CIRCULAR ECONOMY

DOUBLE MATERIALITY

MATERIAL TOPICS:
- Circular economy

SUSTAINABILITY PLAN PILLAR

GROWTH ACCELERATORS
- Circular economy

SUSTAINABLE DEVELOPMENT GOALS (SDGs)

For Enel, the circular economy is a strategic lever to boost the energy transition through an integrated approach to reduce fossil fuel consumption by generating renewable energy and raw materials involved in the construction of new assets.

Below the 2023 results related to the previous 2023-2025 Sustainability Plan, the resulting progress and targets of the 2024-2026 Sustainability Plan, which may be redefined, added, or outdated with respect to the previous Plan.

ACTIVITIES	2023 RESULTS	2024-2026 TARGETS	MAIN SDGs
CIRCULARITY ALONG THE VALUE CHAIN			
Valorization of spare parts, equipment and scrap from the demolition of thermal power plants and promoting the adoption of circular business models	**39 million euros** in revenues generated from Reselling and Recycling activities in the two-year period 2022-2023	**53 million euros** in revenues generated from Reselling and Recycling activities in 2024(1)	12
Circularity improvement(2)	**68%**	*Target is considered outdated*	8 12

(1) Reselling and Recycling activities carried out on the basis of the progress of demolition work and the market value of the scrap.
(2) The Circularity improvement KPI measures the reduction in the consumption of fuel and materials by the Group's plants throughout their life cycle compared to the energy produced, compared to 2015.

Goals
New · Redefined · Outdated

Progress
Not in line · In line · Achieved

N.A. = not applicable, target not included in the 2023-2025 Sustainability Plan

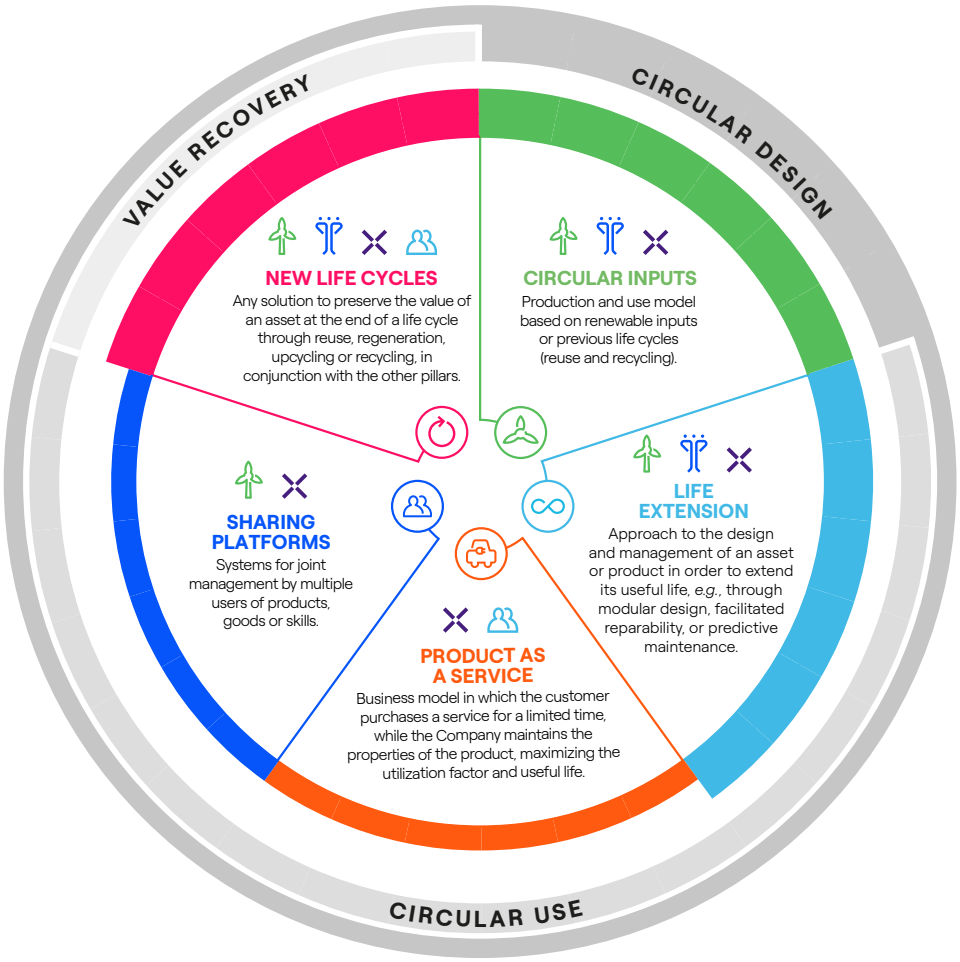
CIRCULAR ECONOMY

As part of Enel's energy transition process, an integrated approach was adopted from the outset, which allows for a reduction in the consumption both of fossil fuels thanks to power generation from renewable sources, and of raw materials used in the construction of new assets thanks to the principles of the circular economy.

