Circular Economy
Enel Position Paper

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Enel's vision

Six years ago, Enel embarked on its transition towards a sustainable business model, with a decisive acceleration of the decarbonization process through the development of renewable sources and the progressive closure of coal-fired power plants. In 2016, in line with this decision, Enel extended this approach to encompass all the Group's businesses by adopting, amongst other things, the circular economy concept as a strategic driver. This enabled both the launch of new business initiatives as well as the reappraisal of existing ones through the application of innovative thinking to the design, production, operation and end-of-life phases of the life cycles of both assets and materials.

The circular economy represents something of a paradigm for enabling Enel to rethink the current development model by combining innovation, competitiveness and sustainability so as to respond to today’s major environmental and social challenges. This approach, in line with our Open Power model, has been systematically implemented within Enel over the course of several years, enhancing collaborations with and contributions from external stakeholders.

This transition has been pursued with the objective of achieving, in addition to the environmental and social benefits, clear business benefits deriving from:

- **New revenues**, through the value recovery of assets and materials or the development of new services;
- **The reduction of costs and risks**, through redesign, circular inputs and value recovery;
- **A focus on innovation**, thanks to the continuous improvements that the circular economy approach demands.

Enel's circular economy strategy is characterized by the reappraisal of the business along the entire value chain, starting from the design and procurement phases. Enel's circular economy vision is based on the following pillars, which define the areas and methods of application:

- **Circular inputs**: production and usage models based on renewable inputs or inputs from previous life cycles (reuse and recycling);
- **Product as a service**: business model in which the customer purchases a service for a limited time while the company maintains ownership of the product, thus maximizing the usage factor and useful life;

- **Sharing platforms**: shared use between multiple users of products and goods;
- **Extension of useful life**: approach to the design and management of an asset or product aimed at extending its useful life, for example through modular design, ease of repair and predictive maintenance;
- **New life cycles**: any solution aimed at preserving the value of an asset at the end of its life cycle through, in synergy with the other pillars, reuse, regeneration, upcycling or recycling.

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Enel’s activities for combating climate change

Since the issue of decarbonization represents one of the key pillars of the circular economy strategy, it’s important to recall and outline the Group’s current activities in this regard.

Climate change is the main global challenge of the 21st century, and responding to this challenge requires the active involvement of all stakeholders, including those in the private sector. Enel is fully aware of this challenge, and has developed a business model aligned with the objectives of the Paris Agreement and the aim of decarbonizing its energy mix by 2050. A journey that was underlined in 2019 by responding to the "call to action" from the United Nations and signing a commitment to limit the increase in global temperatures to 1.5° C as well as to achieve zero emissions by 2050. A transition that must also be fair and inclusive for all, promoting wide-ranging actions which are founded on climatic, energy, environmental, industrial and social considerations.

In autumn 2020, Enel announced the new target of a 80% reduction in direct greenhouse gas (GHG) emissions per kWheq by 2030, compared to 2017, a target certified by the Science Based Targets initiative according to a 1.5°C pathway.

As a demonstration of its continuous commitment in this regard, the pattern of reducing GHG emissions continued, enabling Enel to achieve its certified target, set in 2015, of 350 gCO_{2eq} /kWh by 2020, i.e. a year in advance. Indeed, GHG emissions relating to the consolidated production of electricity were 298 gCO_{2eq}/kWh, in 2019, 20% less than in 2018.

Furthermore, approximately 51% of the electricity generated in 2020 was produced from renewable sources, equivalent to an installed consolidated renewable capacity of 45 GW.

In order to guarantee ever greater transparency in the communications and relationships with its stakeholders, Enel periodically reports, in line with the international standards of the GRI (Global Reporting Initiative), on its activities and has made a public commitment to adopting the recommendations of the Task force on Climate-related Financial Disclosures (TCFD) of the Financial Stability Board, which in June 2017 published specific recommendations on the voluntary reporting of the financial impact of climate risks. The Group also integrated the "Guidelines on reporting climate-related information" published by the European Commission in June 2019, and took into account the results of the initial work conducted by the European Lab Project Task Force on Climate-related Reporting (PTF-CRR) which identifies good practices

regarding climate-related reporting ("How to improve climate-related reporting").
The Enel Group’s sustainable strategy, confirmed and strengthened by the 2021-2023 Strategic Plan, aims to create value through, amongst other things, the integration of Environmental, Social and Governance (ESG) factors.

