

# Environmental Product Declaration

In accordance with ISO 14025 and EN 15804 +A2

**ROCKWOOL Norden**



The Norwegian  
EPD Foundation

**Owner of the declaration:**  
ROCKWOOL Nordics

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

**Declaration number:**  
NEPD-3411-2024-EN

**Registration Number:**  
NEPD-3411-2024-EN

**Issue date:** 24.03.2022  
**Valid to:** 24.03.2027

**Product name:**

ROCKWOOL® stone wool  
thermal insulation

TOPROCK System for  
the Scandinavian market

Manufacturer  
ROCKWOOL Nordics

# General information

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## Product:

ROCKWOOL® stone wool thermal insulation,  
TOPROCK System for the Scandinavian market

## Program Operator:

The Norwegian EPD Foundation  
Post Box 5250 Majorstuen, 0303 Oslo, Norway  
Tlf: +47 23 08 80 00  
e-mail: post@epd-norge.no

## Declaration Number:

NEPD-3411-2024-EN

## This declaration is based on Product Category Rules:

CEN Standard EN 15804+A2 serves as core PCR  
NPCR Part A Construction products and services  
NPCR 012:2018 version 2. Part B for Thermal  
insulation products

## 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:

1 m<sup>2</sup> of stone wool thermal insulation with a  
thermal resistance (R) of 1,0 m<sup>2</sup>K/W.


## Functional unit:

1 m<sup>2</sup> of stone wool thermal insulation with a  
thermal resistance (R) of 1,0 m<sup>2</sup>K/W with a  
reference service life of minimum 60 years.

## Verification:

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

internal  external



Jane Anderson

Independent verifier approved by EPD Norway

## Owner of the declaration:

ROCKWOOL Nordics  
Contact person: Christian J. Kofod  
Phone: +45 4656 1616  
e-mail: christian.kofod@rockwool.com

## Manufacturer:

ROCKWOOL Nordics,  
Hovedgaden 501, DK-2640 Hedehusene  
Phone: +45 4656 1616  
e-mail: info@rockwool.com

## Place of production:

Doense factory (Biomethane line), Denmark  
Doense factory (Conventional line), Denmark  
Vamdrup factory (Biomethane), Denmark

## Management system:

ISO 14001, ISO 9001

## Organisation no:

CVR. nr. 42391719

## Issue date:

24.03.2022

## Valid to:

24.03.2027

## Year of study:

2021

## Comparability:

EPDs of construction products may not be  
comparable if they are not compliant with EN  
15804:A2:2019 and not seen in a building context.

## The EPD has been worked out by:

Larisa Xanthopoulou, ROCKWOOL Int. A/S







Approved (Manager of EPD Norway)

## Product

### Description of the product and use of the EPD:

This EPD documents the potential environmental impacts of 1m<sup>2</sup> of ROCKWOOL® TOPROCK System stone wool insulation with a thermal resistance (R-value) equal to 1 m<sup>2</sup>K/W. The intended use of the EPD is to communicate quantified environmental impacts of construction products for application in the assessment of the environmental performance of buildings.

ROCKWOOL® stone wool thermal insulation is a durable and firesafe insulation material that can be used to insulate against heat, cold, fire, vibrations and noise.

ROCKWOOL® stone wool is made primarily from abundantly available volcanic rock, an increasing proportion of recycled ROCKWOOL® stone wool material and a cured resin binder. Other materials utilised in the production of ROCKWOOL® stone wool are by-products from other industries. Since 2012, ROCKWOOL® has been offering a take back system for closed loop recycling – Rockcycle.

The product covered by this declaration is ROCKWOOL® TOPROCK System produced for the Scandinavian market (Denmark, Norway and Sweden). The unfaced and uncoated synthetic resin-bonded stone wool materials described in this declaration are produced in the form of a batt. The density of the product as installed will vary according to end use insulation requirements. Average density as installed: 75 kg/m<sup>3</sup>

ROCKWOOL® stone wool is a non-combustible material that does not react to fire. Stone wool's built-in fire protection is natural and not dependent on flame retardants. Stone wool withstands temperatures exceeding 1,000 degrees Celsius, and retains its fire performance throughout its lifetime.

The insulation properties of stone wool is primarily achieved by the immobile air within in the open structure of the product. Therefore, the declared insulation property will remain constant for the declared lifetime of the product. This also allows the product to absorb noise and sounds and contribute to a better indoor acoustic climate.

ROCKWOOL® stone wool fibers are proven to be safe to manufacture, install and live with. Health and safety installation instructions shall always be followed. ROCKWOOL® stone wool fibers comply with the European REACH regulation and do not have any health-related classifications or negative impact on the indoor environment.

The packaging is included in the assessment.

### Product specification:

The average composition used for this EPD is calculated based on average factory consumption figures for raw materials.. The raw materials are mainly non-scarce stones, and resin binder.

| Materials                          | %     |
|------------------------------------|-------|
| Mineral Wool                       | > 95% |
| De-duster and water repellency oil | <1%   |
| Binder                             | <5%   |

### Technical data:

For the products covered by this EPD, the performance data are in accordance with the declaration of performance with respect to its essential characteristics according to EN 13162:2012+A1:2015, "Thermal insulation products for buildings – Factory made mineral wool (MW) products – Specification".

A full overview of the technical specifications can be found on [www.rockwool.com/dk](http://www.rockwool.com/dk)

| Declared             | Performance | Norms                    |
|----------------------|-------------|--------------------------|
| Thermal conductivity | 0,039 W/mK  | EN 12939 and EN 12667    |
| Fire class           | A2-S1,d0    | EN 13501-1:2007+ A1:2009 |

### Market:

This EPD is intended for the Nordic markets (A4 module can be adjusted with scaling factors provided to reflect correct transportation distance).

### Reference service life, product:

ROCKWOOL® stone wool thermal insulation products are extremely durable and provide effective performance for the lifetime of a building or host structure, with no need to be replaced. The thermal, fire-resistance, and acoustic performance of ROCKWOOL® stone wool products, when correctly installed, remains the same during 60 years reference service life or as long as the insulation is part of the building.

### Reference service life, building:

In this EPD, the reference service life of a building is set to 60 years.

## LCA: Calculation rules

|                                       |  |
|---------------------------------------|--|
| Declared unit                         | 1m <sup>2</sup> of ROCKWOOL® TOPROCK System with a thermal resistance RD=1 m <sup>2</sup> K/W.                                 |
| Density of reference product          | 75 kg/m <sup>3</sup>   |
| Thickness of reference product        | 39 mm  |
| Scope                                 | Cradle to Grave  |
| Reference service life                | 60 years   |
| Energy used for manufacturing process | Renewable electricity mix GO's from Danish wind power, to be prolonged to be valid at least equal to the validity of this EPD. |
| - Electricity                         |  |
| - Gas                                 | Biogas (Danish biomethane)   |
| - Fossil                              | Coke   |

### Declared unit:

The specific product, referred to in the declared unit is 1m<sup>2</sup> of an ROCKWOOL® TOPROCK System stone wool batt with a thermal resistance R=1m<sup>2</sup>K/W. The reference product is 39 mm thick with a density of 75 kg/m<sup>3</sup>. The weight of the reference product corresponding to the declared unit is 2,9 kg.

