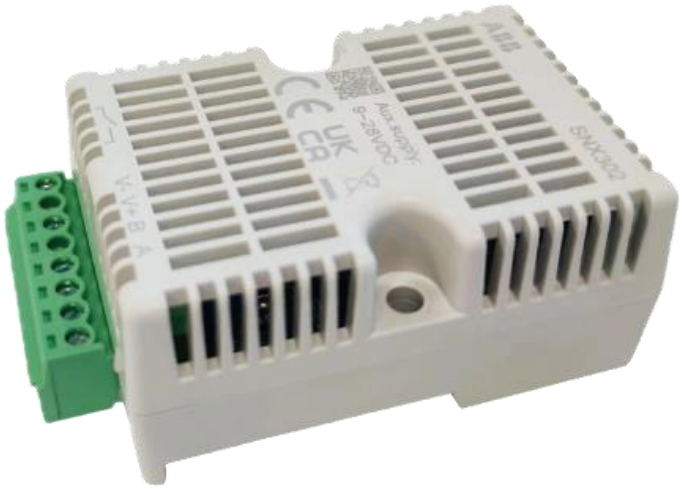
EPD

Environmental Product Declaration

SNX300 Environmental Temperature and Humidity Sensor and Controller Series

Production site: XiaMen, China



DOCUMENT KIND Environmental Product Declaration	IN COMPLIANCE WITH ISO 14025 and EN 50693			
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OWNING ORGANIZATION ABB Switzerland Ltd, Group Technology Management	ABB DOCUMENT ID 2CTH000035	REV. A	LANG. EN	PAGE 1/15

EPD Owner	ABB Switzerland Ltd, Group Technology Management
Organization No.	CHE-101.538.426
Manufacturer name and address	ABB Xiamen Switchgear Co., Ltd. No.885, FangShanXiEr Road Fangshan Road, Xiamen, FuJian, China
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Program operator	The Norwegian EPD Foundation Post Box 5250 Majorstuen, 0303 Oslo, Norway phone: +47 23 08 80 00, email: post@epd-norge.no
Declared product	SNX300 Environmental Temperature and Humidity Sensor and Controller Series
Product description	SNX300 is a series of environmental temperature and humidity sensors and controllers which support Modbus RTU protocol over an RS485 interface. While SNX301 is a pure temperature and humidity sensor, SNX302 can act stand-alone or remotely connected to M&D concentrator, to control a local heater to prevent moisture based on dew point calculation.
Functional unit	To measure and control the temperature and humidity, with a power consumption of 0.2W, and use rate of 100%, during a service life of 20 years in China.
Reference flow	A single SNX302 device, includes packaging.
Independent verification	Independent verification of the declaration and data, according to ISO 14025:2010 ☐ INTERNAL ☒ EXTERNAL Independent verifier approved by EPD-Norge: Elisabet Amat Signature: 
Approved by	Håkon Hauan, CEO EPD-Norge Signature: 
Reference PCR	EN 50693:2019 – Product Category Rules for Life Cycle Assessments of Electronic and Electrical Products and Systems. EPDItaly007 – Electronic and Electrical Products and Systems, Rev. 3.0, 2023/01/13.
Program instructions	The Norwegian EPD Foundation/EPD-Norge, General Programme Instructions 2019, Version 3.0, 2019/04/24.
LCA study	This EPD is based on the LCA study described in the LCA report 2CHT000033.
EPD type	Specific product
EPD scope	Cradle-to-grave
Product RSL	20 years
Geographical representativeness	Manufacturing (suppliers): Global Manufacturing (ABB): China Downstream: China
Reference year	2023
LCA software	SimaPro 9.5 (2023)
LCI database	Ecoinvent v3.9.1 (2022)
Comparability	EPDs published within the same product category, though originating from different programs, may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible.
Liability	The owner of the declaration shall be liable for the underlying information and evidence. EPD-Norge shall not be liable with respect to manufacturer, life cycle assessment data, and evidence.

Contents

Sustainability at ABB

ABB is a leading global technology company that energizes the transformation of society and industry to achieve a more productive, sustainable future. By connecting software to its electrification, robotics, automation, and motion portfolio, ABB pushes the boundaries of technology to drive performance to new levels.