In particular, **a circular model enables an accelerated transition and ensures competitiveness, resilience, and sustainability** in several areas:

- environmental, by reducing environmental impacts tied to the procurement of virgin raw materials;
- social, by fostering the creation of local value chains;
- economic, by creating new revenues and reducing procurement risks and uncertainties tied to supply chains and external shocks.

The Group's vision of the circular economy is inspired by the main international standards and is structured through all the different phases of a product's life, based on five pillars: circular inputs (inputs from renewables, recycling, reuse); life extension (through modularity, facilitated reparability, and predictive maintenance); product as a service (the Company provides the customer with a service and remains the owner of the product, maximizing its use factor and useful life); sharing platforms (shared use of an asset among multiple users); and new life cycles (recovery of value of assets and materials, *e.g.*, through reuse and recycling).



A key element to fully redesign the value chain with a circular approach is the collaboration with suppliers, customers, institutions, associations, other actors in the supply chain and other sectors more generally, since waste material from one production chain may serve as a resource for another. It is vital to extend this collaboration to the innovation ecosystem too (see the chapter on "Innovation"), so that the entire model can be redesigned by leveraging new solutions, not only from a technological standpoint, but also from a business model, regulatory and collaborative perspective.

Governance and policy

The circular economy is a cross-cutting issue that impacts the entire life cycle of an asset. This is why it is key to engage different areas of the Company, from procurement, operation & maintenance, through to the structures that manage assets at the end of life. This integrated approach makes it possible to minimize commodity-related impacts and identify economic and improvement opportunities.
To this end, the "Enel Grids and Innovability – Sustainability" Function contains a specific unit, which plays a guiding and coordinating role at Group level in management processes that deal with circularity and activities in the Countries and Business Lines to ensure a coordinated approach to strategies, foster knowledge-sharing and build synergies.
The circular economy is an essential lever for Enel's environmental commitments and its application in business activities is one of the strategic objectives of the Group's Environmental Policy[1], which was updated this year to further strengthen the commitment to circularity. In particular, these include promoting circular economy approaches and initiatives that involve working with the supplier ecosystem throughout the life cycle to reduce resource consumption and minimize environmental impacts throughout the value chain, incentivizing the use of secondary raw materials, improving material tracking, and identifying opportunities for extending the useful life of assets and maximizing the amount of assets and materials recovered at the end of life.

Role of raw materials in the energy transition and in Enel's strategy

Over the past few years, there has been a heightened interest in raw materials as a result of growing demand in key energy sectors (renewables, storage systems, distribution networks, electric mobility) as well as pressing concerns over supply risks, price uncertainty, and environmental and social impacts. Against this backdrop, events such as the war in Ukraine and other geopolitical tensions in recent years have added to the complexity of the issue, prompting a shift in response from numerous organizations. For example, in early 2024 the European Union approved the **Critical Raw Materials Act** with the aim of fostering EU access to a competitive and sustainable supply of critical materials[2] by supporting the development of domestic supply chains and innovative research projects. This document lists 34 critical raw materials (including silicon, lithium, copper and aluminum), identified according to their economic importance and supply risk. Of the critical raw materials, 17 are listed as strategic given their use in technologies of high strategic importance; these include rare earths, lithium and silicon, materials used in wind turbine motors (mainly in offshore wind turbines), batteries and photovoltaic panels.

