epddanmark

ECO PLATFORM EPD VERIFIED

Owner: VisBlue A/S
No.: MD-25075-EN
Issued: 19-08-2026
Valid to: 19-08-2031

3rd PARTY **VERIFIED**

EPD

VERIFIED ENVIRONMENTAL PRODUCT DECLARATION | **ISO 14025 & EN 15804**

Owner of declaration
VisBlue A/S
Bautavej 1A, 8210 Aarhus
CVR: 36427957
https://www.visblue.dk/

Programme
EPD Danmark
www.epddanmark.dk

☐ Industry EPD
☐ Product EPD

☒ Product specific
☐ Average
☐ Worst Case

Declared product(s)
1 kWh of delivered by the VisFlow60 system

Number of declared datasets/product variations: 1

Production site
Bautavej 1A, 8210 Aarhus
Denmark

Use of Guarantees of Origin
☒ No certificates used
☐ Electricity covered by GoO
☐ Biogas covered by GoO

Declared/ functional unit
1 kWh of usable energy storage capacity delivered over the reference service life

Year of production site data (A3)
2024

EPD version
1.00

Issued: 19-08-2026
Valid to: 19-08-2031

Basis of calculation
This EPD is developed and verified in accordance with the European standard EN 15804+A2.

Comparability
EPDs of construction products may not be comparable if they do not comply with the requirements in EN 15804. EPD data may not be comparable if the datasets used are not developed in accordance with EN 15804 and if the background systems are not based on the same database.

Validity
This EPD has been verified in accordance with ISO 14025 and is valid for 5 years from the date of issue.

Use
The intended use of an EPD is to communicate scientifically based environmental information for construction products, for the purpose of assessing the environmental performance of buildings.

EPD type
☐Cradle-to-gate with modules C1-C4 and D
☒Cradle-to-gate with options, modules C1-C4 and D
☐Cradle-to-grave and module D
☐Cradle-to-gate
☐Cradle-to-gate with options

CEN standard EN 15804 serves as the core PCR

Independent verification of the declaration and data, according to EN ISO 14025

☐ internal ☒ external

Third party verifier:

Guangli Du

Martha Katrine Sørensen
EPD Danmark

Life cycle stages and modules (ND = module not declared)																
Product			Construction process		Use							End of life				Beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport	Installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Re-use, recovery and recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	**X**	**X**	**ND**	**ND**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**

Product information

Product description

VisFlow60 is a vanadium redox flow battery system developed by VisBlue A/S for stationary energy storage. This EPD covers the VisFlow60 configuration with 2 x 9000 L vanadium electrolyte tanks, corresponding to 360 kWh usable energy storage capacity. The system consists of a steel framework with integrated tanks, six independent 10 kW stack units, control and hydraulic components, cooling equipment, and vanadium-based electrolyte. The product is designed for long service life, high recyclability, scalability, and safe operation without fire or explosion risk.

Material/component	Amount (kg)	Weight-% of declared product
VisFlow60 configuration without vanadium	3,378.41	12.79%
Vanadium electrolyte, 2 x 9000 L	23,040.00	87.21%
Total	**26,418.41**	**100.00%**

Product packaging:

Due to the size and nature of the product, VisFlow60 is generally not shipped with dedicated sales or transport packaging. Any packaging from incoming components is handled at VisBlue A/S's production site and is not considered accompanying product packaging leaving the factory gate.

Representativity

This declaration represents the VisFlow60 vanadium redox flow battery system in the 2 x 9000L electrolyte tank configuration, manufactured by VisBlue A/S at the production site in Aarhus V, Denmark. Foreground data are based on project-specific information supplied by VisBlue A/S, while background data are modelled using ecoinvent 3.11 datasets and representative proxies where product-specific datasets were unavailable. Generally, the used background datasets are of high quality, and the majority of the datasets are only a couple of years old.

Hazardous substances

VisFlow60 does not contain substances listed on the "Candidate List of Substances of Very High Concern for authorisation".