At ABB, we actively contribute to a more sustainable world, leading by example in our own operations and partnering with customers and suppliers to enable a low-carbon society, preserve resources, and promote social progress.

Learn more on our website global.abb/group/en/sustainability or scan the QR code.

General Information

This Environmental Product Declaration is a “specific product EPD”, and the declared product is the SNX300, including related packaging.

The SNX300 is a series of environmental temperature and humidity sensors and controllers which support Modbus RTU protocol over an RS485 interface. While SNX301 is a pure temperature and humidity sensor, SNX302 can act stand-alone or remotely connected to M&D concentrator, to control a local heater to prevent moisture based on dew point calculation.
This EPD is based on SNX302 as reference workflow and with sensitivity analysis the environment impact of SNX301 is also further discussed, thus this EPD covers the SNX300 series products, including related packaging.

General technical information of the SNX300 is presented below.

Description		Values
Size	**Width**	45.6 mm
	Height	30.0 mm
	Length	74.8 mm
Weight	**SNX301**	62 g
	SNX302	69 g
Basic parameters	**Voltage input**	9…28 VDC
	Measuring range	-40…80 ℃, 0…100% RH
	Accuracy	Temperature: ±1 ℃ Humidity: ±4% RH
	Response period	Temperature: 5…30 s (τ63%) Humidity: <8s (τ63%, 25 ℃ and 1 m/s airflow)
	Operating temperature range	-40…80 ℃

The SNX300 is owned by ABB Xiamen Switchgear Co., Ltd. (ELDS division), which specializes in the production, sales, and service of 3.6kV – 40.5kV switchgears and circuit breakers and related intelligent components for smart systems and technologies for electrical distribution supplied to utilities, industrial, and tertiary sector customers. ABB ELDS division, China adopts and implements for its own activities an integrated Quality/Environmental/Health Management System in compliance with the following standards:

- ISO 9001:2015 – Quality Management Systems
- ISO 14001:2015 – Environmental Management Systems
- ISO 45001:2018 – Occupational Health and Safety Management Systems
- ISO 50001:2018 – Energy management systems

The SNX300 is manufactured by ABB supplier WE (Wisdom Electronics) located in Xiamen, China.

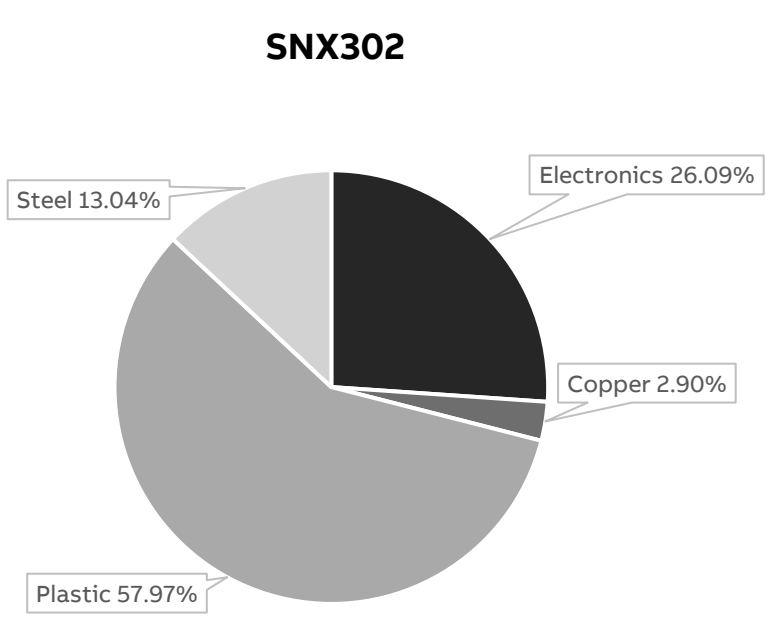
The manufacturing site is certified according to the following standards:

- ISO 9001:2015 – Quality Management Systems
- ISO 14001:2015 – Environmental Management Systems

Constituent Materials

The constituent materials of SNX302 are presented below.

