Vallourec Tubular Solutions Worldwide

EPD®
THE INTERNATIONAL EPD® SYSTEM

ENVIRONMENTAL PRODUCT DECLARATION

VALLOUREC TUBULAR SOLUTIONS WORLDWIDE

DATE OF PUBLICATION:
10/12/2024

VALID UNTIL:
09/12/2029

DECLARED UNIT:
1 ton of final steel product

OWNER OF THE DECLARATION:
Vallourec

CONSIDERED STAGES:
Cradle to Gate

AUTHORS:
Thibaut ABERGEL

EPD REGISTRATION NUMBERS:
EPD-IES-0018140

BASED ON:
PCR 2014:10 “Fabricated Steel Products, Except Construction Products” v2.12

vallourec
SMART TUBULAR SOLUTIONS

GENERAL INFORMATION

OWNER OF THE DECLARATION:

Vallourec SA
12 rue de la Verrerie
92190 Meudon, France

PRODUCT:

VALLOUREC TUBULAR SOLUTIONS

PLACE OF PRODUCTION:

Steel plant, tube mills and finishing lines in the USA, Brazil, France and China
Finishing lines in Mexico, Saudi Arabia and Indonesia.

UN CPC CODE 4128

PCR review was conducted by:
The technical Committee of the International EPD® system
Chair: Massimo Marino
Contact via: info@environdec.com

INDEPENDENT VERIFICATION OF THE ENVIRONMENTAL DECLARATION AND DATA

according to PCR 2014:10 "Fabricated Steel Products, Except Construction Products" v2.12.

EPD process certification (Internal) ☐
EPD verification (External) ☒
The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programs may not be comparable. EPDs of fabricated metal products may not be comparable if they do not comply with PCR 2014:10.

PROGRAM:

Program: The International EPD® System
Program operator:
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SE-100 31 Stockholm
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THIRD PARTY VERIFIER:

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Approved by: The International EPD® System
Procedure for follow-up during EPD® validity involves third party:
Yes ☐
No ☒

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1- COMPANY AND PRODUCT PRESENTATION

COMPANY DESCRIPTION

Vallourec is a world leader in premium tubular solutions. Its 15 000 employees are present worldwide in over 20 countries. Through its integrated production sites and state-of-the-art Research and Development (R&D), the Group provides customers with innovative cutting-edge steel solutions tailored to the energy challenges of the 21st century.

Building on more than **100 years** of expertise, Vallourec supplies a **full range of tubular solutions for Oil & Gas** (OCTG, line pipes), Petrochemicals, Industry (mechanical, automotive, construction), and the Energy Transition market (geothermal, hydrogen and CCUS). Its product portfolio includes seamless and welded tubes, connections and accessories, all available in a wide range of sizes and grades.

In 2023, the Group saw a substantial uplift in its New Energies business, with an 80% increase in volumes and contracts — and more than 10 new customers. 2023 also saw the inauguration of Vallourec's proprietary vertical hydrogen gas storage solution, Delphy.

With over **35 production units and finishing lines** around the world, Vallourec is at the forefront of the American, Brazilian, European, Middle Eastern and Asian markets.

As of January 1st, 2024, Vallourec facilities included:

- **2 steel mills,** including an electric arc furnace in the United States and a blast furnace and electric arc furnace in Brazil;
- **8 tube mills** across Europe, the United States, Brazil and Asia;
- **23 finishing units;**
- **A group of forest assets,** an iron ore mine and a pelletization plant in Brazil.

Vallourec has an annual worldwide production capacity of **2.1 million tons of tubular products.**

97% of Vallourec sites are ISO 45001 certified. Moreover, 100% of the Group's sites are ISO 14001 certified. Vallourec is also committed to ISO 50001 certification for its primary production facilities. This certification has been obtained for the Barreiro and Jeceaba sites in Brazil and for VCHA Changzhou in China. Production at ISO 50001 certified sites accounted for 37% of total production in 2023.

COMPANY MARKETS

OIL & GAS

INDUSTRY

(mechanical engineering, transportation and construction)

NEW ENERGIES

From exploration and production to the transport and processing of oil and gas, Vallourec provides a full range of tubular solutions. These include OCTG casing and tubing; VAM® premium connections and accessories for Oil & Gas well equipment; and flowlines, onshore line pipes and specialized carbon steel and steel alloy seamless tubes for oil refineries.

Vallourec's hot-rolled seamless steel tubes are used in a variety of the most demanding applications, from daring architectural projects to extremely high-performing mechanical equipment. Our products include hollow bars (semi-finished tubes for processing into products that meet the needs of a specific market) and sections (circular, square, rectangular or octagonal sections for a vast array of applications), and are all manufactured in a large range of sizes and steel grades to fit any customer requirement.

Vallourec provides integrated products and services for innovative low-carbon and renewable energy projects. This includes geothermal wells, CO_2 injection wells and transportation pipelines (for Carbon Capture and Storage), long-span structures for photovoltaic panels, and hydrogen refueling stations. The Group has also developed Delphy, a unique vertical hydrogen storage solution that uses Vallourec's tubular technology to enable safe on-site hydrogen storage in a variety of medium-sized applications, with a limited footprint and a high level of safety.