The impact indicators for specific thicknesses can be calculated by multiplying the results of the EPD with the respective scaling factor from a range of products covered by this EPD. A table with the different products available in the portfolio and their respective scaling factors is provided within the 'Additional technical information' section.

### Data quality:

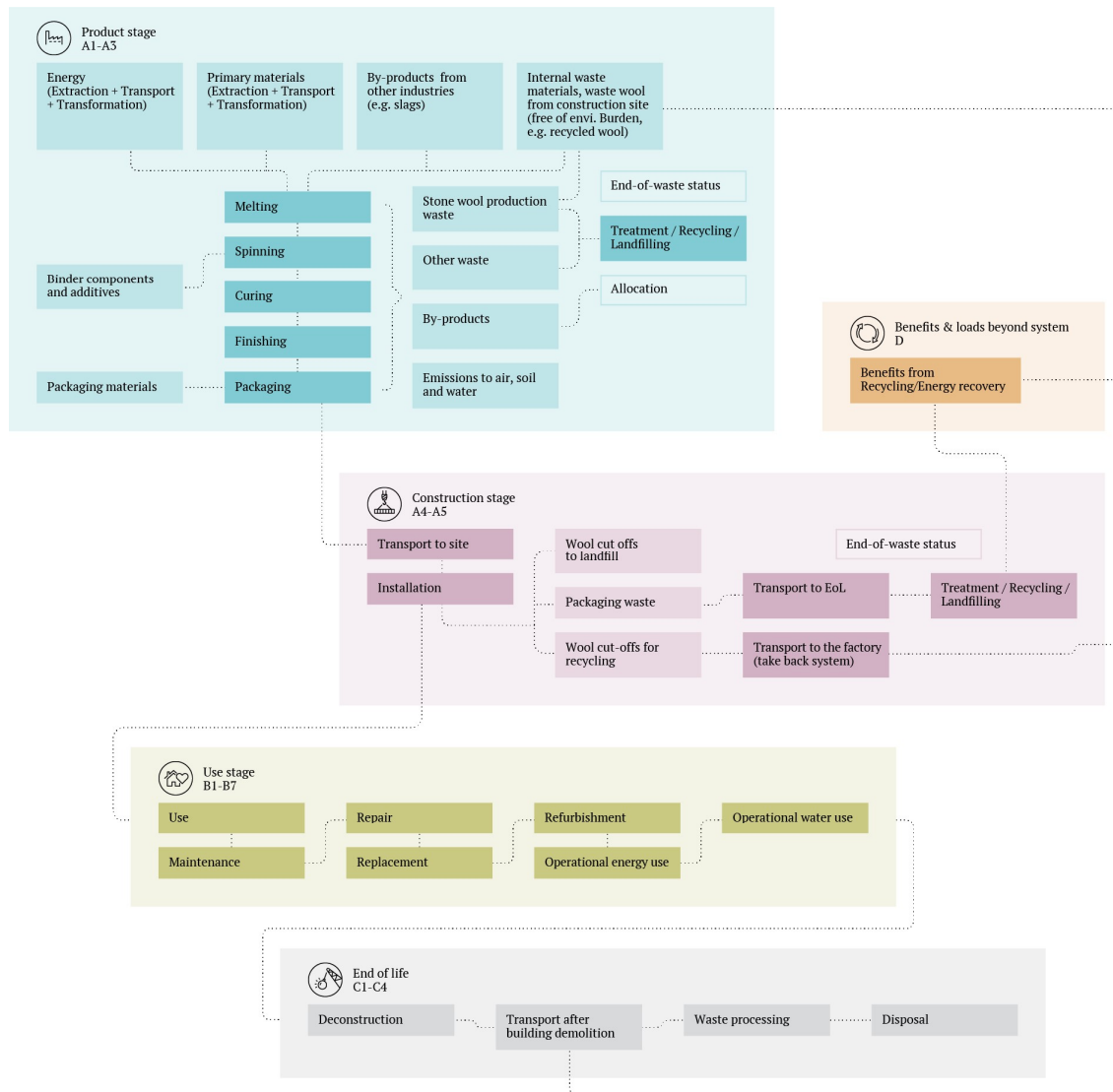
All data represents the applicable geography, time and technology for the specific and generic data, generally assessed as good and very good. Primary data are collected from respective production sites in Doense and Vamdrup, Denmark, in the reference year 2021 and represent stabilized production. Generic data is from GaBi database (version 2021) with GaBi Software version 10.0.1.92.

### Allocation:

The allocation is made in accordance with the provisions of EN 15804+A2. Production activities, electricity and energy consumption and waste generation are allocated equally among all products from the production site through mass allocation.

### System boundary:

The LCA is performed as a ‘cradle-to-grave’ study, addressing all life cycle stages identified in the EN 15804+A2. All major raw materials, energy, electricity use and waste are included for all life cycle modules, see flowchart below. Use stage B1-7 modules are considered but are not relevant, as there are no activities and no significant environmental impact in the use stage.



### Cut-off criteria:

All major raw materials and all the essential energy are included. All hazardous materials and substances are considered in the inventory. Data sets within the system boundary are complete and fulfil criteria for the exclusion of inputs and output criteria. All data, materials and energy consumptions, have been specified according to the production data and have been considered within the inventory analysis

## LCA: Scenarios and additional technical information

The following information describe the scenarios in the different modules of the EPD. The EPD is based on LCA inventory data from the 2 factories. The reference flow is a weighted average based on the distribution of production capacity of the specific product between the 2 factories. For Doense factory, distribution of production capacity between biomethane and conventional line for the specific product is also accounted for in the weighted average.

### Transport from production place to assembly/user (A4)

| Type  | Capacity utilisation (incl. return) % | Type of vehicle            | Distance KM | Fuel/Energy consumption | value (l/t) |
|-------|---------------------------------------|----------------------------|-------------|-------------------------|-------------|
| Truck | 30 %                                  | Euro 6, with a 27t payload | 285         | Diesel: 0,019 l/tkm     | 5,41 l/t    |

The A4 distance is calculated as a weighted average distance for the Nordic market.

