Environmental Product Declaration (EPD)

C-2000 NF Concrete Admixture

Xypex Chemical Corporation

The Xypex Chemical Corporation is pleased to present this environmental product declaration (EPD) for C-2000 NF Concrete Admixture. This EPD was developed in compliance with CAN/CSA-ISO 14025 and ISO 21930 and has been verified under Rob Sianchuk Consulting.

The EPD owner has the sole ownership, liability, and responsibility for the EPD

The EPD includes life cycle assessment (LCA) results for A1-C4 and D.

For more information about Xypex Chemical Corporation, please go to https://www.xypex.com/

This environmental product declaration (EPD) is in accordance with CAN/CSA-ISO 14025, EN 15804:2012+A2:2019/AC:2021, ISO 21930, which is also referenced as the core PCR.

EPDs within the same product category but published in different EPD programmes, may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the same first-digit version number) or be based on fully aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared units); have identical scope in terms of included life-cycle stages (unless the excluded life-cycle stage is demonstrated to be insignificant); apply identical impact assessment methods (including the same version of characterisation factors); and be valid at the time of comparison.

PROGRAM OPERATOR	CSA Group 178 Rexdale Blvd Toronto, ON Canada M9W 1R3 www.csagroup.org
PRODUCT	C-2000 NF Concrete Admixture
EPD REGISTRATION NUMBER	[LEAVE BLANK – CSA WILL INSERT DURING REGISTRATION]
EPD RECIPIENT ORGANIZATION	Xypex Chemical Corporation 13731Mayfield Place, Richmond British Columbia, Canada 1-604-273-5265 / enquiry@xypex.com
REFERENCE PCR	ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services Date of issue: 2017-07
EPD TYPE	Product – specific

EPD SYSTEM BOUNDARY	Cradle to gate with options, modules C1–C4, module D and with optional modules (A1–A3 + C + D and additional modules). The additional modules A4–A5 and B1–B7 are selected.
DATE OF ISSUE	[LEAVE BLANK – CSA WILL INSERT DURING REGISTRATION]
PERIOD OF VALIDITY	[LEAVE BLANK – CSA WILL INSERT DURING REGISTRATION]

The PCR review was conducted by:	Technical Committee ISO/TC 59, Buildings and civil engineering works, Subcommittee SC 17, Sustainability in buildings and civil engineering works
Information on LCA practitioner(s): LCA accountability:	Trenor Philbin, TrueNorth Collective LLC Olivia Fritz, TrueNorth Collective LLC
This EPD and related data were independently verified by an external verifier, Rob Sianchuk Consulting, robsianchukconsulting.ca, according to CAN/CSA-ISO 14025:2006	[Insert signature of verifier here] Rob Sianchuk; info@robsianchukconsulting.ca

DESCRIPTION OF Xypex Chemical Corporation

Owner of the EPD:

Xypex Chemical Corporation (Xypex)

Contact:

Kelly Nix; kelly.nix@xypex.com

Description of the organisation:

More than fifty-five years ago, the development of crystalline technology by a team of scientists at Xypex Chemical Corporation revolutionized the way that concrete is protected from intrusive liquids. The key to Xypex concrete waterproofing technology is its innovative approach to treating concrete at the microscopic level. Through commitment to excellence and ongoing research and testing, Xypex Crystalline Technology has evolved into a family of waterproofing products that solve water issues in construction and permanently protect concrete structures in challenging environments in all climates across the globe.

Product-related or management system-related certifications:

ISO 9001:2015,

NSF 61

Name and location of production site(s):

Richmond, British Columbia, Canada

DESCRIPTION OF PRODUCT

Product name:

C-2000 NF Concrete Admixture

Product identification:

The product under study is a concrete admixture product. Once mixed the concrete admixture product is inseparable from the other concrete materials. Xypex C-2000 NF Concrete Admixture is added to the concrete mix at the time of batching.

Xypex C-2000 NF Concrete Admixture consists of Portland cement and various active, proprietary chemicals.