Material	Weight [kg]	Weight %
Electronics	0.018	26.09%
Copper	0.002	2.90%
Plastic	0.040	57.97%
Steel	0.009	13.04%
Total	**0.069**	**100**



The constituent materials of the packaging and accessories are presented below.

Description	Material	Weight [kg]	Weight %
Packaging box	Cardboard	0.008	80%
Foam bag	PE low density	0.002	20%
Total		**0.010**	**100**

LCA Background Information

Functional Unit

The functional unit of this study is to measure and control the temperature and humidity, with a power consumption of 0.2W and use rate of 100%, during a service life of 20 years in China. The reference flow is a single SNX302 device, including related packaging.
As SNX301 only supports measurement of temperature and humidity but doesn't support controlling – the difference is discussed later with sensitivity analysis.

Note, the reference service life (RSL) of 20 years is a theoretical period selected for calculation purposes only – this is not representative for the minimum, average, nor actual service life of the product.

System Boundaries

The life cycle assessment of the SNX300, an EEPS (Electronic and Electrical Products and Systems), is a "cradle-to-grave" analysis. Below table shows the product life cycle stages, and the information considered in the LCA.

Life cycle stages of the product in the LCA

MANUFACTURING STAGE	DISTRIBUTION STAGE	INSTALLATION STAGE	USE & Maintenance STAGE	END-OF-LIFE STAGE De-installation
Acquisition of raw materials Transport to manufacturing site Components/parts manufacturing Assembly Packaging	Transport to distributor / logistic center Transport to place of use	Installation EOL treatment of generated waste (packaging)	Usage	De-Installation Collection and transport EOL treatment

In terms of exclusions from the system boundary, according to PCR, capital goods such as machinery, tools, buildings, infrastructure, packaging for internal transports, and administrative activities, which cannot be allocated directly to the production of the reference product, are excluded.

Infrastructures, when present, such as in processes deriving from the ecoinvent database, have not been excluded. Scraps for metal working and plastic processes are also included when already defined in ecoinvent.

Data quality

Both primary and secondary data are used. The main sources for primary data are the bill of materials (BOM), CAD-files, technical drawings, and site-specific foreground data provided by ABB. Secondary raw material contents are also considered, which is provided by the suppliers for the main materials.

For all processes for which primary data are not available, generic background data originating from the ecoinvent v3.9.1 database, with system model “allocation, cut-off by classification”, are used. The database Industry Data 2.0 is also used for chemical substance which is not available by ecoinvent. The LCA software used for the calculations is SimaPro 9.5.

Allocation rules

The utility consumption and waste generation by ABB, in the core manufacturing stage, is allocated to the production of one reference product according to applicable rules. For the end-of-life allocation, the “Polluter Pays” principle is adopted according to what is defined in the CEN/TR 16970 standard. However, the potential benefits and avoided loads from recovery and recycling processes are not considered because it is not required by the PCR.

Cut-off criteria

No cut-off criteria were applied to exclude materials from the calculation.

Inventory Analysis

Manufacturing Stage

In this LCA, both primary and secondary data were used. Site specific foreground data were provided by ABB and WE, and the Bills of Material (BOM) were provided by R&D team of ABB. A BOM is essentially a list of all the components and assemblies that constitute the finished product, organized by levels. Each item was matched with its code, quantity, weight, and supplier. The BOM's were then processed by adding materials, surface areas, weights, manufacturing processes, and surface treatments, according to the technical drawings.

According to the defined system boundaries and life cycle stages, the manufacturing stage includes the upstream manufacturing stage, which includes the raw materials and production as well as transportation of semi-finished parts, components, and sub-assemblies from both direct and indirect suppliers to WE, the final assembling stage, which includes the utility consumption and waste generation at the manufacturing site as well as the production and use of packaging materials and accessories.

Distribution

The distribution stage includes the transportation of the final product from WE plant to the ABB factory for installation to ABB Switchgears (14km) by lorry, and the transportation with ABB switchgears to customer site (300km), by lorry, as suggested by the PCR EPDItaly015, as the actual distance is unknown. The environmental impacts can be multiplied accordingly if the actual distance is known.