Additional distances estimated for specific markets are given in the table below

| Market  | Distance | A4, GWP fossil                 |
|---------|----------|--------------------------------|
| Denmark | 212 km   | 5,53E-02 kg CO <sub>2</sub> eq |
| Norway  | 300 km   | 7,82E-02 kg CO <sub>2</sub> eq |
| Sweden  | 398 km   | 1,04E-01 kg CO <sub>2</sub> eq |

### Assembly (A5)

|                               | Unit           | Value   |
|-------------------------------|----------------|---------|
| Auxiliary                     | Kg             | 0       |
| Water consumption             | m <sup>3</sup> | 0       |
| Electricity consumption       | kWh            | 0       |
| Other energy carriers         | MJ             | 0       |
| Material loss                 | Kg             | 2%      |
| Cardboard and paper packaging | Kg             | 0,00013 |
| Plastic packaging             | Kg             | 0,026   |
| Wood packaging                | Kg             | 0,07    |

In A5 the default installation is assumed to be manual, therefore no energy consumption or ancillary equipment is needed. The product waste from installation is assumed to be 2% and according to the modularity principle of EN 15804+A2 its impacts are fully allocated to A5, following same EoL scenario as in C. The A5 module includes also the corresponding end-of-life considerations for packaging (10 % landfill). The credits from heat and electricity recovery from incineration or material recycling from module A5 (90% recycling and energy recovery) are attributed to module D.

### Use stage (B1, B2, B3, B4, B5, B6, B7)

There are no consumables and no maintenance (B2), repair (B3), replacements (B4) or refurbishments (B5) required during the use of ROCKWOOL® thermal insulation products in standard conditions. They do not use energy (B6) or water (B7) during their operational life. No significant emissions to the indoor environment occur in module (B1). Therefore, modules B1-B7 are not relevant for this EPD.

### End of Life (C1, C3, C4)

|                                       | Unit | Value |
|---------------------------------------|------|-------|
| Hazardous waste disposed              | %    | 0     |
| Collected as mixed construction waste | %    | 100   |
| Reuse                                 | %    | 0     |
| Recycling                             | %    | 7     |
| Energy recovery                       | %    | 0     |
| To landfill                           | %    | 0,93  |

ROCKWOOL stone wool insulation can be recycled via RockCycle or local recycling offerings.

### Transport to waste processing (C2)

| Type          | Capacity utilisation (incl. Return) % | Type of vehicle            | Distance KM | Fuel/Energy consumption | value (l/t) |
|---------------|---------------------------------------|----------------------------|-------------|-------------------------|-------------|
| Truck, Euro 6 | 50%                                   | Truck, with 17,3 t payload | 100 km      | Diesel: 0,025 l/tkm     | 2,5 l/t     |

The distance represents an average distance to waste treatment facility or landfill.

### Benefits and loads beyond the system boundaries (D)

|                          | Unit | Value |
|--------------------------|------|-------|
| Packaging recycled       | kg   | 0,03  |
| Energy recovered         | MJ   | 0,7   |
| Stone wool for recycling | kg   | 0,2   |

Benefits in module D are created from packaging materials treatment (recycled materials and recovered energy) after installation and recycling potential of stone wool in the end of life. Recycling potential of net stone wool material is considered here.



## Additional technical information

Below a list of ROCKWOOL TOPROCK System thickness' covered by this EPD and their scaling factors. The scaling factor can be used to estimate the environmental performance indicators for

| Thickness | R [m <sup>2</sup> K/W] | Scaling factor per m2 | Scaling factor per m3 |
|-----------|------------------------|-----------------------|-----------------------|
| <b>39</b> | <b>1</b>               | <b>1</b>              | <b>26</b>             |
| 230       | 5,9                    | 5,9                   | 26                    |
| 250       | 6,4                    | 6,3                   | 25                    |
| 280       | 7,2                    | 6,9                   | 25                    |
| 310       | 7,95                   | 7,5                   | 24                    |
| 360       | 9,25                   | 8,6                   | 24                    |
| 430       | 11,05                  | 10,0                  | 23                    |
| 530       | 13,6                   | 12,2                  | 23                    |

## LCA: Results

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

| Product stage |           |               | Construction stage |          | Use stage |             |        |             |               |                        |                       | End of life stage          |           |                  |          | Benefits & loads beyond system boundary |
|---------------|-----------|---------------|--------------------|----------|-----------|-------------|--------|-------------|---------------|------------------------|-----------------------|----------------------------|-----------|------------------|----------|---|
| Raw materials | Transport | Manufacturing | Transport          | Assembly | Use       | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | De-construction 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        | MNR       | MNR         | MNR    | MNR         | MNR           | MNR                    | MNR                   | X                          | X         | X                | X        | X                                       |

How to read scientific notation

| Scientific notation | Decimal form |
|---------------------|--------------|
| 1,00E-01            | 0,1          |
| 1,00E-02            | 0,01         |
| 1,00E-03            | 0,001        |
| 1,00E-04            | 0,0001       |
| 1,00E-05            | 0,00001      |