TYPE OF EPD

Generic and specific data used for calculations relates to the product in accordance with PCR 2014:10 “Fabricated Steel Products, Except Construction Products” v2.12.

The approach used in this EPD is “Cradle to Gate”.

SOFTWARE:
SimaPro 9.1.1.1

MAIN DATABASE:
Ecoinvent v3.9.1

LCA STUDY REALIZED BY:
WeLOOP
254 rue du Bourg
59130 Lambersart - France

DATE OF LCA STUDY:
2024/09

VALLOUREC DATABASE:
Environmental data from all sites collected using the CR360 tool. Material flows and transportation data sourced from the Group Financial Dashboard

PERIOD OF DATA COLLECTION:
Full year 2023

REPORT LCA:
Life Cycle Assessment (LCA) applied to tubular steel products for EPD® purposes

SCOPE OF EPD

- **Geographical scope:**
  All Vallourec plants worldwide contributing to the manufacture of tubular steel solutions were included in the assessment.

- **PCR Scope:**
  The present assessment complies with the guidelines of PCR 2014:10 “Fabricated Steel Products, Except Construction Products” v2.12 Cradle-to-Gate approach.
  It includes in particular:

  - Upstream processes for the supply of raw materials and steel billets purchased from external manufacturers, as well as for the integrated manufacturing of steel;
  - Core processes for the internal manufacturing of tubes, covering key steps such as rolling, heat treatment, threading, quality testing and finishing.

This segregation enhances data transparency as the impact of steelmaking, including upstream transportation, is clearly disclosed in the present EPD as the upstream step of the value chain’s process.

The impact from cradle-to-gate would be the sum of environmental impacts of both upstream and core processes.

The cradle-to-gate assessment of the PCR standard corresponding to the products analysed in this EPD requires the exclusion of downstream processes. In particular, the transportation of finished goods for delivery to the customer is not included. The environmental impacts of use and end-of-life phases are also excluded from the assessment.

DETAILED PRODUCT DESCRIPTION

Vallourec provides a wide range of cutting-edge steel solutions, as well as value-added digital solutions. This combined offer helps customers meet their operational challenges while prioritizing safety.
The Group's portfolio includes:

- one of the most extensive ranges of seamless tubes in the world, including sizes and proportions (length, diameter, thickness) of up to 457 millimeters in outside diameter (OD), and a variety of more than 250 steel grades (high-grade and low-grade carbon steel alloys, stainless steels, nickel alloys, etc.);
- world-renowned premium connections, including VAM® connections and accessories;
- specialty tubes;
- a complete offer of innovative and digital services.

	OUTSIDE DIAMETER (OD)	WALL THICKNESS (WT)	YIELD STRENGTH (YS)	GRADES	
PLP	From 2.375" (60mm) to 18" (457mm)	From 0.2" (5mm) to 4" (100mm)	From 245 to 555Mpa	API 5L up to X80 DNV-ST-F101 up to DNV SMLS 555	
OCTG	From 2 3/8" to 18 5/8"	**Casing:** up to 27/28mm **Sleeve blanks:** up to 45mm	From 55 to 150ksi	API standards (API 5CT) High collapse High strength Sour Service	13CR and S13CR Corrosion-resistant alloys (including Nickel-based, Austenitic, Duplex, Super Duplex)
Industry	**Circular:** 21.3 to 406.4mm **Square:** 50x50 to 300x300mm **Rectangular:** 60x40mm to 406.4x203.2mm	**Circular:** 2.9mm to 50mm **Square:** 3.2mm to 20mm **Rectangular:** 3.2mm to 20mm	**Circular:** From 30 to 125ksi **Square:** From 30 to 70ksi **Rectangular:** From 30 to 70ksi	Basic Structural and Mechanical Grades and Multicert® series Engineering Grades Forterior® and Spirafort® series Advanced Engineering grades: Avadur® series and Bearing grades, alloyed heat treatable steels, case hardening steels, unalloyed heat treatable steels Offshore grades Oceanfit® series Fine-Grain High Strength Grades FineXcell® series Ballistic Protection Grades Durascilt® series	

DETAILED PRODUCT DESCRIPTION

Vallourec products are made 100% from steel, with the following chemical composition.

	SUBSTANCES	ELEMENTS	SHARE OF WEIGHT (%)
Iron	Iron	Fe	Balance
Alloys	Manganese	Mn	0.2-3.0
	Silicon	Si	≤ 0.6
	Carbon	C	0.05-1.0
	Nickel	Ni	≤ 3.0
	Chromium	Cr	≤ 13.0
	Phosphorus	P	≤ 0.04
	Sulphur	S	≤ 0.04
	Molybdenum	Mo	≤ 2.25
	Copper	Cu	≤ 1.00
	Aluminium	Al	0.01-0.06
	Vanadium	V	≤ 1.00
	Niobium	Nb	≤ 1.00
	Tin	Sn	≤ 0.4
	Titanium	Ti	≤ 0.05
	Boron	B	≤ 0.003
	Nitrogen	N	≤ 0.011
	Zinc	Zn	≤ 0.01

PRE-CONSUMER RECYCLED CONTENT

61%

of the global chemical composition of Vallourec products, including ferroalloys, is derived from recycled content.


