

Environmental Product Declaration



In accordance with ISO 14025 and EN 15804:2012+A2:2019 for:

Plastic pipes for the protection and management of insulated electrical cables or communication cables

CENTRALTUBI KIWAGREEN DE200 SDR11
CENTRALTUBI KIWAGREEN DE250 SDR11
CENTRALTUBI ELECTROPIPE50 DE200 SDR11
CENTRALTUBI ELECTROPIPE DE200 SDR26
CENTRALTUBI ELECTROPIPE DE200 SDR21

CENTRALTUBI ELECTROPIPE100 DE200 SDR11
CENTRALTUBI ELECTROPIPE100 DE160 SDR13.6
CENTRALTUBI GROUP5 DE450 SDR13.6
CENTRALTUBI FENDER 7x14/10
CENTRALTUBI SYSTEM PACK OD50 7x12/10

from

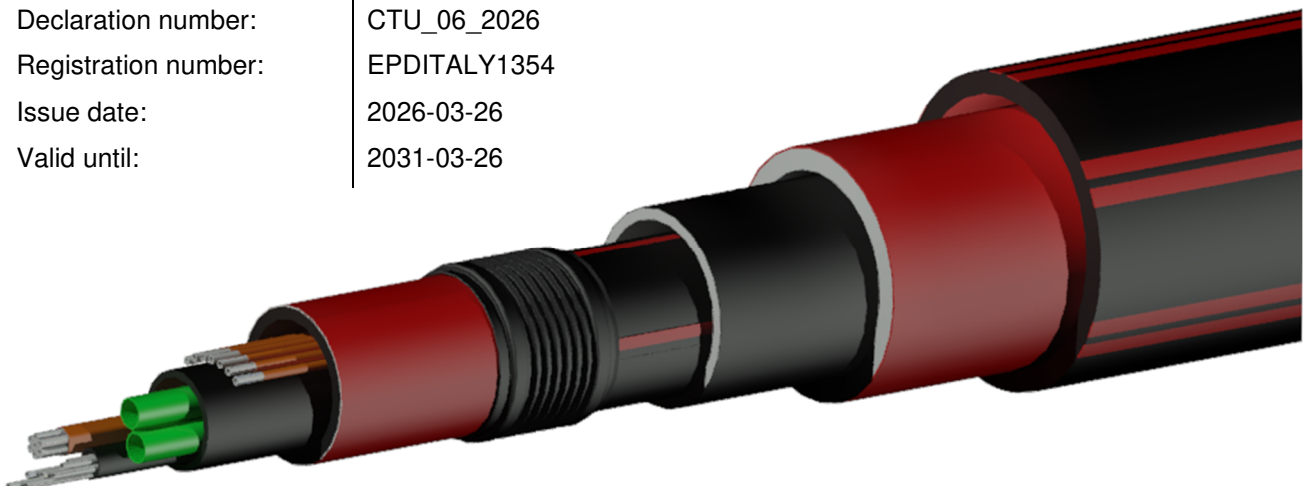
Centraltubi S.p.A.

plant:

Via Foglia 11, 61026 Lunano (PU)



Program operator:	EPDItaly, www.epditaly.it
Publisher:	EPDItaly
Declaration number:	CTU_06_2026
Registration number:	EPDITALY1354
Issue date:	2026-03-26
Valid until:	2031-03-26



1. General information

EPD owner	Centraltubi S.p.A. Via Foglia 11, 61026 Lunano (PU), Italia www.tubi.net/aziende/centraltubi/
Plant involved in the declaration	Centraltubi S.p.A. Via Foglia 11, 61026 Lunano (PU), Italy
Scope of application	This Environmental Product Declaration (EPD) is valid for CENTRALTUBI pipes. The production facility is in Lunano (PU). The type of declaration is related to the declared pipe produced in Lunano. The life cycle assessment is representative for the product introduced in the declaration for the given system boundaries.
Program operator	EPDItaly Via Gaetano De Castillia 10, 20124 Milano, Italy. www.epditaly.it
Independent check	This declaration has been developed referring to EPDItaly, following the General Program Instruction; further information and the document itself are available at: www.epditaly.it . EPD document valid within the following geographical area: Italy. CEN standard EN 15804 served as the core PCR (PCR ICMQ-001/15 rev.3.2). Independent verification of the declaration and data, according to EN ISO 14025:2010.
UN CPC Code	3632 - Tubes, pipes and hoses, and fittings therefor, of plastics
Corporate contact	Alberto Mezzanotti; a.mezzanotti@tubi.net
Technical support	TETIS Institute srl (www.tetisinstitute.it)
Comparability	Environmental statements published within the same product category, but from different programs, may not be comparable. In particular, EPDs of construction products may not be comparable if they do not comply with EN 15804+A2.
Accountability	Centraltubi S.p.A. relieves EPDItaly from any non-compliance with environmental legislation. The holder of the declaration will be responsible for the information and supporting evidence; EPDItaly

	declines all responsibility for the manufacturer's information, data and results of the life cycle assessment.
Reference document	This declaration has been developed following the General Programme Instruction document of EPDItaly, available at www.epditaly.it .
Product Category Rules (PCR)	PCR ICMQ-001/15 rev.3.2 EN 15804+A2:2019 is the framework reference for PCRs.
Products names:	CENTRALTUBI KIWAGREEN DE200 SDR11 CENTRALTUBI KIWAGREEN DE250 SDR11 CENTRALTUBI ELECTROPIPE50 DE200 SDR11 CENTRALTUBI ELECTROPIPE DE200 SDR26 CENTRALTUBI ELECTROPIPE DE200 SDR21 CENTRALTUBI ELECTROPIPE100 DE200 SDR11 CENTRALTUBI ELECTROPIPE100 DE160 SDR13.6 CENTRALTUBI GROUP5 DE450 SDR13.6 CENTRALTUBI FENDER 7x14/10 CENTRALTUBI SYSTEM PACK OD50 7x12/10
Products identification:	<i>PE or HDPE, or PE100, or PE100-RC, or PE100 RT, solid wall conduit systems with circular cross section, manufactured with virgin and/or recycled materials, individually or as part of an assembly, buried underground for the protection and management of insulated conductors and/or power cables or communication cables.</i>
Products description	<i>Plastic pipes for the protection and management of insulated electrical cables or communication cables. The material must be PE, HDPE, PE100 or PE100 RC or RT or a mixture with additives and non-virgin material of certified origin, if applicable and in according to the product standard. Solid wall conduit, suitable for cable installation by blowing, floating, pulling or pushing, intended for underground installation in open trenches or using trenchless technologies.</i>



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

CEN standard EN 15804 serves as the core PCR ^a
Independent verification of the declaration and data, according to EN ISO 14025:2010 ☐ internal ☒ external
Third party verifier: ICMQ SpA, via De Castillia, 10 20124 Milano (www.icmq.it).
^a Product Category Rules.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same 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/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.



2. Company description

Centraltubi S.p.A. was founded in 1979. It is the founder Company of what later became System Group: a group of 20 companies belonging to the holding “HB Boscarini S.p.A.”. Centraltubi S.p.A. produces smooth solid wall polyethylene (PE) pipes, in high and medium density for water supply, gas distribution, drainage and sewerage, irrigation, slotted pipes for underground drainage, dredging, protection of electrical and telecommunications cables. The company is equipped with high-tech extrusion lines, which allow it to obtain notable levels of productivity and high process quality standards. Centraltubi S.p.A. carries out all the processes for the production of products internally without outsourcing specific activities or processes, and targets many foreign markets, in addition to the Italian national one. The production range goes from the (external) diameter 7 mm to 1000 mm, divided into numerous pressure and annular stiffness classes based on the thicknesses and characteristics of the basic raw material.



Centraltubi S.p.A. is a company operating with QUALITY MANAGEMENT systems in accordance with the UNI EN ISO 9001 standard, ENVIRONMENTAL QUALITY MANAGEMENT systems in accordance with the UNI EN ISO 14001 standard, SAFETY MANAGEMENT systems in accordance with the UNI ISO 45001 standard and ENERGY MANAGEMENT systems in accordance with the UNI CEI EN ISO 50001 standard all regularly certified by accredited third parties. Centraltubi S.p.A. it is also regularly registered with the PolieCo Consortium (National Consortium for the recycling of polyethylene-based waste goods), mandatory by law (Legislative Decree 152/2006 – art. 234). The quality of the products is ensured by a careful selection of materials and a scrupulous control plan, as well as by the numerous inspection visits carried out by the various certification institutes issuing the quality marks, for the different nations and on various standards based on target applications. The most important quality marks are:

- IIP Srl
- Certificat NF114 for polyethylene pipes for electrical transmission confinement (Gr5)
- IMQ (Quality Mark Institute)
- Bureau Veritas
- SI Cert Italy S.r.l.

- Kiwa Covenant for Cable protection pipe of recycled polyethylene
- Kiwa Green focused on recycled content and recyclability of products
- Plastica Seconda Vita (PSV) for pipes obtained through the use of recycled plastic
- Made Green in Italy: voluntary national scheme for assessing and communicating the environmental footprint of products.

Together with other System Group companies, CentraLubi S.p.A. annually draws up a Sustainability Report according to the GRI standards in force. The conformity of the document and the correctness of the reported data are certified by IIP Srl.

LABORATOIRE
NATIONAL
DE MÉTROLOGIE
ET D'ESSAIS

LNE

kiwa



NF

CISQ is a member of

IOnet

THE INTERNATIONAL CERTIFICATION NETWORK
www.iqnet-certification.com

IQNet, the association of the world's first class certification bodies, is the largest provider of management System Certification in the world. IQNet is composed of more than 30 bodies and counts over 150 subsidiaries all over the globe.

Covenant Kiwagreen
K0215744/01

Issued 2024-03-15
Replaces -
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CERTIFICATO N. 148
CERTIFICATE N.Kiwa Covenant K15014
Level 2

Statement by KIWA
With this Covenant, issued in accordance with the Kiwa Regulations for Certification, Kiwa declares that legitimate confidence exists that the products supplied by

CentraLubi S.P.A.

As specified in this certificate and marked with the Kiwa mark in the manner as indicated in this product certificate may, on delivery, be relied upon to comply with the Kiwa Covenant manual K15014 dated 01-04-2020.

Ron Scheepers
Kiwa

certifica che il Sistema di Gestione Ambientale di
certify that the Environmental Management System operated by

CENTRALTUBI SPA

sede legale: VIA FOGLIA, 11 — 61020 LUNANO (PU)

UNITA' OPERATIVE / OPERATIVE UNITS

VIA FOGLIA, 11 — 61020 LUNANO (PU)
IRCONVALLAZIONE snc — 61026 LUNANO (PU)

è conforme alla norma
is in compliance with the standard

UNI EN ISO 14001:2015

è conforme alla norma
is in compliance with the standard

UNI EN ISO 9001:2015

è conforme alla norma
is in compliance with the standard

UNI EN ISO 45001:2023

Product

Pipes

Classification

EG 92

Type, Model

CENTRALTUBI EUROPA EVOLUITION

Remarks to the type

PAS 1075 Type 1 - TW
Basis EN 12201-2

Testing basis

PAS 1075:2009-04
Certification Scheme Plastic pipe system (pressure pipes and fittings) (2015-03)

Mark of conformity



27/10/2016

CENTRALTUBI SPA

sede legale: VIA FOGLIA, 11 — 61026 LUNANO (PU)

UNITA' OPERATIVE / OPERATIVE UNITS

VIA FOGLIA, 11 — 61026 LUNANO (PU)
VIA CIRCONVALLAZIONE snc — 61026 LUNANO (PU)
LOCALITA' MONTERONE — 52038 SESTINO (AR)

è conforme alla norma
is in compliance with the standard

UNI CEI EN ISO 50001:2018

COVENANT



Infatti per la Promozione
della Plastica da Riciclo

This certificate consists of 2 pages.



Certificato n° 1940/2021

Scopo
Scope

Tubi ottenuti mediante (estrazione in continuo) l'impiego di materia plastica da
riciclo da raccolta differenziata (RD) e/o scarto industriale (SI) MIXECO
Pipes obtained by continuous extrusion using plastic materials from separate
collection (RD) and/or industrial waste (SI) MIXECO

Gamma di prodotti
Range of products

vedere allegato / see annex

Nome commerciale
Trade name

vedere allegato / see annex

Produttore
Manufacturer

ITALIANA CORRUGATI SPA

Sede legale
Head office

LOCALITA' FONTE DEL DOGLIO, 22/E — 61026 PIANDIMELETO (PU)

Sito produttivo
Production site

LOCALITA' FONTE DEL DOGLIO, 22/E — 61026 PIANDIMELETO (PU)

IIP Srl certifica che i prodotti sopra elencati ottenuti dall'impiego di materiali da riciclo sono conformi ai requisiti
specificati nel Regolamento di certificazione "Plastica Seconda Vita" Ed. 2 rev. 1 del 10/2022, che include il rispetto
dei requisiti della norma EN 15343:2007.
Il produttore, sottoposto a sorveglianza continua da parte di IIP Srl, è quindi autorizzato ad apporre sui prodotti
certificati il marchio "Plastica Seconda Vita" PSV/MixEco con numero distintivo 287 ed utilizzarlo in conformità alle
prescrizioni del Regolamento per l'uso del marchio PSV Ed. 2 rev. 5 del 10/2022.
Il presente certificato di conformità è valido, salvo modifica, sospensione o revoca, fino al 03/06/2026.

IIP Srl certifies that the above listed products obtained from the use of recycled materials comply with the requirements specified in
the "Rules for the PSV certification" ed. 2 rev. 1 issued 10/2022, that includes the compliance with EN 15343:2007 requirements.
The manufacturer, which is subjected to continuous surveillance by IIP Srl, is so entitled to put on the certified products the
"Plastica Seconda Vita" PSV/MixEco mark with the distinctive number 287 and to use it in compliance with the "Rules for the use of
PSV mark" ed. 2 rev. 5 issued 10/2022.
This certificate of conformity is valid, unless modification, suspension or revocation, until 03/06/2026.

Prima emissione
First issue

04/06/2020

Emissione corrente
Current issue

09/07/2024

Scadenza
Expiry

03/06/2026

IIP

Via Velleia, 2 - 20090 Monza (MB)
Tel +39 039 2045700 - Fax +39 039 2045701
www.iip.it - info@iip.it



MEMBRO DELL'ACCORDO DI MUTUO
RICONOSCIMENTO EA, IAF E ILAC

ISTITUTO ITALIANO DEI PLASTICI SRL
L'Amministratore Delegato
(Maurizio La Ciacerà)

Maurizio La Ciacerà

ACCREDITA
ENTE ITALIANO DI ACCREDITAMENTO

SGQ n° 006A

Membro degli Accordi di Mutuo
Riconoscimento EA, IAF e ILAC
Signatory of EA, IAF and ILAC Mutual
Recognition Agreements

3. Goal and scope of the EPD

The full products' life cycle is considered (type of EPD: cradle to grave), and the following modules are defined in this EPD:

- Module **A1** includes all the processes related the extraction of raw materials (virgin HDPE and carbon black) and recycling processes for second-life materials, for the production of pipes and for the production of the pipes' packaging and the energy supply from different sources (electricity, natural gas and diesel);
- Module **A2** considers the transport to the factory gate of the plant;
- Module **A3** considers all the processes related to pipes' manufacturing as well as waste transport and treatment, direct emissions into air and water;
- Module **A4** is related to the transport from the production site to the construction site;
- Module **A5** includes all the processes related to the pipes' installation activities like energy consumption, yard waste processing, excavated soil management, production and transport to the site of cover materials (bitumen, concrete, sand, gravel), production and transport of ancillary elements to the building site;
- Module **B1** considers the use of the installed product. During the use of plastic piping systems, a zero-impact scenario is considered;
- Module **B2** includes the maintenance of the product. A zero-impact scenario is considered;
- Modules **B3-B4-B5** are related to the repair, replacement and refurbishment of the products. If the products are properly installed no repair, replacement or refurbishment processes are necessary. A zero-impact scenario is considered;
- Modules **B6-B7** consider energy use and operational water to operate building integrated technical systems. No operational energy or water use are considered. A zero-impact scenario is considered;
- Module **C1** considers deconstruction, including dismantling or demolition of the product from the building site. Since these products are not for provisional but for definitive use, it has been assumed that they will be replaced and not simply removed: as a result, the effect of this intervention will be attributed to the newly constructed pipes that will be installed. The impact of such action is previously considered in module A5 of this study. A zero-impact scenario is considered;
- Module **C2** considers transportation of the substituted pipes to a recycling or disposal treatment;
- Module **C3** considers waste processing for products recycling and waste to energy treatment;
- Module **C4** includes all waste disposal and incineration processes, including pre-treatment and management of the disposal site;
- Module **D** includes benefits from all net flows in the end-of-life stage that leave the product boundary system after having passed the end-of-waste stage. Benefits from pipes' recycling are declared within this module.

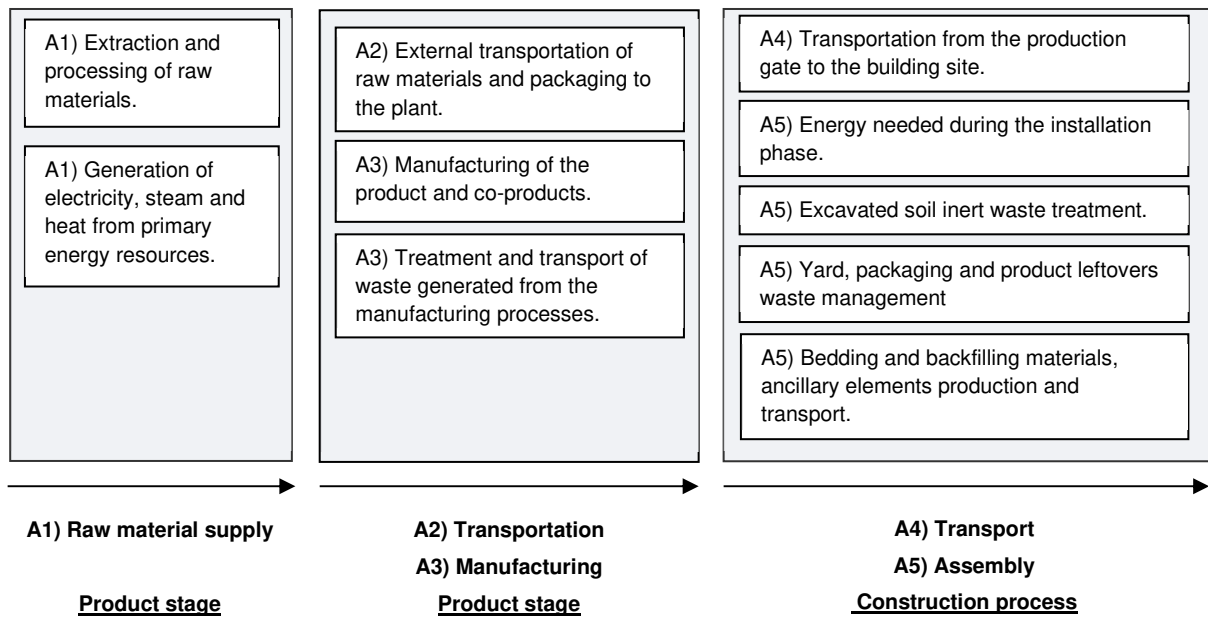
According to the PCR ICMQ-001/15 rev.3.2 the LCA study and the relative EPD, is "Cradle to grave and module D (A, B, C and D)". Modules included are A1, A2, A3, A4, A5, B, C and D and refers to the products declared in chapter 1.