This strategy focuses on achieving the UN’s Sustainable Development Goals (SDGs) along the entire value chain, and has SDG 13 (Climate Action) as its central goal. The decarbonization of the energy mix, through increased growth in renewable capacity (SDG 7 - Affordable and Clean Energy), and the progressive closure of coal-fired power plants, together with the electrification of consumption, represent the strategic pillars for the coming three years. These are supported by two enablers, infrastructures and networks, in line with SDG 9 (Industry, Innovation and Infrastructure), and ecosystems and platforms, in line with SDG 11 (Sustainable Cities and Communities).

With a view to achieving a sustainable business model, finance plays a fundamental role in enabling the development of financing tools in line with the objectives of sustainable development. At the end of 2019, Enel issued the world’s first "General Purpose SDG Linked Corporate Bond", the proceeds of which will not be allocated to individual projects, but will support Enel's sustainable strategy, based precisely on the UN’s SDG objectives. Sustainable finance sources will guarantee 48% of Enel's total funding in 2023 (rising to 70% in 2030), a significant increase compared to 32% in 2020.

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Enel’s Circular Economy governance

One of the main challenges to the effective and cross-sector implementation of the circular economy is that of Governance. To support the Group's activities, a light but broad structure has been created that includes the holding company level as well as the various business lines and geographical areas.

In particular, while the business lines define and identify the business models, products, services and processes within the new context, the units in the geographical areas contribute to constructive dialogues and collaborations with institutions, other companies (from various sectors) and with stakeholders in general. This broad, integrated approach supports the entire Group’s commitment to find innovative and competitive solutions by ensuring a coherent implementation across all businesses and ecosystems.

The principal business areas include:

- **Power Generation**: with the aim of reappraising the main renewable energy supply chains along their entire value chain and the management of thermoelectric assets through to their decommissioning;
- **Infrastructure and Network**: with the aim of using "Circularity by Design" to redefine the value chain of major assets and render them circular, and accelerating, through digitalization, the role of the network as a platform;
- **End customers**: with the aim of fostering its customers’ transition to circularity through new products, services and consultancy services;
- **Suppliers**: to guide the entire supply chain towards circularity.

All other areas are also actively involved, from digital infrastructures to trading through to the management of our offices.

Moving to the system level, Enel is also doing a significant amount of work both globally, with major international organizations and events, as well as in its main countries of operation. These include European countries (Italy, Spain, Romania) as well as countries in other continents (United States, Argentina, Brazil, Chile, Colombia, Peru), where Enel is undertaking circular economy collaborations with institutions, other companies, NGOs, universities, etc. to increase knowledge and understanding regarding the circular economy and to support the system transition.

The classic representation of the five pillars of the circular economy includes:

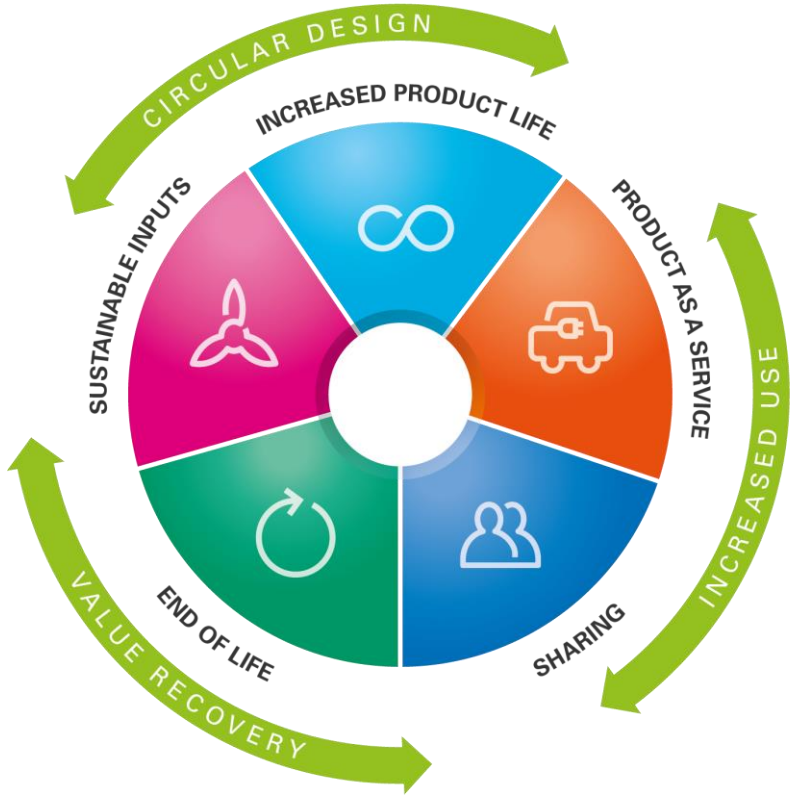
Circular inputs
Production and use model based on renewable inputs or previous life cycles (reuse and recycling).