JOHN DEERE
DEERE
CAP. MAX 5,5 TON

2- GENERAL MANUFACTURING SPECIFICATION

STEEL PRODUCTION

The steel used by Vallourec to manufacture tubes is prepared partly by the Group's steel mills, and partly by purchasing steel ingots and bars from external suppliers. Internally, two processes are used. First, the blast furnace and electric arc furnace facilitate the processing of iron ore pellets and scrap in Jeceaba (Brazil). Second, the fully scrap-based electric arc furnace process is used in Youngstown (United States). Scrap, cast iron and pig iron (depending on the mill) are melted in the furnaces and then poured into the ladle. The continuous casting method then transforms the liquid steel into round solid bars for rolling. In Europe, the share of scrap-based steel suppliers has increased steadily, reaching 30% in 2023.

In Brazil, the Group extracts iron ore from its Pau Branco mine to supply the pellet plant at Jeceaba. Vallourec also owns 165 000 hectares of forests, including 85 000 hectares of eucalyptus plantations and 64 000 hectares of protected forests. Eucalyptus wood is used to produce biomass charcoal, which replaces coal to convert the iron ore into pig iron in the blast furnace.

ROLLING MILLS

The hot-process production of seamless steel tubes, invented in 1886 by the Mannesmann brothers, is a fundamental technology for Vallourec, and is constantly being improved thanks to research. Vallourec offers a wide range of steel products, containing up to 13% chromium.

The hot bars are transferred to the hot rolling mill to carry out piercing, thickness rolling and diameter sizing. Vallourec mills use different methods of hot rolling such as the forge method in France, and the PQF® continuous rolling method in Tianda, China. Once the piercing process is complete, the hollow is created and sent to the lamination mill to obtain the desired final dimensions.

HEAT TREATMENTS

A large share of the Group's premium products is heat-treated to significantly strengthen performance. The heat treatment process is continually being improved to meet the needs of the Group's customers, in particular in terms of respect for the environment, deformation resistance or breaking strength, corrosion resistance, and tube weldability.

FINISHING

Tubes are then finalized in line with market and customer requirements. Non-destructive tests are used to assess the integrity of structures or materials to avoid degradation at various stages of life. Cutting-edge non-destructive test benches, capable of detecting imperfections independently of direction, are used on a daily basis to inspect premium products. Threading technologies are used for API or VAM® premium connections. Other finishing processes can be requested by the customer, such as coating, markings, machining, etc.

PACKAGING

The environmental impact of packaging used for product delivery is considered negligible in accordance with the cut-off criteria established in PCR. Typical packaging includes steel strapping and plastic protectors on tube ends.Some products and accessories are also delivered in wooden boxes.

Vallourec is continuously searching to innovate in terms of sustainable development.
The Group is currently developing a new protector recycling service for customers, which consists of recovering, inspecting, cleaning and reconditioning worn protectors.

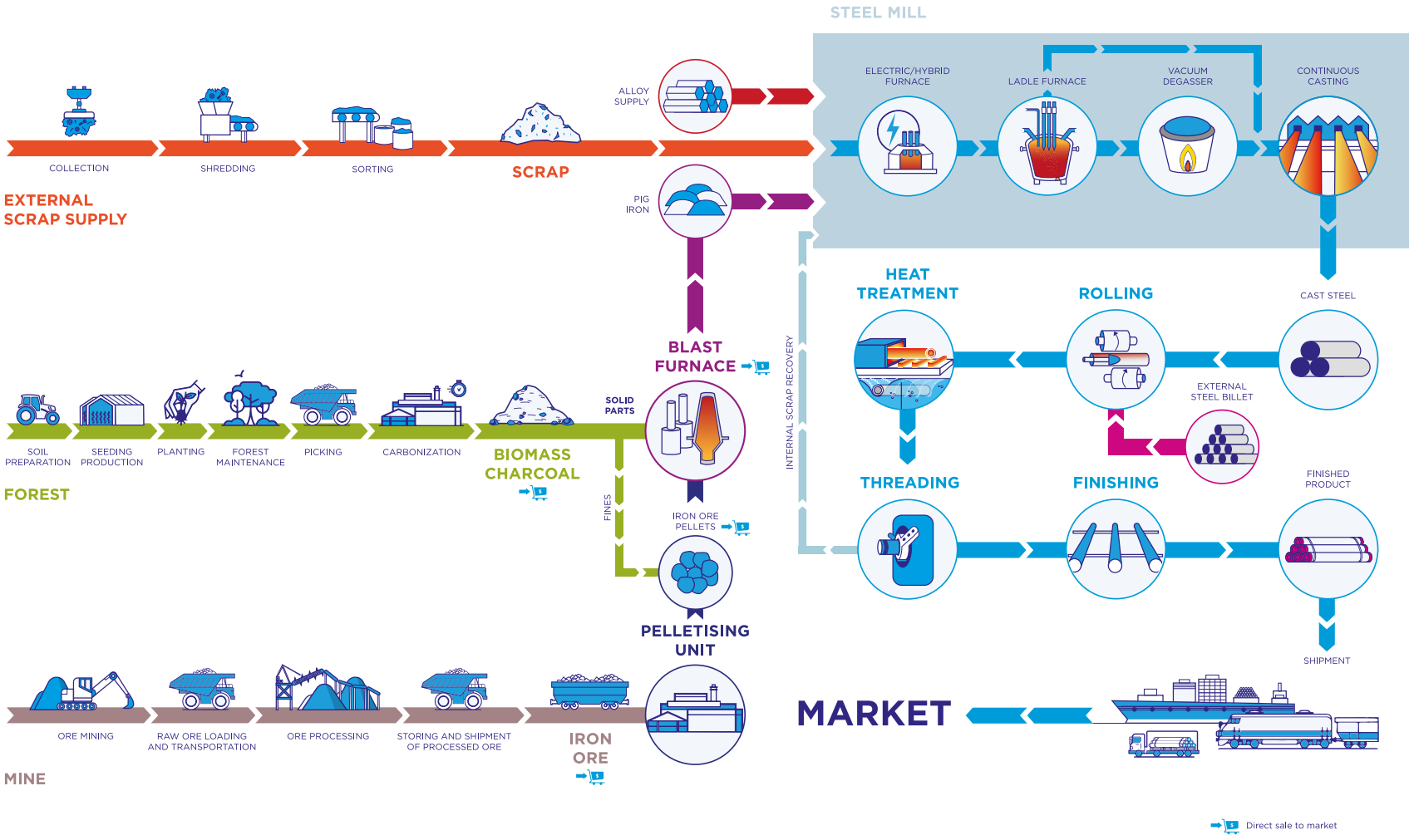
Vallourec is also developing a recovery cycle for non-compliant and unused protectors, which reintroduces them into the manufacturing process after a grinding operation, thus reducing the purchase of plastics.