## Core environmental impact indicators

| Indicator   | Unit                   | A1-3      | A4       | A5       | B1-B7 | C1 | C2       | C3 | C4       | D         |
|---|------------------------|-----------|----------|----------|-------|----|----------|----|----------|-----------|
| GWP-total   | kg CO2 eq.             | 2,03E+00  | 1,04E-01 | 2,28E-01 | MNR   | 0  | 1,02E-02 | 0  | 4,07E-02 | -7,92E-02 |
| <i>Global Warming Potential-total is the sum of GWP-fossil, GWP-biogenic and GWP luluc.<br/>GWP measures the Carbon Dioxide (CO<sub>2</sub>) and other greenhouse gas emissions associated with the product</i> |                        |           |          |          |       |    |          |    |          |           |
| GWP-fossil  | kg CO2 eq.             | 2,19E+00  | 1,03E-01 | 6,26E-02 | MNR   | 0  | 1,01E-02 | 0  | 4,06E-02 | -8,79E-02 |
| <i>GWP-fossil takes into account the GWP of greenhouse gas emissions from fossil fuels or fossil carbon containing substances (e.g. combustion, landfilling, etc.).</i>   |                        |           |          |          |       |    |          |    |          |           |
| GWP-biogenic  | kg CO2 eq.             | -1,64E-01 | 0,00E+00 | 1,65E-01 | MNR   | 0  | 0,00E+0  | 0  | 0,00E+00 | 8,78E-03  |
| <i>GWP-biogenic represents the atmospheric CO<sub>2</sub> absorbed from biomass growth and emitted during e.g. incineration or natural decay.</i>   |                        |           |          |          |       |    |          |    |          |           |
| GWP-LULUC   | kg CO2 eq.             | 1,09E-03  | 8,47E-04 | 4,26E-05 | MNR   | 0  | 8,31E-05 | 0  | 1,19E-04 | -2,99E-05 |
| <i>GWP-land use and land use change (luluc) takes into account greenhouse gas emissions from changes in carbon stock as a result of land use and land use change, e.g. deforestation</i>                        |                        |           |          |          |       |    |          |    |          |           |
| ODP   | kg CFC11 eq.           | 6,81E-09  | 1,32E-17 | 3,22E-10 | MNR   | 0  | 1,29E-18 | 0  | 1,58E-16 | -6,92E-15 |
| <i>The Ozone Depletion Potential, describes the potential for degradation of the ozone layer. High ODP substances are forbidden today.</i>  |                        |           |          |          |       |    |          |    |          |           |
| AP  | mol H <sup>+</sup> eq. | 2,50E-02  | 9,18E-05 | 5,53E-04 | MNR   | 0  | 1,06E-05 | 0  | 2,90E-04 | -2,27E-04 |
| <i>The Acidification Potential reflects the potential to cause the acid deposition or "acid rain"</i>   |                        |           |          |          |       |    |          |    |          |           |
| EP-freshwater   | kg P eq.               | 1,48E-05  | 1,89E-06 | 4,60E-07 | MNR   | 0  | 3,01E-08 | 0  | 6,81E-08 | -9,79E-08 |
| <i>Eutrophication Potential-freshwater represents potential excessive growth of algae and damage of the ecosystems from nutrients emissions reaching the fresh water end compartment.</i>                       |                        |           |          |          |       |    |          |    |          |           |
| EP-marine   | kg N eq.               | 3,00E-03  | 2,70E-05 | 8,00E-05 | MNR   | 0  | 3,51E-06 | 0  | 7,52E-05 | -4,95E-05 |
| <i>As above, but emitted to the marine end compartment.</i>   |                        |           |          |          |       |    |          |    |          |           |
| EP-terrestrial  | mol N eq.              | 9,44E-02  | 3,28E-04 | 2,08E-03 | MNR   | 0  | 4,16E-05 | 0  | 8,24E-04 | -5,39E-04 |
| <i>Eutrophication Potential-terrestrial. Indicator for enrichment of terrestrial ecosystems w. nitrogen based nutrients, e.g. ammonia.</i>  |                        |           |          |          |       |    |          |    |          |           |
| POCP  | kg NMVOC eq.           | 6,47E-03  | 7,80E-05 | 1,77E-04 | MNR   | 0  | 9,31E-06 | 0  | 2,27E-04 | -1,55E-04 |
| <i>Photochemical Ozone Creation Potential, most commonly manifested as smog.</i>  |                        |           |          |          |       |    |          |    |          |           |
| ADP-M&M   | kg Sb eq.              | 6,03E-07  | 7,86E-09 | 1,38E-08 | MNR   | 0  | 7,72E-10 | 0  | 3,83E-09 | -1,46E-08 |
| <i>Abiotic Depletion Potential for non-fossil resources (minerals and metals); relates to the consumption and scarcity of minerals and metals.</i>  |                        |           |          |          |       |    |          |    |          |           |
| ADP-fossil  | MJ                     | 2,18E+01  | 1,38E+00 | 6,47E-01 | MNR   | 0  | 1,35E-01 | 0  | 5,40E-01 | -2,07E+00 |
| <i>Abiotic Depletion Potential for fossil resources (oil, gas, coal). Indicator for the depletion of fossil resources for energy use or as feedstock for the petrochemical industry.</i>                        |                        |           |          |          |       |    |          |    |          |           |
| WDP   | m <sup>3</sup>         | 2,45E-01  | 8,96E-04 | 2,24E-02 | MNR   | 0  | 8,81E-05 | 0  | 4,36E-03 | -2,76E-02 |
| <i>Water Deprivation Potential, a "water scarcity footprint" indicator for the potential impact of water use, linked to water deficiency to downstream human users and ecosystems</i>                           |                        |           |          |          |       |    |          |    |          |           |

**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; See "additional Norwegian requirements" for indicator given as PO4 eq. **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

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

## Additional environmental impact indicators

| Indicator | Unit              | A1-3  | A4       | A5       | B1-B7 | C1 | C2       | C3 | C4       | D         |
|-----------|-------------------|---|----------|----------|-------|----|----------|----|----------|-----------|
| PM        | Disease incidence | 1,99E-07  | 5,82E-10 | 4,39E-09 | MNR   | 0  | 6,13E-11 | 0  | 3,59E-09 | -3,41E-09 |
|           |                   | <i>Particulate Matter. An indicator for potential disease incidences (occurrences) linked to emissions of particulate matter from, e.g. diesel engines.</i>           |          |          |       |    |          |    |          |           |
| IRP       | kBq U235 eq.      | 2,04E-02  | 2,39E-04 | 2,50E-03 | MNR   | 0  | 2,34E-05 | 0  | 5,94E-04 | -1,67E-03 |
|           |                   | <i>Ionising radiation Potential, relates to the possible damage to human health from exposure to low level radiation linked to generation of nuclear energy only.</i> |          |          |       |    |          |    |          |           |
| ETP-fw    | CTUe              | 6,48E+00  | 9,94E-01 | 2,26E-01 | MNR   | 0  | 9,76E-02 | 0  | 3,07E-01 | -8,87E-02 |
|           |                   | <i>Ecotoxicity Potential-freshwater. Potential toxic effects on freshwater species of emissions of substances/chemicals.</i>  |          |          |       |    |          |    |          |           |
| HTP-c     | CTUh              | 2,47E-09  | 2,01E-11 | 5,47E-11 | MNR   | 0  | 1,97E-12 | 0  | 4,53E-11 | -1,10E-11 |
|           |                   | <i>Human toxicity potential - cancer effects. Potential carcinogenic impacts on people from the emissions of substances and chemicals</i>                             |          |          |       |    |          |    |          |           |
| HTP-nc    | CTUh              | 1,63E-08  | 1,03E-09 | 7,67E-10 | MNR   | 0  | 1,02E-10 | 0  | 4,99E-09 | -4,41E-10 |
|           |                   | <i>Human toxicity Potential - non-cancer effects. Potential toxic effects on humans other than carcinogenic from the emission of substances and chemicals.</i>        |          |          |       |    |          |    |          |           |
| SQP       | Dimension-less    | 3,43E+01  | 4,73E-01 | 7,23E-01 | MNR   | 0  | 4,63E-02 | 0  | 1,09E-01 | -1,80E+00 |
|           |                   | <i>Soil Quality Potential. Indicator representing factors impacting soil quality, e.g. Erosion, filtration ability and groundwater regeneration.</i>                  |          |          |       |    |          |    |          |           |

**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       |
|   | Potential incidence of disease due to PM emissions (PM)   | None       |
|   | Acidification potential, Accumulated Exceedance (AP)  | None       |
|   | Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater) | None       |
| ILCD type / level 2   | 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          |
| <p><b>Disclaimer 1</b> – 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.</p> <p><b>Disclaimer 2</b> – 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 experienced with the indicator</p> |   |            |