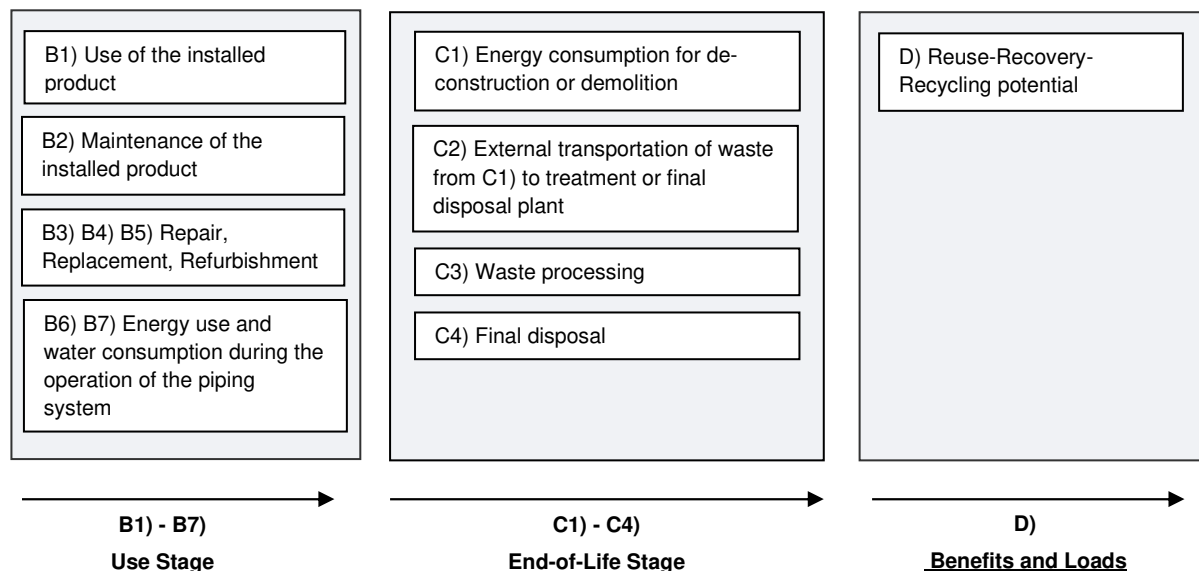
The production plant is in Lunano (PU). The market range is Italy.

Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
Raw material supply	Transport	Manufacturing	Transport	Construction installation	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
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

✓ stands for “module included in the study”.

Therefore, the boundaries of the system are illustrated in the following figures.





All data refer to the 2024 production and sales.

The declaration is a Type 3 EPD (Product EPD based on a qualified LCA-Tool) according to the EPDItaly regulation.

Geographical validity:	Italy
Database:	Ecoinvent 3.9
Software:	"Gas, water and cables pipes LCA tool", implemented through SimaPro 9.5 calculation software. The identification code of the EPD process tool used is: Gas, water and cables pipes LCA tool v.3.0 of 22/01/2024 developed by TETIS Institute srl.
EPD realized by means of a validated algorithm:	In 2023 CentraItubi S.p.A. implemented and certified a Process for EPD generation by using an algorithm that has been validated and certified by ICMQ S.p.A., in agreement with EPDItaly's requirements. The process is based on an automatic data collection from the production plant that have been integrated, verified and validated in compliance with internal procedures. The validated algorithm allows the automatic calculation of the indicators reported into the current EPD coming from an LCA model implemented into the EPD process tool.

4. Products description

CENTRALTUBI HDPE KIWA GREEN DE200 SDR11

Minimum and maximum values referring to the pipes characteristics refers to the values given by the reference standard and relies on the data variability. Different ID represents the same pipe with different colouring: differed colour tubes are produced in the same way; the difference in colour defines their different standard or customer specification, and is used solely for distinguishing them logistically; they do not affect the products' environmental performance.

Property	Value			Notes
HDPE pipes compliant with standard CEI EN 50626-2 and technical specification Kiwa Covenant K0215743/01 for plastic piping systems with 70% recycled material, Kiwa Green certified for the protection of electric power and auxiliary cables. The pipes can be buried by directional drilling and/or trenchless construction methods.				
Product ID	AAKG02000011B00012BR AAKG02000011B00012			HDPE Black HDPE Black with red external stripes HDPE Black with external colored layer
Pipe material	HDPE PEBO SpA			With 70% recycled polyethylene according to Kiwa Covenant K0215743-2.
Content of recycled material	70%			Covenant Kiwagreen K0215744-2
Number of layers	Solid wall Single or double layer with the same content fo recycled content			
Reference service life (RSL)	50 years			When properly installed, the durability of more than 50 years may be assumed based on Creep ratio and OIT test results, according with Kiwa Covenant.
Mass conversion factor	10.49 kg/m			
	Min	Max	Average	
Density [kg/m³]	956	962	959	
Weight [kg/m]	9.94	11.05	10.49	
External diameter [mm]	200	201.2	200.6	
Thickness [mm]	18.2	20.2	19.2	

Property	Value	Test method
Appearance	Smooth internal and external surface without any defect that could prejudice the suitability for the application	
Compound density	≥ 935 kg/m ³	ISO 1183
Ring Stiffness	SN	ISO 9969
Colour	Black or black with external red layer or external red stripes	
Melt mass flow rate (MFR)	0,2 ≤ MFR ≤ 1,4	EN ISO 1133-1
Creep Ratio	≤ 5 %	ISO 9967
Carbon Black content	2 to 2,5 % by mass	ISO 6964
Ash content	≤ 3 %	ISO 3451-1
Impact resistance	TIR ≤ 10 %	ISO 18553
Weldability	Resistance ≥ Tensile Strenght. Ductile surface	NEN 7200
Hydrostatic Strenght (80°C; 165 h)	4,0 MPa	EN ISO 1167
Elongation at break	≥ 300 %	EN ISO 6259
Longitudinal Reversion	≤ 3 %	EN ISO 2505
Minimum Tensile Strain at yield (23°C)	18 MPa	EN ISO 6259
Oxidation Induction Time (O.I.T.)	≥ 20 min	ISO 11357-6

CENTRALTUBI KIWA GREEN DE250 SDR11

Minimum and maximum values referring to the pipes characteristics refers to the values given by the reference standard and relies on the data variability. Different ID represents the same pipe with different colouring: differed colour tubes are produced in the same way; the difference in colour defines their different standard or customer specification, and is used solely for distinguishing them logistically; they do not affect the products' environmental performance.

Property	Value			Notes
HDPE pipes compliant with standard CEI EN 50626-2 and technical specification Kiwa Covenant K0215743/01 for plastic piping systems with 70% recycled material, Kiwa Green certified for the protection of electric power and auxiliary cables. The pipes can be buried by directional drilling and/or trenchless construction methods.				
Product ID	AAKG02500011B00012BR AAKG02500011B00012			HDPE Black HDPE Black with red external stripes HDPE Black with external colored layer
Pipe material	HDPE PEBO SpA			With 70% recycled polyethylene according to Kiwa Covenant K0215743-2.
Content of recycled material	70%			Covenant Kiwagreen K0215744-2
Number of layers	Solid wall Single or double layer with the same content fo recycled content			
Reference service life (RSL)	50 years			When properly installed, the durability of more than 50 years may be assumed based on Creep ratio and OIT test results, according with Kiwa Covenant.
Mass conversion factor	16.34 kg/m			
	Min	Max	Average	
Density [kg/m³]	956	962	959	
Weight [kg/m]	15.50	17.17	16.34	
External diameter [mm]	250	251.5	250.75	
Thickness [mm]	22.7	25.1	23.9	

Property	Value	Test method
Appearance	Smooth internal and external surface without any defect that could prejudice the suitability for the application	
Compound density	$\geq 935 \text{ kg/m}^3$	ISO 1183
Ring Stiffness	$SN > 16 \text{ kN/m}^2$	ISO 9969
Colour	Black or black with external red layer or external red stripes	
Melt mass flow rate (MFR)	$0,2 \leq MFR \leq 1,4$	EN ISO 1133-1
Creep Ratio	$\leq 5 \%$	ISO 9967
Carbon Black content	2 to 2,5 % by mass	ISO 6964
Ash content	$\leq 3 \%$	ISO 3451-1
Impact resistance	$TIR \leq 10 \%$	ISO 18553
Weldability	Resistance $\geq$ Tensile Strenght. Ductile surface	NEN 7200
Hydrostatic Strenght (80°C; 165 h)	4,0 MPa	EN ISO 1167
Elongation at break	$\geq 300 \%$	EN ISO 6259
Longitudinal Reversion	$\leq 3 \%$	EN ISO 2505
Minimum Tensile Strain at yield (23°C)	18 MPa	EN ISO 6259
Oxidation Induction Time (O.I.T.)	$\geq 20 \text{ min}$	ISO 11357-6

CENTRALTUBI ELECTROPIPE 50 DE200 SDR11

Minimum and maximum values referring to the pipes characteristics refers to the values given by the reference standard and relies on the data variability. Different ID represents the same pipe with different colouring: differed colour tubes are produced in the same way; the difference in colour defines their different standard or customer specification, and is used solely for distinguishing them logistically; they do not affect the products' environmental performance. The pipes belong to the ECOPIPE MX50 product range, PSV (Plastica Seconda Vita) certified for its recycled plastic content.

Property	Value			Notes
HDPE pipes compliant with standard CEI EN 50626-2 with third-party certificate and CE marking. Plastic piping systems with 50% recycled material, PSV (Plastica Seconda Vita) certified, for the protection and management of insulated conductors and/or power cables or communication cables. Installation in open trench or trenchless.				
Product ID	AHIP02000011B00012 AHXP02000011B00012 AHE502000011B00012			HDPE Black HDPE Black with red external stripes HDPE Black with external colored layer
Pipe material	HDPE PEBO SpA			With 50% recycled polyethylene obtained from the recovery of plastic waste from separate collection (RD) and/or industrial waste (SI), in a minimum ratio of 50%.
Content of recycled material	50%			Certification IIP Srl Plastica Seconda Vita n. 3024/2024
Number of layers	Solid wall Single or double layer with the same content fo recycled content			
Reference service life (RSL)	50 years			Performance Time minimum 50 years according with the standard CEI EN 50626-2.
Mass conversion factor	10.49 kg/m			
	Min	Max	Average	
Density [kg/m³]	956	962	959	
Weight [kg/m]	9.94	11.05	10.49	
External diameter [mm]	200	201.2	200.6	
Thickness [mm]	18.2	20.2	19.2	

Property	Value	Test method
Appearance	The internal and the external surfaces of conduits and fittings shall be smooth, clean and free from edges, grooving, blistering, impurities and pores and any other surface irregularities likely to prevent their conformity to the standard.	
Compound density	≥ 935 kg/m ³	ISO 1183
Ring Stiffness	SN64	ISO 9969
Colour	Black or black with external red layer or external red stripes	
Melt mass flow rate (MFR)	MFR ≤ 1,7	EN ISO 1133-1
Carbon Black content	2 to 2,5 % by mass	ISO 6964
Impact resistance	TIR ≤ 10 %	ISO 18553
Hydrostatic Strenght (80°C; 165 h)	4,0 MPa	EN ISO 1167
Elongation at break	≥ 300 %	EN ISO 6259
Longitudinal Reversion	≤ 3 %	EN ISO 2505
Minimum Tensile Strain at yield (23°C)	18 MPa	EN ISO 6259
Short term resistance to internal pressure	12 bar	EN 50626-2
Oxidation Induction Time (O.I.T.)	≥ 20 min	ISO 11357-6
Tightness with NRG coupler	IP66/IP68	EN 60529

CENTRALTUBI ELECTROPIPE DE200 SDR26

Minimum and maximum values referring to the pipes characteristics refers to the values given by the reference standard and relies on the data variability. Different ID represents the same pipe with different colouring: differed colour tubes are produced in the same way; the difference in colour defines their different standard or customer specification, and is used solely for distinguishing them logistically; they do not affect the products' environmental performance. The pipes belong to the ECOPIPE MX50 product range, PSV (Plastica Seconda Vita) certified for its recycled plastic content.

Property	Value			Notes
HDPE pipes compliant with standard CEI EN 50626-2 with third-party certificate and CE marking. Plastic piping systems with 50% recycled material, PSV (Plastica Seconda Vita) certified, for the protection and management of insulated conductors and/or power cables or communication cables. Installation in open trench.				
Product ID	AHIP02000026B00012 AHXP02000026B00012 AHE502000026B00012			HDPE Black HDPE Black with red external stripes HDPE Black with external colored layer
Pipe material	HDPE PEBO SpA			With 50% recycled polyethylene obtained from the recovery of plastic waste from separate collection (RD) and/or industrial waste (SI), in a minimum ratio of 50%.
Content of recycled material	50%			Certification IIP Srl Plastica Seconda Vita n. 3024/2024
Number of layers	Solid wall Single or double layer with the same content fo recycled content			
Reference service life (RSL)	50 years			Performance Time minimum 50 years according with the standard CEI EN 50626-2.
Mass conversion factor	4.73 kg/m			
	Min	Max	Average	
Density [kg/m³]	956	962	959	
Weight [kg/m]	4.45	5.01	4.73	
External diameter [mm]	200	201.2	200.6	
Thickness [mm]	7.7	8.6	8.15	

Property	Value	Test method
Appearance	The internal and the external surfaces of conduits and fittings shall be smooth, clean and free from edges, grooving, blistering, impurities and pores and any other surface irregularities likely to prevent their conformity to the standard.	
Compound density	≥ 935 kg/m ³	ISO 1183
Ring Stiffness	SN4	ISO 9969
	450 N	CEI EN 50626-1
Colour	Black or black with external red layer or external red stripes	
Melt mass flow rate (MFR)	MFR ≤ 1,7	EN ISO 1133-1
Carbon Black content	2 to 2,5 % by mass	ISO 6964
Impact resistance	TIR ≤ 10 %	ISO 18553
Hydrostatic Strenght (80°C; 165 h)	4,0 MPa	EN ISO 1167
Elongation at break	≥ 250 %	EN ISO 6259
Longitudinal Reversion	≤ 3 %	EN ISO 2505
Minimum Tensile Strain at yield (23°C)	18 MPa	EN ISO 6259
Oxidation Induction Time (O.I.T.)	≥ 20 min	ISO 11357-6
Tightness with NRG coupler	IP66/IP68	EN 60529

CENTRALTUBI ELECTROPIPE DE200 SDR21

Minimum and maximum values referring to the pipes characteristics refers to the values given by the reference standard and relies on the data variability. Different ID represents the same pipe with different colouring: differed colour tubes are produced in the same way; the difference in colour defines their different standard or customer specification, and is used solely for distinguishing them logistically; they do not affect the products' environmental performance. The pipes belong to the ECOPIPE MX50 product range, PSV (Plastica Seconda Vita) certified for its recycled plastic content.

Property	Value			Notes
HDPE pipes compliant with standard CEI EN 50626-2 with third-party certificate and CE marking. Plastic piping systems with 50% recycled material, PSV (Plastica Seconda Vita) certified, for the protection and management of insulated conductors and/or power cables or communication cables. Installation in open trench or trenchless.				
Product ID	AHIP02000021B00012 AHXP02000021B00012 AHE502000021B00012			HDPE Black HDPE Black with red external stripes HDPE Black with external colored layer
Pipe material	HDPE PEBO SpA			With 50% recycled polyethylene obtained from the recovery of plastic waste from separate collection (RD) and/or industrial waste (SI), in a minimum ratio of 50%.
Content of recycled material	50%			Certification IIP Srl Plastica Seconda Vita n. 3024/2024.
Number of layers	Solid wall Single or double layer with the same content fo recycled content			
Reference service life (RSL)	50 years			Performance Time minimum 50 years according with the standard CEI EN 50626-2.
Mass conversion factor	5.82 kg/m			
	Min	Max	Average	
Density [kg/m³]	956	962	959	
Weight [kg/m]	5.49	6.16	5.82	
External diameter [mm]	200	201.2	200.6	
Thickness [mm]	9.6	10.7	10.15	

Property	Value	Test method
Appearance	The internal and the external surfaces of conduits and fittings shall be smooth, clean and free from edges, grooving, blistering, impurities and pores and any other surface irregularities likely to prevent their conformity to the standard.	
Compound density	≥ 935 kg/m ³	ISO 1183
Ring Stiffness	SN8	ISO 9969
	750 N	CEI EN 50626-1
Colour	Black or black with external red layer or external red stripes	
Melt mass flow rate (MFR)	MFR ≤ 1,7	EN ISO 1133-1
Carbon Black content	2 to 2,5 % by mass	ISO 6964
Impact resistance	TIR ≤ 10 %	ISO 18553
Hydrostatic Strenght (80°C; 165 h)	4,0 MPa	EN ISO 1167
Elongation at break	≥ 250 %	EN ISO 6259
Longitudinal Reversion	≤ 3 %	EN ISO 2505
Minimum Tensile Strain at yield (23°C)	18 MPa	EN ISO 6259
Oxidation Induction Time (O.I.T.)	≥ 20 min	ISO 11357-6
Tightness with NRG coupler	IP66/IP68	EN 60529

CENTRALTUBI ELECTROPIPE 100 DE200 SDR11

Minimum and maximum values referring to the pipes characteristics refers to the values given by the reference standard and relies on the data variability. Different ID represents the same pipe with different colouring: differed colour tubes are produced in the same way; the difference in colour defines their different standard or customer specification, and is used solely for distinguishing them logistically; they do not affect the products' environmental performance.

Property	Value			Notes
HDPE pipes compliant with standard CEI EN 50626-2 with third-party certificate and CE marking. Plastic piping systems with Performance Time more than 100 years, for the protection and management of insulated conductors and/or power cables or communication cables. Installation in open trench or trenchless.				
Product ID	AHEX02000011B00012 AHUB02000011B00012 AHE102000011B00012			HDPE Black HDPE Black with red external stripes HDPE Black with external colored layer
Pipe material	Virgin HDPE – PE100 – PE100-RC– PE100-RT RC– PE100-FLEX			
Content of recycled material	0%			
Number of layers	Solid wall Single or double layer with the same content fo recycled content			
Reference service life (RSL)	100 years			Performance Time minimum 100 years according with the standard CEI EN 50626-2.
Mass conversion factor	10.49 kg/m			
	Min	Max	Average	
Density [kg/m³]	956	962	959	
Weight [kg/m]	9.94	11.05	10.49	
External diameter [mm]	200	201.2	200.6	
Thickness [mm]	18.2	20.2	19.2	

Property	Value	Test method
Appearance	The internal and the external surfaces of conduits and fittings shall be smooth, clean and free from edges, grooving, blistering, impurities and pores and any other surface irregularities likely to prevent their conformity to the standard.	
Compound density	≥ 935 kg/m ³	ISO 1183
Ring Stiffness	SN64	ISO 9969
Colour	Black or black with external red layer or external red stripes	
Melt mass flow rate (MFR)	MFR ≤ 1,7	EN ISO 1133-1
Carbon Black content	2 to 2,5 % by mass	ISO 6964
Impact resistance	TIR ≤ 10 %	ISO 18553
Hydrostatic Strenght (80°C; 1000 h)	4,0 MPa	EN ISO 1167
Elongation at break	≥ 300 %	EN ISO 6259
Longitudinal Reversion	≤ 3 %	EN ISO 2505
Minimum Tensile Strain at yield (23°C)	18 MPa	EN ISO 6259
Short term resistance to internal pressure	12 bar	EN 50626-2
Oxidation Induction Time (O.I.T.)	≥ 20 min	ISO 11357-6
Tightness with NRG coupler	IP66/IP68	EN 60529
Weldability	Resistance ≥ Tensile Strenght. Ductile surface	ISO 13953

CENTRALTUBI ELECTROPIPE 100 DE160 SDR13.6

Minimum and maximum values referring to the pipes characteristics refers to the values given by the reference standard and relies on the data variability. Different ID represents the same pipe with different colouring: differed colour tubes are produced in the same way; the difference in colour defines their different standard or customer specification, and is used solely for distinguishing them logistically; they do not affect the products' environmental performance.