Finally, Vallourec's teams are developing protectors made from resistant biobased plastics to reduce their environmental impact.

VALLOUREC IN BRAZIL A STEEL PRODUCTION MODEL USING BIOMASS

Vertical integration has been a key feature of Vallourec's subsidiary in Brazil since the very beginning. Vallourec Tubos do Brasil supplies the blast furnace of its Jeceaba steel mill with charcoal from its own eucalyptus forests, and iron ore from its mine in Pau Branco. The Group owns and operates a 165 000-hectare forest estate, of which about 40% is preserved in its natural state. The eucalyptus trees absorb CO_2, from the trunks, stumps and roots, forming a giant carbon sink.This eliminates the need for fossil coke in the blast furnace, thus significantly reducing the Group's carbon footprint.

VALLOUREC GROUP TUBE MANUFACTURING PROCESS



APPLICATION OF CALCULATION RULES TO VALLOUREC'S PROCESSS

UPSTREAM PROCESS

EXTERNAL RAW MATERIAL SUPPLY

Upstream processes cover all operations of Vallourec's suppliers for the procurement of raw materials and energy carriers that are then used in the company's operations, such as:

- Steel billets, bars, ingots and tubes;
- Ferroalloys;
- Scrap;
- Other raw materials feeding the pelletizing plant, blast furnaces and steel mills, such as steel scrap, pig iron, coke, coal, lime, limestone, graphite, etc. - all supplied for Youngstown (USA) and Jeceaba (Brazil) integrated sites with steel mills.

The environmental impacts of raw materials and energy carriers are assessed from cradle to Vallourec's gate, and cover in particular:

- Extraction and/or mining and/or collection, sorting and processing;
- Process emissions resulting from the purchase of pellets, pig iron, steel and steel products;
- Land management and wood carbonization for the production of biomass charcoal, including CH_4 emissions associated with the purchase of biogenic pig iron;
- Transportation from the supplier's site to Vallourec's gate.

The environmental impacts of the construction of power plants, such as the manufacture of solar panels or nuclear power plants that supply electricity to Vallourec is accounted for. Transportation and distribution losses are also included, as well as the upstream transformation of fossil fuels consumed by Vallourec.

INTERNAL STEEL MAKING

Steel making can also be integrated as part of Vallourec's operations, in the steel mills of Jeceaba (Brazil) or Youngstown (USA). Industrial processes include:

- Internal raw material manufacturing, such as iron ore extraction and processing, eucalyptus forest management, charcoal production and ore pelletization;
- Land management and wood carbonization for the production of biomass charcoal (in Brazil's Florestal Eucalyptus forest) with CH_4 emissions from charcoal carbonization kilns, and zero CH_4 emissions from Vallourec's innovative Carboval process;
- Process emissions related to chemical reactions in the pelletizing plant, blast furnace and electric arc furnaces;
- Internal transportation of raw materials and intermediate products (including iron ore, pellets and charcoal) to the pelletizing unit, blast furnaces and steel mills.

CORE PROCESS

TUBE MANUFACTURING

Tube making represents the last part of Vallourec's process, which consists of:

- Rolling mills, transforming steel billets into hollow tubes;
- Heat treatment units, so that seamless steel products meet specification criteria;
- Finishing lines, with various applications such as threading, quality testing, painting, or coupling tube ends with plugs;
- Transportation of semi-finished tubes from one Vallourec mill to another;
- Electricity production, either through on-site solar panels, or diesel generators;
- Internal recovery, or treatment of the waste generated by the manufacturing process;
- Water treatment and recirculation, as the core process requires cooling and quenching.