Product description:

Xypex is a unique chemical treatment for the waterproofing, protection and improvement of concrete. XYPEX ADMIX C-2000 NF is added to the concrete mix at the time of batching. Xypex Admix C-2000 NF consists of Portland cement and various active, proprietary chemicals. These active chemicals react with moisture and with the by-products of cement hydration to cause a catalytic reaction. This reaction generates a non-soluble crystalline formation throughout the pores and capillary tracts of the concrete that permanently seals the concrete and prevents the penetration of water and other liquids from any direction.

UN CPC code: 3423

Geographical scope: The end-to-end process is fully developed and implemented in Richmond, British Columbia, Canada.

Input and output flows are selected to represent Canadian-specific activities where granular inventory is available. Regional electricity process for Canada was chosen. Canadian-specific inventory flows and proxies are used where available to represent the production pathways in Canada. For processes following the manufacturing of the product global average data is used to represent the concrete materials.

Geographic coverage for this study is determined as good following the guidance in EN15804. The data represented includes average data from larger area in which the area under study is included.

SCOPE OF EPD

Product category rules (PCR):

ISO 21930:2017

Declared unit:

The declared unit being evaluated, as specified by the PCR, is:

1 kg of admixture product

The reference flow is the mass of material required to provide the equivalent product mass for the declared unit. The total production mass is provided as primary data from Xypex for the declared unit of 1 kg.

Lifespan:

75 years of product lifespan over 75 years of building estimated service life (ESL). The lifespan of the admixture product is assumed to be equal to that of the building service life since the product is inseparable from the other components of concrete within the building. This assumes

the admixture remains active and stable throughout the life of the concrete. The lifespan only applies to these reference in-use conditions. If used in environments with aggressive exposure where concrete does not last the lifetime of the building, the lifespan of the additive may differ.

Time representativeness:
The primary data is provided for the reference year of 2023.

Database(s) and LCA software used:
System modeling was performed using the commercial LCA software SimaPro (version 9.6), developed by PRé Sustainability, the Netherlands
The study uses a combination of primary and secondary data. Where primary data was not available, default datasets were used from ecoinvent v3.10.1, Cut-off at Classification. This dataset contains detailed peer reviewed LCI data. Secondary data is sourced from a variety of literature sources, verified public reports and widely used databases.

Description of system boundaries:

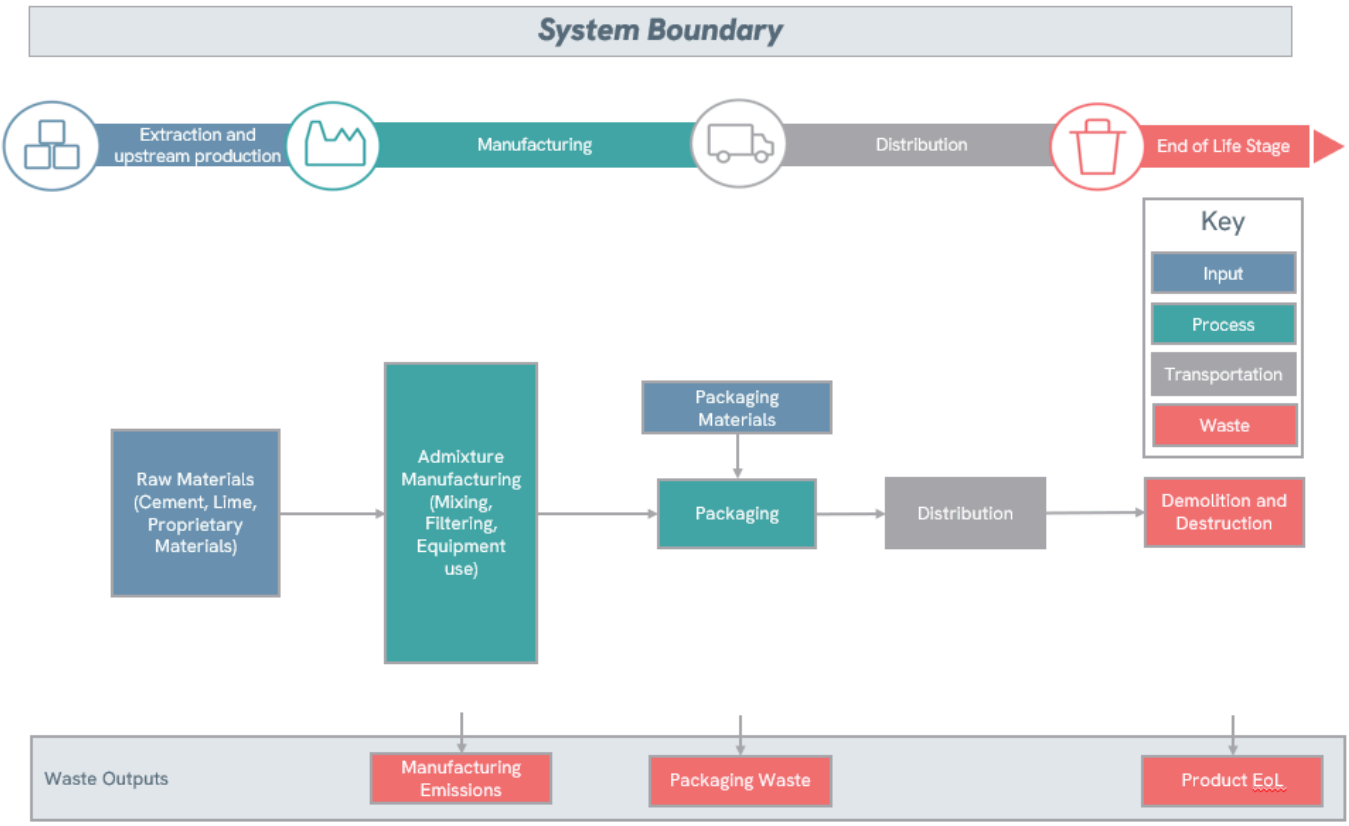

Figure 1: System boundary process flow diagram for C-2000 NF Concrete Admixture

As per the guiding PCR, the system boundaries of the LCA and EPD shall follow the modular

structure for life cycle stages in line with ISO 21930 (ISO 21930, 2017), as shown below.

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and variation in GWP-GHG results between products and sites

	PRODUCT STAGE			CONSTRUCTION STAGE		USE STAGE							END OF LIFE STAGE				LOADS AND BENEFITS
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	Extraction and upstream production	Transport to factory	Manufacturing	Transport to site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational water use	De-construction / Demolition	Transport to waste processing or disposal	Waste processing	Disposal of waste	Potential net benefits from reuse, recycling and/or energy recovery beyond the system boundary
Modules Declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Share of specific data	>90%			50%		-	-	-	-	-	-	-	-	-	-	-	-
Variation - Products	0%			0%		-	-	-	-	-	-	-	-	-	-	-	-
Variation - sites	0%			0%		-	-	-	-	-	-	-	-	-	-	-	-
Geography	CA-BC; RoW; GLO			RoW; GLO													

*MND: module not declared;

The system boundary for the LCA and EPDs is cradle to gate with options, modules C1–C4, module D and with optional modules (A1–A3 + C + D and additional modules). The additional modules A4-A5 and B1-B7 are selected. This boundary is chosen to align with comparable products manufactured by Xypex.

The percentage of specific data is assumed to be larger than 60%, but it cannot be proved since one or several EPDs that are used as data sources lack information on the percentage of specific data used. The EPD represents one product and one facility, therefore no variation in products or sites is not applicable.

Assumptions

Following the same assumptions as concrete, modules B1-B7 are assumed to be zero. A lifetime of 75 years is assumed for the product. End of life treatment for the product follows the same treatment as concrete based on EPA 2020 C&D Debris Management by Material and Destination. Concrete is disposed of at 82.4% recycling and 17.6% landfilling.

Exclusions

A number of processes are excluded from the study as allowed by the PCR (ISO 21930). Typically, in an LCA, some aspects within the set boundaries are excluded due to statistical insignificance or irrelevancy to the goal and scope. The following activities were excluded from the scope and boundaries for this study:

- Human activities (e.g., employee travel to and from work)
- R&D (i.e., the laboratory and inputs related to the development of technologies)
- Services (e.g., the use of purchased marketing, consultancy services and business travel).
- Construction of capital equipment and maintenance and operation of support equipment
- Maintenance and operation of support equipment

Capital equipment and plant infrastructure are not included in the foreground data however, background data from ecoinvent include the infrastructure components.