Property	Value			Notes
HDPE pipes compliant with standard CEI EN 50626-2 with third-party certificate and CE marking. Plastic piping systems with Performance Time more than 100 years, for the protection and management of insulated conductors and/or power cables or communication cables. Installation in open trench or trenchless.				
Product ID	AHEX01600013.6B00012 AHUB01600013.6B00012 AHE101600013.6B00012			HDPE Black HDPE Black with red external stripes HDPE Black with external colored layer
Pipe material	Virgin HDPE – PE100 – PE100-RC– PE100-RT RC– PE100-FLEX			
Content of recycled material	0%			
Number of layers	Solid wall Single or double layer with the same content fo recycled content			
Reference service life (RSL)	100 years			Performance Time minimum 100 years according with the standard CEI EN 50626-2.
Mass conversion factor	5.55 kg/m			
	Min	Max	Average	
Density [kg/m³]	956	962	959	
Weight [kg/m]	5.25	5.86	5.55	
External diameter [mm]	160	161	160.5	
Thickness [mm]	11.8	13.1	12.45	

Property	Value	Test method
Appearance	The internal and the external surfaces of conduits and fittings shall be smooth, clean and free from edges, grooving, blistering, impurities and pores and any other surface irregularities likely to prevent their conformity to the standard.	
Compound density	≥ 935 kg/m3	ISO 1183
Ring Stiffness	SN32	ISO 9969
Colour	Black or black with external red layer or external red stripes	
Melt mass flow rate (MFR)	MFR ≤ 1,7	EN ISO 1133-1
Carbon Black content	2 to 2,5 % by mass	ISO 6964
Impact resistance	TIR ≤ 10 %	ISO 18553
Hydrostatic Strenght (80°C; 1000 h)	4,0 MPa	EN ISO 1167
Elongation at break	≥ 300 %	EN ISO 6259
Longitudinal Reversion	≤ 3 %	EN ISO 2505
Minimum Tensile Strain at yield (23°C)	18 MPa	EN ISO 6259
Short term resistance to internal pressure	12 bar	EN 50626-2
Oxidation Induction Time (O.I.T.)	≥ 20 min	ISO 11357-6
Tightness with NRG coupler	IP66/IP68	EN 60529
Weldability	Resistance ≥ Tensile Strenght. Ductile surface	
		ISO 13953

CENTRALTUBI GROUP 5 DE450 SDR13.6

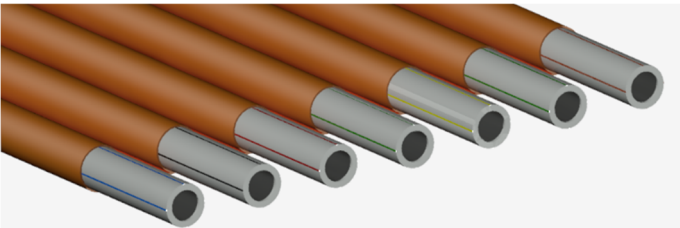
Minimum and maximum values referring to the pipes characteristics refers to the values given by the reference standard and relies on the data variability. Different ID represents the same pipe with different colouring: differed colour tubes are produced in the same way; the difference in colour defines their different standard or customer specification, and is used solely for distinguishing them logistically; they do not affect the products' environmental performance.

Property	Value	Notes
HDPE pipes for plastic piping systems with performance time more than 100 years, for the protection and management of insulated conductors and/or power cables or communication cables. Produced with PE100 or PE100 RC or PE100 with improved thermal resistance. Dimensions in accordance with EN 12201-2 and performance characteristics according to specific product standards. Installation in open trench or trenchless.		
Product ID	AHHT045012.5, AHHN045012.5, AEUB04500012.5, AEUI04500012.5, AMDB04500012.5, AMUI04500012.5, AHUB04500012.5, AHII04500012.5.	PE100 Black with or without red external layer or stripes PE100 RC Black with or without red external layer or stripes PE100 RCD Black with or without red external layer or stripes PE100 RT Black with or without red external layer or stripes PE100 RC RT Black with or without red external layer or stripes PE100 FLEX Black with or without red external layer or stripes
Pipe material	Virgin HDPE – PE100 – PE100-RC– PE100-RCD – PE100 RT- PE100 FLEX	
Content of recycled material	0%	
Number of layers	Solid wall Single or double layer of the same polymer	
Reference service life (RSL)	100 years	According to FprEN 16903 and (Ulrich Schulte and Joachim Hessel, 2006)
Mass conversion factor	43.74 kg/m	
	Min	
	Max	
	Average	
Density [kg/m³]	956	
Weight [kg/m]	41.44	
External diameter [mm]	450	452,7
Thickness [mm]	33.1	36.6

Property	Value	Test method
Minimum Required Strength (MRS)	10 MPa	EN ISO 9080
Compound density	≥ 930 kg/m ³	EN ISO 1183
Oxidation induction time (OIT) 210°C	≥ 15 min	EN ISO 11357-6
Colour	Black with external blue or brown layer or external blue or brown stripes	
Melt mass flow rate (MFR)	0,2 ≤ MFR ≤ 1,4	EN ISO 1133-1
Water Content	≤ 300 mg/kg	EN ISO 15512
Carbon Black content	2 to 2,5 % by mass	ISO 6964
Carbon Black or pigment dispersion	Grade ≤ 3	ISO 18553
Hydrostatic Strenght (10°C; 100 h)	12,0 MPa	EN ISO 1167
Hydrostatic Strenght (80°C; 165 h)	5,4 MPa	EN ISO 1167
Hydrostatic Strenght (80°C; 1000 h)	5,0 MPa	EN ISO 1167
Elongation at break	≥ 350 %	EN ISO 6259
Longitudinal Reversion	≤ 3 %	EN ISO 2505
Minimum Tensile Strain at yield	19 MPa	EN ISO 6259
Flexural modulus	> 900 MPa	EN ISO 178
Coefficient of Thermal Linear Expansion	0,22 mm/m/°C	

CENTRALTUBI FENDER 7 x 10/14

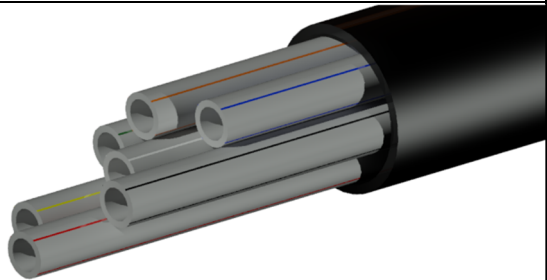
Minimum and maximum values referring to the pipes characteristics refers to the values given by the reference standard and relies on the data variability. Different ID represents the same pipe with different colouring: differed colour tubes are produced in the same way; the difference in colour defines their different standard or customer specification, and is used solely for distinguishing them logistically; they do not affect the products' environmental performance.

Property	Value			Notes
System of seven polyethylene mini pipes compliant with standard CEI EN 50626-2 with third-party certificate and CE marking, for the protection and management of optical fibers, communication and power cables. Multiple pipes with smooth external wall, internally treated to improve the transit of the cable, enveloped individually under a colored high density polyethylene tight membrane in a plan configuration. Installation in open trench or mini trench.				
Product ID	TF7A001402 TF7B001402			Fully colored mini pipes Neutral color pipes with external colored layer or colored stripes Colored or black guaine
Pipe material	Virgin HDPE			
Content of recycled material	0%			
Number of layers	Solid wall Single or double layer with the same content fo recycled content			
Reference service life (RSL)	50 years			Performance Time minimum 50 years according with the standard CEI EN 50626-2.
Mass conversion factor	0.63 kg/m			
	Min	Max	Average	
Density [kg/m³]	956	962	959	
Weight [kg/m]	0.61	0.65	0.63	
External diameter [mm]	14	14.1	14.05	
Thickness [mm]	2.0	2.15	2.07	

Property	Value	Test method
Appearance	When viewed without magnification the internal and external surfaces of pipes shall be clean and shall have no scoring, cavities and other surface defects to an extent that would prevent the conformity for the application.	
Compound density	≥ 935 kg/m3	ISO 1183
Ring Stiffness	SN128	ISO 9969
	750 N	CEI EN 50626-1
Colour	Fully colored or neutral with external colored layer or colored stripes	
Melt mass flow rate (MFR)	MFR ≤ 1,7	EN ISO 1133-1
Bending radius	120 mm	EN 60794
Impact resistance	TIR ≤ 10 %	ISO 18553
Hydrostatic Strenght (80°C; 165 h)	4,0 MPa	EN ISO 1167
Elongation at break	≥ 250 %	EN ISO 6259
Longitudinal Reversion	≤ 3 %	EN ISO 2505
Minimum Tensile Strain at yield (23°C)	16 MPa	EN ISO 6259
Oxidation Induction Time (O.I.T.)	≥ 20 min	ISO 11357-6
The characteristics refer to each pipe in the assembled system		

CENTRALTUBI SYSTEM PACK OD50 7x12/10

Minimum and maximum values referring to the pipes characteristics refers to the values given by the reference standard and relies on the data variability. Different ID represents the same pipe with different colouring: differed colour tubes are produced in the same way; the difference in colour defines their different standard or customer specification, and is used solely for distinguishing them logistically; they do not affect the products' environmental performance. The pipes belong to the ECOPIPE MX50 product range, PSV (Plastica Seconda Vita) certified for its recycled plastic content.

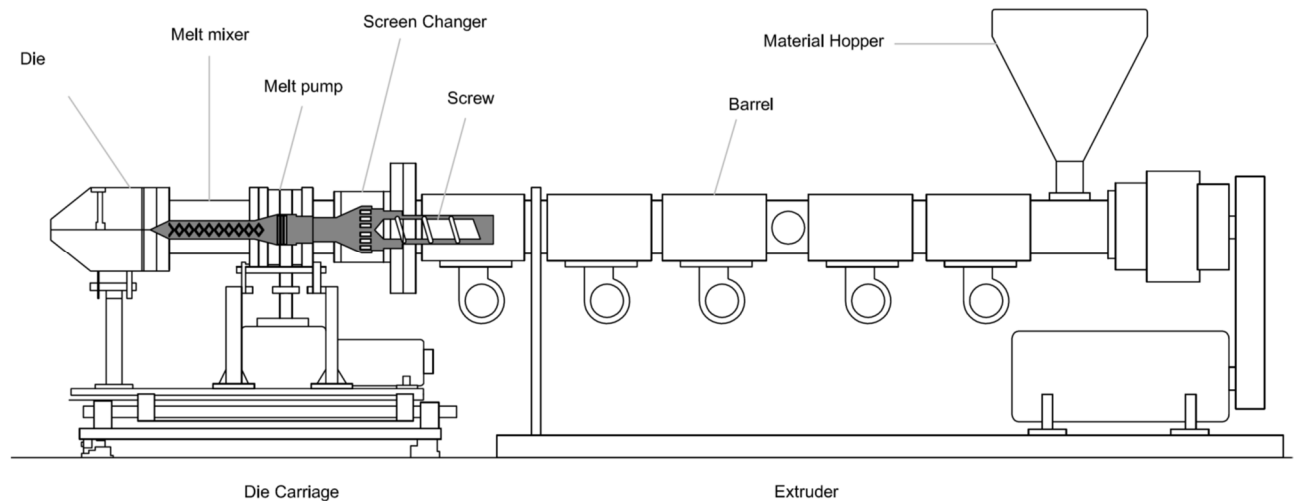
Property	Value			Notes
System of seven polyethylene mini pipes compliant with standard CEI EN 50626-2 with third-party certificate and CE marking, for the protection and management of optical fibers, communication and power cables. Multiple pipes with smooth external wall, internally treated to improve the transit of the cable, pre-inserted into an HDPE protective tube. Installation in open trench, mini trench or directional drilling.				
Product ID	AHIP02000021B00012 AHXP02000021B00012 AHE502000021B00012			Fully colored mini pipe Neutral color pipe with external colored layer or colored stripes Black or Colored guaine pipe
Pipe material	HDPE - HDPE PEBO SpA			External guaine pipe with 50% recycled polyethylene obtained from the recovery of plastic waste from separate collection (RD) and/or industrial waste (SI) with Certification IIP Srl Plastica Seconda Vita n. 3024/2024. 30% recycled material calculated on the total weight of the assembly.
Content of recycled material	30%			
Number of layers	Solid wall Single or double layer with the same content fo recycled content			
Reference service life (RSL)	50 years			Performance Time minimum 50 years according with the standard CEI EN 50626-2.
Mass conversion factor	0.76 kg/m			
	Min	Max	Average	
Density [kg/m³]	956	962	959	
Weight [kg/m]	0.70	0.81	0.76	
External diameter [mm]	12	12.1	12.05	
Thickness [mm]	1.1	1.2	1.15	

Property	Value	Test method
Appearance	When viewed without magnification the internal and external surfaces of pipes shall be clean and shall have no scoring, cavities and other surface defects to an extent that would prevent the conformity for the application.	
Compound density	≥ 935 kg/m3	ISO 1183
Ring Stiffness	SN32	ISO 9969
	450 N	CEI EN 50626-1
Colour	Fully colored or neutral with external colored layer or colored stripes	
Melt mass flow rate (MFR)	MFR ≤ 1,7	EN ISO 1133-1
Bending radius	120 mm	EN 60794
Impact resistance	TIR ≤ 10 %	ISO 18553
Hydrostatic Strenght (80°C; 165 h)	4,0 MPa	EN ISO 1167
Elongation at break	≥ 250 %	EN ISO 6259
Longitudinal Reversion	≤ 3 %	EN ISO 2505
Minimum Tensile Strain at yield (23°C)	16 MPa	EN ISO 6259
Oxidation Induction Time (O.I.T.)	≥ 20 min	ISO 11357-6
The characteristics refer to each pipe in the assembled system		

5. Production processes description

Production processes description

The principal aspects of a solid wall polyethylene pipe manufacturing facility are presented in the figure below.



The raw material in granules is supplied in pre coloured or neutral color according with the specifications of the product standard, normally the colour of HDPE in granules is black, the colour red is often associated with cable protection pipes. After the material passes the resin's manufacturer quality control tests, it is shipped to Centraletubi in 30 ton capacity bulk trucks as loose material or in bags of 25 kg each one, dispatched on pallets. Selected recycled materials came from PEBO SpA S.p.A. which is a Italian company specialized in the recovery and recycling of high density polyethylene.

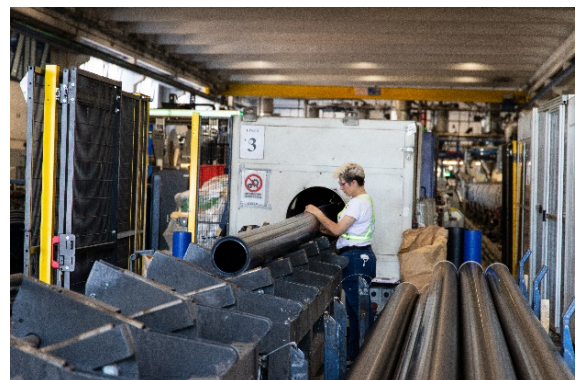
The quality plan Centraletubi establishes specification requirements of the quality control procedure for testing incoming resins. Resins is pneumatically conveyed from the bulk transporters to silos and, carefully dried, from the silos to the pipe extruder by a vacuum transfer system, and then directly into the hooper above the extruder.

The function of an extruder is to heat, melt, mix and convey the material to the die, where it is shaped into a pipe. The extruder is used to heat the raw material and then force the resulting melted polymer through the pipe extrusion die. During the manufacturing process, the major portion of the heat supplied to the polymer is provided by the motor. The temperature of the extruder melted polymer is usually between 200 and 230 °C, and under high pressure (180 – 280 bar).



The dimension and tolerance of the pipe are determined and set during the sizing and cooling operation. For solid wall pipe, the process is accomplished by drawing the hot material from the die through a sizing sleeve and into a cooling tank, sizing may be done by using either vacuum or pressure techniques. The outside surface of the pipe is held against the sizing sleeve by vacuum. After the pipe exits the vacuum sizing tank, it is moved through a series of spray or immersion cooling tanks. Cooling water temperature are typically in the optimum range of 5 – 10 °C. The total length of the cooling baths must be adequate to cool the pipe below 85°C, in order to withstand the subsequent handling operations. A puller provide the necessary force to pull the pipe through the entire cooling operation, it also maintains the proper wall thickness control by providing a constant pulling rate. The rate at which the pipe is pulled, in combination with the extruder screw speed, determines the wall thickness of the finished pipe.

Pipes with external diameter up to 180 mm can be coiled for handling and shipping convenience. Some equipments allows the pipe to be coiled in various lengths. Pipes can also be cut into specific lengths up to 20 m. At the end of the line of production the procedure of quality control start according with the specific plan and standard reference.



Products distribution, installation and use

Pipes are produced and delivered in different dimensions with appropriate packaging for the transport, in bars or coil. The packaging is composed by LDPE caps, steel or PET strips and wooden slats and reels.

Installation

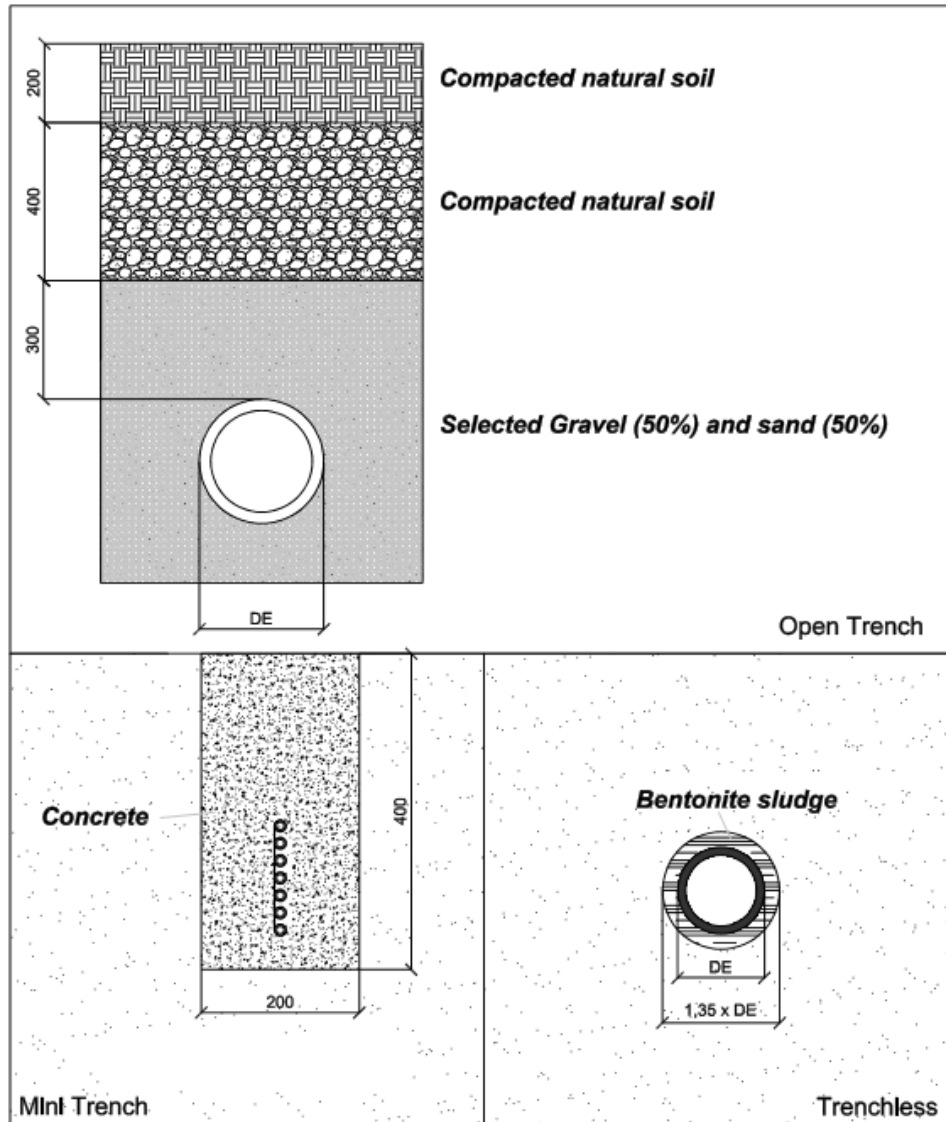
Ancillary materials, bedding and backfilling materials, and diesel are used during the installation phase. The functional unit of a PE underground system of 100 m of pipes for the protection and management of insulated conductors and/or power cables or communication cables:

- Polyethylene pipes;
- Butt fusion weldings or couplers with gaskets
- Diesel used during the installation phase.

