−1	1,12E0	1,1E−1	−1,46E2
NRPE	MJ	1,28E3	9,63E1	3,31E1	1,41E3	3,09E1	7,85E−1	5,35E2	1,11E3	0	7,82E0	1,17E1	6,06E0	−3,47E2
NRPM	MJ	1,14E1	0E0	1,91E0	1,33E1	0E0	0E0	0E0	0E0	0	0E0	0E0	0E0	−1,59E1
TRPE	MJ	1,29E3	9,63E1	3,5E1	1,42E3	3,09E1	7,85E−1	5,35E2	1,11E3	0	7,82E0	1,17E1	6,06E0	−3,63E2
SM	kg	3,21E−1	0E0	2,24E−2	3,44E−1	0E0	0E0	1,22E−1	1,63E−2	0	0E0	0E0	0E0	−1,12E−1
RSF	MJ	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0	0E0	0E0	0E0	0E0
NRSP	MJ	0E0	0E0	6,05E1	6,05E1	0E0	0E0	0E0	0E0	0	0E0	0E0	0E0	0E0
W	m3	7,8E−1	1,66E−2	1,74E−2	8,14E−1	6,44E−3	2,42E−4	2,32E−1	5,5E−1	0	1,35E−3	6,22E−3	6,19E−3	−1,04E−1

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

FIXED FRAME WINDOW WITH ALUMINIUM CLADDING: END OF LIFE-WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B2	B4	C1	C2	C3	C4	D
HW	Kg	8,02E0	9,91E−2	2,38E0	1,05E1	3E−2	4,1E−3	1,34E0	5,5E0	0	8,04E−3	0E0	5,49E−2	−4,97E0
NHW	Kg	1,64E2	6,83E0	5,71E0	1,77E2	3,32E0	1,29E−1	2,8E1	1,62E2	0	5,54E−1	0E0	1,96E1	2,32E1
RW	Kg	4,32E−3	6,59E−4	1,41E−4	5,12E−3	2,12E−4	3,38E−6	3,7E−4	3,9E−3	0	5,35E−5	0E0	3,2E−5	−2,06E−3

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

FIXED FRAME WINDOW WITH ALUMINIUM CLADDING: END OF LIFE-OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B2	B4	C1	C2	C3	C4	D
CR	Kg	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0
MR	Kg	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	1,22E0	0E0	0E0
MER	Kg	0E0	0E0	7,29E−1	7,29E−1	0E0	0E0	0E0	0E0	0E0	0E0	3,95E1	0E0	0E0
EEE	MJ	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0
ETE	MJ	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0

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

Norwegian Additional Requirements

Greenhouse gas emissions from the use of electricity in A3 manufacturing

National market mix with low-voltage imports, including production of transmission lines and grid losses, has been used for electricity in the production process (A3).

Data Source	Amount	Unit
Ecoinvent v3.6 (2019)	23.1	g CO2-eqv/ kWh

Hazardous substances

☒ The product contains no substances from REACH Candidate List or the Norwegian Priority List

☐ The product contains substances below 0.1% by weight on the REACH Candidate List

☐ The product contains substances from REACH Candidate List or the Norwegian Priority List, see table under Specific Norwegian requirements

☐ The product does not contain any substances on the REACH Candidate List or the Norwegian Priority List. The product can be characterized as hazardous waste (according to the Waste Shift, Appendix III), see table under Specific Norwegian requirements.

Transport

Transport from production site to construction site in A4: 330km

Indoor air quality

According to SINTEF Technical Approval No. 20447, the products are evaluated to not release any particles, gases or radiation that has a negative impact on the indoor climate or to health.

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