For the processes within the system boundary, all energy and material flows have been included in the model. No known flows are excluded. All upstream and downstream activities are included using a combination of primary and secondary data. While the majority of inventory data is sourced from primary resources, representative proxies are used to close gaps in the absence of primary data.

Allocation

In accordance with the guiding PCR, mass should be used as the primary basis for co-product allocation. The allocations of relevance for calculation (appropriation of impacts across various products) shall be indicated, at least:

- Allocation in the use of recycled and/or secondary raw materials.
- Allocation of energy, ancillary and operating materials used for individual products in a factory.

No multi-output allocation was necessary in the foreground of the study. Allocation of secondary data taken from ecoinvent v3.10.1 cut-off by classification has allocation applied to it.

This study uses the cut-off approach method for recycling. According to this approach, the first life of a material bears the environmental burdens of its production (e.g., raw material extraction and processing) and the second life (e.g., scrap input) bears the burdens of refurbishment (e.g., collection and refining of scrap). The burdens from waste treatment are taken on by the next life of the product and not included in this study. For all materials treated as waste in the model the end-of-waste boundary ends after processing. End-of-waste state for final use materials ends with the treatment of the waste whereas the burdens of materials intended to be used in a second process will end after the transportation to the waste treatment facility.

Cut-off Criteria

This study uses the cut-off approach method for recycling. According to this approach, the first life of a material bears the environmental burdens of its production (e.g., raw material extraction and processing) and the second life (e.g., scrap input) bears the burdens of refurbishment (e.g., collection and refining of scrap). The burdens from waste treatment are taken on by the next life of the product and not included in this study.

LCA Data

The study uses a combination of primary and secondary data. Where primary data was not available, default datasets were used from ecoinvent v3.10.1, Cut-off at Classification. This dataset contains detailed peer reviewed LCI data. Secondary data is sourced from a variety of literature sources, verified public reports and widely used databases. Each data point was reviewed and verified individually.

Under the direction of TrueNorth, Xypex collected primary manufacturing data and data from key suppliers. Representative unit processes were customized based on the type of material and recycled content, to represent the characteristics of actual input raw materials to the greatest extent possible. Primary data was collected through customizable templates and reviewed internally to ensure completeness and credibility. Common practices such as mass balance, energy balance and stoichiometry were considered. Final model inputs were reviewed by the client to verify key assumptions.

Manufacturing inventories were assigned using a mass allocation approach based on provided data of production volumes.

LIFE CYCLE INVENTORY

A1 Supplied Raw Materials per kg of product

Material	Amount	Unit
Cement	0.5-1	kg
Lime	0.1-0.2	kg
Proprietary Ingredient 1-3	0.01-0.2	kg
Tracer	>0.01	kg

A3 Packaging Materials per kg of product

Material	Amount	Unit	Biogenic Content (%)	Biogenic Content (kg C)	Biogenic Content (kg CO2e)
Pallets	0.017	kg	40.98%	7.09E-03	2.60E-02
Cardboard	0.035	kg	45.02%	1.56E-02	5.71E-02
Plastic sheet	5.54E-05	kg	0	0	0
Plastic wrap	0.003	kg	0	0	0

A2 Transportation Modes and Distances of Inputs

Material and Link	Transportation Mode	Distance	Unit
Cement	Truck	16	km
Lime	Truck	8	km
Proprietary Ingredient 1	Truck	Undisclosed	km
Proprietary Ingredient 2	Truck	Undisclosed	km
Proprietary Ingredient 3	Truck	Undisclosed	km
Tracer	Truck	32	km
Tracer	Freight	8531	km
Tracer	Truck	16	km

Manufacturing of concrete admixture products includes several processing steps.