Various laying methods were examined, and for all of them it was assumed that 2% of the pipes would be left over during the installation. Cable protection pipes can be laid underground using various methods:

- Open trench according to UNI ENV 1046;
- Trenchless technologies (e.g. horizontal directional drilling)
- Mini Trench (e.g. optical fiber protection pipes).

The following figure shows an open trench and the assumed backfilling materials, according with the standard UNI ENV 1046: "Thermoplastics piping and ducting systems – Outside the building structures for gravity and pressure systems – Trench installation", considering the use of selected imported backfill materials with suitable particles size, other than excavated soil.



According with the technical literature (e.g. "Handbook of polyethylene pipes" Plastic Pipe Institute) soil and embedment materials have a range of density; in this calculation these values have been considered: sand and gravel: 1700 kg/m^3 ; excavated soil: 2000 kg/m^3 .

Often, pipes for protecting fibre optic cables are installed in open trenches with precision excavations, which are small in size, narrow and shallow. In this study mini-trench has a width of 20 cm and a depth of 40 cm. After positioning, the pipe is backfilled with concrete (50% sand, 40% gravel, 10% cement). In many applications, cable protection pipes are laid without opening a trench. The trenchless installation process begins with boring a small, horizontal pilot hole under the crossing obstacle (i.e. a highway) with a continuous string of steel drill rod. When the bore head and rod emerge on the opposite side of the crossing, a special cutter, called a back reamer, is attached and pulled back through the pilot hole. The reamer bores out the pilot hole so that the pipe can be pulled through. The pipe is usually pulled

through from the side of the crossing opposite the drill rig. Usually a “drilling mud” such as fluid bentonite clay is injected into the bore during cutting and reaming to stabilize the hole and remove soil cuttings. The primary clay for drilling mud is sodium montmorillonite (bentonite). Properly ground and refined bentonite is added to fresh water to produce a “mud.” The mud reduces drilling torque and gives stability and support to the bored hole. This study considered a bore size equal to 135% of the diameter of the pipe to be installed, the gap between the hole and the pipe is filled with a mixture of water and bentonite (6%), this mud has density of 1150 kg/m³.

Use

Operational use (pumping energy) is not relevant for the EPD, since it falls outside the system boundaries of the LCA project. Maintenance is not needed for the HDPE pipes systems. According to PREN 16904:2021 a general scenario of zero impact for plastic piping systems inside the building is considered.

Reference service life

Performance time is defined as indicated in the product specifications and in the standard CEI EN 50626-2 as 50 or 100 years based on accelerated mechanical tests for virgin HDPE, even with a specific certified percentage of recycled material of known origin. For PE100, PE100 RC and PE100 RCD, the service lifetime of 100 years is considered according to relevant international publication on this item (FprEN 16903 and Ulrich Schulte and Joachim Hessel, 2006).

Colouring

The colour utilized for the different products is necessary for a logistical differentiation between the various functions that the same tube can perform: differed colour tubes are produced in the same way; the difference in colour defines their different function (gas pipe, water pipe, etc.) and is used solely for distinguishing them logistically.

Products end of life

Since the infrastructure is a crucial asset, the replacement of an existing system with a new one end of life scenario is chosen. For the definition of the end-of-life treatment of substituted pipes and leftovers the data reported in latest version of Annex C to the PEF/OEF Methods for the specific application/material are considered (22.5% recycled, and a subdivision between incineration and landfill respectively equal to 35% and 65%). Also for the end of life of the packaging materials the data reported in latest version of Annex C to the PEF/OEF Methods for the specific application/material are considered, an exception is represented by the wood packaging: this material is not present in the Annex C to the PEF/OEF Methods materials' list, in this case the latest data from Eurostat¹ are taken into account.

¹ https://ec.europa.eu/eurostat/databrowser/view/env_wastrt_custom_9411639/default/table?lang=en

Ancillary elements' end of life depends on the type of material they are made of according to latest version of Annex C to the PEF/OEF Methods: plastic elements are assumed to have the same end of life as substituted pipes and leftovers, 95% of metals are recycled while 5% are landfilled, rubber is assumed to be fully incinerated. For the incineration process, energy recovery (both thermal and electricity) is taken into account.

Bedding and backfilling materials are assumed treated in a landfill for inert materials.

Functional unit

The functional unit is defined as **1 m polyethylene pipe produced** for the protection and management of insulated electrical cables or communication cables.

6. LCA results – Environmental impact per functional unit

The tables below show the results of the LCA (Life Cycle Assessment), expressed per functional unit for each pipe. Additional environmental impact indicators have been calculated but are not declared according to EN 15804+A2:2019 chapter 7.2.3.2.

CENTRALTUBI KIWAGREEN DE200 SDR11 Trenchless installation

CORE ENVIRONMENTAL IMPACT INDICATORS

INDICATOR	UNIT		A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Global Warming Potential (GWP)	Fossil	kg CO ₂ eq.	1,43E+01	1,69E-02	9,76E-01	1,56E+00	3,29E+00	0,00E+00	0,00E+00	3,50E-01	8,61E+00	6,74E-01	2,00E+00
	Biogenic	kg CO ₂ eq.	1,94E-01	5,14E-06	1,55E-02	4,60E-04	1,96E-03	0,00E+00	0,00E+00	1,02E-04	5,94E-05	3,38E-04	-1,41E-01
	LULUC	kg CO ₂ eq.	7,87E-03	8,19E-06	8,89E-04	7,40E-04	1,54E-03	0,00E+00	0,00E+00	1,71E-04	2,34E-05	4,79E-05	-1,24E-03
	TOTAL	kg CO₂ eq.	1,45E+01	1,69E-02	9,93E-01	1,56E+00	3,30E+00	0,00E+00	0,00E+00	3,50E-01	8,61E+00	6,74E-01	1,86E+00
Acidification (AP)	mol H ⁺ eq.		5,01E-02	6,90E-05	4,38E-03	6,49E-03	1,44E-02	0,00E+00	0,00E+00	1,45E-03	1,11E-03	4,54E-04	1,36E-02
Eutrophication - freshwater (EP-freshwater)	kg P eq.		3,38E-04	1,40E-07	1,86E-05	1,27E-05	2,89E-05	0,00E+00	0,00E+00	2,82E-06	1,07E-06	9,57E-07	-3,83E-05
Eutrophication - marine (EP-marine)	kg N eq.		9,63E-03	2,58E-05	1,46E-03	2,44E-03	5,28E-03	0,00E+00	0,00E+00	5,48E-04	5,32E-04	2,98E-04	1,59E-03
Eutrophication terrestrial (EP)	mol N eq.		1,03E-01	2,78E-04	1,66E-02	2,62E-02	5,71E-02	0,00E+00	0,00E+00	5,90E-03	5,76E-03	1,79E-03	1,79E-02
Ozone depletion layer (ODP)	kg CFC-11 eq.		2,03E-07	3,71E-10	2,00E-08	3,44E-08	6,85E-08	0,00E+00	0,00E+00	7,66E-09	2,17E-09	1,46E-09	-1,31E-07
Photochemical ozone formation (POCP)	kg NMVOC eq.		4,67E-02	1,04E-04	5,71E-03	9,85E-03	2,03E-02	0,00E+00	0,00E+00	2,12E-03	1,43E-03	7,72E-04	1,41E-02
Depletion of abiotic resources (ADP) - Minerals and metals ²	kg Sb eq.		6,05E-05	5,01E-08	5,86E-06	4,24E-06	9,70E-06	0,00E+00	0,00E+00	1,13E-06	1,73E-07	1,32E-07	2,06E-05
Depletion of abiotic resources (ADP) - Fossil fuels ²	MJ, net calorific value		3,36E+02	2,46E-01	1,32E+01	2,30E+01	5,09E+01	0,00E+00	0,00E+00	4,99E+00	7,92E-01	1,36E+00	2,47E+02
Water use (WDP) ²	m ³ eq.		5,77E+00	1,13E-03	1,23E-01	1,10E-01	1,88E+00	0,00E+00	0,00E+00	2,04E-02	1,25E-02	5,70E-02	6,09E+00

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.

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Particulate Matter emissions (PM)	Disease incidence	5,66E-07	1,59E-09	8,09E-08	1,61E-07	2,83E-07	0,00E+00	0,00E+00	2,86E-08	4,98E-09	9,57E-09	1,42E-07
Ionizing radiation, human health (IRP) ¹	kBq U235 eq.	4,69E-01	1,28E-04	1,00E-02	1,11E-02	2,50E-02	0,00E+00	0,00E+00	2,50E-03	3,50E-04	7,48E-04	-8,58E-02
Eco-toxicity, freshwater (ETP-fw) ²	CTUe	4,08E+01	1,20E-01	6,48E+00	1,11E+01	2,34E+01	0,00E+00	0,00E+00	2,46E+00	1,66E+00	1,01E+00	-6,82E+00
Human toxicity, cancer effects (HTP-c) ²	CTUh	6,21E-09	7,47E-12	1,47E-09	6,81E-10	1,43E-09	0,00E+00	0,00E+00	1,60E-10	3,00E-10	3,72E-11	-1,18E-09
Human toxicity, non-cancer effects (HTP-nc) ²	CTUh	1,03E-07	1,75E-10	1,09E-08	1,65E-08	2,91E-08	0,00E+00	0,00E+00	3,52E-09	1,31E-08	1,46E-09	-5,03E-10
Land use related impacts/Soil quality ²	-	7,45E+01	2,19E-01	4,33E+01	2,34E+01	4,32E+01	0,00E+00	0,00E+00	2,97E+00	2,17E-01	3,07E+00	-2,03E+01

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.

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.

PARAMETERS DESCRIBING RESOURCE USE

INDICATOR	UNIT		A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Use of primary energy resources - Renewable	Used as energy carrier	MJ, net calorific value	9,95E+00	2,99E-03	3,02E-01	2,61E-01	5,70E-01	0,00E+00	0,00E+00	5,86E-02	1,20E-02	1,95E-02	-8,18E+00
	Used as raw material	MJ, net calorific value	8,87E+00	8,93E-04	6,36E+00	7,56E-02	4,53E-01	0,00E+00	0,00E+00	1,89E-02	6,44E-03	5,65E-03	-2,32E+00
	TOTAL	MJ, net calorific value	1,88E+01	3,88E-03	6,67E+00	3,37E-01	1,02E+00	0,00E+00	0,00E+00	7,75E-02	1,85E-02	2,51E-02	-8,20E+00
Use of primary energy resources - Non renewable	Used as energy carrier	MJ, net calorific value	1,65E+02	2,61E-01	1,41E+01	2,44E+01	5,41E+01	0,00E+00	0,00E+00	5,31E+00	8,62E-01	1,44E+00	1,81E+02
	Used as raw material	MJ, net calorific value	1,95E+02	0,00E+00	0,00E+00	0,00E+00	9,21E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	TOTAL	MJ, net calorific value	3,61E+02	2,61E-01	1,41E+01	2,44E+01	5,41E+01	0,00E+00	0,00E+00	5,31E+00	8,62E-01	1,44E+00	1,81E+02
Use of secondary material	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
Use of renewable secondary fuels	MJ, net calorific value		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
Use of non-renewable secondary fuels	MJ, net calorific value		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
Net use of fresh water	m ³		1,07E-01	3,60E-05	3,64E-03	3,37E-03	4,45E-02	0,00E+00	0,00E+00	6,67E-04	6,93E-04	1,37E-03	4,45E-02

OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Hazardous waste disposed	kg	7,46E-02	6,64E-06	4,53E-03	6,41E-04	3,17E-03	0,00E+00	0,00E+00	1,24E-04	6,37E-02	5,66E-05	-4,80E-02
Non-hazardous waste disposed	kg	2,10E+00	1,87E-02	6,84E-01	2,02E+00	6,47E+01	0,00E+00	0,00E+00	2,44E-01	8,05E-02	5,30E+00	-1,07E+00
Radioactive waste disposed	kg	3,72E-04	8,28E-08	6,89E-06	7,01E-06	1,66E-05	0,00E+00	0,00E+00	1,62E-06	2,27E-07	4,57E-07	-7,70E-05

ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Components for re-use	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
Materials for recycling	kg	0,00E+00	0,00E+00	6,07E-01	0,00E+00	1,48E-01	0,00E+00	0,00E+00	0,00E+00	2,36E+00	0,00E+00	0,00E+00
Materials for energy recovery	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
Exported electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,89E-01	0,00E+00	0,00E+00	0,00E+00	1,94E+01	0,00E+00	0,00E+00
Exported thermal energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,58E+00	0,00E+00	0,00E+00	0,00E+00	3,88E+01	0,00E+00	0,00E+00

BIOGENIC CARBON CONTENT

INDICATOR	UNIT	TOTAL
Biogenic carbon content	kg C	8,70E-02

CENTRALTUBI ACQUA KIWAGREEN DE250 SDR11 Trenchless installation

CORE ENVIRONMENTAL IMPACT INDICATORS

INDICATOR	UNIT		A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Global Warming Potential (GWP)	Fossil	kg CO ₂ eq.	2,22E+01	2,63E-02	1,52E+00	2,46E+00	5,15E+00	0,00E+00	0,00E+00	5,45E-01	1,34E+01	1,05E+00	3,12E+00
	Biogenic	kg CO ₂ eq.	3,02E-01	7,99E-06	2,41E-02	7,25E-04	3,06E-03	0,00E+00	0,00E+00	1,58E-04	9,26E-05	5,26E-04	-2,20E-01
	LULUC	kg CO ₂ eq.	1,22E-02	1,27E-05	1,38E-03	1,17E-03	2,41E-03	0,00E+00	0,00E+00	2,66E-04	3,64E-05	7,46E-05	-1,92E-03
	TOTAL	kg CO₂ eq.	2,25E+01	2,63E-02	1,55E+00	2,46E+00	5,15E+00	0,00E+00	0,00E+00	5,45E-01	1,34E+01	1,05E+00	2,90E+00
Acidification (AP)	mol H ⁺ eq.		7,80E-02	1,07E-04	6,82E-03	1,02E-02	2,25E-02	0,00E+00	0,00E+00	2,26E-03	1,73E-03	7,07E-04	2,12E-02
Eutrophication - freshwater (EP-freshwater)	kg P eq.		5,26E-04	2,17E-07	2,90E-05	2,00E-05	4,51E-05	0,00E+00	0,00E+00	4,39E-06	1,66E-06	1,49E-06	-5,94E-05
Eutrophication - marine (EP-marine)	kg N eq.		1,50E-02	4,02E-05	2,28E-03	3,84E-03	8,24E-03	0,00E+00	0,00E+00	8,53E-04	8,28E-04	4,65E-04	2,48E-03
Eutrophication terrestrial (EP)	mol N eq.		1,61E-01	4,33E-04	2,58E-02	4,14E-02	8,92E-02	0,00E+00	0,00E+00	9,19E-03	8,97E-03	2,78E-03	2,79E-02
Ozone depletion layer (ODP)	kg CFC-11 eq.		3,15E-07	5,77E-10	3,11E-08	5,42E-08	1,07E-07	0,00E+00	0,00E+00	1,19E-08	3,38E-09	2,28E-09	-2,04E-07
Photochemical ozone formation (POCP)	kg NMVOC eq.		7,27E-02	1,62E-04	8,89E-03	1,55E-02	3,18E-02	0,00E+00	0,00E+00	3,30E-03	2,23E-03	1,20E-03	2,19E-02
Depletion of abiotic resources (ADP) - Minerals and metals ²	kg Sb eq.		9,42E-05	7,77E-08	9,12E-06	6,68E-06	1,51E-05	0,00E+00	0,00E+00	1,76E-06	2,69E-07	2,06E-07	3,21E-05
Depletion of abiotic resources (ADP) - Fossil fuels ²	MJ, net calorific value		5,24E+02	3,83E-01	2,06E+01	3,62E+01	7,94E+01	0,00E+00	0,00E+00	7,77E+00	1,23E+00	2,11E+00	3,85E+02
Water use (WDP) ²	m ³ eq.		9,00E+00	1,76E-03	1,92E-01	1,73E-01	2,94E+00	0,00E+00	0,00E+00	3,17E-02	1,94E-02	8,88E-02	9,49E+00

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.

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Particulate Matter emissions (PM)	Disease incidence	8,80E-07	2,47E-09	1,26E-07	2,54E-07	4,43E-07	0,00E+00	0,00E+00	4,45E-08	7,76E-09	1,49E-08	2,21E-07
Ionizing radiation, human health (IRP) ¹	kBq U235 eq.	7,30E-01	1,99E-04	1,56E-02	1,74E-02	3,90E-02	0,00E+00	0,00E+00	3,90E-03	5,45E-04	1,17E-03	-1,33E-01
Eco-toxicity, freshwater (ETP-fw) ²	CTUe	6,36E+01	1,87E-01	1,01E+01	1,74E+01	3,65E+01	0,00E+00	0,00E+00	3,84E+00	2,58E+00	1,58E+00	-1,06E+01
Human toxicity, cancer effects (HTP-c) ²	CTUh	9,65E-09	1,16E-11	2,29E-09	1,07E-09	2,24E-09	0,00E+00	0,00E+00	2,49E-10	4,67E-10	5,79E-11	-1,85E-09
Human toxicity, non-cancer effects (HTP-nc) ²	CTUh	1,61E-07	2,72E-10	1,70E-08	2,60E-08	4,55E-08	0,00E+00	0,00E+00	5,48E-09	2,04E-08	2,27E-09	-7,18E-10
Land use related impacts/Soil quality ²	-	1,12E+02	3,41E-01	6,75E+01	3,68E+01	6,73E+01	0,00E+00	0,00E+00	4,63E+00	3,38E-01	4,78E+00	-3,16E+01

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.

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.