Product(s) use

VisFlow60 is used for stationary storage of renewable electricity, enabling surplus energy from sources such as solar and wind to be stored and discharged when needed. The declared configuration is the 2 x 9000 L version with 360 kWh usable energy storage capacity and intended for long-term operation with daily cycling.

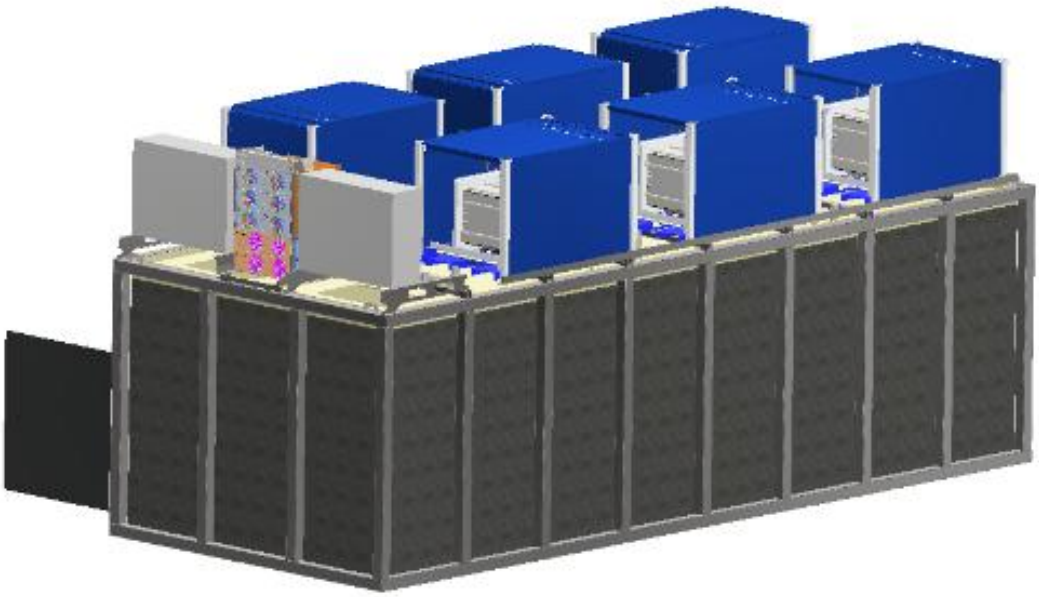
Essential characteristics

Key technical characteristics for the VisFlow60 system include: max. AC power of 60 kW, comprised of six independent 10 kW stack units; usable energy storage capacity of 360 kWh, with this EPD covering the 2 x 9000 L, 360 kWh configuration; depth of discharge from 0–100%; nominal AC voltage of 400 V, 3-phase; response time below 20 ms; annual capacity degradation below 0.5%, with capacity restorable; and stack design lifetime above 20,000 cycles / 20 years at full depth of discharge. The system fits in a standard 20-foot container, has a footprint of 6.0 m x 2.3 m and a height of 2.6 m. The system is CE certified and follows IEC 62932-1, IEC 62932-2-1 and IEC 62932-2-2.

Reference Service Life (RSL)

The reference service life is 20 years. VisFlow60 is designed for daily cycling operation and an estimated cycle durability of more than 20,000 full charge-discharge cycles under typical operating conditions. The RSL applies to the declared 2 x 9000 L configuration.

visblue
flow batteries



LCA background

Declared unit

The LCI and LCIA results in this EPD relate to 1 kWh of usable energy storage capacity delivered by the VisFlow60 system over the 20-year reference service life. The declared VisFlow60 configuration is the 2 x 9000 L version with 360 kWh usable energy storage capacity.

Name	Value	Unit
Declared unit	1	kWh
Net energy output	2,506,837	kWh
Reference flow	3.99E-07	p/kWh

Material properties

The vanadium electrolyte corresponds to 23,040 kg of electrolyte in the declared configuration, and the total declared system mass is 26,418.41 kg.

PCR

This EPD is developed according to EN 15804:2012+A2:2019, using EN 15804 as core PCR, and the product category rules for electronic and electrical products and systems – Energy storage, 2024, EPD Italy.