3- LIFECYCLE ASSESSEMENT RESULTS

LCA RESULTS

CRADLE TO GATE

The following tables present detailed environmental performance in terms of potential environmental impacts, use of resources and waste generation per ton of tubes produced.

Results are presented for the two defined stages of the "Cradle to Gate" analysis, including upstream processes and core processes.

To enhance data transparency, core processes have been split between steelmaking operations and tube manufacturing.

DECLARED UNIT (D.U.)

Results are expressed per ton of fabricated tube ready to be delivered to the final customer.

The LCA inventory was produced for tubular products manufactured worldwide.

The grouping of inventories for each plant was determined by the share each plant contributes to the overall production of tubular products worldwide.

POTENTIAL ENVIRONMENTAL IMPACTS

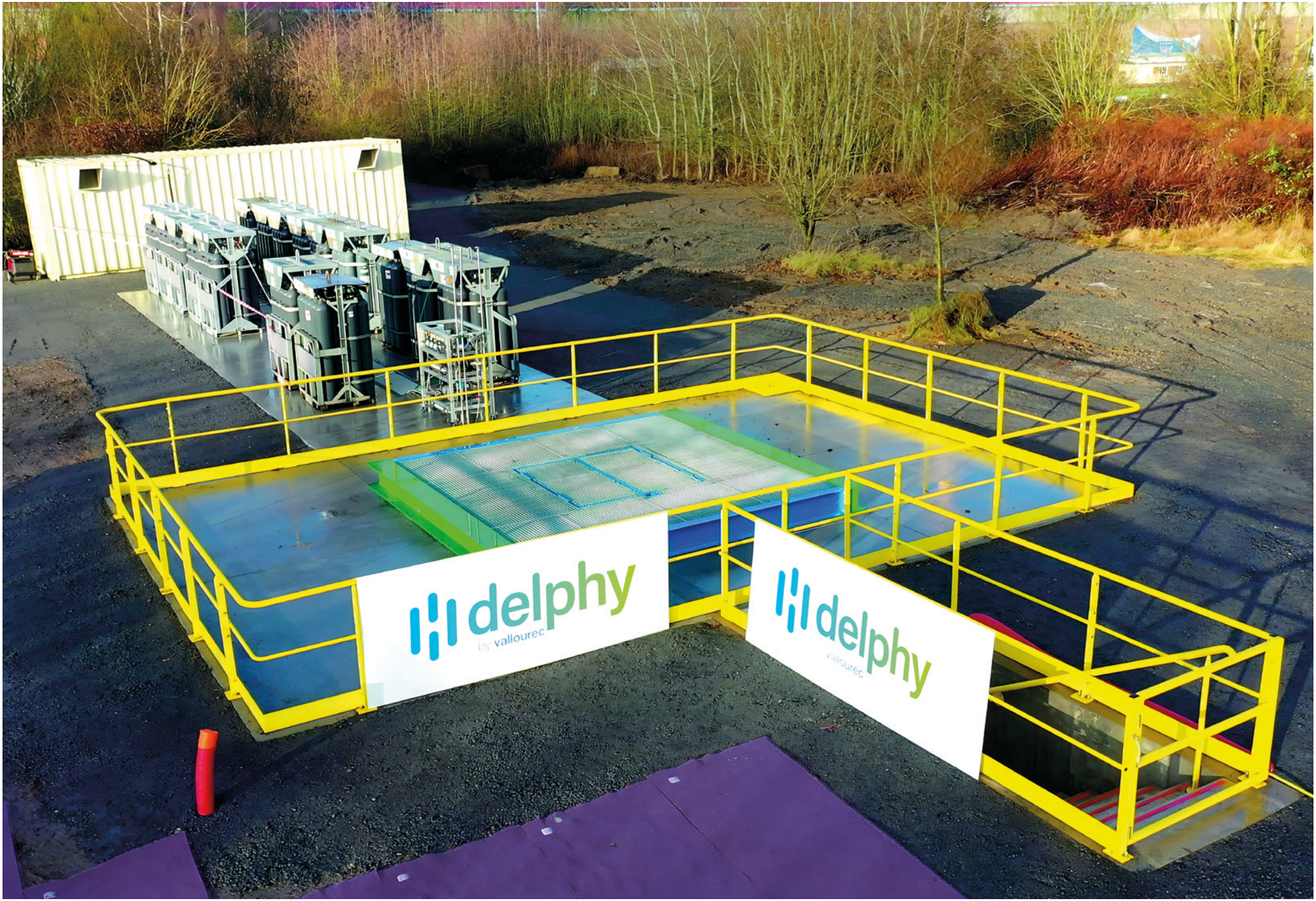
PARAMETERS		UNITS / DU	Upstream	Core	TOTAL
Global warming potential (GWP)	Climate change - Fossil	kg CO_2 eq	8.12E+02	4.83E+02	**1.30E+03**
	Climate change - Biogenic	kg CO_2 eq	1.36E+02	1.03E+01	**1.46E+02**
	Climate change - Land use and land use change	kg CO_2 eq	2.06E+00	5.83E+00	**7.88E+00**
	TOTAL	**kg CO_2 eq**	**9.51E+02**	**5.00E+02**	**1.45E+03**
Ozone Depletion Potential (ODP)		kg CFC11 eq	1.36E-05	9.71E-06	**2.33E-05**
Acidification potential (AP)		mol H+ eq	3.85E+00	1.46E+00	**5.32E+00**
Eutrophication potential (EP)	Eutrophication, freshwater	kg P eq	5.34E-02	3.20E-03	**5.66E-02**
	Eutrophication, marine	kg N eq	8.65E-01	4.93E-01	**1.36E+00**
	Eutrophication, terrestrial	mol N eq	9.19E+00	5.16E+00	**1.44E+01**
Photochemical oxidante creation potential (POCP)		kg NMVOC eq	4.15E+00	1.85E+00	**6.01E+00**
Abiotic depletion potential (ADP)	Metals and minerals	kg Sb eq	3.25E-02	5.88E-04	**3.31E-02**
	Fossil resources	MJ	1.27E+04	8.99E+03	**2.17E+04**
Water scarcity potential (WSP)		m^3 depriv.	1.68E+02	2.61E+02	**4.28E+02**