1. Cement is blown into silos, which are augered into a weigh hopper above the mixer.
2. Lime is received in super sacks and suspended above a feeder. The lime is then sent through the a weigh hopper.
3. Smaller constituents are added to the top of the mixer by hand.
4. The batcher selects the recipe from the panel and the PLC determines how much of each material is fed into the mixer.
5. The batch is mixed,
6. The batch is dispensed into the appropriate container and added to a pallet

The manufacturing module includes manufacturing of products and co-products:

- A3, use of various fuel sources within the manufacturing process
- A3, generation of electricity from primary energy resources used in manufacturing including their extraction, refining and transport
- A3, water use within the manufacturing process
- A3, emissions from the combustion of secondary fuels and waste used in the manufacturing process
- A3, waste management from manufacturing and manufacturing wastages transport up to the recycler or disposal

A3 Manufacturing Processes per kg product

Manufacturing Processes	Amount	Unit
Inputs		
Electricity	0.034	kWh
Propane - Super Save	0.001	kg
City of Richmond Water	1.85E-06	Cubic Meters
Waste		
Recycle	4.00E-05	Cubic Meters
Organics Waste (food)	1.35E-05	Gallons
General Waste	6.15E-05	Cubic Meters

Xypex is not aware of any substances within the production and manufacturing of C2000 NF that would exceed the limits for registration in the latest "Candidate List of Substances of Very High Concern for authorisation".

A5 Assembly/Installation Inventory per kg of product

Process Descriptions	LD Amount	Unit
Product Loss		
Installation Water	0.530	litre
Auxiliary Materials		
Installation Power	2.00E-04	MJ
Disposal of Packaging Waste		
Packaging Waste pallets	0.017	kg
Packaging Waste pulp	0.035	kg
Packaging waste plastic	0.003	kg
Waste Transport		
Packaging waste transport	2.760	Kg/km

During the use phase (modules B1-B7), the concrete admixture product is assumed to follow the same assumptions as concrete considering the product is inseparable from the other components of concrete. Concrete assumptions require no maintenance, repair, or operation inputs throughout the lifetime of the product as referenced in the EPD developed for Xypex Admix C-1000 NF, a similar product to C-2000 NF Concrete Admixture. Under these assumptions, modules B1-B7 are assumed to be equal to zero.

C1 End of Life Inventory per kg of product

Process Descriptions	**LD Amount**	**Unit**
Demolition and Deconstruction	0.010	kwh

Module D Primary Production Potentially Substituted by Recovered Materials from C-2000 NF Concrete Admixture

Life Cycle States	Flow Type	Material	Admixture	Unit, per kg of final product
A1 Raw Materials consumption	(-) Secondary Material used	None	0	Kg
A3 Scrap and excess materials recovered	(+) Material recovery	None	0	kg

C4 Materials recovered	(+) Material recovery	Crushed Concrete	0.824*	kg
Net Material flow		Crushed Concrete	0.824	kg

** Includes a load associated with transformation*

Additionally, a portion of the product and packaging is recycled at the end-of-life. The associated biogenic emission from this recycled material is added to module D following the ACLCA 21930 calculation guidance of products in module C3 and packaging in module A5. Any remaining biogenic carbon not accounted for may result from average or generic background datasets for landfilling and incineration and may have to be corrected to match the specific carbon content of the disposed waste.

ENVIRONMENTAL IMPACTS

Impact assessment methods are used to convert LCI data (environmental emissions and raw material extractions) into a set of environmental impacts.

In compliance with the PCR, Xypex C-2000 NF Concrete Admixture products are assessed based on multiple impact categories. Results are calculated using the EN15804 + A2 (adapted) V1.01/EF 3.1 method. For this study only foreground data was considered. Results are calculated using the EN15804 + A2 (adapted) V1.01/EF 3.1 method.

Following the ACLCA guidance document, the RPRM and NRPRM inventory metrics in this report were calculated manually using net calorific value (lower heating value, MJ/kg) for the raw materials with energy content that were used as materials (ACLCA, 2019). The RPRE and NRPRE were calculated as the difference between the total renewable and non-renewable primary energy, provided by the Cumulative Energy Demand (LHV) method, and the RPRM and NRPRM inventory metrics, respectively (Weidema B P, 2013).

Net use of fresh water was determined by calculating the ReCiPe midpoint (h) method for water use from the life cycle inventory.

Below are the results for the study of C-2000 NF Concrete Admixture.

Electricity processes used in the model are represented using CA-BC regional data for production electricity and global average data for demolition and deconstruction electricity. Global average data is used after the distribution as a conservative estimation of the product since no primary data for region of use was provided. Manufacturing electricity is model with the conservative estimate for local grid electricity of CA-BC. The dataset for grid electricity, Electricity, medium voltage {CA-BC}| market for electricity, medium voltage | Cut-off, U, in the CA-BC region was used in the model. In SimaPro the ecoinvent process included regional data for CA-BC specific electricity. The GWP-GHG impact for this process is 0.074 kg CO2e/kWh. The process used for electricity in the model is calculated from the following sources:

hydroelectricity (94.02%), natural gas (2.50%), oil (0.08%), wind (2.64%), wood (0.69%), and biogas (0.07%).