	Scenario	Transport	Representation
Transport	*Transport, freight, lorry 16-32 metric ton, EURO4 {RoW}*	314 km	PCR

Installation

The installation phase only implies manual activities, and no energy is consumed. Therefore, this phase only considers the end-of-life of the packaging materials used.

	Scenario	Transport	Representation
Packaging End-of-Life	*Packaging waste by Chinese literature, which comes from the reports of government and association representative for China*	100 km by lorry (assumption)	China

Use

The use stage considers the reference power consumption over the reference service life as defined in the functional unit. This is calculated using the following formula, according to PCR EPDItaly015:

$$E_{use}[kWh] = \frac{P_{use} * 8760 * RSL * \alpha}{1000} = \frac{0.2\ \text{W} * 8760\ \text{hours} * 20\ \text{years} * 100\ \%}{1000} = 35.04\ kWh$$

Where:

- E_{use} = Total energy use over the reference service life
- P_{use} = Reference power consumption in watts
- *RSL* = Reference Service Life in years
- α = Use time rate
- 8760 is the number of hours in a year
- 1000 is the conversion factor from W to kW

	Dataset	Amount	Unit	Represent.
Energy	*Electricity, low voltage {CN}| market group for electricity, low voltage | Cut-off, S*	0.966	kg CO_2-eq./kWh	China

Maintenance is not considered because the product is designed to be maintenance free.

End of life

Decommissioning of the product only implies manual activities, and no energy is consumed. Therefore, this phase only considers the end-of-life of the product.

	Scenario	Transport	Representation
Product End-of-Life	IEC/TR 62635 (Annex D.3) *	100 km by lorry (assumption)	Global

*A conservative approach is adopted by considering all parts as either: requiring selective treatment, difficult to process, or going through a separation process; no individual part is considered as a single recyclable material. Also, due to the transformer containing parts difficult to process through separation, these are all modelled as 100 % waste to landfill to represent the typical waste streams within Europe.

Environmental Indicators

In accordance with the PCR EPDItaly007, the environmental impact indicators are determined by using the characterization factors and impact assessment methods specified in EN 15804:2012+A2:2019.

SNX302

			Cradle-to-gate	Cradle-to-grave			
Impact category	Unit	Total	UPSTREAM	DOWNSTREAM			
			Manufacturing	Distribution	Installation	Use and maintenance	End-of-life
GWP – total	kg CO_2 eq.	3.59E+01	2.02E+00	4.74E-03	8.66E-03	3.38E+01	3.72E-02
GWP – fossil	kg CO_2 eq.	3.61E+01	2.01E+00	4.74E-03	2.30E-03	3.40E+01	3.68E-02
GWP – biogenic	kg CO_2 eq.	-1.85E-01	2.20E-03	1.66E-06	6.36E-03	-1.94E-01	3.64E-04
GWP – luluc	kg CO_2 eq.	1.72E-02	3.30E-03	2.47E-06	2.94E-07	1.39E-02	8.51E-06
ODP	kg CFC-11 eq.	1.48E-07	7.51E-08	7.51E-11	1.11E-11	7.28E-08	8.72E-11
AP	mol H+ eq.	2.06E-01	1.84E-02	2.08E-05	2.81E-06	1.88E-01	3.79E-05
EP – freshwater	kg P eq.	9.38E-03	2.57E-03	3.86E-07	6.28E-08	6.80E-03	2.12E-06
EP – marine	kg N eq.	4.17E-02	3.07E-03	7.64E-06	2.61E-06	3.86E-02	9.16E-05
EP – terrestrial	mol N eq.	4.43E-01	3.13E-02	8.18E-05	1.15E-05	4.12E-01	1.21E-04
POCP	kg NMVOC eq.	1.19E-01	9.65E-03	2.81E-05	3.48E-06	1.09E-01	3.55E-05
ADP – minerals and metals	kg Sb eq.	8.59E-04	7.20E-04	1.53E-08	1.68E-09	1.39E-04	4.44E-08
ADP – fossil	MJ, net calorific value	3.58E+02	2.63E+01	6.71E-02	6.14E-03	3.31E+02	8.22E-02
WDP	m^3 eq.	4.53E+00	6.75E-01	2.96E-04	1.84E-04	3.86E+00	1.77E-03