## Resource use

| Indicator  | Unit           | A1-3  | A4       | A5        | B1-B7 | C1 | C2       | C3 | C4       | D         |
|--|----------------|---|----------|-----------|-------|----|----------|----|----------|-----------|
| RPEE   | MJ             | 3,69E+01  | 7,69E-02 | 8,36E-01  | MNR   | 0  | 7,53E-03 | 0  | 7,26E-02 | -4,19E-01 |
|  |                | <i>Renewable Primary Energy used as Energy carrier only.</i><br><i>Typically renewable energy from Biomethane, windmills or hydropower</i>  |          |           |       |    |          |    |          |           |
| RPEM   | MJ             | 1,91E+00  | 0,00E+00 | -5,74E-02 | MNR   | 0  | 0,00E+00 | 0  | 0,00E+00 | 0,00E+00  |
|  |                | <i>Renewable primary energy resources used as raw materials – indicates the consumption of energy resources as raw materials e.g. wood, or biomethane as feedstock for bio-plastics</i> |          |           |       |    |          |    |          |           |
| TPE  | MJ             | 3,88E+01  | 7,69E-02 | 7,78E-01  | MNR   | 0  | 7,53E-03 | 0  | 7,26E-02 | -4,19E-01 |
| <i>Total use of renewable primary energy resources (RPEE+RPEM)</i>     |                |   |          |           |       |    |          |    |          |           |
| NRPE   | MJ             | 2,10E+01  | 1,38E+00 | 6,57E-01  | MNR   | 0  | 1,35E-01 | 0  | 5,40E-01 | -2,15E+00 |
|  |                | <i>Non renewable primary energy used as Energy carrier, e.g. energy from fossil fuel power plants or transportation</i>   |          |           |       |    |          |    |          |           |
| NRPM   | MJ             | 9,92E-01  | 0,00E+00 | -2,98E-02 | MNR   | 0  | 0,00E+00 | 0  | 0,00E+00 | 0,00E+00  |
|  |                | <i>Non renewable primary energy resources used as raw materials, e.g. oil derivatives used as feedstock material for the petrochemical industry / plastics</i>                          |          |           |       |    |          |    |          |           |
| TRPE   | MJ             | 2,20E+01  | 1,38E+00 | 6,27E-01  | MNR   | 0  | 1,35E-01 | 0  | 5,40E-01 | -2,15E+00 |
| <i>Total use of non renewable primary energy resources (NRPE+NRPM)</i> |                |   |          |           |       |    |          |    |          |           |
| SM   | kg             | 5,17E-02  | 0,00E+00 | 1,03E-03  | MNR   | 0  | 0,00E+00 | 0  | 0,00E+00 | 1,92E-01  |
| <i>Secondary materials, Use of recycled material, e.g. return wool</i> |                |   |          |           |       |    |          |    |          |           |
| RSF  | MJ             | 0,00E+00  | 0,00E+00 | 0,00E+00  | MNR   | 0  | 0,00E+00 | 0  | 0,00E+00 | 0,00E+00  |
|  |                | <i>Renewable secondary fuels. E.g. used frying oil. Renewable secondary fuels can represent a limited resource why increased consumption potentially can create shortages.</i>          |          |           |       |    |          |    |          |           |
| NRSF   | MJ             | 0,00E+00  | 0,00E+00 | 0,00E+00  | MNR   | 0  | 0,00E+00 | 0  | 0,00E+00 | 0,00E+00  |
| <i>Non-renewable secondary fuels, e.g. waste oil</i>                   |                |   |          |           |       |    |          |    |          |           |
| W  | m <sup>3</sup> | 6,68E-03  | 8,80E-05 | 5,63E-04  | MNR   | 0  | 8,62E-06 | 0  | 1,33E-04 | -7,63E-04 |
|  |                | <i>net fresh water consumption. Fresh water is a limited resource why high consumption of fresh water can create local shortages</i>  |          |           |       |    |          |    |          |           |

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

| Parameter | Unit | A1-3  | A4       | A5       | B1-B7 | C1 | C2       | C3 | C4       | D         |
|-----------|------|---|----------|----------|-------|----|----------|----|----------|-----------|
| HW        | kg   | 6,46E-07  | 6,93E-11 | 8,71E-09 | MNR   | 0  | 6,81E-12 | 0  | 5,73E-11 | -9,85E-10 |
|           |      | <i>Hazardous waste, collected and sent special treatment</i>  |          |          |       |    |          |    |          |           |
| NHW       | kg   | 4,70E-02  | 2,05E-04 | 4,66E-02 | MNR   | 0  | 2,01E-05 | 0  | 2,69E+00 | -2,05E-02 |
|           |      | <i>Non Hazardous Waste Disposed consists of inactive (inert) waste e.g. construction waste that typically is sent to landfill. An increased fraction is sent to reuse or recycling.</i> |          |          |       |    |          |    |          |           |
| RW        | kg   | 1,01E-04  | 1,67E-06 | 1,71E-05 | MNR   | 0  | 1,63E-07 | 0  | 5,64E-06 | -1,46E-05 |
|           |      | <i>Radioactive Waste Disposed. Mainly represents waste from nuclear power plants.</i>   |          |          |       |    |          |    |          |           |