Energy modelling principles

Foreground system:

The foreground system is modelled using site-specific production data from VisBlue A/S from 2024. Electricity used in production is modelled with the Danish residual electricity. No Guarantees of Origin or Power Purchase Agreements are applied. District heat is modelled using a Danish natural gas-based heat dataset.

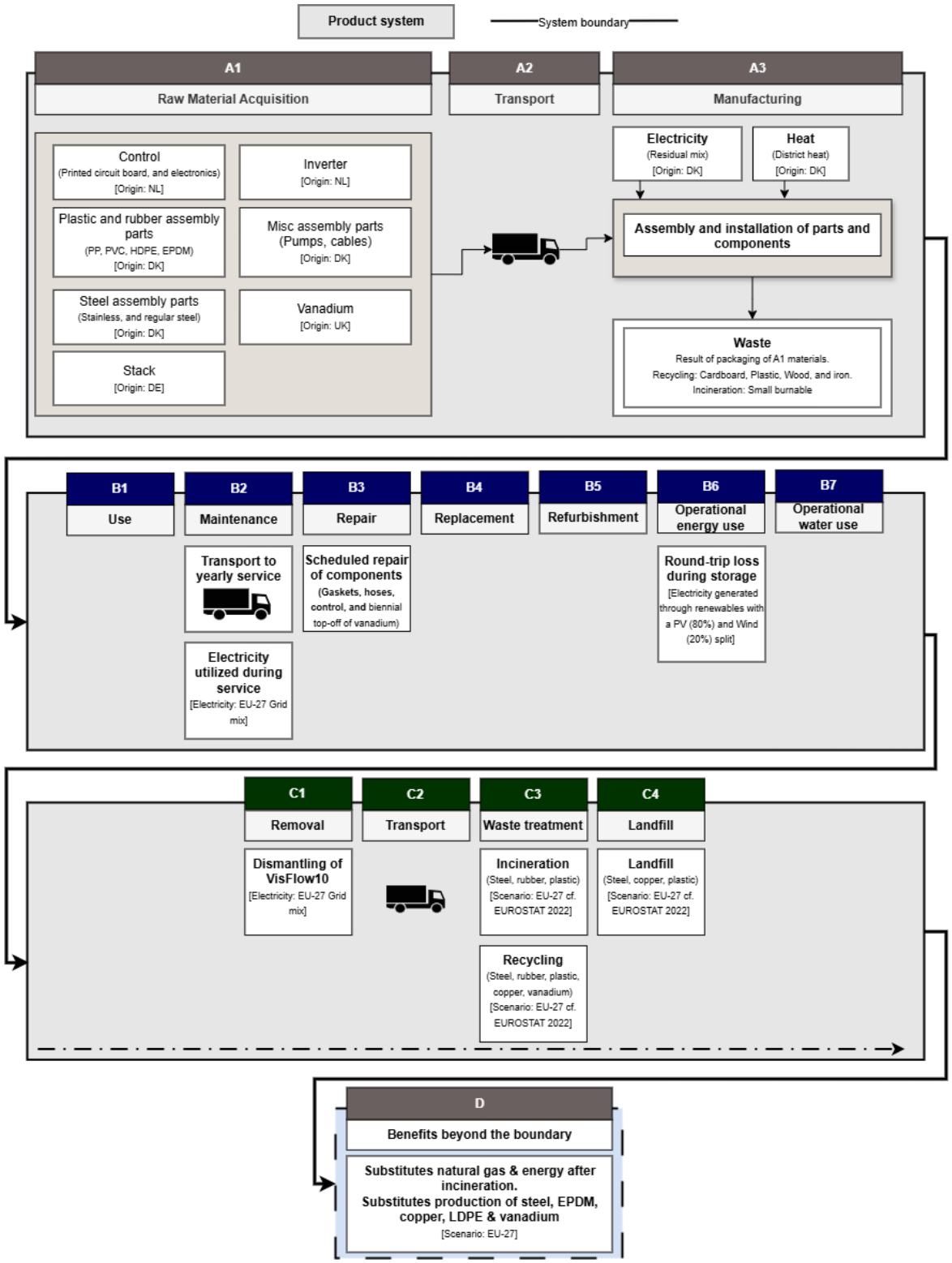
Information about the energy mix in the foreground system:

Energy mix	EF	Unit
Residual grid mix, DK, reference year 2024	0.647	kg CO_2e/kWh
Natural gas mix, DK, reference year 2024	0.517	kg CO_2e/kWh

Background system:

Upstream processes are modelled using national energy grid mixes. Downstream processes are modelled using national residual mixes.

Flowdiagram



System boundary

This EPD is based on a cradle-to-gate LCA with options, modules C1-C4 and D. The declared modules are A1-A3, B2, B3, B6, C1-C4 and D. All relevant material and energy flows are included in accordance with the cut-off criteria defined in EN 15804.

The general rules for the exclusion of inputs and outputs follows the requirements in EN 15804, 6.3.5, where the total of neglected input flows per module shall be a maximum of 5 % of energy usage and mass and 1 % of energy usage and mass for unit processes.

Product stage (A1-A3) includes:

A1 – Extraction and processing of raw materials

A2 – Transport to the production site

A3 – Manufacturing processes

A1 includes the production of raw materials, semi-finished components, electrolyte solution, stack components, tanks, electrical components, plastics, metals, and other assembly parts. Most components are sourced from Europe. This includes, for example, vanadium electrolyte supplied from the UK, stack components from Germany, and several assembly components from Denmark. Most material datasets are modelled as European averages, including average market assumptions for recycled or secondary material content where relevant, e.g. for the steel used in the system. The applied background datasets are selected to reflect the closest available technological and geographical representation.

A2 includes transport of components from the respective manufacturers or suppliers to VisBlue's assembly location in Randers/Denmark. All inbound transport is modelled as road freight using a 16–32 tonne lorry, EURO 5. The applied transport datasets include the Ecoinvent load factors, including assumptions on vehicle utilisation and empty return transport.

A3 covers final assembly at VisBlue's facility. The production process is primarily an assembly operation using pre-manufactured components, with limited activities outside assembly. Activities included in A3 are mainly manual assembly, use of power tools, limited welding of structural components, site energy use, heating, and waste from incoming packaging and assembly-related operations. No significant material transformation or component manufacturing takes place at VisBlue beyond the final assembly of the VisFlow systems.

Use stage (B1-B7) includes:

The use phase is modelled as an EU-27 scenario over the 20.000 cycles which approximates a 20-year reference service life.

B1 – Use. During normal use, the product does not release substances to indoor air, soil or water.

B2 – Maintenance includes one annual service inspection, covering technician transport, visual and functional checks, and minor electricity use for testing. Electricity used during maintenance is modelled with a European market mix. Technician transport is modelled as 600 km for each trip.

B3 – Repair includes periodic repair-related activities, transport of materials used for repair from the manufacturer or supplier to the system location, selected replacement parts expected over the service life, and electrolyte balancing. Electrolyte balancing is modelled as a biennial activity, corresponding to one balancing event every two years over the 20-year reference service life, and is represented by the annualized vanadium input specified in the B3 scenario table.

B4 – Replacement. There are no replacements during the RSL

B5 – Refurbishment. There are no refurbishments during the RSL

B6 – Operational energy use covers electricity losses during charge-discharge operation, modelled as the electricity required to compensate for round-trip efficiency losses in order to deliver the declared net usable energy output. The system's own consumption during operation is included in, and powered through, the round-trip efficiency loss. The electricity used to model these losses is based on a renewable electricity scenario consisting of 80% solar power and 20% wind power, reflecting the intended function of the battery system as flexibility for renewable electricity generation.

B7 – Operational water use. There are no water consumption during the use phase.