Useful life extension
Approach to the design and management of an asset or product aimed at extending its useful life, e.g. by means of modular design, facilitated repairability, predictive maintenance.

Product as a service
Business model in which the customer purchases a service for a limited time, while the company maintains the properties of the product, maximizing the utilization factor and useful life.

Shared platforms
Management systems in common among multiple users of products, assets, or skills.

New life cycles
All solutions aimed at preserving the value of an asset at the end of its life cycle thanks to reuse, regeneration, upcycling or recycling, in synergy with the other pillars



Designing sustainable products

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According to Enel's vision, the circular economy doesn’t begin with the material recycling phase but with the asset’s design. For this reason, right from the very outset Enel has focused on the entire value chain of products, redesigning every single phase starting from the design, supply and production, ensuring the full involvement of suppliers through structured programs.

4.1. Circularity by Design and Circular Procurement

In recent years, the role of procurement has changed significantly to become increasingly more important for the implementation of corporate strategies, and is therefore one of the key elements of a circular production process. Everything a company buys represents a significant component of its overall circularity, both in terms of information, in order to evaluate the overall impact of its business, as well as in a transformative sense, i.e. the extent to which reuse and recycling, for example, are maximized. New and more circular solutions and a "Circularity by Design" approach may be tested in collaboration with suppliers so as to redesign the value chain.

We have started working on a Circular Procurement strategy, aimed at the purchase of goods, works or services that aim to minimize and/or avoid negative environmental impacts and the creation of waste during their life cycle.

The strategy is based on three fundamental pillars:

- **Engagement of suppliers**: reward suppliers via a specific tendering tool for their commitment to the circular economy transition;
- **Definition of metrics and KPIs**: measure, evaluate and validate environmental KPIs resulting from a product’s manufacturing cycle;
- **Co-innovation**: launching co-innovation projects together with suppliers in order to review production processes and/or modify purchasing methods according to circular economy models.

The "Circular Economy Initiative for Suppliers' Engagement" project involves around 200 suppliers worldwide across 12 product categories which, as of today, account for more than 60% of the expenditure for the purchase of materials. The initiative is based on the adoption of the environmental product declaration (EPD) with the aim of quantifying, certifying and objectively communicating the impacts generated throughout the entire life cycle of supplies (water consumption, CO2 emissions, impact on the soil, etc.).

In particular, in order to measure the circularity of products and their impact in

terms of environmental, energy and material resources, a life cycle assessment is carried out for certain categories of products, in accordance with ISO 14040. The output from this assessment is used to devise a specific protocol for the product (set of rules, KPIs, metrics) that's transformed into an international standard (PCR = Product Category Rule) through the EPD system. The EPD is a certified declaration that sets out the consumption of natural and energy resources as well as the environmental impacts connected with manufacturing the product.

Thus far, Enel has published PCRs for wind turbines, photovoltaic panels, insulators, meters, switches and is currently working on PCRs for storage facilities, cables, charging stations for electric vehicles, transformers, domestic appliances, public lighting and electrical panels.
Once the data from all the suppliers has been obtained it will be possible to analyze the suppliers' KPIs and to implement:

- corrective actions for poorly performing suppliers;
- activities for rewarding suppliers who perform well;
- the redesign of products/processes with suppliers in relation to specific KPIs that emerge from the data analysis.

Enel has already started working towards the "Circularity by Design" principle with its main suppliers, i.e. "Circularity" to be incorporated into the process from the beginning of the design phases of the product/process because Enel's entire ecosystem has to evolve at the same pace if it is to achieve a truly sustainable supply chain.