Impacts describing environmental impacts based on EN15804+A2 (EF3.1)

Construction works life cycle information within the system boundary																
		Production Stage	Construction Stage		Use Stage							End-of-life Stage				Optional supplementary information beyond the system boundary
Indicator	Unit	Total A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	Module D
Core mandatory impact indicators																
GWP - total	kg CO2 eq.	1.12E+00	1.13E-02	8.60 E-02	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	7.25E-03	7.60E-03	0.00E+0 0	3.74E-02	2.20E-05
GWP - fossil	kg CO2 eq.	1.24E+00	1.13E-02	2.90 E-03	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	7.24E-03	7.57E-03	0.00E+0 0	1.10E-03	2.20E-05
GWP - biogenic	kg CO2 eq.	-1.19E-01	0.00E+0 0	8.31 E-02	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	3.63E-02	0.00E+00
GWP - GHG	kg CO2 eq.	1.24E+00	1.13E-02	2.91 E-03	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	7.25E-03	7.60E-03	0.00E+0 0	1.10E-03	2.20E-05
GWP - Land use and LU change	kg CO2 eq.	6.41E-03	3.76E-05	2.19 E-06	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	9.71E-06	2.53E-05	0.00E+0 0	5.66E-07	1.89E-08
ODP	kg CFC 11 eq.	1.49E-08	1.90E-10	1.36 E-10	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	4.66E-11	1.28E-10	0.00E+0 0	3.18E-11	3.60E-13
AP	mol H+ eq.	4.24E-03	5.16E-05	9.21 E-06	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	3.52E-05	3.46E-05	0.00E+0 0	7.79E-06	1.90E-07
EP - freshwater	kg P eq	2.03E-04	9.20E-07	3.60 E-07	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	3.13E-06	6.17E-07	0.00E+0 0	9.13E-08	5.17E-09
EP - aquatic marine	kg N eq.	1.36E-03	1.97E-05	2.09 E-05	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	7.04E-06	1.32E-05	0.00E+0 0	2.97E-06	8.81E-08
EP - terrestrial	mol N eq.	1.20E-02	2.12E-04	2.75 E-05	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	7.09E-05	1.42E-04	0.00E+0 0	3.24E-05	9.52E-07
POCP	kg NMVOC eq.	3.98E-03	7.32E-05	1.28 E-05	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	2.10E-05	4.91E-05	0.00E+0 0	1.16E-05	2.86E-07
ADP - minerals&metals	kg Sb eq.	6.55E-06	3.54E-08	5.02 E-09	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	6.56E-09	2.38E-08	0.00E+0 0	1.72E-09	-1.28E-11
ADP - fossil	MJ, net	1.29E+01	1.61E-01	1.92 E-02	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	0.00E+0 0	9.33E-02	1.08E-01	0.00E+0 0	2.69E-02	3.12E-04

	calorific value															
WDP	m3 world eq. deprived	9.24E-03	2.46E-05	4.92 E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.44E-05	1.65E-05	0.00E+00	2.80E-05	-2.93E-06

Indicators describing environmental impacts based on TRACI 2.1

Construction works life cycle information within the system boundary																Optional supplementary information beyond the system boundary
		Production Stage	Construction Stage		Use Stage							End-of-life Stage				
Indicator	Unit	Total A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	Module D
Core mandatory impact indicators																
GWP	kg CO_2e	1.12E+00	1.13 E-02	8.60 E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.25E-03	7.60 E-03	0.00E+00	3.74 E-02	2.20E-05
ODP	kg CFC11e	1.73E-08	2.06 E-10	1.67 E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.32E-11	1.38 E-10	0.00E+00	3.40 E-11	3.96E-13
EP	kg N eq	2.55E-03	1.23 E-05	4.27 E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.15E-05	8.28 E-06	0.00E+00	1.32 E-06	5.29E-08
AP	kg SO2 eq	3.58E-03	4.65 E-05	8.64 E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.02E-05	3.12 E-05	0.00E+00	7.02 E-06	1.76E-07
POCP	kg O3 eq	6.11E-02	1.22 E-03	1.50 E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.04E-04	8.19 E-04	0.00E+00	1.87 E-04	5.58E-06
Additional optional impact indicators																
Fossil fuel depletion	MJ surplus	1.43E+00	2.12 E-02	1.92 E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.24E-03	1.43 E-02	0.00E+00	3.68 E-03	4.19E-05
System Boundary																