PARAMETERS DESCRIBING RESOURCE USE

INDICATOR	UNIT		A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Use of primary energy resources - Renewable	Used as energy carrier	MJ, net calorific value	1,55E+01	4,64E-03	4,71E-01	4,11E-01	8,90E-01	0,00E+00	0,00E+00	9,12E-02	1,87E-02	3,03E-02	-1,27E+01
	Used as raw material	MJ, net calorific value	1,30E+01	1,39E-03	9,91E+00	1,19E-01	6,89E-01	0,00E+00	0,00E+00	2,94E-02	1,00E-02	8,80E-03	-3,56E+00
	TOTAL	MJ, net calorific value	2,85E+01	6,02E-03	1,04E+01	5,31E-01	1,58E+00	0,00E+00	0,00E+00	1,21E-01	2,88E-02	3,91E-02	-1,28E+01
Use of primary energy resources - Non renewable	Used as energy carrier	MJ, net calorific value	2,58E+02	4,07E-01	2,19E+01	3,85E+01	8,45E+01	0,00E+00	0,00E+00	8,26E+00	1,34E+00	2,25E+00	2,85E+02
	Used as raw material	MJ, net calorific value	3,04E+02	0,00E+00	0,00E+00	0,00E+00	9,21E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	TOTAL	MJ, net calorific value	5,62E+02	4,07E-01	2,19E+01	3,85E+01	8,45E+01	0,00E+00	0,00E+00	8,26E+00	1,34E+00	2,25E+00	2,85E+02
Use of secondary material	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
Use of renewable secondary fuels	MJ, net calorific value		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
Use of non-renewable secondary fuels	MJ, net calorific value		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
Net use of fresh water	m ³		1,66E-01	5,60E-05	5,67E-03	5,31E-03	6,96E-02	0,00E+00	0,00E+00	1,04E-03	1,08E-03	2,13E-03	6,94E-02

OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Hazardous waste disposed	kg	1,16E-01	1,16E-01	1,03E-05	7,05E-03	1,01E-03	0,00E+00	0,00E+00	1,92E-04	9,92E-02	8,81E-05	-7,47E-02
Non-hazardous waste disposed	kg	3,27E+00	3,27E+00	2,91E-02	1,07E+00	3,18E+00	0,00E+00	0,00E+00	3,80E-01	1,25E-01	8,25E+00	-1,66E+00
Radioactive waste disposed	kg	5,79E-04	5,79E-04	1,29E-07	1,07E-05	1,11E-05	0,00E+00	0,00E+00	2,53E-06	3,54E-07	7,11E-07	-1,20E-04

ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Components for re-use	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
Materials for recycling	kg	0,00E+00	0,00E+00	9,45E-01	0,00E+00	2,16E-01	0,00E+00	0,00E+00	0,00E+00	3,68E+00	0,00E+00	0,00E+00
Materials for energy recovery	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
Exported electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,18E+00	0,00E+00	0,00E+00	0,00E+00	3,02E+01	0,00E+00	0,00E+00
Exported thermal energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,35E+00	0,00E+00	0,00E+00	0,00E+00	6,04E+01	0,00E+00	0,00E+00

BIOGENIC CARBON CONTENT

INDICATOR	UNIT	TOTAL
Biogenic carbon content	kg C	1,22E-01

CENTRALTUBI ELECTROPIPE50 DE200 SDR11 Open trench installation

CORE ENVIRONMENTAL IMPACT INDICATORS

INDICATOR	UNIT		A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Global Warming Potential (GWP)	Fossil	kg CO ₂ eq.	1,69E+01	1,48E-02	9,77E-01	5,01E-01	4,48E+01	0,00E+00	0,00E+00	3,59E-01	8,82E+00	6,90E-01	-9,09E-01
	Biogenic	kg CO ₂ eq.	1,47E-01	4,51E-06	1,55E-02	1,48E-04	2,01E-02	0,00E+00	0,00E+00	1,04E-04	6,09E-05	3,46E-04	-9,25E-02
	LULUC	kg CO ₂ eq.	7,53E-03	7,25E-06	8,89E-04	2,37E-04	2,53E-02	0,00E+00	0,00E+00	1,75E-04	2,39E-05	4,91E-05	-1,01E-03
	TOTAL	kg CO₂ eq.	1,70E+01	1,48E-02	9,93E-01	5,01E-01	4,49E+01	0,00E+00	0,00E+00	3,59E-01	8,82E+00	6,90E-01	-1,00E+00
Acidification (AP)	mol H ⁺ eq.		5,95E-02	6,10E-05	4,38E-03	2,08E-03	2,27E-01	0,00E+00	0,00E+00	1,49E-03	1,14E-03	4,65E-04	1,38E-03
Eutrophication - freshwater (EP-freshwater)	kg P eq.		3,40E-04	1,24E-07	1,86E-05	4,08E-06	5,25E-04	0,00E+00	0,00E+00	2,89E-06	1,09E-06	9,80E-07	-5,18E-05
Eutrophication - marine (EP-marine)	kg N eq.		1,10E-02	2,28E-05	1,46E-03	7,82E-04	8,00E-02	0,00E+00	0,00E+00	5,62E-04	5,45E-04	3,06E-04	-6,82E-05
Eutrophication terrestrial (EP)	mol N eq.		1,20E-01	2,46E-04	1,66E-02	8,42E-03	8,73E-01	0,00E+00	0,00E+00	6,05E-03	5,90E-03	1,83E-03	-1,45E-03
Ozone depletion layer (ODP)	kg CFC-11 eq.		2,11E-07	3,26E-10	2,00E-08	1,10E-08	9,18E-07	0,00E+00	0,00E+00	7,86E-09	2,22E-09	1,50E-09	-1,44E-07
Photochemical ozone formation (POCP)	kg NMVOC eq.		5,68E-02	9,20E-05	5,71E-03	3,16E-03	3,02E-01	0,00E+00	0,00E+00	2,18E-03	1,46E-03	7,91E-04	2,65E-03
Depletion of abiotic resources (ADP) - Minerals and metals ²	kg Sb eq.		6,99E-05	4,35E-08	5,86E-06	1,36E-06	1,76E-04	0,00E+00	0,00E+00	1,16E-06	1,77E-07	1,35E-07	-1,63E-05
Depletion of abiotic resources (ADP) - Fossil fuels ²	MJ, net calorific value		4,65E+02	2,17E-01	1,32E+01	7,37E+00	6,94E+02	0,00E+00	0,00E+00	5,12E+00	8,11E-01	1,39E+00	1,09E+02
Water use (WDP) ²	m ³ eq.		8,85E+00	1,02E-03	1,23E-01	3,52E-02	2,62E+01	0,00E+00	0,00E+00	2,09E-02	1,28E-02	5,84E-02	2,75E+00

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.

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Particulate Matter emissions (PM)	Disease incidence	6,42E-07	1,44E-09	8,09E-08	5,16E-08	4,24E-06	0,00E+00	0,00E+00	2,93E-08	5,10E-09	9,80E-09	5,52E-08
Ionizing radiation, human health (IRP) ¹	kBq U235 eq.	4,66E-01	1,11E-04	1,00E-02	3,55E-03	4,68E-01	0,00E+00	0,00E+00	2,57E-03	3,58E-04	7,66E-04	-9,06E-02
Eco-toxicity, freshwater (ETP-fw) ²	CTUe	4,00E+01	1,06E-01	6,48E+00	3,55E+00	3,25E+02	0,00E+00	0,00E+00	2,53E+00	1,70E+00	1,04E+00	-8,92E+00
Human toxicity, cancer effects (HTP-c) ²	CTUh	6,01E-09	6,61E-12	1,47E-09	2,18E-10	2,35E-08	0,00E+00	0,00E+00	1,64E-10	3,07E-10	3,81E-11	-1,30E-09
Human toxicity, non-cancer effects (HTP-nc) ²	CTUh	1,08E-07	1,55E-10	1,09E-08	5,30E-09	4,49E-07	0,00E+00	0,00E+00	3,61E-09	1,34E-08	1,49E-09	-3,15E-08
Land use related impacts/Soil quality ²	-	6,84E+01	2,04E-01	4,33E+01	7,49E+00	7,98E+02	0,00E+00	0,00E+00	3,05E+00	2,22E-01	3,14E+00	-1,48E+01

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.

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.

PARAMETERS DESCRIBING RESOURCE USE

INDICATOR	UNIT		A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Use of primary energy resources - Renewable	Used as energy carrier	MJ, net calorific value	9,83E+00	2,60E-03	3,03E-01	8,37E-02	1,09E+01	0,00E+00	0,00E+00	6,01E-02	1,23E-02	1,99E-02	-8,38E+00
	Used as raw material	MJ, net calorific value	9,17E+00	7,72E-04	6,37E+00	2,42E-02	3,72E+00	0,00E+00	0,00E+00	1,94E-02	6,60E-03	5,79E-03	-2,73E+00
	TOTAL	MJ, net calorific value	1,90E+01	3,37E-03	6,67E+00	1,08E-01	1,46E+01	0,00E+00	0,00E+00	7,95E-02	1,89E-02	2,57E-02	-8,80E+00
Use of primary energy resources – Non renewable	Used as energy carrier	MJ, net calorific value	1,67E+02	2,31E-01	1,41E+01	7,84E+00	7,20E+02	0,00E+00	0,00E+00	5,44E+00	8,83E-01	1,48E+00	3,21E+01
	Used as raw material	MJ, net calorific value	3,32E+02	0,00E+00	0,00E+00	0,00E+00	1,86E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	TOTAL	MJ, net calorific value	4,99E+02	2,31E-01	1,41E+01	7,84E+00	7,38E+02	0,00E+00	0,00E+00	5,44E+00	8,83E-01	1,48E+00	3,21E+01
Use of secondary material	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
Use of renewable secondary fuels	MJ, net calorific value		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
Use of non-renewable secondary fuels	MJ, net calorific value		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
Net use of fresh water	m ³		1,41E-01	3,21E-05	3,64E-03	1,08E-03	6,32E-01	0,00E+00	0,00E+00	6,84E-04	7,10E-04	1,40E-03	6,50E-03

OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Hazardous waste disposed	kg	5,51E-02	5,98E-06	4,53E-03	2,05E-04	2,46E-02	0,00E+00	0,00E+00	1,27E-04	6,52E-02	5,80E-05	-2,76E-02
Non-hazardous waste disposed	kg	1,72E+00	1,75E-02	6,85E-01	6,47E-01	8,04E+02	0,00E+00	0,00E+00	2,50E-01	8,24E-02	5,43E+00	-6,87E-01
Radioactive waste disposed	kg	3,70E-04	7,14E-08	6,89E-06	2,25E-06	3,05E-04	0,00E+00	0,00E+00	1,66E-06	2,33E-07	4,68E-07	-8,05E-05

ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Components for re-use	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
Materials for recycling	kg	0,00E+00	0,00E+00	6,07E-01	0,00E+00	1,42E-01	0,00E+00	0,00E+00	0,00E+00	2,42E+00	0,00E+00	0,00E+00
Materials for energy recovery	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
Exported electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,46E-01	0,00E+00	0,00E+00	0,00E+00	1,99E+01	0,00E+00	0,00E+00
Exported thermal energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,49E+00	0,00E+00	0,00E+00	0,00E+00	3,98E+01	0,00E+00	0,00E+00

BIOGENIC CARBON CONTENT

INDICATOR	UNIT	TOTAL
Biogenic carbon content	kg C	8,70E-02

CENTRALTUBI ELECTROPIPE DE200 SDR26 Open trench installation

CORE ENVIRONMENTAL IMPACT INDICATORS

INDICATOR	UNIT		A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Global Warming Potential (GWP)	Fossil	kg CO ₂ eq.	7,63E+00	7,77E-03	4,40E-01	2,23E-01	4,40E+01	0,00E+00	0,00E+00	1,59E-01	3,95E+00	3,06E-01	-4,15E-01
	Biogenic	kg CO ₂ eq.	6,65E-02	2,43E-06	6,98E-03	6,56E-05	1,84E-02	0,00E+00	0,00E+00	4,62E-05	2,74E-05	1,53E-04	-4,22E-02
	LULUC	kg CO ₂ eq.	3,58E-03	3,90E-06	4,00E-04	1,05E-04	2,48E-02	0,00E+00	0,00E+00	7,78E-05	1,08E-05	2,18E-05	-4,33E-04
	TOTAL	kg CO₂ eq.	7,70E+00	7,77E-03	4,47E-01	2,23E-01	4,40E+01	0,00E+00	0,00E+00	1,59E-01	3,95E+00	3,06E-01	-4,58E-01
Acidification (AP)	mol H ⁺ eq.		2,70E-02	3,17E-05	1,97E-03	9,25E-04	2,22E-01	0,00E+00	0,00E+00	6,59E-04	5,10E-04	2,06E-04	1,48E-03
Eutrophication - freshwater (EP-freshwater)	kg P eq.		1,56E-04	6,62E-08	8,40E-06	1,81E-06	4,97E-04	0,00E+00	0,00E+00	1,28E-06	4,92E-07	4,35E-07	-2,00E-05
Eutrophication - marine (EP-marine)	kg N eq.		5,02E-03	1,18E-05	6,59E-04	3,48E-04	7,94E-02	0,00E+00	0,00E+00	2,49E-04	2,44E-04	1,36E-04	5,83E-06
Eutrophication terrestrial (EP)	mol N eq.		5,44E-02	1,27E-04	7,47E-03	3,74E-03	8,66E-01	0,00E+00	0,00E+00	2,68E-03	2,64E-03	8,12E-04	-1,11E-04
Ozone depletion layer (ODP)	kg CFC-11 eq.		9,92E-08	1,71E-10	9,01E-09	4,90E-09	9,06E-07	0,00E+00	0,00E+00	3,49E-09	1,03E-09	6,64E-10	-6,75E-08
Photochemical ozone formation (POCP)	kg NMVOC eq.		2,58E-02	4,75E-05	2,57E-03	1,40E-03	2,99E-01	0,00E+00	0,00E+00	9,65E-04	6,55E-04	3,51E-04	1,34E-03
Depletion of abiotic resources (ADP) - Minerals and metals ²	kg Sb eq.		3,16E-05	2,44E-08	2,64E-06	6,05E-07	1,44E-04	0,00E+00	0,00E+00	5,15E-07	7,98E-08	5,99E-08	4,71E-06
Depletion of abiotic resources (ADP) - Fossil fuels ²	MJ, net calorific value		2,10E+02	1,13E-01	5,96E+00	3,28E+00	6,71E+02	0,00E+00	0,00E+00	2,27E+00	3,65E-01	6,17E-01	4,99E+01
Water use (WDP) ²	m ³ eq.		3,99E+00	5,23E-04	5,56E-02	1,57E-02	2,56E+01	0,00E+00	0,00E+00	9,26E-03	6,05E-03	2,59E-02	1,27E+00

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.

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Particulate Matter emissions (PM)	Disease incidence	2,95E-07	7,15E-10	3,64E-08	2,30E-08	4,22E-06	0,00E+00	0,00E+00	1,30E-08	2,29E-09	4,35E-09	2,68E-08
Ionizing radiation, human health (IRP) ¹	kBq U235 eq.	2,11E-01	6,09E-05	4,52E-03	1,58E-03	4,34E-01	0,00E+00	0,00E+00	1,14E-03	1,66E-04	3,40E-04	-4,08E-02
Eco-toxicity, freshwater (ETP-fw) ²	CTUe	1,82E+01	5,58E-02	2,92E+00	1,58E+00	3,20E+02	0,00E+00	0,00E+00	1,12E+00	8,11E-01	4,60E-01	-2,81E+00
Human toxicity, cancer effects (HTP-c) ²	CTUh	2,81E-09	3,54E-12	6,61E-10	9,70E-11	2,29E-08	0,00E+00	0,00E+00	7,28E-11	1,37E-10	1,69E-11	-4,10E-10
Human toxicity, non-cancer effects (HTP-nc) ²	CTUh	4,90E-08	8,07E-11	4,91E-09	2,35E-09	4,16E-07	0,00E+00	0,00E+00	1,60E-09	5,95E-09	6,62E-10	-2,61E-09
Land use related impacts/Soil quality ²	-	4,64E+01	9,83E-02	1,95E+01	3,33E+00	7,94E+02	0,00E+00	0,00E+00	1,35E+00	1,00E-01	1,39E+00	-6,51E+00

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.

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.

PARAMETERS DESCRIBING RESOURCE USE

INDICATOR	UNIT		A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Use of primary energy resources - Renewable	Used as energy carrier	MJ, net calorific value	4,45E+00	1,42E-03	1,36E-01	3,72E-02	1,02E+01	0,00E+00	0,00E+00	2,67E-02	5,67E-03	8,84E-03	-3,80E+00
	Used as raw material	MJ, net calorific value	7,02E+00	4,31E-04	2,87E+00	1,08E-02	3,30E+00	0,00E+00	0,00E+00	8,60E-03	3,00E-03	2,57E-03	-1,27E+00
	TOTAL	MJ, net calorific value	1,15E+01	1,85E-03	3,00E+00	4,80E-02	1,35E+01	0,00E+00	0,00E+00	3,53E-02	8,66E-03	1,14E-02	-3,91E+00
Use of primary energy resources - Non renewable	Used as energy carrier	MJ, net calorific value	7,54E+01	1,20E-01	6,34E+00	3,48E+00	7,09E+02	0,00E+00	0,00E+00	2,42E+00	3,97E-01	6,56E-01	1,35E+01
	Used as raw material	MJ, net calorific value	1,50E+02	0,00E+00	0,00E+00	0,00E+00	4,46E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	TOTAL	MJ, net calorific value	2,25E+02	1,20E-01	6,34E+00	3,48E+00	7,13E+02	0,00E+00	0,00E+00	2,42E+00	3,97E-01	6,56E-01	1,35E+01
Use of secondary material	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
Use of renewable secondary fuels	MJ, net calorific value		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
Use of non-renewable secondary fuels	MJ, net calorific value		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
Net use of fresh water	m ³		6,35E-02	1,68E-05	1,64E-03	4,81E-04	6,23E-01	0,00E+00	0,00E+00	3,03E-04	3,62E-04	6,21E-04	3,21E-03

OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Hazardous waste disposed	kg	2,49E-02	3,09E-06	2,04E-03	9,13E-05	2,35E-02	0,00E+00	0,00E+00	5,63E-05	2,92E-02	2,57E-05	-1,26E-02
Non-hazardous waste disposed	kg	7,84E-01	8,37E-03	3,08E-01	2,88E-01	8,04E+02	0,00E+00	0,00E+00	1,11E-01	3,74E-02	2,41E+00	-3,10E-01
Radioactive waste disposed	kg	1,67E-04	3,97E-08	3,10E-06	1,00E-06	2,78E-04	0,00E+00	0,00E+00	7,38E-07	1,08E-07	2,07E-07	-3,64E-05

ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Components for re-use	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
Materials for recycling	kg	0,00E+00	0,00E+00	2,73E-01	0,00E+00	1,16E-01	0,00E+00	0,00E+00	0,00E+00	1,07E+00	0,00E+00	0,00E+00
Materials for energy recovery	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
Exported electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,32E-01	0,00E+00	0,00E+00	0,00E+00	8,91E+00	0,00E+00	0,00E+00
Exported thermal energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,06E+00	0,00E+00	0,00E+00	0,00E+00	1,78E+01	0,00E+00	0,00E+00

BIOGENIC CARBON CONTENT

INDICATOR	UNIT	TOTAL
Biogenic carbon content	kg C	8,70E-02

CENTRALTUBI ELECTROPIPE DE200 SDR21 Open trench installation

CORE ENVIRONMENTAL IMPACT INDICATORS

INDICATOR	UNIT		A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Global Warming Potential (GWP)	Fossil	kg CO ₂ eq.	9,39E+00	9,11E-03	5,42E-01	2,36E-01	4,40E+01	0,00E+00	0,00E+00	1,96E-01	4,85E+00	3,76E-01	-4,79E-01
	Biogenic	kg CO ₂ eq.	8,19E-02	2,83E-06	8,60E-03	6,93E-05	1,85E-02	0,00E+00	0,00E+00	5,68E-05	3,36E-05	1,89E-04	-5,19E-02
	LULUC	kg CO ₂ eq.	4,33E-03	4,54E-06	4,94E-04	1,13E-04	2,48E-02	0,00E+00	0,00E+00	9,58E-05	1,33E-05	2,68E-05	-5,30E-04
	TOTAL	kg CO₂ eq.	9,48E+00	9,12E-03	5,51E-01	2,36E-01	4,41E+01	0,00E+00	0,00E+00	1,96E-01	4,85E+00	3,77E-01	-5,32E-01
Acidification (AP)	mol H ⁺ eq.		3,32E-02	3,73E-05	2,43E-03	1,04E-03	2,22E-01	0,00E+00	0,00E+00	8,11E-04	6,27E-04	2,54E-04	1,90E-03
Eutrophication - freshwater (EP-freshwater)	kg P eq.		1,91E-04	7,71E-08	1,03E-05	1,91E-06	4,98E-04	0,00E+00	0,00E+00	1,58E-06	6,04E-07	5,35E-07	-2,42E-05
Eutrophication - marine (EP-marine)	kg N eq.		6,17E-03	1,39E-05	8,13E-04	3,82E-04	7,95E-02	0,00E+00	0,00E+00	3,07E-04	2,99E-04	1,67E-04	2,23E-05
Eutrophication terrestrial (EP)	mol N eq.		6,68E-02	1,50E-04	9,20E-03	4,11E-03	8,67E-01	0,00E+00	0,00E+00	3,30E-03	3,24E-03	9,99E-04	3,98E-05
Ozone depletion layer (ODP)	kg CFC-11 eq.		1,21E-07	2,00E-10	1,11E-08	5,18E-09	9,07E-07	0,00E+00	0,00E+00	4,29E-09	1,26E-09	8,17E-10	-8,16E-08
Photochemical ozone formation (POCP)	kg NMVOC eq.		3,17E-02	5,59E-05	3,17E-03	1,52E-03	2,99E-01	0,00E+00	0,00E+00	1,19E-03	8,05E-04	4,32E-04	1,74E-03
Depletion of abiotic resources (ADP) - Minerals and metals ²	kg Sb eq.		3,89E-05	2,80E-08	3,25E-06	6,38E-07	1,44E-04	0,00E+00	0,00E+00	6,33E-07	9,78E-08	7,38E-08	5,86E-06
Depletion of abiotic resources (ADP) - Fossil fuels ²	MJ, net calorific value		2,58E+02	1,33E-01	7,35E+00	3,47E+00	6,72E+02	0,00E+00	0,00E+00	2,79E+00	4,48E-01	7,59E-01	6,21E+01
Water use (WDP) ²	m ³ eq.		4,91E+00	6,17E-04	6,85E-02	1,65E-02	2,57E+01	0,00E+00	0,00E+00	1,14E-02	7,35E-03	3,19E-02	1,57E+00

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.