End of Life (C1-C4) includes:

The end-of-life stage is modelled as an EU-27 scenario and covers deconstruction, transport to waste treatment, waste processing for reuse, recovery and recycling, and final disposal. Waste treatment routes are based on EU-27 Eurostat waste treatment statistics for relevant material fractions, supplemented by product-specific assumptions for vanadium electrolyte recovery. The system is assumed to be collected separately and dismantled by qualified personnel.

C1 – Deconstruction includes minor electricity use for disassembly, as the VisFlow60 system is designed as a plug-and-play system and can be uninstalled with limited deconstruction activities. The electricity use is modelled using the standard value of 10 kWh/ton from the PCR for Construction Products, based on the total mass of the installed system including the vanadium electrolyte.

C2 – Transport includes transport from the dismantling site to waste treatment and recycling facilities. The scenario is modelled using the standard transport assumptions from the PCR for Construction Products, with a distance of 80 km using a 16–32 tonne EURO5 lorry and the applied load factor from the transport dataset.

C3 – Waste processing includes sorting and processing of the separately collected system into ferrous metals, non-ferrous metals, plastics, rubber and vanadium electrolyte. End-of-life status is reached after waste fractions are either sorted and pressed for recycling or incinerated for energy recovery. Ferrous and non-ferrous metals are assumed to be collected, sorted and processed into secondary raw materials suitable for new metallurgical processes. Vanadium electrolyte is treated separately and is assumed to be recovered by qualified personnel for subsequent purification, rebalancing and reuse. For energy recovery, only material fractions with more than 60% combustible content are included; non-combustible fractions, such as any steel fraction routed to energy recovery, are considered lost in the process.

C4 – Disposal includes only residual fractions sent to landfill after sorting, recycling and energy recovery. This includes residual plastic and rubber fractions disposed of in landfill.

Re-use, recovery and recycling potential (D) includes:

Module D includes the potential benefits from recycling and energy recovery after end-of-life processing. Recovered materials from recycling are assumed to substitute equivalent European-produced materials. Recovered ferrous metals substitute European-produced low-alloy steel and recovered non-ferrous metals substitute European-produced primary copper. Metals are treated as permanent materials and a 1:1 substitution ratio is applied due to their ability to be recycled without loss of fundamental material properties. Recovered plastics substitute European-produced virgin LDPE with a material degradation factor of 0.8, while recovered rubber substitutes European-produced virgin EPDM with a material degradation factor of 0.7. Recovered vanadium substitutes European-produced primary vanadium; as the electrolyte can be recovered, re-energised and reused while retaining its function as an energy carrier, vanadium is treated as a permanent material, although a conservative degradation factor of 0.9 is applied.

Energy recovered from plastic and rubber fractions sent to energy recovery is credited as exported electricity and thermal energy using a generic EU combined heat and power scenario. Exported thermal energy (EET) substitutes an EU natural gas mix, while exported electrical energy (EEE) substitutes an EU market grid mix.