Back in 2020, Enel launched a working group that involves all internal business areas to develop and update the Group's raw materials strategy, with a particular focus on critical raw materials.
The Group's strategy involves: assessing raw material needs based on industrial and strategic plans and end-of-life material flows; risk and impact assessments on environmental, economic, geopolitical and social issues (with a particular focus on human rights); identifying priority areas of intervention; and lastly, developing measures to mitigate risks and impacts through specific business projects and actions.
The results of the analysis conducted by the working group in 2023 show that **the equipment and related raw materials sourced by the Group (both currently and prospectively) are mainly tied to the development of renewable technologies** (photovoltaic, wind, batteries) **and the distribution network, but also involve end-customer solutions and digital assets**.
With respect to the raw materials used by the Group, it is estimated that concrete and metals (steel, aluminum, copper) have the highest volumes (in tons). Concrete is the most widely used material, being used in particular for foundations of wind and solar power plants as well as grid assets such as substations and poles. Metals are present in all of the Group's assets: steel for wind towers, foundations, poles, transformers, public lighting, photovoltaic trackers; aluminum is used in cables and photovoltaic panels; and copper in various electronic components used in grid, wind, photovoltaic, and battery assets.
Based on the most recent list of the Critical Raw Materials Act, **the Group is estimated to require around 8% critical raw materials**. If copper and aluminum (metals recently

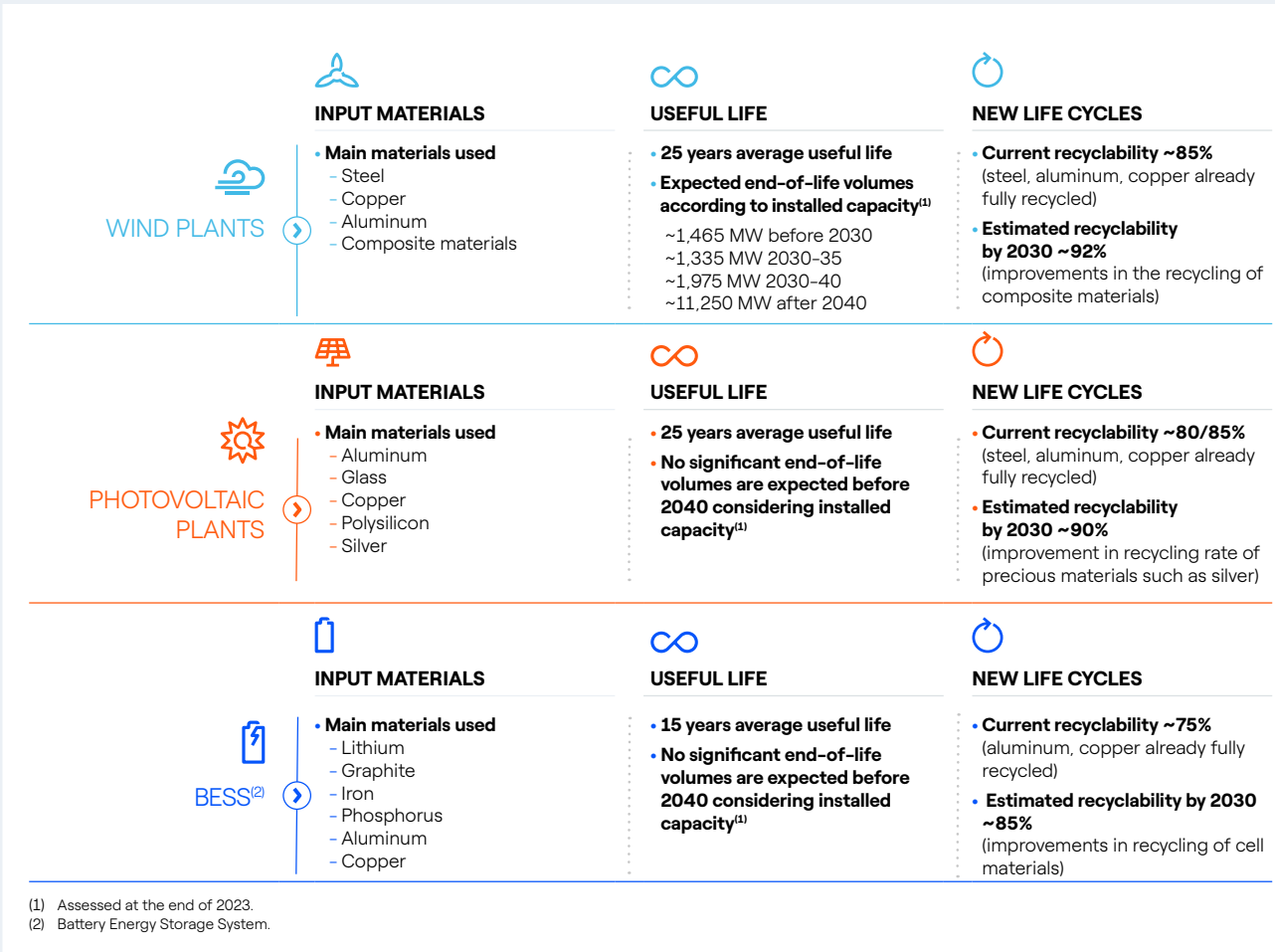
(1) Reported in the "Roadmap towards natural capital conservation" chapter of this Report.
(2) https://ec.europa.eu/commission/presscorner/detail/en/ip_23_1661.