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Particulate Matter emissions (PM)	Disease incidence	3,61E-07	8,54E-10	4,49E-08	2,42E-08	4,22E-06	0,00E+00	0,00E+00	1,60E-08	2,81E-09	5,35E-09	3,36E-08
Ionizing radiation, human health (IRP) ¹	kBq U235 eq.	2,60E-01	7,04E-05	5,57E-03	1,66E-03	4,34E-01	0,00E+00	0,00E+00	1,40E-03	2,02E-04	4,18E-04	-4,97E-02
Eco-toxicity, freshwater (ETP-fw) ²	CTUe	2,23E+01	6,53E-02	3,60E+00	1,67E+00	3,20E+02	0,00E+00	0,00E+00	1,38E+00	9,84E-01	5,67E-01	-3,43E+00
Human toxicity, cancer effects (HTP-c) ²	CTUh	3,42E-09	4,12E-12	8,15E-10	1,03E-10	2,29E-08	0,00E+00	0,00E+00	8,95E-11	1,68E-10	2,08E-11	-5,22E-10
Human toxicity, non-cancer effects (HTP-nc) ²	CTUh	6,02E-08	9,49E-11	6,05E-09	2,48E-09	4,16E-07	0,00E+00	0,00E+00	1,97E-09	7,32E-09	8,15E-10	-3,11E-09
Land use related impacts/Soil quality ²	-	5,06E+01	1,18E-01	2,41E+01	3,50E+00	7,95E+02	0,00E+00	0,00E+00	1,66E+00	1,23E-01	1,71E+00	-7,98E+00

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.

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.

PARAMETERS DESCRIBING RESOURCE USE

INDICATOR	UNIT		A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Use of primary energy resources - Renewable	Used as energy carrier	MJ, net calorific value	5,48E+00	1,65E-03	1,68E-01	3,93E-02	1,02E+01	0,00E+00	0,00E+00	3,28E-02	6,93E-03	1,09E-02	-4,64E+00
	Used as raw material	MJ, net calorific value	7,43E+00	4,96E-04	3,53E+00	1,14E-02	3,32E+00	0,00E+00	0,00E+00	1,06E-02	3,67E-03	3,16E-03	-1,54E+00
	TOTAL	MJ, net calorific value	1,29E+01	2,14E-03	3,70E+00	5,06E-02	1,36E+01	0,00E+00	0,00E+00	4,34E-02	1,06E-02	1,40E-02	-4,79E+00
Use of primary energy resources – Non renewable	Used as energy carrier	MJ, net calorific value	9,29E+01	1,41E-01	7,82E+00	3,69E+00	7,10E+02	0,00E+00	0,00E+00	2,97E+00	4,88E-01	8,07E-01	1,81E+01
	Used as raw material	MJ, net calorific value	1,84E+02	0,00E+00	0,00E+00	0,00E+00	4,46E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	TOTAL	MJ, net calorific value	2,77E+02	1,41E-01	7,82E+00	3,69E+00	7,14E+02	0,00E+00	0,00E+00	2,97E+00	4,88E-01	8,07E-01	1,81E+01
Use of secondary material	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
Use of renewable secondary fuels	MJ, net calorific value		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
Use of non-renewable secondary fuels	MJ, net calorific value		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
Net use of fresh water	m ³		7,82E-02	1,97E-05	2,02E-03	5,07E-04	6,23E-01	0,00E+00	0,00E+00	3,73E-04	4,35E-04	7,64E-04	4,24E-03

OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Hazardous waste disposed	kg	3,07E-02	3,64E-06	2,51E-03	9,64E-05	2,36E-02	0,00E+00	0,00E+00	6,92E-05	3,59E-02	3,16E-05	-1,55E-02
Non-hazardous waste disposed	kg	9,62E-01	1,01E-02	3,80E-01	3,02E-01	8,04E+02	0,00E+00	0,00E+00	1,37E-01	4,59E-02	2,96E+00	-3,81E-01
Radioactive waste disposed	kg	2,06E-04	4,57E-08	3,82E-06	1,05E-06	2,78E-04	0,00E+00	0,00E+00	9,08E-07	1,32E-07	2,55E-07	-4,44E-05

ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Components for re-use	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
Materials for recycling	kg	0,00E+00	0,00E+00	3,37E-01	0,00E+00	1,21E-01	0,00E+00	0,00E+00	0,00E+00	1,32E+00	0,00E+00	0,00E+00
Materials for energy recovery	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
Exported electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,73E-01	0,00E+00	0,00E+00	0,00E+00	1,09E+01	0,00E+00	0,00E+00
Exported thermal energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,15E+00	0,00E+00	0,00E+00	0,00E+00	2,19E+01	0,00E+00	0,00E+00

BIOGENIC CARBON CONTENT

INDICATOR	UNIT	TOTAL
Biogenic carbon content	kg C	8,70E-02

CENTRALTUBI ELECTROPIPE100 DE200 SDR11 Trenchless installation

CORE ENVIRONMENTAL IMPACT INDICATORS

INDICATOR	UNIT		A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Global Warming Potential (GWP)	Fossil	kg CO ₂ eq.	2,35E+01	1,42E-02	9,77E-01	4,43E-01	3,53E+00	0,00E+00	0,00E+00	3,50E-01	8,61E+00	6,74E-01	-7,49E+00
	Biogenic	kg CO ₂ eq.	2,90E-02	4,29E-06	1,55E-02	1,30E-04	2,34E-03	0,00E+00	0,00E+00	1,02E-04	5,95E-05	3,38E-04	2,73E-02
	LULUC	kg CO ₂ eq.	6,70E-03	6,90E-06	8,89E-04	2,10E-04	1,61E-03	0,00E+00	0,00E+00	1,71E-04	2,34E-05	4,79E-05	-1,97E-04
	TOTAL	kg CO₂ eq.	2,36E+01	1,42E-02	9,93E-01	4,43E-01	3,53E+00	0,00E+00	0,00E+00	3,50E-01	8,61E+00	6,74E-01	-7,46E+00
Acidification (AP)	mol H ⁺ eq.		8,36E-02	5,87E-05	4,38E-03	1,84E-03	1,53E-02	0,00E+00	0,00E+00	1,45E-03	1,11E-03	4,54E-04	-2,07E-02
Eutrophication - freshwater (EP-freshwater)	kg P eq.		3,47E-04	1,18E-07	1,86E-05	3,60E-06	3,27E-05	0,00E+00	0,00E+00	2,82E-06	1,07E-06	9,57E-07	-5,06E-05
Eutrophication - marine (EP-marine)	kg N eq.		1,47E-02	2,20E-05	1,46E-03	6,91E-04	5,41E-03	0,00E+00	0,00E+00	5,48E-04	5,32E-04	2,99E-04	-3,58E-03
Eutrophication terrestrial (EP)	mol N eq.		1,61E-01	2,37E-04	1,66E-02	7,44E-03	5,86E-02	0,00E+00	0,00E+00	5,90E-03	5,76E-03	1,79E-03	-4,16E-02
Ozone depletion layer (ODP)	kg CFC-11 eq.		2,31E-07	3,13E-10	2,00E-08	9,74E-09	6,98E-08	0,00E+00	0,00E+00	7,66E-09	2,17E-09	1,46E-09	-1,61E-07
Photochemical ozone formation (POCP)	kg NMVOC eq.		8,25E-02	8,87E-05	5,71E-03	2,79E-03	2,12E-02	0,00E+00	0,00E+00	2,12E-03	1,43E-03	7,72E-04	-2,27E-02
Depletion of abiotic resources (ADP) - Minerals and metals ²	kg Sb eq.		9,39E-05	4,09E-08	5,86E-06	1,20E-06	1,09E-05	0,00E+00	0,00E+00	1,13E-06	1,73E-07	1,32E-07	-1,36E-05
Depletion of abiotic resources (ADP) - Fossil fuels ²	MJ, net calorific value		7,91E+02	2,09E-01	1,32E+01	6,51E+00	6,08E+01	0,00E+00	0,00E+00	4,99E+00	7,92E-01	1,36E+00	-2,17E+02
Water use (WDP) ²	m ³ eq.		1,67E+01	9,85E-04	1,23E-01	3,11E-02	2,11E+00	0,00E+00	0,00E+00	2,04E-02	1,25E-02	5,70E-02	-5,07E+00

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.

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Particulate Matter emissions (PM)	Disease incidence	8,33E-07	1,41E-09	8,09E-08	4,56E-08	2,91E-07	0,00E+00	0,00E+00	2,86E-08	4,98E-09	9,57E-09	-1,35E-07
Ionizing radiation, human health (IRP) ¹	kBq U235 eq.	4,70E-01	1,05E-04	1,00E-02	3,14E-03	3,08E-02	0,00E+00	0,00E+00	2,50E-03	3,50E-04	7,49E-04	-9,04E-02
Eco-toxicity, freshwater (ETP-fw) ²	CTUe	3,80E+01	1,01E-01	6,48E+00	3,13E+00	2,35E+01	0,00E+00	0,00E+00	2,46E+00	1,66E+00	1,01E+00	-4,10E+00
Human toxicity, cancer effects (HTP-c) ²	CTUh	5,50E-09	6,31E-12	1,47E-09	1,93E-10	1,49E-09	0,00E+00	0,00E+00	1,60E-10	3,00E-10	3,72E-11	-5,52E-10
Human toxicity, non-cancer effects (HTP-nc) ²	CTUh	1,19E-07	1,49E-10	1,09E-08	4,68E-09	3,03E-08	0,00E+00	0,00E+00	3,52E-09	1,31E-08	1,46E-09	-1,68E-08
Land use related impacts/Soil quality ²	-	4,50E+01	2,00E-01	4,33E+01	6,62E+00	4,29E+01	0,00E+00	0,00E+00	2,97E+00	2,17E-01	3,07E+00	9,97E-01

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.

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.

PARAMETERS DESCRIBING RESOURCE USE

INDICATOR	UNIT		A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Use of primary energy resources - Renewable	Used as energy carrier	MJ, net calorific value	9,70E+00	2,47E-03	3,03E-01	7,40E-02	6,93E-01	0,00E+00	0,00E+00	5,86E-02	1,20E-02	1,95E-02	-7,96E+00
	Used as raw material	MJ, net calorific value	8,42E+00	7,27E-04	6,37E+00	2,14E-02	4,72E-01	0,00E+00	0,00E+00	1,89E-02	6,44E-03	5,65E-03	-3,51E+00
	TOTAL	MJ, net calorific value	1,81E+01	3,19E-03	6,67E+00	9,54E-02	1,16E+00	0,00E+00	0,00E+00	7,75E-02	1,85E-02	2,51E-02	-9,22E+00
Use of primary energy resources – Non renewable	Used as energy carrier	MJ, net calorific value	1,72E+02	2,22E-01	1,41E+01	6,93E+00	6,48E+01	0,00E+00	0,00E+00	5,31E+00	8,63E-01	1,45E+00	-3,18E+02
	Used as raw material	MJ, net calorific value	6,77E+02	0,00E+00	0,00E+00	0,00E+00	1,36E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	TOTAL	MJ, net calorific value	8,49E+02	2,22E-01	1,41E+01	6,93E+00	6,48E+01	0,00E+00	0,00E+00	5,31E+00	8,63E-01	1,45E+00	-3,18E+02
Use of secondary material	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
Use of renewable secondary fuels	MJ, net calorific value		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
Use of non-renewable secondary fuels	MJ, net calorific value		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
Net use of fresh water	m ³		2,28E-01	3,08E-05	3,64E-03	9,56E-04	4,76E-02	0,00E+00	0,00E+00	6,67E-04	6,94E-04	1,37E-03	-7,96E-02

OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Hazardous waste disposed	kg	6,15E-03	5,77E-06	4,53E-03	1,82E-04	2,93E-03	0,00E+00	0,00E+00	1,24E-04	6,37E-02	5,66E-05	2,17E-02
Non-hazardous waste disposed	kg	7,65E-01	1,72E-02	6,85E-01	5,72E-01	6,46E+01	0,00E+00	0,00E+00	2,44E-01	8,05E-02	5,30E+00	2,87E-01
Radioactive waste disposed	kg	3,72E-04	6,73E-08	6,89E-06	1,99E-06	2,12E-05	0,00E+00	0,00E+00	1,62E-06	2,27E-07	4,57E-07	-7,97E-05

ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Components for re-use	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
Materials for recycling	kg	0,00E+00	0,00E+00	6,07E-01	0,00E+00	1,13E-01	0,00E+00	0,00E+00	0,00E+00	2,36E+00	0,00E+00	0,00E+00
Materials for energy recovery	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
Exported electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,38E-01	0,00E+00	0,00E+00	0,00E+00	1,94E+01	0,00E+00	0,00E+00
Exported thermal energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,28E+00	0,00E+00	0,00E+00	0,00E+00	3,88E+01	0,00E+00	0,00E+00

BIOGENIC CARBON CONTENT

INDICATOR	UNIT	TOTAL
Biogenic carbon content	kg C	6,09E-02

CENTRALTUBI ELECTROPIPE100 DE160 SDR13.6 Trenchless installation

CORE ENVIRONMENTAL IMPACT INDICATORS

INDICATOR	UNIT		A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Global Warming Potential (GWP)	Fossil	kg CO ₂ eq.	1,25E+01	1,01E-02	5,17E-01	2,07E-01	2,18E+00	0,00E+00	0,00E+00	1,85E-01	4,56E+00	3,57E-01	-3,95E+00
	Biogenic	kg CO ₂ eq.	1,60E-02	3,24E-06	8,20E-03	6,10E-05	1,41E-03	0,00E+00	0,00E+00	5,37E-05	3,15E-05	1,79E-04	1,47E-02
	LULUC	kg CO ₂ eq.	3,46E-03	5,19E-06	4,71E-04	9,81E-05	1,01E-03	0,00E+00	0,00E+00	9,06E-05	1,24E-05	2,54E-05	-1,03E-04
	TOTAL	kg CO₂ eq.	1,25E+01	1,02E-02	5,26E-01	2,07E-01	2,18E+00	0,00E+00	0,00E+00	1,85E-01	4,56E+00	3,57E-01	-3,94E+00
Acidification (AP)	mol H ⁺ eq.		4,43E-02	4,12E-05	2,32E-03	8,60E-04	9,54E-03	0,00E+00	0,00E+00	7,67E-04	5,89E-04	2,40E-04	-1,10E-02
Eutrophication - freshwater (EP-freshwater)	kg P eq.		1,84E-04	8,76E-08	9,87E-06	1,69E-06	2,00E-05	0,00E+00	0,00E+00	1,49E-06	5,64E-07	5,07E-07	-2,71E-05
Eutrophication - marine (EP-marine)	kg N eq.		7,78E-03	1,53E-05	7,75E-04	3,24E-04	3,41E-03	0,00E+00	0,00E+00	2,90E-04	2,81E-04	1,58E-04	-1,89E-03
Eutrophication terrestrial (EP)	mol N eq.		8,55E-02	1,65E-04	8,77E-03	3,48E-03	3,69E-02	0,00E+00	0,00E+00	3,12E-03	3,05E-03	9,47E-04	-2,20E-02
Ozone depletion layer (ODP)	kg CFC-11 eq.		1,42E-07	2,23E-10	1,06E-08	4,56E-09	4,43E-08	0,00E+00	0,00E+00	4,05E-09	1,15E-09	7,74E-10	-9,23E-08
Photochemical ozone formation (POCP)	kg NMVOC eq.		4,37E-02	6,14E-05	3,02E-03	1,31E-03	1,33E-02	0,00E+00	0,00E+00	1,12E-03	7,57E-04	4,09E-04	-1,20E-02
Depletion of abiotic resources (ADP) - Minerals and metals ²	kg Sb eq.		4,99E-05	3,31E-08	3,10E-06	5,63E-07	6,75E-06	0,00E+00	0,00E+00	5,99E-07	9,13E-08	6,99E-08	-7,36E-06
Depletion of abiotic resources (ADP) - Fossil fuels ²	MJ, net calorific value		4,19E+02	1,47E-01	7,00E+00	3,05E+00	3,70E+01	0,00E+00	0,00E+00	2,64E+00	4,19E-01	7,19E-01	-1,15E+02
Water use (WDP) ²	m ³ eq.		8,83E+00	6,74E-04	6,53E-02	1,46E-02	1,31E+00	0,00E+00	0,00E+00	1,08E-02	6,61E-03	3,02E-02	-2,68E+00

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.

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Particulate Matter emissions (PM)	Disease incidence	4,41E-07	9,01E-10	4,28E-08	2,14E-08	1,83E-07	0,00E+00	0,00E+00	1,51E-08	2,64E-09	5,07E-09	-7,21E-08
Ionizing radiation, human health (IRP) ¹	kBq U235 eq.	2,49E-01	8,19E-05	5,31E-03	1,47E-03	1,86E-02	0,00E+00	0,00E+00	1,33E-03	1,85E-04	3,96E-04	-4,71E-02
Eco-toxicity, freshwater (ETP-fw) ²	CTUe	2,03E+01	7,31E-02	3,43E+00	1,47E+00	1,49E+01	0,00E+00	0,00E+00	1,30E+00	8,78E-01	5,37E-01	-2,16E+00
Human toxicity, cancer effects (HTP-c) ²	CTUh	3,12E-09	4,68E-12	7,77E-10	9,03E-11	9,35E-10	0,00E+00	0,00E+00	8,46E-11	1,59E-10	1,97E-11	-1,65E-10
Human toxicity, non-cancer effects (HTP-nc) ²	CTUh	6,36E-08	1,05E-10	5,77E-09	2,19E-09	1,89E-08	0,00E+00	0,00E+00	1,86E-09	6,92E-09	7,72E-10	-8,91E-09
Land use related impacts/Soil quality ²	-	1,35E+01	1,21E-01	2,29E+01	3,10E+00	2,70E+01	0,00E+00	0,00E+00	1,57E+00	1,15E-01	1,62E+00	5,28E-01

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.

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.