- Loss: 25.00%
- EET: 56.25%
- EEE: 18.75%

LCA results

ENVIRONMENTAL IMPACTS for VisFlow60 PER kWh										
Parameter	**Unit**	**A1-A3**	**B2**	**B3**	**B6**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-total	[kg CO_2 eq.]	5.94E-03	1.72E-03	6.48E-04	1.64E-02	3.64E-05	1.61E-04	4.72E-04	1.53E-06	-2.03E-03
GWP-fossil	[kg CO_2 eq.]	5.76E-03	1.71E-03	6.46E-04	1.63E-02	3.51E-05	1.60E-04	4.48E-04	1.52E-06	-2.01E-03
GWP-biogenic	[kg CO_2 eq.]	1.77E-04	8.41E-07	1.54E-06	3.98E-05	1.20E-06	1.06E-07	2.38E-05	1.46E-09	-1.56E-05
GWP-luluc	[kg CO_2 eq.]	9.19E-06	9.04E-07	9.34E-07	3.15E-05	1.05E-07	5.32E-08	4.14E-07	4.03E-11	-2.41E-06
ODP	[kg CFC 11 eq.]	2.79E-09	3.33E-11	1.73E-11	1.58E-09	5.86E-13	3.50E-12	1.76E-12	5.15E-15	-4.87E-11
AP	[mol H^+ eq.]	8.62E-05	6.02E-06	1.03E-05	1.28E-04	1.74E-07	5.15E-07	6.31E-07	1.17E-09	-6.44E-05
EP-freshwater	[kg P eq.]	2.93E-06	2.80E-07	7.52E-07	1.07E-05	3.24E-08	1.10E-08	7.94E-08	1.32E-11	-2.61E-06
EP-marine	[kg N eq.]	5.00E-06	1.48E-06	9.79E-07	1.93E-05	3.08E-08	1.73E-07	2.46E-07	3.47E-08	-2.46E-06
EP-terrestrial	[mol N eq.]	4.78E-05	1.59E-05	1.10E-05	2.02E-04	2.64E-07	1.89E-06	1.37E-06	5.22E-09	-2.96E-05
POCP	[kg NMVOC eq.]	2.05E-05	7.05E-06	4.46E-06	7.36E-05	8.47E-08	7.81E-07	4.23E-07	2.23E-09	-1.16E-05
ADPm[1]	[kg Sb eq.]	1.06E-07	1.77E-08	2.26E-07	1.13E-06	7.45E-11	5.40E-10	1.44E-09	3.37E-13	-3.27E-07
ADPf[1]	[MJ]	9.31E-02	2.28E-02	9.44E-03	2.08E-01	8.16E-04	2.27E-03	1.98E-03	4.00E-06	-3.28E-02
WDP[1]	[m^3 world eq. deprived]	6.32E-03	1.97E-04	3.45E-04	2.32E-02	1.82E-05	1.15E-05	5.59E-05	-3.20E-06	-3.52E-03
Caption	GWP-total = Globale Warming Potential - total; 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 = Ozone Depletion; AP = Acidifcation; EP-freshwater = Eutrophication – aquatic freshwater; EP-marine = Eutrophication – aquatic marine; EP-terrestrial = Eutrophication – terrestrial; POCP = Photochemical zone formation; ADPm = Abiotic Depletion Potential – minerals and metals; ADPf = Abiotic Depletion Potential – fossil fuels; WDP = water depletion potential									
	The numbers are declared in scientific notation, fx 1,95E+02. This number can also be written as: $1{,}95*10^2$ or 195, while 1,12E-11 is the same as $1{,}12*10^{-11}$ or 0,0000000000112.									
Disclaimer	[1] The results of this environmental indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.									

ADDITIONAL ENVIRONMENTAL IMPACTS PER VisFlow60 PER kWh										
Parameter	**Unit**	**A1-A3**	**B2**	**B3**	**B6**	**C1**	**C2**	**C3**	**C4**	**D**
PM	[Disease incidence]	6.24E-10	8.00E-11	5.75E-11	1.21E-09	5.99E-13	1.28E-11	4.10E-12	2.77E-14	-3.47E-10
IRP[2]	[kBq U235 eq.]	1.22E-03	5.16E-05	6.06E-05	1.32E-03	2.29E-05	2.71E-06	4.85E-05	7.29E-09	-3.57E-04
ETP-fw[1]	[CTUe]	6.00E-02	7.48E-03	1.77E-02	1.61E-01	7.77E-05	3.02E-04	1.17E-03	4.54E-06	-5.20E-02
HTP-c[1]	[CTUh]	5.22E-12	7.00E-13	3.61E-13	1.26E-11	5.83E-15	2.74E-14	7.67E-14	6.13E-17	-5.34E-12
HTP-nc[1]	[CTUh]	2.65E-10	1.58E-11	2.47E-11	8.04E-10	2.64E-13	1.42E-12	2.64E-12	9.06E-15	-3.63E-10
SQP[1]	-	2.40E-02	8.28E-03	4.91E-03	8.82E-02	1.15E-04	1.34E-03	1.34E-03	9.66E-06	-1.34E-02
Caption	PM = Particulate Matter emissions; IRP = Ionizing radiation – human health; ETP-fw = Eco toxicity – freshwater; HTP-c = Human toxicity – cancer effects; HTP-nc = Human toxicity – non cancer effects; SQP = Soil Quality (dimensionless)									
	The numbers are declared in scientific notation, fx 1,95E+02. This number can also be written as: $1{,}95*10^2$ or 195, while 1,12E-11 is the same as $1{,}12*10^{-11}$ or 0,0000000000112.									
Disclaimers	[1] The results of this environmental indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.									
	[2] 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.									