added to the list) were excluded, and only critical raw materials for specialized technological applications (such as polysilicon and lithium) were considered, this requirement decreases to around 1%.

The materials identified as priorities for the Group are polysilicon, base metals (steel, copper, and aluminum), **and specialized materials used in batteries** (*e.g.*, lithium and graphite). Identifying priority focus areas is key to determining the actions and circular economy projects needed to mitigate the associated risks and impacts (see the section on "Enel's key circularity initiatives").
Some **examples of these actions** include developing specialized expertise on raw materials, with an analysis of the recyclability of key assets (see the box on "Analysis of recycling technologies for renewables"); targeted training on raw materials aimed at the units most involved in the topic; specialized studies (see the box on "Enel Foundation"); external benchmarks with other leading companies; analyses of market dynamics on raw materials; and focus groups with raw material producers.
Enel also collaborates with associations and institutions active on the issue. For example, the Company is part of the European Raw Materials Alliance (ERMA) – an initiative launched by the European Union in late 2020 with the aim of ensuring access to all raw materials needed to realize the vision for Europe's Green New Deal. ERMA identifies barriers, opportunities and investment cases for building capacity at all stages of the value chain, from mining through to waste recovery.

Analysis of recycling technologies for renewables

In 2023, the raw materials working group conducted an analysis of current and forward-looking recycling technologies for key renewable technology equipment (wind turbine, photovoltaic module, lithium batteries) by engaging suppliers, recycling companies, internal estimates, and external studies on the topic. The analysis considered the characteristics of the recycling technologies generally available to date on an industrial scale, and made a prospective estimate of the recycling efficiency trends for the main materials involved in renewable technologies.



(1) Assessed at the end of 2023.
(2) Battery Energy Storage System.

Circularity in mining and renewable energy value chains

In 2023, the Fondazione Centro Studi Enel (Enel Foundation) developed several initiatives to investigate possible material shortages and what has been called "green inflation". This term was introduced to describe the rising prices of metals and minerals, such as copper, aluminum, and lithium, which are essential for solar and wind power, electric cars and other renewable technologies. To this end, as part of the collaboration agreement between Enel Foundation and ICMM (International Council on Mining and Metals), the study "Circularity in mining and renewable energy value chains. Technological, policy and financial aspects"[3] was developed together with CCSI (Columbia Center on Sustainable Investment). The research focused on identifying the political, legal, regulatory and financial barriers in the mining and energy sector, as well as on the levers and strategies to explore potential circular business models and pathways for energy transition, to be adopted in line with the specific characteristics of the sectors and various value chains.

The aim of the study was to highlight and disseminate the idea that, in order to eliminate technical and logistical barriers to circularity in solar and wind energy mining value chains, more political and financial support is needed, along with commitment from the sectors involved: from mining and metals companies through to utilities, manufacturers and research institutions. The report therefore prompts these sectors to actively develop strategies that increase the circularity of the critical materials needed for the energy transition.

Circular economy metrics and targets

In Enel's journey towards circularity models, metrics have long been a key element in assessing the effectiveness of the solutions to be implemented and in defining a roadmap for improvement (for more information see the CirculAbility© model). Throughout the years, various indicators and metrics have been developed on the measurement objective, maintaining a joint approach based on both the quantitative analysis of all input and output resource flows, and the dual assessment of environmental and economic impacts.

Specifically, two types of indicators are currently used at the Group level:

- operational indicators, which measure in-depth the impacts of individual circular economy initiatives in both environmental (*e.g.*, assessment of the tons of material recovered) and economic terms (*e.g.*, assessment of the EBITDA generated from the sale of materials for recovery);
- overall performance, which is assessed by decoupling business activities from resource consumption, *i.e.*, maximizing economic value creation (*e.g.*, in terms of EBITDA) or industrial value creation (*e.g.*, in terms of energy produced) of a business activity, while reducing the consumption of fuels and raw materials it requires.