PARAMETERS DESCRIBING RESOURCE USE

INDICATOR	UNIT		A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Use of primary energy resources - Renewable	Used as energy carrier	MJ, net calorific value	5,16E+00	1,91E-03	1,60E-01	3,46E-02	4,20E-01	0,00E+00	0,00E+00	3,10E-02	6,37E-03	1,03E-02	-4,17E+00
	Used as raw material	MJ, net calorific value	2,53E+00	5,84E-04	3,37E+00	1,00E-02	2,30E-01	0,00E+00	0,00E+00	1,00E-02	3,41E-03	2,99E-03	-1,91E+00
	TOTAL	MJ, net calorific value	7,69E+00	2,49E-03	3,53E+00	4,47E-02	6,50E-01	0,00E+00	0,00E+00	4,10E-02	9,78E-03	1,33E-02	-4,89E+00
Use of primary energy resources - Non renewable	Used as energy carrier	MJ, net calorific value	9,14E+01	1,57E-01	7,45E+00	3,24E+00	3,95E+01	0,00E+00	0,00E+00	2,81E+00	4,57E-01	7,65E-01	-1,70E+02
	Used as raw material	MJ, net calorific value	3,58E+02	0,00E+00	0,00E+00	0,00E+00	9,21E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	TOTAL	MJ, net calorific value	4,50E+02	1,57E-01	7,45E+00	3,24E+00	3,95E+01	0,00E+00	0,00E+00	2,81E+00	4,57E-01	7,65E-01	-1,70E+02
Use of secondary material	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
Use of renewable secondary fuels	MJ, net calorific value		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
Use of non-renewable secondary fuels	MJ, net calorific value		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
Net use of fresh water	m ³		1,21E-01	2,20E-05	1,93E-03	4,47E-04	2,99E-02	0,00E+00	0,00E+00	3,53E-04	3,67E-04	7,24E-04	-4,19E-02

OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Hazardous waste disposed	kg	3,47E-03	3,99E-06	2,40E-03	8,50E-05	1,46E-03	0,00E+00	0,00E+00	6,54E-05	3,37E-02	3,00E-05	1,15E-02
Non-hazardous waste disposed	kg	4,17E-01	1,03E-02	3,62E-01	2,68E-01	4,13E+01	0,00E+00	0,00E+00	1,29E-01	4,26E-02	2,80E+00	1,49E-01
Radioactive waste disposed	kg	1,97E-04	5,38E-08	3,65E-06	9,30E-07	1,27E-05	0,00E+00	0,00E+00	8,59E-07	1,20E-07	2,42E-07	-4,15E-05

ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Components for re-use	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
Materials for recycling	kg	0,00E+00	0,00E+00	3,21E-01	0,00E+00	4,08E-02	0,00E+00	0,00E+00	0,00E+00	1,25E+00	0,00E+00	0,00E+00
Materials for energy recovery	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
Exported electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,07E-01	0,00E+00	0,00E+00	0,00E+00	1,03E+01	0,00E+00	0,00E+00
Exported thermal energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,13E-01	0,00E+00	0,00E+00	0,00E+00	2,06E+01	0,00E+00	0,00E+00

BIOGENIC CARBON CONTENT

INDICATOR	UNIT	TOTAL
Biogenic carbon content	kg C	0,00E+00

CENTRALTUBI GROUP5 DE450 SDR13.6 Open trench installation

CORE ENVIRONMENTAL IMPACT INDICATORS

INDICATOR	UNIT		A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Global Warming Potential (GWP)	Fossil	kg CO ₂ eq.	9,80E+01	6,24E+00	4,07E+00	6,63E+00	1,17E+02	0,00E+00	0,00E+00	1,46E+00	3,59E+01	2,81E+00	-3,10E+01
	Biogenic	kg CO ₂ eq.	1,19E-01	1,84E-03	6,46E-02	1,95E-03	4,95E-02	0,00E+00	0,00E+00	4,23E-04	2,48E-04	1,41E-03	1,15E-01
	LULUC	kg CO ₂ eq.	2,69E-02	2,95E-03	3,71E-03	3,14E-03	6,45E-02	0,00E+00	0,00E+00	7,13E-04	9,75E-05	2,00E-04	-7,90E-04
	TOTAL	kg CO₂ eq.	9,81E+01	6,24E+00	4,14E+00	6,63E+00	1,17E+02	0,00E+00	0,00E+00	1,46E+00	3,59E+01	2,81E+00	-3,08E+01
Acidification (AP)	mol H ⁺ eq.		3,48E-01	2,59E-02	1,83E-02	2,75E-02	5,82E-01	0,00E+00	0,00E+00	6,04E-03	4,63E-03	1,89E-03	-8,57E-02
Eutrophication - freshwater (EP-freshwater)	kg P eq.		1,43E-03	5,08E-05	7,77E-05	5,39E-05	1,29E-03	0,00E+00	0,00E+00	1,17E-05	4,44E-06	3,99E-06	-2,07E-04
Eutrophication - marine (EP-marine)	kg N eq.		6,09E-02	9,74E-03	6,10E-03	1,03E-02	2,08E-01	0,00E+00	0,00E+00	2,28E-03	2,22E-03	1,24E-03	-1,48E-02
Eutrophication terrestrial (EP)	mol N eq.		6,69E-01	1,05E-01	6,91E-02	1,11E-01	2,27E+00	0,00E+00	0,00E+00	2,46E-02	2,40E-02	7,45E-03	-1,72E-01
Ozone depletion layer (ODP)	kg CFC-11 eq.		9,76E-07	1,37E-07	8,34E-08	1,46E-07	2,39E-06	0,00E+00	0,00E+00	3,19E-08	9,06E-09	6,10E-09	-6,69E-07
Photochemical ozone formation (POCP)	kg NMVOC eq.		3,43E-01	3,93E-02	2,38E-02	4,18E-02	7,85E-01	0,00E+00	0,00E+00	8,84E-03	5,96E-03	3,22E-03	-9,39E-02
Depletion of abiotic resources (ADP) - Minerals and metals ²	kg Sb eq.		3,91E-04	1,69E-05	2,44E-05	1,80E-05	3,79E-04	0,00E+00	0,00E+00	4,72E-06	7,19E-07	5,50E-07	-5,62E-05
Depletion of abiotic resources (ADP) - Fossil fuels ²	MJ, net calorific value		3,29E+03	9,18E+01	5,52E+01	9,75E+01	1,80E+03	0,00E+00	0,00E+00	2,08E+01	3,30E+00	5,66E+00	-9,02E+02
Water use (WDP) ²	m ³ eq.		6,95E+01	4,39E-01	5,14E-01	4,66E-01	6,51E+01	0,00E+00	0,00E+00	8,48E-02	5,21E-02	2,38E-01	-2,11E+01

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.

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

.	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Particulate Matter emissions (PM)	Disease incidence	6,43E-07	3,37E-07	6,83E-07	1,11E-05	6,43E-07	0,00E+00	0,00E+00	1,19E-07	2,08E-08	3,99E-08	-5,58E-07
Ionizing radiation, human health (IRP) ¹	kBq U235 eq.	4,42E-02	4,18E-02	4,70E-02	1,13E+00	4,42E-02	0,00E+00	0,00E+00	1,04E-02	1,46E-03	3,12E-03	-3,72E-01
Eco-toxicity, freshwater (ETP-fw) ²	CTUe	4,42E+01	2,70E+01	4,69E+01	8,41E+02	4,42E+01	0,00E+00	0,00E+00	1,03E+01	6,91E+00	4,23E+00	-1,68E+01
Human toxicity, cancer effects (HTP-c) ²	CTUh	2,72E-09	6,12E-09	2,89E-09	5,97E-08	2,72E-09	0,00E+00	0,00E+00	6,67E-10	1,25E-09	1,55E-10	-2,53E-09
Human toxicity, non-cancer effects (HTP-nc) ²	CTUh	6,60E-08	4,54E-08	7,01E-08	1,09E-06	6,60E-08	0,00E+00	0,00E+00	1,47E-08	5,45E-08	6,08E-09	-6,89E-08
Land use related impacts/Soil quality ²	-	9,33E+01	1,81E+02	9,91E+01	2,05E+03	9,33E+01	0,00E+00	0,00E+00	1,24E+01	9,04E-01	1,28E+01	4,55E+00

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.

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.

PARAMETERS DESCRIBING RESOURCE USE

INDICATOR	UNIT		A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Use of primary energy resources - Renewable	Used as energy carrier	MJ, net calorific value	4,03E+01	1,04E+00	1,26E+00	1,11E+00	2,65E+01	0,00E+00	0,00E+00	2,44E-01	5,02E-02	8,12E-02	-3,27E+01
	Used as raw material	MJ, net calorific value	1,98E+01	3,02E-01	2,65E+01	3,21E-01	8,73E+00	0,00E+00	0,00E+00	7,88E-02	2,69E-02	2,36E-02	-1,43E+01
	TOTAL	MJ, net calorific value	6,01E+01	1,34E+00	2,78E+01	1,43E+00	3,52E+01	0,00E+00	0,00E+00	3,23E-01	7,70E-02	1,05E-01	-3,84E+01
Use of primary energy resources - Non renewable	Used as energy carrier	MJ, net calorific value	7,15E+02	9,76E+01	5,87E+01	1,04E+02	1,91E+03	0,00E+00	0,00E+00	2,21E+01	3,60E+00	6,02E+00	-1,31E+03
	Used as raw material	MJ, net calorific value	2,82E+03	0,00E+00	0,00E+00	0,00E+00	4,07E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	TOTAL	MJ, net calorific value	3,54E+03	9,76E+01	5,87E+01	1,04E+02	1,92E+03	0,00E+00	0,00E+00	2,21E+01	3,60E+00	6,02E+00	-1,31E+03
Use of secondary material	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
Use of renewable secondary fuels	MJ, net calorific value		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
Use of non-renewable secondary fuels	MJ, net calorific value		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
Net use of fresh water	m ³		9,49E-01	1,35E-02	1,52E-02	1,43E-02	1,57E+00	0,00E+00	0,00E+00	2,78E-03	2,89E-03	5,70E-03	-3,29E-01

OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Hazardous waste disposed	kg	2,50E-02	2,56E-03	1,89E-02	2,72E-03	6,30E-02	0,00E+00	0,00E+00	5,15E-04	2,66E-01	2,36E-04	9,06E-02
Non-hazardous waste disposed	kg	3,14E+00	8,05E+00	2,85E+00	8,56E+00	2,13E+03	0,00E+00	0,00E+00	1,02E+00	3,35E-01	2,21E+01	1,21E+00
Radioactive waste disposed	kg	1,54E-03	2,80E-05	2,87E-05	2,98E-05	7,23E-04	0,00E+00	0,00E+00	6,76E-06	9,47E-07	1,90E-06	-3,29E-04

ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Components for re-use	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
Materials for recycling	kg	0,00E+00	0,00E+00	2,53E+00	0,00E+00	1,98E-01	0,00E+00	0,00E+00	0,00E+00	9,84E+00	0,00E+00	0,00E+00
Materials for energy recovery	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
Exported electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,62E+00	0,00E+00	0,00E+00	0,00E+00	8,09E+01	0,00E+00	0,00E+00
Exported thermal energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,24E+00	0,00E+00	0,00E+00	0,00E+00	1,62E+02	0,00E+00	0,00E+00

BIOGENIC CARBON CONTENT

INDICATOR	UNIT	TOTAL
Biogenic carbon content	kg C	0,00E+00

CENTRALTUBI FENDER 7x14/10 Installed in mini-trench

CORE ENVIRONMENTAL IMPACT INDICATORS

INDICATOR	UNIT		A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Global Warming Potential (GWP)	Fossil	kg CO ₂ eq.	1,44E+00	5,66E-02	5,87E-02	2,58E-02	2,05E+01	0,00E+00	0,00E+00	2,10E-02	5,17E-01	4,05E-02	-5,11E-01
	Biogenic	kg CO ₂ eq.	2,12E-03	1,68E-05	9,31E-04	7,59E-06	7,36E-03	0,00E+00	0,00E+00	6,10E-06	3,57E-06	2,03E-05	1,32E-03
	LULUC	kg CO ₂ eq.	6,39E-04	2,70E-05	5,34E-05	1,23E-05	6,96E-03	0,00E+00	0,00E+00	1,03E-05	1,41E-06	2,88E-06	-1,94E-05
	TOTAL	kg CO₂ eq.	1,44E+00	5,67E-02	5,97E-02	2,58E-02	2,05E+01	0,00E+00	0,00E+00	2,11E-02	5,17E-01	4,05E-02	-5,09E-01
Acidification (AP)	mol H ⁺ eq.		5,16E-03	2,35E-04	2,63E-04	1,10E-04	6,99E-02	0,00E+00	0,00E+00	8,71E-05	6,68E-05	2,73E-05	-1,39E-03
Eutrophication - freshwater (EP-freshwater)	kg P eq.		2,53E-05	4,63E-07	1,12E-06	2,10E-07	2,43E-04	0,00E+00	0,00E+00	1,69E-07	6,41E-08	5,75E-08	-3,91E-06
Eutrophication - marine (EP-marine)	kg N eq.		9,30E-04	8,82E-05	8,80E-05	4,10E-05	2,34E-02	0,00E+00	0,00E+00	3,29E-05	3,20E-05	1,79E-05	-2,44E-04
Eutrophication terrestrial (EP)	mol N eq.		1,02E-02	9,49E-04	9,96E-04	4,41E-04	2,60E-01	0,00E+00	0,00E+00	3,55E-04	3,46E-04	1,07E-04	-2,84E-03
Ozone depletion layer (ODP)	kg CFC-11 eq.		1,47E-08	1,25E-09	1,20E-09	5,67E-10	2,33E-07	0,00E+00	0,00E+00	4,60E-10	1,31E-10	8,79E-11	-1,21E-08
Photochemical ozone formation (POCP)	kg NMVOC eq.		5,14E-03	3,56E-04	3,43E-04	1,65E-04	8,44E-02	0,00E+00	0,00E+00	1,28E-04	8,59E-05	4,64E-05	-1,53E-03
Depletion of abiotic resources (ADP) - Minerals and metals ²	kg Sb eq.		5,78E-06	1,56E-07	3,52E-07	6,99E-08	4,02E-05	0,00E+00	0,00E+00	6,80E-08	1,04E-08	7,93E-09	-9,63E-07
Depletion of abiotic resources (ADP) - Fossil fuels ²	MJ, net calorific value		4,78E+01	8,33E-01	7,95E-01	3,80E-01	1,84E+02	0,00E+00	0,00E+00	3,00E-01	4,76E-02	8,16E-02	-1,39E+01
Water use (WDP) ²	m ³ eq.		1,02E+00	3,97E-03	7,42E-03	1,81E-03	6,04E+00	0,00E+00	0,00E+00	1,22E-03	7,51E-04	3,43E-03	-3,23E-01

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.

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Particulate Matter emissions (PM)	Disease incidence	5,45E-08	5,78E-09	4,86E-09	2,65E-09	1,01E-06	0,00E+00	0,00E+00	1,72E-09	3,00E-10	5,75E-10	-9,11E-09
Ionizing radiation, human health (IRP) ¹	kBq U235 eq.	2,98E-02	4,05E-04	6,03E-04	1,82E-04	2,07E-01	0,00E+00	0,00E+00	1,50E-04	2,10E-05	4,50E-05	-6,43E-03
Eco-toxicity, freshwater (ETP-fw) ²	CTUe	2,02E+00	4,01E-01	3,89E-01	1,83E-01	8,09E+01	0,00E+00	0,00E+00	1,48E-01	9,97E-02	6,09E-02	-3,20E-01
Human toxicity, cancer effects (HTP-c) ²	CTUh	4,50E-10	2,48E-11	8,82E-11	1,12E-11	6,50E-09	0,00E+00	0,00E+00	9,61E-12	1,80E-11	2,24E-12	1,56E-11
Human toxicity, non-cancer effects (HTP-nc) ²	CTUh	7,62E-09	5,98E-10	6,55E-10	2,72E-10	1,60E-07	0,00E+00	0,00E+00	2,11E-10	7,86E-10	8,76E-11	-1,24E-09
Land use related impacts/Soil quality ²	-	2,21E+01	8,35E-01	2,60E+00	3,85E-01	1,76E+02	0,00E+00	0,00E+00	1,79E-01	1,30E-02	1,84E-01	-3,02E-02

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.

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.

PARAMETERS DESCRIBING RESOURCE USE

INDICATOR	UNIT		A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Use of primary energy resources - Renewable	Used as energy carrier	MJ, net calorific value	6,21E-01	9,55E-03	1,82E-02	4,30E-03	4,23E+00	0,00E+00	0,00E+00	3,52E-03	7,23E-04	1,17E-03	-5,79E-01
	Used as raw material	MJ, net calorific value	4,11E+00	2,78E-03	3,82E-01	1,25E-03	1,40E+00	0,00E+00	0,00E+00	1,14E-03	3,87E-04	3,40E-04	-3,11E-01
	TOTAL	MJ, net calorific value	4,73E+00	1,23E-02	4,01E-01	5,55E-03	5,63E+00	0,00E+00	0,00E+00	4,66E-03	1,11E-03	1,51E-03	-5,58E-01
Use of primary energy resources – Non renewable	Used as energy carrier	MJ, net calorific value	9,73E+00	8,85E-01	8,46E-01	4,04E-01	1,71E+02	0,00E+00	0,00E+00	3,19E-01	5,18E-02	8,68E-02	-2,35E+01
	Used as raw material	MJ, net calorific value	4,16E+01	0,00E+00	0,00E+00	0,00E+00	2,46E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	TOTAL	MJ, net calorific value	5,14E+01	8,85E-01	8,46E-01	4,04E-01	1,96E+02	0,00E+00	0,00E+00	3,19E-01	5,18E-02	8,68E-02	-2,35E+01
Use of secondary material	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
Use of renewable secondary fuels	MJ, net calorific value		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
Use of non-renewable secondary fuels	MJ, net calorific value		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
Net use of fresh water	m ³		1,40E-02	1,22E-04	2,19E-04	5,56E-05	1,54E-01	0,00E+00	0,00E+00	4,01E-05	4,17E-05	8,22E-05	-5,29E-03

OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Hazardous waste disposed	kg	5,13E-04	2,32E-05	2,72E-04	1,06E-05	6,00E-03	0,00E+00	0,00E+00	7,43E-06	3,83E-03	3,40E-06	1,30E-03
Non-hazardous waste disposed	kg	5,68E-02	7,20E-02	4,11E-02	3,32E-02	1,66E+02	0,00E+00	0,00E+00	1,47E-02	4,84E-03	3,18E-01	1,35E-02
Radioactive waste disposed	kg	2,36E-05	2,58E-07	4,14E-07	1,16E-07	1,50E-04	0,00E+00	0,00E+00	9,75E-08	1,37E-08	2,74E-08	-5,67E-06

ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Components for re-use	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
Materials for recycling	kg	0,00E+00	0,00E+00	3,65E-02	0,00E+00	7,09E-02	0,00E+00	0,00E+00	0,00E+00	1,42E-01	0,00E+00	0,00E+00
Materials for energy recovery	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
Exported electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,83E-01	0,00E+00	0,00E+00	0,00E+00	1,17E+00	0,00E+00	0,00E+00
Exported thermal energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,65E-01	0,00E+00	0,00E+00	0,00E+00	2,33E+00	0,00E+00	0,00E+00

BIOGENIC CARBON CONTENT

INDICATOR	UNIT	TOTAL
Biogenic carbon content	kg C	6,32E-02

CENTRALTUBI SYSTEM PACK OD50 7x12/10 Trenchless installation

CORE ENVIRONMENTAL IMPACT INDICATORS

INDICATOR	UNIT		A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Global Warming Potential (GWP)	Fossil	kg CO ₂ eq.	1,40E+00	4,61E-02	7,05E-02	3,09E-02	2,19E-01	0,00E+00	0,00E+00	2,52E-02	6,21E-01	4,86E-02	-2,41E-01
	Biogenic	kg CO ₂ eq.	7,18E-03	1,36E-05	1,12E-03	9,11E-06	1,44E-04	0,00E+00	0,00E+00	7,32E-06	4,29E-06	2,44E-05	-3,20E-03
	LULUC	kg CO ₂ eq.	4,99E-04	2,18E-05	6,41E-05	1,46E-05	9,98E-05	0,00E+00	0,00E+00	1,23E-05	1,69E-06	3,46E-06	-4,59E-05
	TOTAL	kg CO₂ eq.	1,41E+00	4,61E-02	7,16E-02	3,10E-02	2,19E-01	0,00E+00	0,00E+00	2,53E-02	6,21E-01	4,86E-02	-2,45E-01
Acidification (AP)	mol H ⁺ eq.		4,95E-03	1,91E-04	3,16E-04	1,29E-04	9,46E-04	0,00E+00	0,00E+00	1,05E-04	8,02E-05	3,27E-05	-4,23E-04
Eutrophication - freshwater (EP-freshwater)	kg P eq.		2,44E-05	3,75E-07	1,34E-06	2,52E-07	2,01E-06	0,00E+00	0,00E+00	2,03E-07	7,69E-08	6,90E-08	-3,21E-06
Eutrophication - marine (EP-marine)	kg N eq.		8,94E-04	7,20E-05	1,06E-04	4,83E-05	3,36E-04	0,00E+00	0,00E+00	3,95E-05	3,84E-05	2,15E-05	-9,59E-05
Eutrophication terrestrial (EP)	mol N eq.		9,77E-03	7,75E-04	1,20E-03	5,20E-04	3,64E-03	0,00E+00	0,00E+00	4,26E-04	4,16E-04	1,29E-04	-1,13E-03
Ozone depletion layer (ODP)	kg CFC-11 eq.		1,84E-08	1,01E-09	1,44E-09	6,80E-10	4,42E-09	0,00E+00	0,00E+00	5,53E-10	1,57E-10	1,06E-10	-1,19E-08
Photochemical ozone formation (POCP)	kg NMVOC eq.		4,78E-03	2,91E-04	4,12E-04	1,95E-04	1,31E-03	0,00E+00	0,00E+00	1,53E-04	1,03E-04	5,57E-05	-4,86E-04
Depletion of abiotic resources (ADP) - Minerals and metals ²	kg Sb eq.		5,73E-06	1,25E-07	4,23E-07	8,40E-08	7,16E-07	0,00E+00	0,00E+00	8,16E-08	1,24E-08	9,52E-09	3,37E-08
Depletion of abiotic resources (ADP) - Fossil fuels ²	MJ, net calorific value		4,28E+01	6,79E-01	9,55E-01	4,55E-01	3,64E+00	0,00E+00	0,00E+00	3,60E-01	5,71E-02	9,80E-02	-1,22E+00
Water use (WDP) ²	m ³ eq.		8,75E-01	3,24E-03	8,90E-03	2,18E-03	1,28E-01	0,00E+00	0,00E+00	1,47E-03	9,01E-04	4,11E-03	-1,92E-02

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.