RESOURCE USE PER VisFlow60 PER kWh										
Parameter	**Unit**	**A1-A3**	**B2**	**B3**	**B6**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	[MJ]	1.26E-02	7.39E-04	8.57E-04	1.00E+00	1.80E-04	3.70E-05	4.85E-04	1.17E-07	-4.14E-03
PERM	[MJ]	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
PERT	[MJ]	1.26E-02	7.39E-04	8.57E-04	1.00E+00	1.80E-04	3.70E-05	4.85E-04	1.17E-07	-4.14E-03
PENRE	[MJ]	9.31E-02	2.28E-02	9.44E-03	2.08E-01	8.16E-04	2.28E-03	1.98E-03	4.00E-06	-3.28E-02
PENRM	[MJ]	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
PENRT	[MJ]	9.31E-02	2.28E-02	9.44E-03	2.08E-01	8.16E-04	2.28E-03	1.98E-03	4.00E-06	-3.28E-02
SM	[kg]	3.23E-03	2.02E-05	5.90E-05	3.35E-04	8.25E-08	1.02E-06	7.08E-07	1.59E-09	-2.31E-03
RSF	[MJ]	1.17E-06	1.72E-07	1.82E-07	1.36E-05	3.60E-10	1.33E-08	3.05E-08	2.70E-11	-2.57E-07
NRSF	[MJ]	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
FW	[m^3]	1.53E-04	4.92E-06	8.45E-06	5.71E-04	4.90E-07	2.84E-07	1.46E-06	-7.45E-08	-8.37E-05
Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials; PENRM = Use of non renewable primary energy resources used as raw materials; PENRT = Total use of non renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non renewable secondary fuels; FW = Net use of fresh water									
	The numbers are declared in scientific notation, fx 1,95E+02. This number can also be written as: $1,95*10^2$ or 195, while 1,12E-11 is the same as $1,12*10^{-11}$ or 0,0000000000112.									

WASTE CATEGORIES AND OUTPUT FLOWS PER VisFlow60 PER kWh										
Parameter	**Unit**	**A1-A3**	**B2**	**B3**	**B6**	**C1**	**C2**	**C3**	**C4**	**D**
HWD	[kg]	8.99E-04	9.07E-05	6.25E-05	2.29E-03	1.77E-06	3.26E-06	1.05E-05	5.94E-09	-5.60E-04
NHWD	[kg]	2.64E-02	1.57E-03	3.09E-03	5.62E-02	1.59E-04	6.99E-05	6.84E-04	9.44E-05	-1.08E-02
RWD	[kg]	3.12E-07	1.29E-08	1.50E-08	3.31E-07	5.89E-09	6.69E-10	1.24E-08	1.67E-12	-9.15E-08
CRU	[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
MFR	[kg]	8.78E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E-02	0.00E+00	0.00E+00
MER	[kg]	1.77E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.39E-05	0.00E+00	0.00E+00
EEE	[MJ]	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
EET	[MJ]	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
Caption	HWD = Hazardous waste disposed; NHWD = Non hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy									
	The numbers are declared in scientific notation, fx 1,95E+02. This number can also be written as: $1,95*10^2$ or 195, while 1,12E-11 is the same as $1,12*10^{-11}$ or 0,0000000000112.									