GWP-fossil: Global Warming Potential fossil; 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; EP-freshwater: Eutrophication potential-freshwater compartment; EP-marine: Eutrophication potential-marine compartment; EP-terrestrial: Eutrophication potential-accumulated exceedance; POCP: Formation potential of tropospheric ozone; ADP-minerals & metals: Abiotic Depletion for non-fossil resources potential; ADP-fossil: Abiotic Depletion for fossil resources potential; WDP: Water deprivation potential.

Resource use parameters	Unit	Total	Cradle-to-gate	Cradle-to-grave			
			UPSTREAM	DOWNSTREAM			
			Manufacturing	Distribution	Installation	Use and maintenance	End-of-life
PENRE	MJ, low cal. value	3.57E+02	2.52E+01	6.71E-02	6.14E-03	3.31E+02	8.22E-02
PERE	MJ, low cal. value	4.23E+01	2.55E+00	8.54E-04	1.86E-04	3.98E+01	7.26E-03
PENRM	MJ, low cal. value	1.05E+00	1.05E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERM	MJ, low cal. value	1.10E-01	1.10E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ, low cal. value	3.58E+02	2.63E+01	6.71E-02	6.14E-03	3.31E+02	8.22E-02
PERT	MJ, low cal. value	4.25E+01	2.66E+00	8.54E-04	1.86E-04	3.98E+01	7.26E-03
FW	m^3	1.17E-01	2.14E-02	9.57E-06	6.21E-06	9.55E-02	5.90E-05
MS	kg	1.04E-02	1.04E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

PENRE: Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material; PERE: Use of renewable primary energy excluding renewable primary energy resources used as raw material; PENRM: Use of non-renewable primary energy resources used as raw material; PERM: Use of renewable primary energy resources used as raw material; PENRT: Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials); PERT: Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials); FW: Net use of fresh water; MS: Use of secondary materials; RFS: Use of renewable secondary fuels; NRSF: Use of non-renewable secondary fuels.

System output indicators	Unit	Total	Cradle-to-gate	Cradle-to-grave			
			UPSTREAM	DOWNSTREAM			
			Manufacturing	Distribution	Installation	Use and maintenance	End-of-life
HWD	kg	3.64E-04	1.26E-04	4.34E-07	3.30E-08	2.37E-04	3.28E-07
NHWD	kg	3.07E+00	1.80E-01	3.26E-03	1.01E-03	2.84E+00	4.79E-02
RWD	kg	4.06E-04	4.91E-05	1.36E-08	3.14E-09	3.57E-04	1.33E-07
MER	kg	1.41E-02	0.00E+00	0.00E+00	4.61E-03	0.00E+00	9.53E-03
MFR	kg	2.15E-02	2.62E-03	0.00E+00	5.11E-03	0.00E+00	1.38E-02
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ETE	MJ	6.36E-02	0.00E+00	0.00E+00	2.54E-02	0.00E+00	3.83E-02
EEE	MJ	3.53E-02	0.00E+00	0.00E+00	1.41E-02	0.00E+00	2.13E-02

HWD: hazardous waste disposed; NHWD: non-hazardous waste disposed; RWD: radioactive waste disposed; MER: materials for energy recovery; MFR: material for recycling; CRU: components for reuse; ETE: exported thermal energy; EEE: exported electricity energy.

Sensitivity analysis

Compared to SNX302 which supports both temperature & humidity measurement and control function with additional relay and supporting circuit, SNX301 only supports the measurement function, thus SNX301 has less impact to the environment compared to SNX302 due to less using of electronic components.
A sensitivity analysis is conducted to understand how the impact category “GWP – total” varies between two products. The results are presented in table.