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Particulate Matter emissions (PM)	Disease incidence	4,96E-08	4,75E-09	5,84E-09	3,19E-09	1,81E-08	0,00E+00	0,00E+00	2,06E-09	3,60E-10	6,91E-10	-1,09E-09
Ionizing radiation, human health (IRP) ¹	kBq U235 eq.	3,39E-02	3,27E-04	7,24E-04	2,19E-04	1,84E-03	0,00E+00	0,00E+00	1,81E-04	2,52E-05	5,40E-05	-6,29E-03
Eco-toxicity, freshwater (ETP-fw) ²	CTUe	2,54E+00	3,26E-01	4,67E-01	2,19E-01	1,47E+00	0,00E+00	0,00E+00	1,78E-01	1,20E-01	7,31E-02	-3,78E-01
Human toxicity, cancer effects (HTP-c) ²	CTUh	4,07E-10	2,01E-11	1,06E-10	1,35E-11	9,31E-11	0,00E+00	0,00E+00	1,15E-11	2,16E-11	2,69E-12	-6,43E-11
Human toxicity, non-cancer effects (HTP-nc) ²	CTUh	8,03E-09	4,88E-10	7,86E-10	3,27E-10	1,92E-09	0,00E+00	0,00E+00	2,54E-10	9,44E-10	1,05E-10	-7,38E-10
Land use related impacts/Soil quality ²	-	2,43E+00	6,90E-01	3,13E+00	4,63E-01	2,67E+00	0,00E+00	0,00E+00	2,15E-01	1,56E-02	2,21E-01	-5,80E-01

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.

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.

PARAMETERS DESCRIBING RESOURCE USE

INDICATOR	UNIT		A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Use of primary energy resources - Renewable	Used as energy carrier	MJ, net calorific value	7,08E-01	7,71E-03	2,18E-02	5,17E-03	4,17E-02	0,00E+00	0,00E+00	4,23E-03	8,68E-04	1,40E-03	-5,72E-01
	Used as raw material	MJ, net calorific value	3,08E-01	2,23E-03	4,59E-01	1,50E-03	2,55E-02	0,00E+00	0,00E+00	1,36E-03	4,65E-04	4,08E-04	-3,15E-01
	TOTAL	MJ, net calorific value	1,02E+00	9,94E-03	4,81E-01	6,67E-03	6,72E-02	0,00E+00	0,00E+00	5,59E-03	1,33E-03	1,81E-03	-6,33E-01
Use of primary energy resources – Non renewable	Used as energy carrier	MJ, net calorific value	1,16E+01	7,21E-01	1,02E+00	4,84E-01	3,88E+00	0,00E+00	0,00E+00	3,83E-01	6,22E-02	1,04E-01	-1,13E+01
	Used as raw material	MJ, net calorific value	3,44E+01	0,00E+00	0,00E+00	0,00E+00	9,21E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	TOTAL	MJ, net calorific value	4,60E+01	7,21E-01	1,02E+00	4,84E-01	3,88E+00	0,00E+00	0,00E+00	3,83E-01	6,22E-02	1,04E-01	-1,13E+01
Use of secondary material	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
Use of renewable secondary fuels	MJ, net calorific value		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
Use of non-renewable secondary fuels	MJ, net calorific value		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
Net use of fresh water	m ³		1,28E-02	9,95E-05	2,63E-04	6,68E-05	2,93E-03	0,00E+00	0,00E+00	4,81E-05	5,01E-05	9,87E-05	-1,86E-03

OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Hazardous waste disposed	kg	2,55E-03	1,89E-05	3,27E-04	1,27E-05	1,72E-04	0,00E+00	0,00E+00	8,92E-06	4,60E-03	4,08E-06	-5,85E-04
Non-hazardous waste disposed	kg	9,55E-02	5,95E-02	4,94E-02	3,99E-02	4,04E+00	0,00E+00	0,00E+00	1,76E-02	5,81E-03	3,82E-01	-2,09E-02
Radioactive waste disposed	kg	2,69E-05	2,07E-07	4,97E-07	1,39E-07	1,26E-06	0,00E+00	0,00E+00	1,17E-07	1,64E-08	3,29E-08	-5,59E-06

ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

INDICATOR	UNIT	A1	A2	A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Components for re-use	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
Materials for recycling	kg	0,00E+00	0,00E+00	4,38E-02	0,00E+00	3,51E-03	0,00E+00	0,00E+00	0,00E+00	1,70E-01	0,00E+00	0,00E+00
Materials for energy recovery	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
Exported electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,82E-02	0,00E+00	0,00E+00	0,00E+00	1,40E+00	0,00E+00	0,00E+00
Exported thermal energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,64E-02	0,00E+00	0,00E+00	0,00E+00	2,80E+00	0,00E+00	0,00E+00

BIOGENIC CARBON CONTENT

INDICATOR	UNIT	TOTAL
Biogenic carbon content	kg C	0,00E+00

7. Calculation rules

Cut-off rules

According to PCR, inventory data that contributes less than 5% to the environmental impacts of each module may not be included in the life cycle.

Allocation rules

According to the PCR, since the process under consideration is characterised by different products, an allocation procedure was required. Where possible, the system was divided into sub-processes and the data collected per process. Where this has not been possible, the allocation between different products and co-products has been made on the basis of physical relationships, namely the mass (kg) of the products.

Environmental impacts

The environmental impacts considered, expressed per declared unit, and divided into the phases considered, are the following:

- Global warming, kg CO₂ equivalent (GWP100);
- Acidification potential, Accumulated Exceedance (AP), mol H⁺ equivalent;
- Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater), kg PO₄ equivalent;
- Eutrophication potential, fraction of nutrients reaching marine end compartment (EP-marine), kg N equivalent;
- Eutrophication potential, Accumulated Exceedance (EP-terrestrial), mol N equivalent;
- Depletion potential of the stratospheric ozone layer (ODP), kg CFC 11 equivalent;
- Formation potential of tropospheric ozone (POCP), kg NMVOC equivalent;
- Abiotic depletion potential for non-fossil resources (ADP-minerals&metals), kg Sb equivalent;
- Abiotic depletion for fossil resources potential (ADP-fossil), MJ net calorific value;
- Water (user) deprivation potential, deprivation-weighted water consumption (WDP), m³ world equivalent deprived;
- Potential incidence of disease due to PM emissions (PM), disease incidence;
- Potential Human exposure efficiency relative to U235 (IRP); kBq U235 equivalent;
- Potential Comparative Toxic Unit for ecosystems (ETP-fw), CTUe;
- Potential Comparative Toxic Unit for humans (HTP-c), CTUh;
- Potential Comparative Toxic Unit for humans (HTP-nc), CTUh;
- Potential Soil quality index (SQP), dimensionless.

Resource use

The consumption of resources considered, expressed per declared unit and subdivided in the phases considered, are the following:

- Use of renewable primary energy resources used as energy carrier (MJ, net calorific value);
- Use of renewable primary energy resources used as raw materials (MJ, net calorific value);
- Total use of renewable primary energy resources (MJ, net calorific value);
- Use of non-renewable primary energy resources used as energy carrier (MJ, net calorific value);
- Use of non-renewable primary energy resources used as raw materials (MJ, net calorific value);
- Total use of non-renewable primary energy resources (MJ, net calorific value);
- Use of secondary material (kg);
- Use of renewable secondary fuels (MJ, net calorific value);
- Use of non-renewable secondary fuels (MJ, net calorific value);
- Use of net fresh water (m³).

Waste

The waste products concerned, expressed per declared unit and divided into the stages concerned, are as follows:

- Hazardous waste disposed (kg);
- Non-hazardous waste disposed (kg);
- Radioactive waste disposed (kg).

Data quality

For most of the processes that refer to the production of the object of study and its logistics, specific data collected from company accounting reports are used. The transport of raw materials is modelled from the means of transport used and the distance from the supplier, as well as the delivery of the product to the yard.

Generic data selected from the Ecoinvent database v.3.9 are used for the production of raw materials, fuels and electricity (www.ecoinvent.org).

The product installation scenario, as well as its end-of-life, have been modelled on the basis of specific data and the requirements of the reference standard.

The reference version of the characterization factors used is the “EF 3.1 normalization and weighting set”.

The LCA method applied is “Cut of by classification”. The calculation software used is SimaPro 9.5.

Residual energy mix was considered in the calculation, for the low voltage energy consumption the data set is: “Electricity, low voltage {IT}| market for electricity, low voltage | Cut-off, U - Residual mix 2022” with an emission factor of 0.6483 kgCO₂eq/kWh and for medium voltage energy consumption the data set is “Electricity, medium voltage {IT}| market for electricity, medium voltage | Cut-off, U - Residual mix 2022” with an emission factor of 0.6496 kgCO₂eq/kWh.

8. Scenarios and additional technical information

A4 – Transport to the building site

The 2024 logistic scenario referred to the product under study is depicted in the table below.

Mean of transport	Truck		Ship	
	Quantity in percentage	Average distance	Quantity in percentage	Average distance
CENTRALTUBI KIWAGREEN DE200 SDR11	100,00%	1415,9	0,00%	0,0
CENTRALTUBI KIWAGREEN DE250 SDR11	100,00%	1435,0	0,00%	0,0
CENTRALTUBI ELECTROPIPE50 DE200 SDR11	100,00%	454,9	0,00%	0,0
CENTRALTUBI ELECTROPIPE DE200 SDR26	100,00%	439,5	0,00%	0,0
CENTRALTUBI ELECTROPIPE DE200 SDR21	92,23%	409,5	7,77%	451,89
CENTRALTUBI ELECTROPIPE100 DE200 SDR11	100,00%	404,0	0,00%	0,0
CENTRALTUBI ELECTROPIPE100 DE160 SDR13.6	100,00%	360,6	0,00%	0,0
CENTRALTUBI GROUP5 DE450 SDR13.6	100,00%	1469,2	0,00%	0,0
CENTRALTUBI FENDER 7x14/10	97,28%	334,8	2,72%	524,15
CENTRALTUBI SYSTEM PACK OD50+7x12/10	99,86%	396,6	0,14%	451,89

The truck is assumed to be Lorry > 32 metric ton, EURO 4 – Average load factor 15.96 tonnes, - Gross vehicle weight 29.96 tonnes.

The ship is assumed to be Container ship – Load capacity 43000 tonnes.

A5 – Installation in the trench

For Module A5 the following parameters have been taken into account.

		KIWAGREEN DE200 SDR11	KIWAGREEN DE250 SDR11	ELECTRO PIPE50 DE200 SDR11	ELECTRO PIPE DE200 SDR26	ELECTRO PIPE DE200 SDR21	ELECTRO PIPE100 DE200 SDR11	ELECTRO PIPE100 DE160 SDR13.6	GROUP5 DE450 SDR13.6	FENDER 7x14/10	SYSTEM PACK OD50 7x12/10
Energy consumption of the excavated volume ^a [MJ/tonne excavated]		2.69									
Type of installation		Trenchless	Trenchless	Open trench	Open trench	Open trench	Trenchless	Trenchless	Open trench	Mini-trench	Trenchless
Excavated mass, total [kg/m]		6,28E+01	9,82E+01	7,80E+02	7,80E+02	7,80E+02	6,28E+01	4,02E+01	2,07E+03	1,61E+02	3,93E-00
Excavated mass transported to depot [kg/m]		6,28E+01	9,82E+01	7,80E+02	7,80E+02	7,80E+02	6,28E+01	4,02E+01	2,07E+03	1,61E+02	3,93E-00
Transport distance from the construction site to depot [km]		200									
Refilling mass [kg/m]		0,00E+00	0,00E+00	6,10E+02	6,10E+02	6,10E+02	0,00E+00	0,00E+00	1,49E+03	1,32E+02	0,00E+00
Ancillary materials for installation [kg/m]	HDPE	0,00E+00	0,00E+00	2,50E-01	3,75E-02	3,75E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	Brass	0,00E+00	0,00E+00	5,11E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	Steel	0,00E+00	0,00E+00	1,67E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	Rubber	0,00E+00	0,00E+00	0,00E+00	1,21E-02	1,21E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	Drilling Mud	2,97E+01	4,64E+01	0,00E+00	0,00E+00	0,00E+00	2,97E+01	1,90E+01	0,00E+00	0,00E+00	1,86E-00
Waste materials on the building site before waste processing, generated by the product's installation [kg/m]	LDPE	2,22E-02	3,71E-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
	Steel	9,52E-03	1,36E-02	9,52E-03	9,52E-03	9,52E-03	6,67E-03	1,60E-02	0,00E+00	6,46E-03	0,00E+00
	PET	4,43E-04	6,16E-04	4,43E-04	4,43E-04	4,43E-04	3,10E-04	1,42E-03	2,41E-03	9,72E-05	2,40E-04
	Wood	1,76E-01	2,46E-01	1,76E-01	1,76E-01	1,76E-01	1,23E-01	0,00E+00	0,00E+00	1,28E-01	0,00E+00

Pipe leftovers			2%									
Output materials (specified by type) as result of waste processing at the building site e.g. of collection for recycling, for energy recovery, disposal (specified by route) [kg/m]	HDPE	Recycling	4,72E-02	7,35E-02	4,72E-02	2,13E-02	2,62E-02	4,72E-02	2,50E-02	1,97E-01	2,84E-03	3,41E-03
		En. recov.	5,69E-02	8,86E-02	5,69E-02	2,56E-02	3,16E-02	5,69E-02	3,01E-02	2,37E-01	3,42E-03	4,11E-03
		Disposal	1,06E-01	1,65E-01	1,06E-01	4,76E-02	5,87E-02	1,06E-01	5,60E-02	4,41E-01	6,35E-03	7,63E-03
	LDPE	Recycling	6,10E-03	1,02E-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
		En. recov.	5,62E-03	9,42E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
		Disposal	1,04E-02	1,75E-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
	Steel	Recycling	9,05E-03	1,30E-02	9,05E-03	9,05E-03	9,05E-03	6,33E-03	1,52E-02	0,00E+00	6,14E-03	0,00E+00
		En. recov.	0	0	0	0	0	0	0	0	0	0
		Disposal	4,76E-04	6,82E-04	4,76E-04	4,76E-04	4,76E-04	3,33E-04	8,00E-04	0,00E+00	3,23E-04	0,00E+00
	PET	Recycling	1,85E-04	2,57E-04	1,85E-04	1,85E-04	1,85E-04	1,29E-04	5,91E-04	1,01E-03	4,06E-05	1,00E-04
		En. recov.	9,03E-05	1,26E-04	9,03E-05	9,03E-05	9,03E-05	6,32E-05	2,89E-04	4,92E-04	1,98E-05	4,90E-05
		Disposal	1,68E-04	2,33E-04	1,68E-04	1,68E-04	1,68E-04	1,17E-04	5,36E-04	9,14E-04	3,68E-05	9,10E-05
	Wood	Recycling	8,51E-02	1,19E-01	8,51E-02	8,51E-02	8,51E-02	5,96E-02	0,00E+00	0,00E+00	6,18E-02	0,00E+00
		En. recov.	8,51E-02	1,19E-01	8,51E-02	8,51E-02	8,51E-02	5,96E-02	0,00E+00	0,00E+00	6,18E-02	0,00E+00
		Disposal	9,11E-02	1,27E-01	9,11E-02	9,11E-02	9,11E-02	6,38E-02	0,00E+00	0,00E+00	6,62E-02	0,00E+00
	Refilling mass	Disposal	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Transport distance for refilling mass to construction site			From Ecoinvent v.3.9 database									
Energy use for compaction ^a			-									
^a Data about energy consumption are collected as a whole												

C1-C4 – End of life

Collection process specified by type:

	KIWAGREEN DE200 SDR11	KIWAGREEN DE250 SDR11	ELECTRO PIPE50 DE200 SDR11	ELECTRO PIPE DE200 SDR26	ELECTRO PIPE DE200 SDR21	ELECTRO PIPE100 DE200 SDR11	ELECTRO PIPE100 DE160 SDR13.6	GROUP5 DE450 SDR13.6	FENDER 7x14/10	SYSTEM PACK OD50 7x12/10
Collected separately [kg/m]	1,05E+01	1,63E+01	1,08E+01	4,78E+00	5,87E+00	1,05E+01	5,55E+00	4,37E+01	6,31E-01	7,57E-01
Collected with mixed construction waste [kg/m]	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

Recovery system specified by type:

	KIWAGREEN DE200 SDR11	KIWAGREEN DE250 SDR11	ELECTRO PIPE50 DE200 SDR11	ELECTRO PIPE DE200 SDR26	ELECTRO PIPE DE200 SDR21	ELECTRO PIPE100 DE200 SDR11	ELECTRO PIPE100 DE160 SDR13.6	GROUP5 DE450 SDR13.6	FENDER 7x14/10	SYSTEM PACK OD50 7x12/10
For re-use [kg/m]	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
For recycling [kg/m]	2,36E+00	3,68E+00	2,42E+00	1,07E+00	1,32E+00	2,36E+00	1,25E+00	9,84E+00	1,42E-01	1,70E-01
For energy recovery [kg/m]	2,85E+00	4,43E+00	2,91E+00	1,30E+00	1,60E+00	2,85E+00	1,51E+00	1,19E+01	1,71E-01	2,05E-01

Disposal specified by type:

	KIWAGREEN DE200 SDR11	KIWAGREEN DE250 SDR11	ELECTRO PIPE50 DE200 SDR11	ELECTRO PIPE DE200 SDR26	ELECTRO PIPE DE200 SDR21	ELECTRO PIPE100 DE200 SDR11	ELECTRO PIPE100 DE160 SDR13.6	GROUP5 DE450 SDR13.6	FENDER 7x14/10	SYSTEM PACK OD50 7x12/10
Incineration [kg/m]	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
Landfill [kg/m]	5,28E+00	8,23E+00	5,41E+00	2,40E+00	2,95E+00	5,29E+00	2,80E+00	2,20E+01	3,18E-01	3,81E-01

In accordance to the ISO standard, the distance from recycling plant is assumed equal to 500 km, the distance from the incineration plant 200 km and the distance from the landfill 50 km.

9. Other additional environmental information

Emissions to indoor air:

No direct emissions at the building site. Centraletubi S.p.A. confirms that the HDPE waste piping system does not contain any substances mentioned on the REACH SVHC -list.

Emissions to soil and water:

No direct emissions at the building site. Centraletubi S.p.A. confirms that the HDPE waste piping system does not contain any substances mentioned on the REACH SVHC -list.

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