4.2. Empowering consumers and public buyers

The circular economy plays a central role in interactions with today's customers, since they are increasingly more aware and concerned regarding issues such as the environment. Our commitment concerns the various business areas that are dedicated to the end customer, with respect to both the energy market and the activities of Enel X, the Group's new division established in 2017 that's dedicated to using new technologies to transform energy into new opportunities.

With respect to the energy market, for families and businesses, Enel is implementing solutions aimed at supporting the circular economy transition in three principal areas:

- **Digitalization and new technologies**: initiatives to increase the use of electronic and/or interactive billing rather than paper bills, the use of electronic channels to eliminate paper-based communications, the move towards completely digital selling (Enel Simplu, in Romania) and via energy contracts priced to assist vulnerable customers, with the level of poverty automatically certified on the blockchain (Fuel Poverty, in Spain);

- **Awareness:** programs like Ecoenel in Brazil that incentivize the collection of paper/plastic/glass for recycling in exchange for discounts on the electricity bill;
- **Green energy**: selling green energy to the residential market that's exclusively produced from renewable sources.

Enel X acts as an accelerator of circularity within the new ecosystem of suppliers, partners and customers. It aims to do this within its own ecosystem through the Circular Economy Boosting Program, i.e. a process of continuous circularity improvement, applying it both to the solutions within the portfolio with the related calculated scoring verified by a certification body, and to industrial customers and public administrations through measuring the energy circularity and identifying a structured roadmap for increasing the level through a series of innovative solutions.

Enel X launched several circular economy projects in 2019, including:

- PV Revamp & Reuse: in line with the circular economy principle of extending a product's useful life, Enel X is developing a new business model that offers second-life photovoltaic systems in Italy, either via direct sales or "Product as a service" (i.e. maintaining ownership of the asset and selling only the energy service provided). Second-life photovoltaic modules will be generated via the revamping processes offered to industrial customers with financial support provided for the photovoltaic systems through major government incentives;
- Regeneration of the spare parts from JuicePoles: by applying the "extension of useful life" circular economy business model Enel X, in collaboration with its suppliers, has introduced processes to recover and regenerate components and functioning spare parts from JuicePoles, the public electric recharging facilities, so that they can be reused for maintenance and repair purposes in both Italy and Spain; similar processes will also be applied in Latin America;
- Circular JuiceBox: Enel X, with the support of its suppliers, has launched a project to redesign, through the application of circular economy principles, the production processes of its electric vehicle recharging infrastructure: JuiceBoxes. Specifically, it has taken action in the material selection phase, by applying business models for the use of sustainable materials as well as the application of reuse and recycling, designing new JuiceBox housings so as to enable them to be made from the recycled plastics of products disused by Enel Group companies.

Another area for strong focus is that of metrics, oriented towards both its products and services and towards its customers. With this objective in mind, Enel X has developed a Circular Economy Scoring methodology to

calculate the level of circularity of each of the products and services offered to customers, providing a useful comparison tool for end consumers who are concerned about environmental issues.

Enel X has also developed a service aimed at companies and public administrations, the Circular Economy Report, which uses a certified methodology to measure energy circularity and also enables us to outline a roadmap for improving the identified level of circularity.

The Circular Economy Report is also an integrated way of representing the Enel X model and the solutions made available to customers.

Enel X aims to accelerate circularity within its ecosystem of stakeholders, suppliers, partners and customers. To this end, it has developed the "Circular Economy Boosting Program", a program aimed at measuring and increasing the level of circular maturity of both solutions and products, as well as of companies and public administrations.

The program is principally based on the use of two models, both owned by Enel X, which are validated and certified by Rina (an impartial, third-party certification body). These are:

- The Circular Economy (CE) Score. Based on Enel's CirculAbility model, the CE Score is a mathematical assessment that enables the measurement, on the basis of material flows, energy flows and sales models, of a product's level of circularity on a scale from 1 to 5. The CE Score represents the starting point for the application of the Boosting Program, a methodology for identifying all opportunities for increasing the initial level of circularity;
- The Circular Economy (CE) Report. The CE Report facilitates a detailed assessment of a company's or public administration's circularity level, producing a score on two levels: the corporate level (relating to the company's entire value chain or, in the case of public administrations, to the city as a whole); and at the specific site level (focusing purely on the energy aspects of a site chosen by the customer).