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

## End of life – output flow

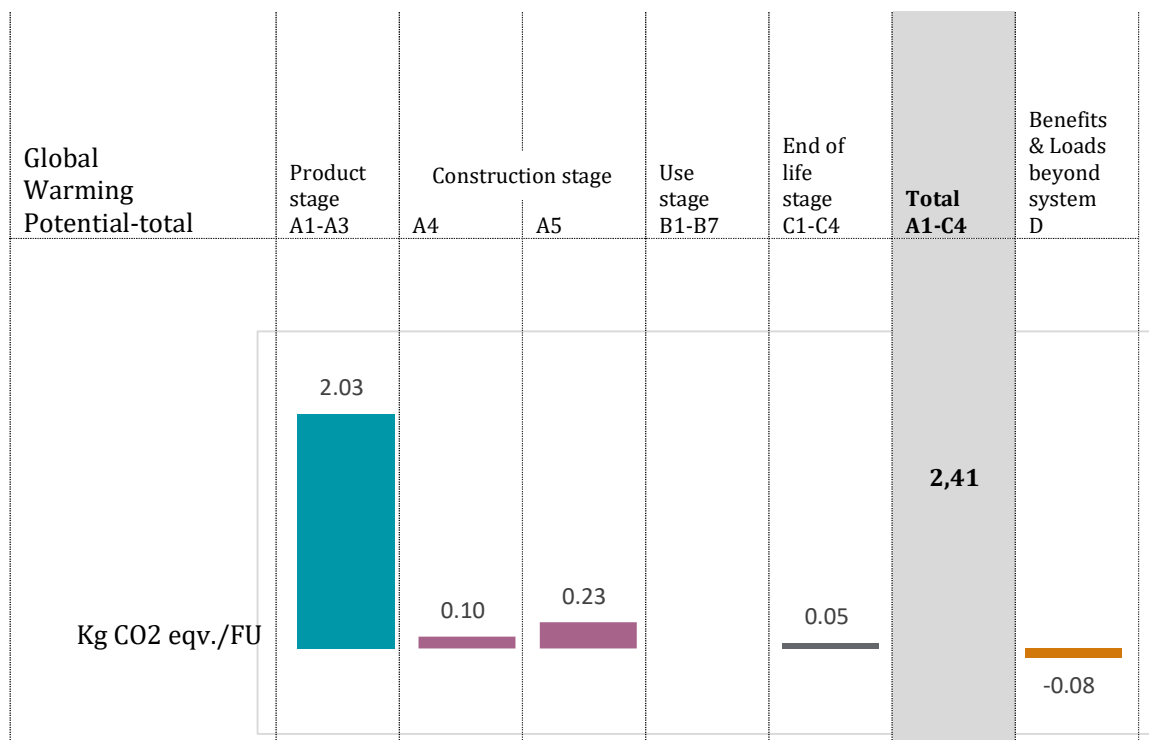
| Parameter | Unit | A1-3  | A4       | A5       | B1-B7 | C1 | C2       | C3 | C4       | D        |
|-----------|------|---|----------|----------|-------|----|----------|----|----------|----------|
| CR        | kg   | 0,00E+00  | 0,00E+00 | 0,00E+00 | MNR   | 0  | 0,00E+00 | 0  | 0,00E+00 | 0,00E+00 |
|           |      | <i>Components for Re-Use. Materials or components which are re-used outside the system boundary.</i>                    |          |          |       |    |          |    |          |          |
| MR        | kg   | 0,00E+00  | 0,00E+00 | 3,19E-02 | MNR   | 0  | 0,00E+00 | 0  | 0,00E+00 | 0,00E+00 |
|           |      | <i>Materials for Recycling. Materials recycled outside the system boundary</i>  |          |          |       |    |          |    |          |          |
| MER       | kg   | 0,00E+00  | 0,00E+00 | 5,41E-02 | MNR   | 0  | 0,00E+00 | 0  | 0,00E+00 | 0,00E+00 |
|           |      | <i>Materials for Energy Recovery. Materials utilised in power plants as secondary fuels outside the system boundary</i> |          |          |       |    |          |    |          |          |
| EEE       | kg   | 0,00E+00  | 0,00E+00 | 1,79E-01 | MNR   | 0  | 0,00E+00 | 0  | 0,00E+00 | 0,00E+00 |
|           |      | <i>Exported electrical energy: Electrical energy from incineration of waste or landfill gas</i>                         |          |          |       |    |          |    |          |          |
| ETE       | kg   | 0,00E+00  | 0,00E+00 | 5,37E-01 | MNR   | 0  | 0,00E+00 | 0  | 0,00E+00 | 0,00E+00 |
|           |      | <i>Exported thermal energy. Thermal energy, e.g. steam from incineration of waste or landfill gas</i>                   |          |          |       |    |          |    |          |          |

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

## Information describing the biogenic carbon content at the factory gate

| Biogenic carbon content                               | Unit | Value  |
|---|------|--------|
| Biogenic carbon content in product                    | kg C | 0      |
| Biogenic carbon content in the accompanying packaging | kg C | 0,0481 |

## GWP-total interpretation



The main GWP contribution from the product life cycle is linked to the Product stage (A1-A3). This is primarily related to the materials delivered to the factory gate and consumption of electricity and coke.

The energy consumption linked to A3, is calculated and verified externally as 100% renewable electricity from Danish windpower and 100% Danish biogas and the coke (consumed on conventional line). The investment in low carbon energy sources secures a significantly lower GWP-total (A1-C4) as compared to conventional energy sources (up to 50%), for the TOPROCK system specific the reduction is approximately 25%.

The CO<sub>2</sub> absorbed by the wood in the wooden pallets is represented by a negative GWP-biogenic. This reduces the GWP-total (A1-A3) by approximately 11%.

The GWP-Biogenic, ie the carbon stored in the wooden pallets, is released during the construction stage phase (A5) where the wood is presumed incinerated with energy recovery.

The benefits from energy recovery (a negative GWP) from incineration of packaging materials (wood pallets and plastic foils) is allocated to Benefits & Loads beyond system (D).

Approximately 50% of the GWP-total from the assembly phase (A5) is linked to fossil emissions from incineration of plastic foils and handling of surplus stone wool/installation waste (2%).

Impacts linked to end of life stages (C1-C4) are primarily linked to transportation of stone wool to recycling or to landfill.

Melting virgin materials or re-melting returned ROCKWOOL stone wool are both similarly energy intensive processes. Increasing the recycling rate for return wool, will therefore not lead to great variations in the overall GWP profile. However, increased recycling will be linked directly to reduction of waste sent to landfill.

## Additional Norwegian requirements

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

The calculations of applied electricity and gas for the manufacturing process (A3) are made taking into account 100% renewable electricity from Danish wind power and 100% Danish biogas use. The renewable sources of energy and electricity are evidenced by Guarantee of Origin certificates (GOs).

National production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) for wind power electricity production.

| National electricity grid (with GOs)            | Unit           | Value |
|---|----------------|-------|
| Denmark, Wind power, GaBi version 10.0.1 (2021) | kg CO2 -eq/kWh | 0,006 |

### Additional GWP results calculations using the physical national electricity grid mix and gas mix (energy sources without a guarantees of origins)

| National electricity grid           | Unit           | Value |
|-------------------------------------|----------------|-------|
| Denmark, GaBi version 10.0.1 (2021) | kg CO2 -eq/kWh | 0,240 |

| Indicator    | Unit       | A1-3      |
|--------------|------------|-----------|
| GWP-total    | kg CO2 eq. | 2,66E+00  |
| GWP-fossil   | kg CO2 eq. | 2,82E+00  |
| GWP-biogenic | kg CO2 eq. | -1,62E-01 |
| GWP-LULUC    | kg CO2 eq. | 1,39E-03  |

The complete additional results for all the impact categories representing the calculations without guarantees of origins, applying Danish national production mix for electricity and natural gas for gas are given in Appendix: Additional LCA Results without GOs.

### Additional environmental impact indicators required in NPCR Part A for construction products

In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator for GWP has been sub-divided into the following:

GWP-IOBC Climate impacts calculated according to the principle of instantaneous oxidation  
 GWP-BC Climate impacts from the net uptake and emission of biogenic carbon from each module.