RESOURCE USE INDICATORS

PARAMETERS		UNITS / DU	Upstream	Core	TOTAL
Primary energy resources - Renewable	Use as energy carrier (PERE)	MJ, net calorific value	1.28E+04	9.01E+02	**1.37E+04**
	Use as raw materials (PERM)	MJ, net calorific value	0.00E+00	0.00E+00	**0.00E+00**
	Total (PERT)	**MJ, net calorific value**	**1.28E+04**	**9.01E+02**	**1.37E+04**
Primary energy resources - Non-renewable	Use as energy carrier (PENRE)	MJ, net calorific value	1.56E+04	9.86E+03	**2.55E+04**
	Use as raw materials (PENRM)	MJ, net calorific value	0.00E+00	0.00E+00	**0.00E+00**
	Total (PENRT)	**MJ, net calorific value**	**1.56E+04**	**9.86E+03**	**2.55E+04**
Secondary material (SM)		kg	5.66E+02	0.00E+00	**5.66E+02**
Renewable secondary fuels (RSF)		MJ, net calorific value	0.00E+00	0.00E+00	**0.00E+00**
Non-renewable secondary fuels (NRSF)		MJ, net calorific value	0.00E+00	0.00E+00	**0.00E+00**
Net use of fresh water (FW)		m^3	5.98E+00	7.40E+00	**1.34E+01**

WASTE

PARAMETERS	UNITS / DU	Upstream	Core	TOTAL
Hazardous waste disposed (HWD)	kg	2.34E+02	7.16E+00	**2.41E+02**
Non-harzardous waste disposed (NHWD)	kg	9.37E+02	1.32E+02	**1.07E+03**
Radioactive waste disposed (RWD)	kg	6.70E-02	3.96E-02	**1.07E-01**


delphy
by vallourec
delphy
vallourec

4- ADDITIONAL ENVIRONMENTAL INFORMATION

VALLOUREC STEELMAKING TECHNOLOGIES ARE LOW-EMISSION BY NATURE

RECYCLED SCRAP FOR STEEL PRODUCTION

OVER
61%
OF STEEL SOURCED FROM RECYCLED SCRAP

THIS FIGURE IS EVEN HIGHER FOR OUR OWN STEEL PRODUCTION:

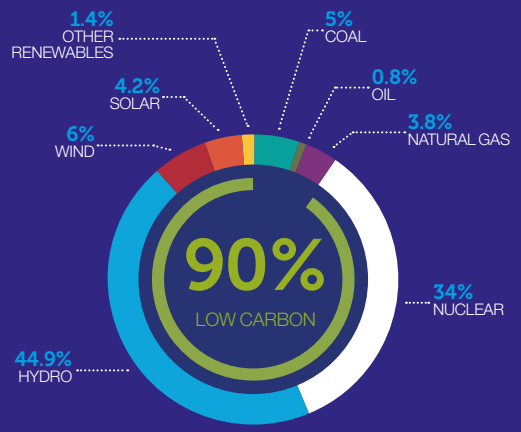
IN US: **>96%**

IN BRAZIL: **>62%**

Global market benchmark:
Vallourec sources over 61% of steel from recycled scrap for tubular products compared to a global average of 29%(1)

(1) WorldSteel Association, 2023

A LOW-CARBON(1) ELECTRICITY MIX



Global market benchmark:
Vallourec uses 90% low-carbon(1) electricity while only 20% of the global electricity supply is low-carbon(2)

(1) Low-carbon electricity includes renewables and nuclear sources
(2) International Energy Agency, World Energy Outlook 2023

BIOMASS CHARCOAL REPLACES FOSSIL COAL(1)

100%
OF PIG IRON USED IN VALLOUREC'S BLAST FURACE IS PRODUCED WITH BIOMASS CHARCOAL

VALLOUREC OPERATES A 165 000-HECTARE FOREST

40%
OF WHICH IS PRESERVED IN ITS NATURAL STATE

(1) Source of Vallourec Data: Vallourec Universal Registration Document (2023 Annual Report)

VALLOUREC: A TRUSTWORTHY PARTNER FOR CUTTING-EDGE STEEL SOLUTIONS

VALLOUREC TUBULAR SOLUTIONS WORLDWIDE KEY FIGURES (2023)