4.3. Circularity in production processes: the "smart meters" case study

The role of Distribution System Operators has changed significantly in recent years: from an electricity network aimed at efficiently transmitting electricity in one direction, from large production facilities to the end user, we have moved to a situation whereby flows are bidirectional and thousands of parties can simultaneously be both producers and consumers (prosumers), thanks to new technologies such as distributed renewable sources, micro-generation and vehicle-to-grid.

The network is increasingly becoming a system catalyst, having to facilitate the integration of distributed generation and guarantee efficiency, safety and quality of

service. To meet the challenges posed by energy transition and climate change, it’s essential to be able to count on the flexibility of an increasingly digitalized network.

In accordance with Enel’s commitments relating to the UN’s Sustainable Development Goals and its policy of creating shared value, the Infrastructure and Networks division has embarked on a challenging journey aimed at redesigning its business processes and, more generally, its value chain, by adopting a circular economy model to reduce environmental impacts through maximizing the recovery of products and materials at the end of their life cycle. Innovation is a fundamental tool for identifying new processes and technological solutions to facilitate the circular transition, thus making the network business increasingly more competitive and sustainable in the long term.

The first example of an attempt to meet this challenge is the "Circular Smart Meter" project. Launched in Italy and Brazil, it demonstrates how it’s possible to reduce the environmental footprint of smart meters by, for example, reusing their constituent materials when they reach the end of the their life cycle, principally the plastic and copper. And that’s not all, from a systemic perspective, minimizing the use of new natural resources also allows you to reduce costs throughout the entire life cycle (from design, manufacture, operation to disposal), thus creating further efficiencies. Such benefits are achievable through a proactive "Circularity by Design" approach, which internalizes circularity right from the early design stages. For this reason, in the design and construction of the "Circular Smart Meter" it was necessary to measure the environmental and economic impacts with the aim of identifying the components that would have the most impact if redesigned from a circular perspective; recovering and regenerating waste such as plastic, copper, steel, etc., giving them a second life as part of new network assets and finally exploring innovative tracking techniques for reverse logistics.

A long and complex process from an engineering standpoint, with comparative analyses and laboratory tests, to guarantee the same reliability as conventional meters. In Brazil, the "Circular Smart Meter" is a virtuous example of how Infrastructure and Networks are looking to create a closed-loop within their value chain with the reuse of waste materials within the same industrial cycle, i.e. to produce the same product, so-called new generation. The objective in the short term is to apply the methodology also developed on other network assets (e.g. cables, transformers, protections), including measuring the expected benefits (economic, environmental and social), and to scale up the methodology on the business’s other operational processes (e.g. in the "sustainable construction site", etc.), thus facilitating the creation of high added value.

5

Key product value chains

There are a number of technology supply chains, within its activities, for which the Group's commitment is particularly significant, largely due to their potential in terms of current and future business development.

5.1. Batteries

One of the challenges being tackled by Enel is that regarding the management of energy storage systems at the end of their life cycle, particularly lithium batteries, which have recently played a key role in the energy transition process and will continue to do so in the near future.
Currently, a number of recycling technologies enable the recovery of 95% of the material used to produce the cathodes in lithium batteries. Regardless of the batteries' state of degradation, the precious metals used in their manufacture can be reused to produce new cathode material, since their quality remains practically unaltered during use.

Enel is aware that the end-of-life management sector is not yet mature enough to support the large-scale adoption of these practices. However, the increasing use of electric vehicles we're currently seeing is acting as a powerful catalyst for the development of a sustainable market for end-of-life batteries.

Start-ups, universities and key sector players are all involved in analyzing and evaluating solutions for the management of end-of-life lithium batteries and the related environmental, economic and social impacts. In this context, Enel has started several collaborations with partners in the recycling and battery material production sectors, with the aim of evaluating the benefits that can be derived from the

various solutions (reuse, recycling, regeneration, etc.). Focus will be placed on a variety of different aspects from design and standardization to the end-of-life recovery phase and the subsequent reuse or recycling, the overall aim of which is to reconsider the entire value chain from a circular perspective.

These collaborations include participation in the Global Battery Alliance, the European

Battery Alliance and in the "IPCEI project to support the development of a sustainable value chain for lithium-ion batteries" (as part of this last project, Enel X will develop tools for predicting failures and modeling the degradation of lithium-ion batteries with a view to increasing their useful life and safety).