In addition, EP-freshwater shall also declared as PO4 eq.

| Indicator      | Unit       | A1-3      | A4       | A5       | B   | C1 | C2       | C3 | C4       | D         |
|----------------|------------|-----------|----------|----------|-----|----|----------|----|----------|-----------|
| EP-freshwater* | kg PO4 eq. | 2,76E-03  | 7,04E-05 | 7,65E-05 | MNR | 0  | 1,11E-06 | 0  | 1,70E-05 | -1,62E-05 |
| GWP-IOBC       | kg CO2 eq. | 2,19E+00  | 7,40E-02 | 6,26E-02 | MNR | 0  | 1,02E-02 | 0  | 4,07E-02 | -8,79E-02 |
| GWP-BC         | kg CO2 eq. | -1,64E-01 | 0,00E+00 | 1,65E-01 | MNR | 0  | 0,00E+00 | 0  | 0,00E+00 | 8,78E-03  |
| GWP            | kg CO2 eq. | 2,03E+00  | 7,40E-02 | 2,28E-01 | MNR | 0  | 1,02E-02 | 0  | 4,07E-02 | -7,92E-02 |

**EP-freshwater\*** Eutrophication potential, fraction of nutrients reaching freshwater end compartment. Declared as PO4 eq. **GWP-IOBC** Global warming potential calculated according to the principle of instantaneous oxidation. **GWP-BC** Global warming potential from net uptake and emissions of biogenic carbon from the materials in each module. **GWP** Global warming potential

## Hazardous substances

The declaration is based upon reference to threshold values and/or test results and/or material safety data sheets provided to EPD verifiers. Documentation available upon request to EPD owner.

- 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 (Avfallsforskiten, Annex III), see table.

Mineral wool fibers produced by ROCKWOOL are classified as non-hazardous under REACH (Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures). ROCKWOOL® are registered with REACH under the following definition: "Man-made vitreous (silicate) fibers with random orientation with alkaline oxide and alkali earth oxide(Na2O+K2O+CaO+MgO+BaO) content greater than 18% by weight and fulfilling one of the Note Q conditions". ROCKWOOL products produced in Europe fulfil the Note Q requirements. This is certified by the independent certification body EUCEB (European Certification Board for mineral wool products). More information on EUCEB can be found at [www.euceb.org](http://www.euceb.org).

## Indoor environment

There are no legal requirements for indoor emissions of stone wool thermal insulation products.

## Carbon footprint

Carbon footprint of 1 m<sup>2</sup> of a 39 mm thick ROCKWOOL® TOPROCK System with a density of 75 kg/m<sup>3</sup> (R=1m<sup>2</sup>K/W) is 2,41 kg CO2 eq (including Module A1-C4). This is elaborated per module in the results section.

## APPENDIX: Additional LCA Results without GOs

The LCA Results were calculated additionally without taking into account the purchase of guarantees of origin. Based on these results the contribution of green electricity and biogas to the reduction of environmental impacts can be observed. ROCKWOOL Nordics has committed to continuous purchase of renewable energy certificates for at least the validity period of this declaration.

Calculations are done applying Danish national production mix for electricity and natural gas for gas in manufacturing processes (A3).

| National electricity grid           | Unit           | Value |
|-------------------------------------|----------------|-------|
| Denmark, GaBi version 10.0.1 (2021) | kg CO2 -eq/kWh | 0,240 |

### Core environmental impact indicators

| Indicator      | Unit                   | A1-3      | A4       | A5       | B   | C1 | C2       | C3 | C4       | D         |
|----------------|------------------------|-----------|----------|----------|-----|----|----------|----|----------|-----------|
| GWP-total      | kg CO2 eq.             | 2,66E+00  | 1,04E-01 | 2,00E-01 | MNR | 0  | 1,02E-02 | 0  | 4,07E-02 | -7,91E-02 |
| GWP-fossil     | kg CO2 eq.             | 2,82E+00  | 1,03E-01 | 3,67E-02 | MNR | 0  | 1,01E-02 | 0  | 4,06E-02 | -8,79E-02 |
| GWP-biogenic   | kg CO2 eq.             | -1,62E-01 | 0,00E+00 | 1,63E-01 | MNR | 0  | 0,00E+00 | 0  | 0,00E+00 | 8,78E-03  |
| GWP-LULUC      | kg CO2 eq.             | 1,39E-03  | 8,47E-04 | 2,74E-05 | MNR | 0  | 8,31E-05 | 0  | 1,19E-04 | -2,99E-05 |
| ODP            | kg CFC11 eq.           | 6,81E-09  | 1,32E-17 | 3,22E-10 | MNR | 0  | 1,29E-18 | 0  | 1,58E-16 | -6,92E-15 |
| AP             | mol H <sup>+</sup> eq. | 2,50E-02  | 9,18E-05 | 5,53E-04 | MNR | 0  | 1,06E-05 | 0  | 2,90E-04 | -2,27E-04 |
| EP-freshwater  | kg P eq.               | 1,54E-05  | 1,89E-06 | 4,62E-07 | MNR | 0  | 3,01E-08 | 0  | 6,81E-08 | -9,79E-08 |
| EP-marine      | kg N eq.               | 2,99E-03  | 2,70E-05 | 7,97E-05 | MNR | 0  | 3,51E-06 | 0  | 7,52E-05 | -4,95E-05 |
| EP-terrestrial | mol N eq.              | 9,43E-02  | 3,28E-04 | 2,08E-03 | MNR | 0  | 4,16E-05 | 0  | 8,24E-04 | -5,39E-04 |
| POCP           | kg NMVOC eq.           | 6,48E-03  | 7,80E-05 | 1,77E-04 | MNR | 0  | 9,31E-06 | 0  | 2,27E-04 | -1,55E-04 |
| ADP-M&M        | kg Sb eq.              | 5,03E-07  | 7,86E-09 | 1,18E-08 | MNR | 0  | 7,72E-10 | 0  | 3,83E-09 | -1,46E-08 |
| ADP-fossil     | MJ                     | 3,21E+01  | 1,38E+00 | 8,52E-01 | MNR | 0  | 1,35E-01 | 0  | 5,40E-01 | -2,07E+00 |
| WDP            | m <sup>3</sup>         | 2,38E-01  | 8,96E-04 | 2,23E-02 | MNR | 0  | 8,81E-05 | 0  | 4,36E-03 | -2,76E-02 |

**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; See "additional Norwegian requirements" for indicator given as PO4 eq. **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