For example, with regard to overall performance appraisal, the **KPI "Improving circularity"** was developed, which measures the reduction (compared to 2015) in the consumption of materials and fuels of the Group's plants against the energy generated. To extend this assessment not only to generation, but also to the activities of the entire Group, the **Economic CirculAbility©** indicator was developed, which considers the Group's total EBITDA (in euros) and compares it with the amount of resources consumed (in tons) by the various business activities (both fuels and raw materials) throughout the value chain.

(3) https://ccsi.columbia.edu/circular-economy-mining-energy.

Enel's key circularity initiatives

The Group's action plan focuses on materials identified as priorities, but initiatives are also being pursued on other materials such as plastics, composites, and concrete, which present significant challenges and highlight room for improvement in terms of circularity. Enel's circularity initiatives cover components for the distribution network, construction and operation of renewable plants (wind, solar, BESS), and products and services for end customers, and focus mainly on three of the five pillars of the circularity model adopted.

Circular inputs

In the design phase of a product, raw material consumption can be reduced by using circular inputs, *i.e.*, from previous or alternative and more sustainable life cycles, or by optimizing the use of resources.
For components of public lighting systems and for electrical distribution assets such as transformers and poles, mechanisms have been introduced in tenders to promote the purchase of equipment with reduced CO_2 impact, encouraging the use of recycled aluminum and steel.
Moreover, storage systems based on non-traditional technologies and chemistries are being studied and tested (see the chapter on "Innovation").
The "Circular by design" approach, on the other hand, allows for integrated action to optimize material consumption and use, and was adopted by Enel Grids as part of the development of the new secondary substation design. Thanks to this approach, a new secondary substation design was developed in 2023 aimed at promoting landscape integration, solutions with lower environmental impact, and modularity (see the chapter on "Innovation").

	BASE METALS	MATERIALS FOR SPECIALIST APPLICATIONS	POLYSILICON	OTHER MATERIALS
CIRCULAR INPUTS	Low-carbon or recycled materials for network assets (*e.g.*, transformers, poles)	New technologies for storage	**Technological innovation and efficiency in solar panel production (3Sun)**	**Use of recycled plastic (charging solutions, Circular Smart Meter)**
	Recycled aluminum for lighting poles			New secondary substation design
	Sustainable Procurement Strategy			

Main Group projects in 2023

TECHNOLOGICAL INNOVATION IN SOLAR PANEL PRODUCTION (3SUN)

The 3Sun Gigafactory project in Catania is moving towards greater independence for the photovoltaic supply chain, not only by bringing cell and panel production to European soil, but also by using innovation to reduce silicon use intensity and aiming for a diversified and sustainable supply chain.
Starting in 2024, the new high-efficiency HJT panel will optimize the amount of silicon in modules by using silicon slices that are 15% thinner. Innovations in metallization grids and Electrically Conductive Adhesives (ECAs) in panels are in the pipeline for the coming years, which will reduce silver use by

30% in 2025 and over 60% in the following years. Moreover, there will be a further increase of at least 20% in panel efficiency compared to today, by using a tandem structure which can produce more energy for the same amount of material used in the installed modules.

SUSTAINABLE PROCUREMENT STRATEGY

With its Sustainable Procurement strategy, the Group aims to improve the sustainability of purchased products in terms of carbon footprint, circularity, and respect for human rights, through whole-life tracking of environmental and social impacts, and mechanisms to select the most virtuous suppliers on these issues. In particular, for the main commodity categories and core components[4], Enel asks its suppliers to disclose the quantities of materials present in the components used by the Group (*e.g.*, metals such as steel, aluminum, and copper), and the respective recycled and recyclable shares. This information is integrated through certifications such as the EPD (Environmental Product Declaration) – a voluntary certification scheme which provides an integrated view of environmental impacts relating to raw materials, enabling the use of bidding requirements and reward factors to incentivize suppliers to offer increasingly sustainable products (*e.g.*, encouraging the use of recycled material).
Similarly, an *ad hoc* tool was developed for mapping the upstream supply chain, with the aim of assessing potential points of concern regarding human rights compliance (see the chapter on "Sustainable supply chain")