One of the circular models evaluated by Enel is based on a "Second life" approach.

The concept underpinning the Second Life project is the removal of battery packs from electric cars that have reached the end of their life cycle, and their subsequent use for other applications. Indeed, a battery pack with a residual capacity of 60-80%, despite not being sufficient to power a motor vehicle (i.e. for a minimum number of kilometers), can still effectively be used in other applications.

Specifically, the Second Life project developed by Enel involves the reuse of electric car batteries to create a stationary storage system that’s integrated into a conventional power plant in the Spanish resort of Melilla.

The project, developed in collaboration with the battery pack supplier Nissan and the system integrator Loccioni, uses an innovative approach to facilitate sustainable battery reuse. The basic idea is simple: once the batteries from the Nissan Leaf car models have reached the end of their life cycle as an electric vehicle battery, they are assembled into a large stationary storage system at the Melilla power plant so as to improve network reliability and to ensure service continuity for the local population.

The solution developed by Enel in Melilla involves the reuse and interconnection of approximately eighty electric vehicle battery packs, amounting to a total power output of 4 MW and a maximum stored energy of 1.7 MWh.

From a circular perspective, the reuse of EV battery packs as a stationary storage system facilitates extending the useful life by using the batteries for an alternative purpose. From an environmental standpoint, therefore, it reduces the necessity to produce new batteries, thus reducing the need for raw materials, and reduces the amount of waste generated.

Specifically in terms of the Melilla project, the reuse of EV batteries avoids the production and use of new raw materials (initial estimates suggest approximately 1600 kg of manganese and 105 kg of lithium). The innovative storage system implemented in Melilla will serve as a technical feasibility model for other installations of this type, a solution that will be of fundamental importance considering the significant expected increase in electric vehicle use in the coming years, and the subsequent increase in the number of end-of-life batteries becoming available.

5.2. Wind turbines

At Enel we believe that environmental sustainability is not just limited to the mitigation of climate change, but that it must also involve the systematic adoption of sustainable and circular practices in all business areas. Whilst on the one hand we are developing new renewable capacity in order to decarbonize the production mix, we are also simultaneously committed to developing and implementing effective solutions for increasing the long-term sustainability of the renewable energy. Wind power has seen exponential growth over the past decade (exceeding the 623 GW threshold of global installed capacity in 2019) with thousands of wind turbines installed annually worldwide. Forecasts indicate that this trend will continue for many more years (an additional 538 GW of onshore wind energy forecast by 2025 according to Bloomberg NEF NEO 2019), keeping wind power at the forefront of renewable energy generation (with a 19% share of the global growth of renewable energy sources in the next 5 years according to Bloomberg NEF NEO 2019).

The average useful life of a wind turbine is around 20 years; following this period, the mechanical and structural properties of the turbines decline and, in some cases, restoration activities may be necessary to extend the useful life by a few years, while in other cases disassembly and replacement are necessary.

While most of a wind turbine’s components are relatively easy to recycle (i.e. parts made of metal), a small but significant number of the non-metallic components, for example the blades, are difficult to recycle.

For the most part, these components are made of composite materials (typically glass/carbon fiber + epoxy matrix), as well

as other more minor materials (such as glue and gelcoat), which make recycling particularly demanding. Currently, these components are mostly sent to landfill.

For this reason, in 2019, we launched a challenge on our Open Innovability platform aimed at identifying the best available methods for recycling or reusing the materials used to make wind turbine blades. More than 130 proposals were submitted, from which we identified 18 solutions. We launched detailed assessments or proofs of concept with selected partners in order to demonstrate the technical feasibility of some of them, from which a number of initial prototypes have been developed. For example, we've demonstrated that by sintering and extruding the turbine blade materials, bricks can be produced for use in the construction sector; using the disused blades taken from three of our wind farms in the United States, we completed our first full blade pilot in 2019 and we're evaluating possible circular economy solutions for incorporating fiberglass pellets into the production of other recycled products for the construction sector. We recently launched a new challenge to further investigate the potential for producing fibers and insulating materials from wind turbine blades and to find possible new partners interested in collaborating with us. So far we have identified many interested companies, based in Europe and the United States, operating in the construction, plastics and other sectors.