1.45
TONS OF CO_2 -EQUIVALENT EMITTED PER TON OF TUBE

90%
OF ELECTRICITY CONSUMED IS LOW-CARBON

11%
OF WATER USE FOR TUBE PRODUCTION COMES FROM RAIN

73%
OF SPENDING IS WITH SUPPLIERS UNDER CSR PERFORMANCE ASSESSMENT

97.6%
OF WASTE IS RECOVERED

THE NEW VALLOUREC PLAN

Puts sustainability at the core of the company's transformation needs through:

- A strong decarbonization commitment
- Supporting customers in their energy transition
- A leading R&D network

RECOGNIZED BY ESG BODIES

CDP 2023
CLIMATE CHANGE A-
WATER B
FOREST C
MSCI 2024 A
ecovadis 2023

WATER MANAGEMENT

Vallourec has set the goal of reducing its water intake by 10% per ton processed by 2025 compared to 2017, particularly by treating wastewater for recirculation. The use of rainwater and investments in new cooling systems are further actions to reduce Vallourec's water footprint.

CIRCULAR ECONOMY

Vallourec promotes sustainable production methods by significantly limiting the need to source new natural resources. In 2023, 78% of resources consumed were from a renewable source. The 3R rule (Reduce, Reuse, Recycle) is deployed at all industrial plants.

CLIMATE

Vallourec's carbon emissions reduction targets cover its full value chain (scope 1, 2, 3 upstream and 3 downstream). They are aligned with a well-below 2°C trajectory, as approved by the Science Based Targets initiative (SBTi).

THE ENVIRONMENTAL BENEFITS OF VALLOUREC'S FOREST (FLORESTAL, BRAZIL)

During growth, eucalyptus trees absorb carbon dioxide (CO_2) from the atmosphere through the process of photosynthesis and convert it into carbon-based compounds including wood. This wood is then pyrolyzed to make biomass charcoal used in the Jeceaba blast furnace and pelletization plant.

The method for calculating the amount of CO_2 sequestered annually by Vallourec's forest is a result of numerous studies conducted in cooperation with different scientific authorities.

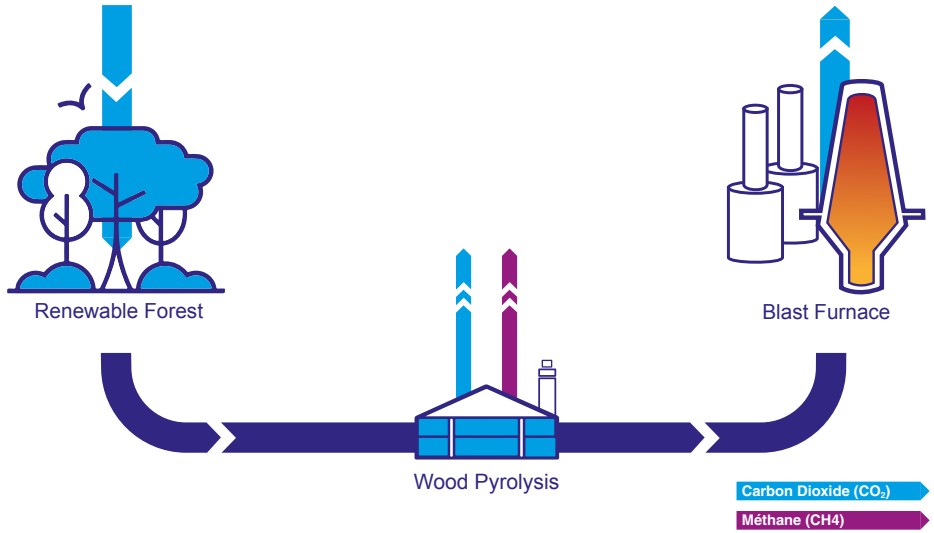
The reference study covered a 30-year period in order to account for the amount of charcoal produced, and the amount of carbon absorbed by the wood (trunks, stumps and roots).

Using this data, it was possible to calculate the ratio of CO_2 sequestered per ton of charcoal produced and the annual amount of CO_2 sequestered by the forest.

Biogenic CO_2 emissions were found to be neutral in terms of biogenic Global Warming Potential in accordance with the PCR.

Using this approach, the CO_2 resulting from charcoal carbonization and combustion by the Jeceaba blast furnace was found to be equal to the forest's carbon dioxide intake during tree growth. This rule is not applicable to CH_4 emissions from charcoal carbonization.

Despite methane emissions, producing pig iron with charcoal has a CO_2 footprint that is roughly two times less than coal-based coke production. This figure could be further reduced using Carboval's methane-free technology.



CARBOVAL : A METHANE-FREE WOOD CARBONIZATION PROCESS

Vallourec has started operating a new industrial plant for the production of biomass charcoal originating from its renewable forests, using Carboval technology. The process reduces the raw material transformation cycle from 16 days to 16 hours, without releasing methane and using around 95% of the energy contained in wood. The first Carboval reactor was successfully implemented in Vallourec's Florestal unit located in Paraopeba (Minas Gerais). Since then, three new reactors have been put into operation.

Carboval also enables a boost in productivity. In just 16 hours, each reactor is capable of producing up to 22 tons of biomass charcoal with a quality that is far superior compared to conventional kilns. The charcoal's fixed carbon content (the source of energy for the chemical reactions) can reach up to 85%.