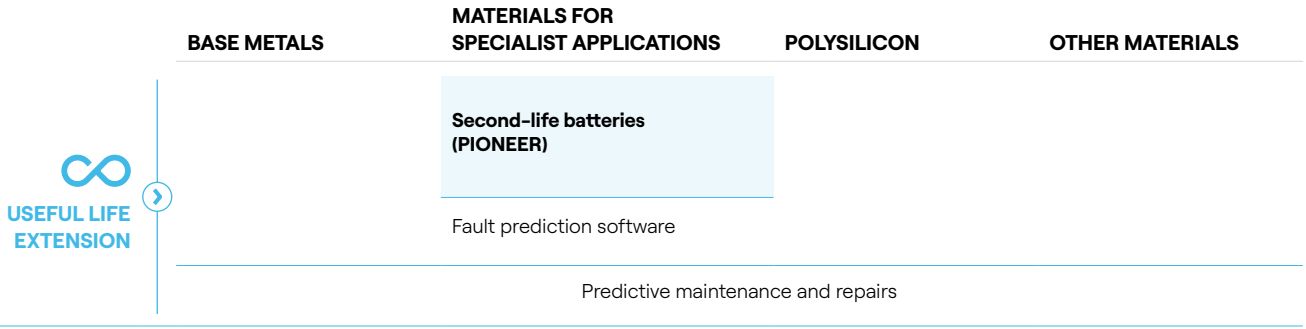
CIRCULAR USE OF PLASTICS

Enel's private and public AC (alternating current) charging solutions use recycled polycarbonate as the main structural material: 100% for Wayboxes and 75% for Waypoles. In 2023 alone, over 3,700 Waypole public charging stations were installed globally, including around 2,000 in Italy, and 88,488 Wayboxes were sold. Thanks to an integrated approach in the design phase, the use of materials (mainly the metal component) for Waypoles was also optimized compared to the previous design, reducing the overall weight of the product by about 32%.
In 2020, production began of the new Circular Smart Meter developed through a circular model with a pathway to redesign the electronic meter value chain using recycled plastic. By 2023, around 2.8 million circular meters were produced with a total consumption of 2,000 tons of recycled plastic. 48% by weight of the new meters are reclaimed materials: end-of-life recyclability (plastic, steel and other metals) is estimated at 79% by weight.

(4) Core categories are those that are strategic to the business, including wind turbines, inverters, smart meters, photovoltaics, switches, switchgear, cables, transformers, charging stations, street lighting, smart home solutions and storage systems.

Useful life extension

Using an asset for longer reduces the need for new assets and, in turn, reduces the overall need for materials. This is why the Group is always looking for new technological solutions to extend the years of asset operation, while still maintaining performance and efficiency. Various initiatives have been carried out in all Countries for several years now, including the application of machine learning techniques for predictive maintenance and, more generally, repairs of components used in the grid and in solar and wind power plants. Another example of life extension activities is the development of software for fault prediction within storage systems.



Main Group projects in 2023

THE PIONEER PROJECT

With the PIONEER project (airPort sustalnability secONd lifE battEry stoRage) in Italy, Enel is collaborating with ADR (Aeroporti di Roma) to develop the design for a storage system to be built at Fiumicino airport, which plans to reuse end-of-life batteries from electric vehicles. In 2023, the system's executive design was completed, for a storage capacity of 10 MWh, which plans to reuse 786 second-life batteries.

The partnership between Enel and ADR also includes the creation of a large self-consumption photovoltaic plant in Europe. The plant will be built in collaboration with Circet SpA, a leading continental infrastructure development company, and will consist of around 55,000 photovoltaic panels placed on a total area of 340,000 m^2. With a capacity of 22 MWp once fully operational, the plant will generate around 32 GWh of renewable energy per year, saving more than 9,300 tons of CO_2.

New life cycles

When an asset reaches the end of its useful life, the goal is to identify solutions that maximize the amount of materials recovered and reintroduce them into new production cycles. All of the Group's various Business Lines are actively involved in major asset recycling projects.
In the photovoltaic sector, Enel – together with other players in the photovoltaic supply chain – is participating as a partner in the Photorama project, funded by the European Union, which aims to demonstrate the technical and industrial feasibility of recycling solar panels by maximizing the recovery of materials including silver, silicon, indium, gallium[5]. Also in the wind power sector, Enel is participating in projects at European level to develop new recycling plants for the recovery of wind blade materials through the generation of secondary raw material that may be used in new industrial processes (see the chapter on "Innovation"). In Chile, some 130 new power distribution poles were built in 2023 using concrete from decommissioned power line poles. The material is processed and used as aggregate for the production of the new poles, thereby avoiding the use of virgin gravel and sand. This way, the new poles have a recycled aggregate content of 45%.
Circular management is also planned for the Group's decommissioned IT assets, including reuse by employees, sale to third parties, or donation for social purposes (see chapter on "Digitalization").