Product type	Unit	Total	Manufacturing	Distribution	Installation	Use and maintenance	End-of-life
SNX302	kg CO_2 eq.	3.59E+01	2.02E+00	4.74E-03	8.66E-03	3.38E+01	3.72E-02
SNX301	kg CO_2 eq.	2.37E+01	1.31E+00	4.36E-03	8.66E-03	2.23E+01	2.82E-02

Additional Environmental Information

Circularity Values

The recyclability potential of the product (excluding packaging) is calculated by dividing “MFR: material for recycling” in the end-of-life stage by the total weight of the product. As a result, the recyclability potential of the product is presented below according to IEC/TR 62635.

	Recyclability potential
SNX301	20.5 %
SNX302	20.0%

The recyclability potential of the packaging is calculated by dividing “MFR: material for recycling” in the installation stage by the total weight of the packaging. The recyclability potential is representative for China according to Chinese literature. The results are presented below.

	Recyclability potential
Packaging materials	49.1 %

Greenhouse gas emissions from the use of electricity in the manufacturing phase

Production mix from import, medium voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process.

Energy mix	Source	Amount	Unit
Electricity, medium voltage {CN-ECGC}| market for electricity, medium voltage | Cut-off, S	Ecoinvent v3.9.1	0.852	kg CO_2-eq/kWh

Dangerous substances

The product complies with REACH and RoHS directive requirements and does not contain any of the listed materials in excess of the authorized proportions. For further information about REACH and RoHS, please visit the ABB webpage:
https://new.abb.com/contact/form.

Indoor environment

The product meets the requirements for low emissions.

Carbon footprint

Carbon footprint has not been worked out for the product.

References

Bran - Jing liu. (2024). *Life Cycle Assessment Report: SNX300* (Report No. 2CHT000033, rev. A). ABB Switzerland Ltd, Group Technology Management.

ecoinvent. ecoinvent v.3.9.1 (2022). https://ecoinvent.org/the-ecoinvent-database/data-releases/ecoinvent-3-9-1/

European Committee for Standardization. (2019). *Product category rules for life cycle assessments of electronic and electrical products and systems* (EN 50693:2019).

European Committee for Standardization. (2019). *Sustainability of constructions - Environmental product declarations* (EN 15804:2012+A2:2019).

Eurostat. (2021). *Packaging waste by waste management operations.* https://ec.europa.eu/eurostat/databrowser/view/ENV_WASPAC/default/table?lang=en

ICMQ S.p.A. (2023). *PCR EPDItaly007 - Electronic and electrical products and systems,* rev. 3.0 (2023-01-13). EPDItaly. https://www.epditaly.it/en/view-pcr/

ICMQ S.p.A. (2022). *PCR EPDItaly015 - Electronic and electrical products and systems - switchboards,* rev. 1.5 (2022-02-23). EPDItaly. https://www.epditaly.it/en/view-pcr/

ICMQ S.p.A (2020b). *Regulations of the EPDItaly Programme Regulations*, rev. 5.2 (2020-02-16). EPDItaly. https://www.epditaly.it/en/wp-content/uploads/2016/12/EPDITALY-Regulament_rev-5.2_EN.pdf

International Electrotechnical Commission. (2012). *Guidelines for end-of-life information provided by manufacturers and recyclers and for recyclability rate calculation of electrical and electronic equipment,* Edition 1.0 (2012-10-1) (IEC/TR 62635).

International Organization for Standardisation. (2006). *Environmental management - Life cycle assessment - Principles and framework* (ISO Standard No. 14040:2006). https://www.iso.org/standard/37456.html

International Organization for Standardisation. (2006). *Environmental management - Life cycle assessment - Requirements and guidelines* (ISO Standard No. 14044:2006). https://www.iso.org/standard/38498.html

PRé Sustainability. (2023). SimaPro (version 9.5) [computer software]. https://pre-sustainability.com/solutions/tools/simapro/

SeaRates. (2022). *Shipping Distances & Time Calculator*. https://www.searates.com/services/distances-time

The Norwegian EPD Foundation/EPD-Norge. (2019). *General Programme Instructions 2019*, Version 3.0 (2019-04-24). https://www.epd-norge.no/getfile.php/1340010-1685100696/Dokumenter/GPI%20Det%20norske%20EPD%20programmet%20approved%20240419%20-%20ver3%20updated%20250523.pdf

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