As a result of the carbonization process, the Carboval production method creates bio-oil, used in the fuel, chemical, food, cosmetic, veterinary and pharmaceutical industries. It also produces pyroligneous extract, which is used in agriculture as an organic herbicide and for soil conditioning.

5- NORMATIVE REFERENCES

In Brazil, Vallourec Florestal LTDA produces its own charcoal from a sustainably-managed forest (Cerflor Certifcate n°XSQ/0237-01/BH).

To comply with the PCR standard, biogenic CO_2 emissions due to charcoal production and combustion are neutralized by capturing CO_2 in the Eucalyptus wood. No benefits have been accounted for other indicators.

CO_2 emissions due to charcoal production and combustion are accounted for in the "Upstream Process, Steelmaking" stage and CO_2 sequestration is also accounted for in this same stage. This does not apply to CH_4 emissions from the carbonization process, which are consequently fully declared in the "Upstream Process, Steelmaking" stage.

ISO 14044:2006

Environmental Management-Life Cycle Assessment-Requirements and guidelines.

ISO 14040:2006

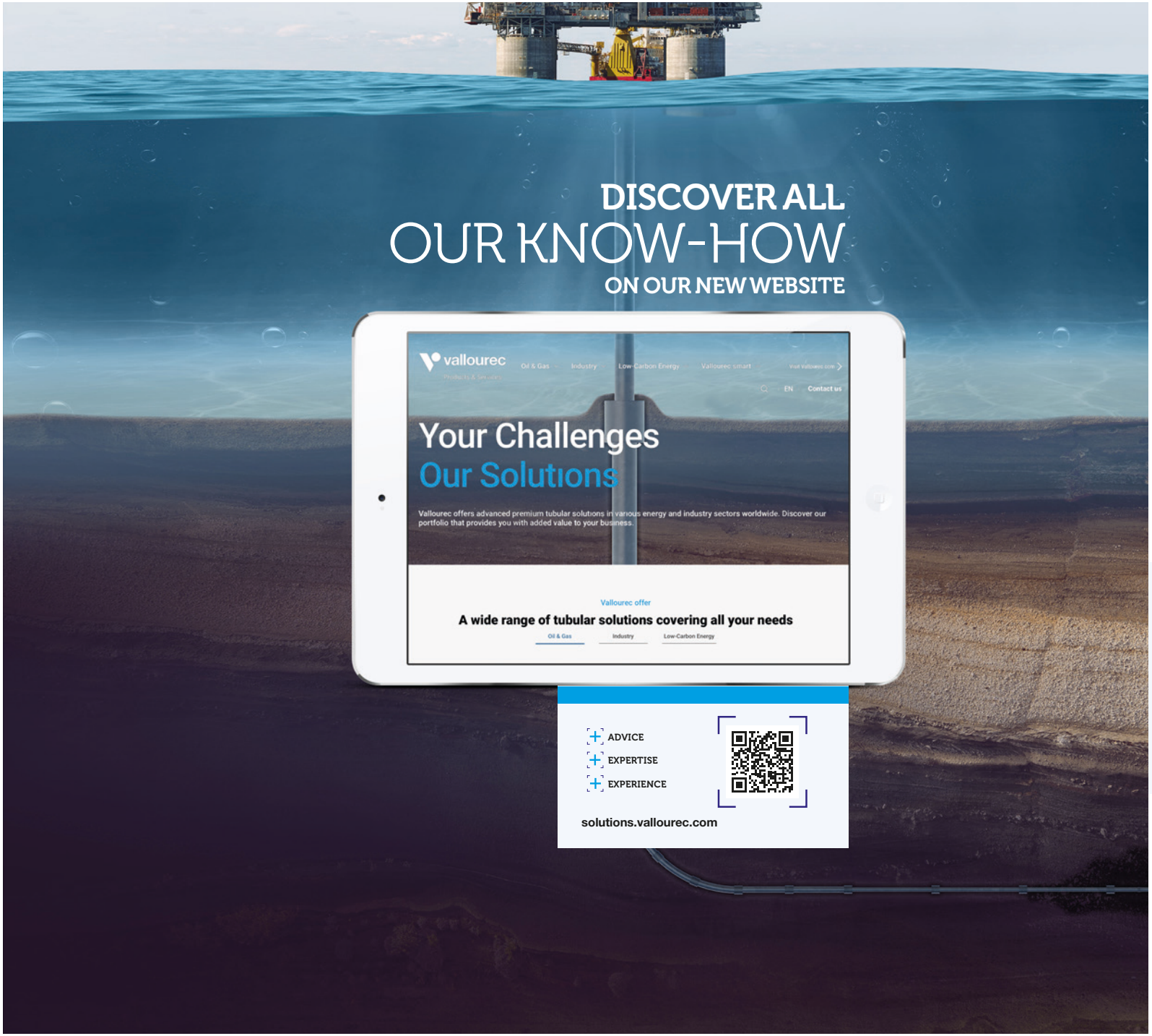
Environmental Management-Life Cycle Assessment-Principles and framework.

ISO 14025:2010

Environmental labels and Declarations-Type III Environmental Declarations-Principles and procedures.

PCR 2014:10

"Fabricated Steel Products, Except Construction Products" v2.12.



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