	BASE METALS	MATERIALS FOR SPECIALIST APPLICATIONS	POLYSILICON	OTHER MATERIALS
NEW LIFE CYCLES	**Grid mining**	**Battery recycling**		Recycling of wind turbine blades
	New Life program for equipment and spare parts		Recycling of solar panels	IT asset recovery

Main Group projects in 2023

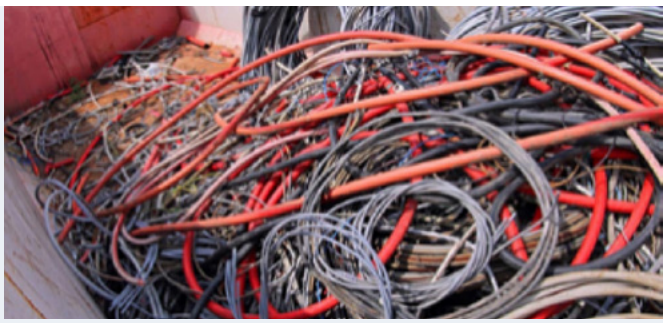
BATTERY RECYCLING

Enel is working with specialized partners to develop a battery recycling plant in Spain (with a target capacity of 8,000 tons/year), with the aim of recovering valuable materials such as cobalt, nickel, and lithium. The project involves the construction of an industrial-scale pilot plant for the recycling of batteries used in the automotive field, near the Compostilla complex – a decommissioned thermoelectric power plant. The innovative system will enable batteries to be recycled through the stages of unloading, dismantling, crushing and sorting of materials, for reintroduction into the production cycles of new accumulators.

(5) https://www.photorama-project.eu/.

GRID MINING

The grid mining strategy aims to review the end-of-life management processes of grid assets with a view to greater sustainability, and to identify practices for recycling and reusing materials to achieve a circular value chain. Grid mining therefore relates to all activities aimed at recovering precious metals and other materials and devices from obsolete infrastructure so as to minimize environmental impacts, maximize social benefits in the area, and create market value.
To ensure comprehensive tracking of materials and facilitate the implementation of the grid mining strategy, a new digital information gathering tool was designed and implemented: the "digital passport" makes it possible to collect and manage data on each type of asset regarding the various types and quantities of materials in use, with the aim



of facilitating recovery opportunities, effectively scheduling grid decommissioning, and maximizing the value of materials. This system is a driving force in the Group's ambition to open up the "mine" to the outside world, making it available to other production chains, and to feed new markets for secondary raw materials. The aim is to promote development in the local area and save virgin materials, thereby creating new job opportunities in waste material recovery initiatives.

NEW LIFE PROGRAM FOR EQUIPMENT AND SPARE PARTS

The New Life program aims to give new life to obsolete spare parts and equipment in power generation plants or warehouses across the globe, for all technologies be it conventional or renewable. With a methodology established at global level, the aim is to give a new life to obsolete parts located in power plant warehouses, equipment in decommissioned power plants, and plants undergoing repowering (*e.g.*, wind and hydro plants) by identifying the best opportunities for the assets: internal reuse, sale, and ultimately recycling. In 2023, the program brought in around 23 million euros in economic value, with 13.8 million euros in "avoided costs" thanks to the internal reuse of spare parts and equipment at all plants in the global scope. An excellent example of internal reuse was the recovery, from the Montalto di Castro plant, of a 1 GT Rotor that was destined for Chile as a strategic spare to cover 3 plants in the country. Another example is the resale of wind turbine components to the Original Equipment Manufacturer.

Daniela Calarco
Head of Asset Management Agreement & New Life Program, Program PM

"With the New Life program, we optimize the management of all spare parts and equipment that are no longer used or obsolete in power generation plants, with the goal of giving these assets a new life. We then identify the most appropriate solution, be it donation, internal reuse in other plants, sale in the external market or, as a last resort, recycling to recover useful parts, thereby generating both financial and environmental benefits"