BIOGENIC CARBON CONTENT PER VisFlow60 PER kWh		
Parameter	**Unit**	**At the factory gate**
Biogenic carbon content in product	[kg C]	0.00
Biogenic carbon content in accompanying packagaing	[kg C]	0.00
Note	1 kg biogenic carbon is equivalent to 44/12 kg of CO_2	

Additional information

LCA interpretation

The use stage, especially B6 operational energy use, is the main contributor to the life cycle impacts because electricity is required to compensate for round-trip efficiency losses over the 20-year reference service life. The production stage is mainly influenced by the vanadium electrolyte, steel components and cell/membrane-related materials. For VisFlow60, manufacturing and maintenance impacts are distributed over a larger lifetime energy output than for VisFlow10, reducing their relative contribution per delivered kWh.

Technical information on scenarios

Reference service life

RSL information		Unit
Reference service Life	20	Years
Cycles per year	365	Cycles/year
Declared product properties	VisFlow60, 2 x 9000 L electrolyte configuration, 360 kWh usable capacity	Description
Design application parameters	Daily cycling, stationary renewable energy storage	Description
Usage conditions	EU-27 use scenario; indoor/outdoor stationary operation	Description
Maintenance	Annual inspection	1/year

B2 - Maintenance	Value	Unit
Maintenance process	Annual service inspection, checks and minor testing	-
Maintenance cycle	1	/year
Ancillary materials for maintenance	None significant	kg/year
Waste materials resulting from maintenance	None significant	kg/year
Energy input during maintenance (EU market mix)	10	kWh/year
Maintenance related transport	600	km/year

B3 – Repair		
Repair process, including biennial electrolyte balancing	Replacement parts, transport and electrolyte balancing every 2 years	-
Inspection process	Included with repair activities	-
Repair cycle	As required over RSL	/year
Ancillary materials (Gaskets, hoses, electronics, pumps)	2.03	kg/year
Transport of ancillary materials	66.96	tkm/year
Electrolyte balancing: annualised vanadium input	57.60	kg/year
Net freshwater consumption during repair	0	m^3
Energy input during repair	None significant (Part of maintenance)	kWh/cycle

B6 – Use of energy		
Type of energy carrier	80% solar / 20% wind electricity	kWh
Power output of equipment	10	kW
Characteristic performance (Round-trip losses incl. own consumption)	0.25	As appropriate
Further assumptions for scenario development	EU-27 use scenario, 20-year RSL	As appropriate

End of life (C1-C4)

Scenario information	Value	Unit
Collected separately	100%	kg
Collected with mixed waste	0%	kg
For reuse	0	kg

For recycling (Metals and vanadium; Eurostat-based shares)	1.04E-02	kg/kWh
For energy recovery (Combustible fractions only)	7.39E-05	kg/kWh
For final disposal (Residual fractions)	1.74E-05	kg/kWh
Assumptions for scenario development	EU-27 Eurostat scenario; C1/C2 PCR assumptions	As appropriate

Re-use, recovery and recycling potential (D)

Scenario information/Material	Value	Unit
Displaced material (European-produced steel, copper, LDPE, EPDM and vanadium – after degradation)	9.47E-03	kg/kWh
Energy recovery from waste incineration (after loss)	2.72E-03	MJ/kWh

Indoor air

The EPD does not give information on release of dangerous substances to indoor air because the horizontal standards on the relevant measurements are not available. Read more in EN15804+A1 chapter 7.4.1.

Soil and water

The EPD does not give information on release of dangerous substances to soil and water because the horizontal standards on the relevant measurements are not available. Read more in EN15804+A1 chapter 7.4.2.

References

Publisher	www.epddanmark.dk Template version 2025.1
Programme operator	Danish Technological Institute Gregersensvej DK-2630 Taastrup www.teknologisk.dk
LCA-practitioner	NRGi Rådgivning A/S, Hedeager 5, 8200 Aarhus N, Denmark LCA lead practitioner: Jesper Kokborg Lassen
LCA software /background data	SimaPro 10.2 ecoinvent 3.11 – Allocation, cut-off, EN15804 database; EN 15804 Reference package EF 3.1
3rd party verifier	Guangli Du Verified according to Verification Checklist 1 v. 2.9

General programme instructions
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Technical Rules and Guidelines
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