Reading example: 9,0 E-03 = 9,0\*10<sup>-3</sup> = 0,009

## Additional environmental impact indicators

| Indicator | Unit           | A1-3     | A4       | A5       | B   | C1 | C2       | C3 | C4       | D         |
|-----------|----------------|----------|----------|----------|-----|----|----------|----|----------|-----------|
| PM        | Disease incid. | 2,03E-07 | 5,82E-10 | 4,46E-09 | MNR | 0  | 6,13E-11 | 0  | 3,59E-09 | -3,41E-09 |
| IRP       | kBq U235 eq.   | 4,75E-02 | 2,39E-04 | 3,05E-03 | MNR | 0  | 2,34E-05 | 0  | 5,94E-04 | -1,67E-03 |
| ETP-fw    | CTUe           | 7,35E+00 | 9,94E-01 | 2,44E-01 | MNR | 0  | 9,76E-02 | 0  | 3,07E-01 | -8,87E-02 |
| HTP-c     | CTUh           | 2,33E-09 | 2,01E-11 | 5,20E-11 | MNR | 0  | 1,97E-12 | 0  | 4,53E-11 | -1,10E-11 |
| HTP-nc    | CTUh           | 1,82E-08 | 1,03E-09 | 8,04E-10 | MNR | 0  | 1,02E-10 | 0  | 4,99E-09 | -4,41E-10 |
| SQP       | Dimensi onless | 3,58E+01 | 4,73E-01 | 7,53E-01 | MNR | 0  | 4,63E-02 | 0  | 1,09E-01 | -1,80E+00 |

**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       |
|                                    | Potential incidence of disease due to PM emissions (PM)   | None       |
| ILCD type / level 2                | Acidification potential, Accumulated Exceedance (AP)  | None       |
|                                    | Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater) | 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       |
| ILCD type / level 3                | Potential Human exposure efficiency relative to U235 (IRP)  | 1          |
|                                    | 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 experienced with the indicator

## Resource use

| Indicator | Unit           | A1-3     | A4       | A5        | B   | C1 | C2       | C3 | C4       | D         |
|-----------|----------------|----------|----------|-----------|-----|----|----------|----|----------|-----------|
| RPEE      | MJ             | 5,99E+00 | 7,69E-02 | 9,51E-02  | MNR | 0  | 7,53E-03 | 0  | 7,26E-02 | -4,19E-01 |
| RPEM      | MJ             | 1,91E+00 | 0,00E+00 | -5,74E-02 | MNR | 0  | 0,00E+00 | 0  | 0,00E+00 | 0,00E+00  |
| TPE       | MJ             | 7,90E+00 | 7,69E-02 | 3,77E-02  | MNR | 0  | 7,53E-03 | 0  | 7,26E-02 | -4,19E-01 |
| NRPE      | MJ             | 3,18E+01 | 1,38E+00 | 1,93E-01  | MNR | 0  | 1,35E-01 | 0  | 5,40E-01 | -2,15E+00 |
| NRPM      | MJ             | 9,92E-01 | 0,00E+00 | -2,98E-02 | MNR | 0  | 0,00E+00 | 0  | 0,00E+00 | 0,00E+00  |
| TRPE      | MJ             | 3,27E+01 | 1,38E+00 | 1,66E-01  | MNR | 0  | 1,35E-01 | 0  | 5,40E-01 | -2,15E+00 |
| SM        | kg             | 5,17E-02 | 0,00E+00 | 0,00E+00  | MNR | 0  | 0,00E+00 | 0  | 0,00E+00 | -1,92E-01 |
| RSF       | MJ             | 0,00E+00 | 0,00E+00 | 0,00E+00  | MNR | 0  | 0,00E+00 | 0  | 0,00E+00 | 0,00E+00  |
| NRSF      | MJ             | 0,00E+00 | 0,00E+00 | 0,00E+00  | MNR | 0  | 0,00E+00 | 0  | 0,00E+00 | 0,00E+00  |
| W         | m <sup>3</sup> | 8,26E-03 | 8,80E-05 | 4,25E-04  | MNR | 0  | 8,62E-06 | 0  | 1,33E-04 | -7,63E-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

| Indicator | Unit | A1-3     | A4       | A5       | B   | C1 | C2       | C3 | C4       | D         |
|-----------|------|----------|----------|----------|-----|----|----------|----|----------|-----------|
| HW        | kg   | 6,53E-07 | 6,93E-11 | 1,31E-08 | MNR | 0  | 6,81E-12 | 0  | 5,73E-11 | -9,85E-10 |
| NHW       | kg   | 5,75E-02 | 2,05E-04 | 4,67E-02 | MNR | 0  | 2,01E-05 | 0  | 2,69E+00 | -2,05E-02 |
| RW        | kg   | 3,47E-04 | 1,67E-06 | 1,99E-05 | MNR | 0  | 1,63E-07 | 0  | 5,64E-06 | -1,46E-05 |

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





## End of life – output flow

| Indicator | Unit | A1-3     | A4       | A5       | B   | C1 | C2       | C3 | C4       | D        |
|-----------|------|----------|----------|----------|-----|----|----------|----|----------|----------|
| CR        | kg   | 0,00E+00 | 0,00E+00 | 0,00E+00 | MNR | 0  | 0,00E+00 | 0  | 0,00E+00 | 0,00E+00 |
| MR        | kg   | 0,00E+00 | 0,00E+00 | 3,19E-02 | MNR | 0  | 0,00E+00 | 0  | 0,00E+00 | 0,00E+00 |
| MER       | kg   | 0,00E+00 | 0,00E+00 | 0,00E+00 | MNR | 0  | 0,00E+00 | 0  | 0,00E+00 | 0,00E+00 |
| EEE       | MJ   | 0,00E+00 | 0,00E+00 | 1,79E-01 | MNR | 0  | 0,00E+00 | 0  | 0,00E+00 | 0,00E+00 |
| ETE       | MJ   | 0,00E+00 | 0,00E+00 | 5,37E-01 | MNR | 0  | 0,00E+00 | 0  | 0,00E+00 | 0,00E+00 |

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

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|   |   |         |                              |
|---|---|---------|------------------------------|
| <br>The Norwegian EPD Foundation | <b>Program Operator</b><br>The Norwegian EPD Foundation<br>Post Box 5250 Majorstuen, 0303 Oslo<br>Norway                                      | tlf     | +47 23 08 80 00              |
|   |   | e-post: | post@epd-norge.no            |
|   |   | web     | www.epd-norge.no             |
| <br>The Norwegian EPD Foundation | <b>Publisher</b><br>The Norwegian EPD Foundation<br>Post Box 5250 Majorstuen, 0303 Oslo<br>Norway   | tlf     | +47 23 08 80 00              |
|   |   | e-post: | post@epd-norge.no            |
|   |   | web     | www.epd-norge.no             |
|                                  | <b>Owner of the declaration</b><br>ROCKWOOL Nordics (ROCKWOOL Group)<br>Hovedgaden 501, 2640 Hedehusene,<br>Denmark                           | tlf     | +45 46 56 16 16              |
|   |   | e-post: | christian.kofod@rockwool.com |
|   |   | web     | www.rockwool.com/dk          |
|                                  | <b>Author of the life cycle assesment</b><br>Larisa Xanthopoulou<br>ROCKWOOL International A/S<br>Hovedgaden 584, 2640 Hedehusene,<br>Denmark | tlf     | +45 46 56 03 00              |
|   |   | Fax     |                              |
|   |   | e-post: | info@rockwool.com            |
|   |   | web     | www.rockwool.com             |

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