Indicators describing use of primary resources

Construction works life cycle information within the system boundary						Optional supplementary information beyond the system boundary
		Production Stage	Construction Stage	Use Stage	End-of-life Stage	

Indicator	Unit	Total A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	Module D
RPR_E	MJ, NCV	2.94E+00	2.35E-03	1.24E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.13E-02	1.58E-03	0.00E+00	2.50E-04	4.60E-06
RPR_M	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
$NRPR_E$	MJ, NCV	1.40E+01	1.72E-01	2.05E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.92E-02	1.15E-01	0.00E+00	2.87E-02	3.32E-04
$NRPR_M$	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
System Boundary																

Indicators describing use of secondary resources

Construction works life cycle information within the system boundary																Optional supplementary information beyond the system boundary
		Production Stage	Construction Stage		Use Stage							End-of-life Stage				
Indicator	Unit	Total A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	Module D
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
System Boundary																

ADPfossil, consumption of freshwater, and emissions and removals of CO2 based on TRACI 2.1

Construction works life cycle information within the system boundary	Optional supplementary information beyond the

		Production Stage	Construction Stage		Use Stage							End-of-life Stage				system boundary
Indicator	Unit	Total A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	Module D
Mandatory inventory parameters																
ADP_{Fossil}	MJ, NCV	1.29E+01	1.61E-01	1.92E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.33E-02	1.08E-01	0.00E+00	2.69E-02	3.12E-04
Consumption of freshwater	m^3	3.15E-01	7.91E-04	2.10E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.13E-03	5.31E-04	0.00E+00	1.18E-03	-1.26E-04
Additional inventory parameters for transparency																
Removals and emissions associated with biogenic carbon content of the bio-based product	kg CO_2e	-3.63E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.63E-02	0.00E+00
Emissions from calcination and uptake from carbonation	kg CO_2e	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Removals and emissions associated with biogenic carbon content of the bio-based packaging	kg CO_2e	-8.31E-02	0.00E+00	8.31E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Emissions from land use change	kg CO_2e	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Emissions from combustion of waste from renewable sources used in production processes	kg CO_2e	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Emissions from combustion of waste from non-renewable sources used in production processes	kg CO_2e	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
System Boundary																

Indicators describing waste

Construction works life cycle information within the system boundary																Optional supplementary information beyond the system boundary
		Production Stage	Construction Stage		Use Stage							End-of-life Stage				
Indicator	Unit	Total A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	Module D
Hazardous waste disposed	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-hazardous waste disposed	kg	1.11E-02	0.00E+00	1.95E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.76E-01	0.00E+00
High-level radioactive waste	kg or m^3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Intermediate and low-level radioactive waste	kg or m^3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Components for re-use	kg or m^3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling,	kg or m^3	4.81E-03	0.00E+00	3.57E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.24E-01	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg or m^3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy exported from the system	kg or m^3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
System Boundary																

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

ILCD Classification	Indicator	Disclaimer
ILCD Type 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 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, Fraction of nutrients reaching terrestrial end compartment (EP-Terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
	Potential Human Exposure efficiency relative to U235 (IRP)	1
ILCD Type 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2

	Abiotic depletion potential for fossil resources(ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2
Disclaimer 1 - This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator		
Disclaimer 2 - The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.		

The results of the end-of-life stage (modules C1-C4) should be considered when using the results of the product stage (modules A1-A3).

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

Some of the data provided in this Environmental Product Declaration (EPD) is based on information supplied by the manufacturer. TrueNorth Collective is not responsible for the accuracy, completeness, or reliability of the data provided by the manufacturer.

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

Additional Environmental Information

N/A

Version History

This is the original version of the EPD.

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