Meeting the recycling challenge requires a multidisciplinary and multi-sectoral approach that integrates technological innovation and the creation of business models with the development of a regulatory framework and the definition of new standards. In other words, one company can't do it all alone, it requires the successful activation of a vast ecosystem of different key players. We believe that creating this community of key players interested in contributing to and participating in this activity is the key to success.

5.3. PV

The proliferation of photovoltaics (PV) has grown at an unprecedented rate since the early 2000s. By the end of 2018, photovoltaics were responsible for around 480 GW of installed capacity worldwide, and its current rate of growth will see it reach a global cumulative capacity of 2,840 GW by 2030 and 8,519 GW by 2050.

Considering the average life cycle of solar panels is around thirty years, large quantities of waste are expected to be generated from the beginning of 2030. The growth in waste deriving from solar panels represents a new environmental challenge, but also an opportunity to create value and pursue new economic paths. It is therefore essential to identify innovative solutions for managing solar panels in a circular perspective, from design right through to the end-of-life management.

Managing the solar panel supply chain from a circular perspective requires a two-thronged approach. Firstly, it's necessary to ensure that the panels currently installed are recovered at the end of their life cycle in a way that maximizes the value recovered, and secondly, it's necessary to apply the circular concept right from the beginning of the design phase for the new solar panels so as to increase their circularity before they reach the production and usage phases.

At Enel we are therefore working in a variety of areas on initiatives aimed at increasing the overall circularity in line with our vision of the circular economy.

- **Circular Design**: it's essential for solar panels to be designed in a way that ensures their end of life is taken into consideration, including possibilities for repairing and extending their useful life. To this end we're currently working on a number of fundamental aspects, such as modularity, design for disassembly, standardization and the choice of materials (including considering the possibility of using bio or recycled materials);
- **Circular use and efficiency**: considering the increase in the installation and employment of solar panels, we have embarked on a number of efficiency maximization initiatives in order to reduce the impact deriving from the necessary production materials, the use of soil, etc.;
- **Circular recovery**: currently there are several options, in many cases not yet fully developed, for managing the end of life of panels ranging from different technologies for recycling to solutions for reuse. We are therefore conducting various initiatives to identify the appropriate circular technologies and business models for maximizing the recovered end-of-life value.

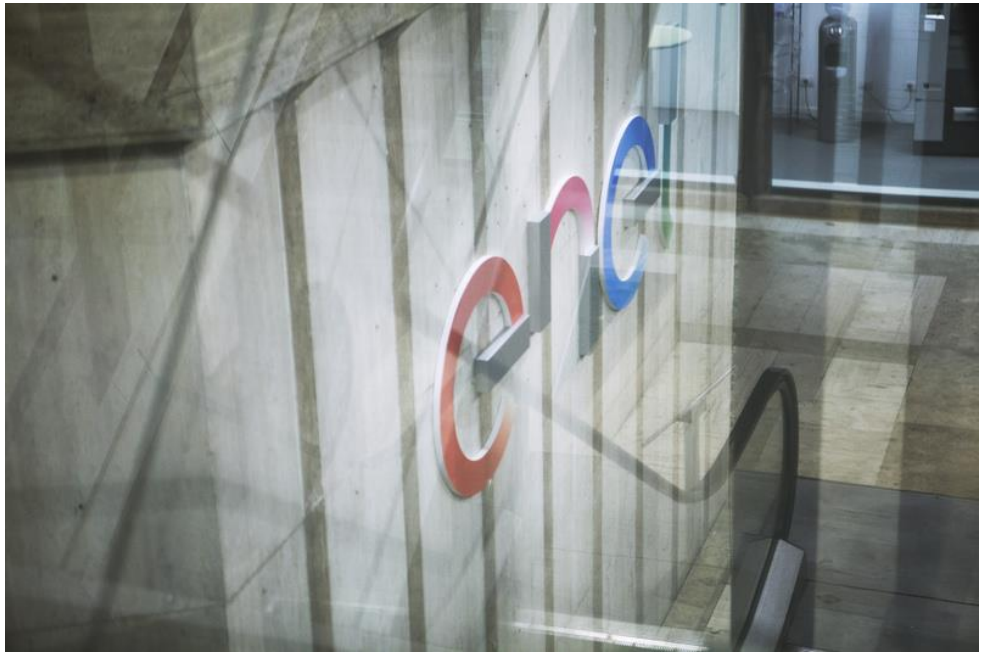
5.4. Buildings and assets

The construction industry is a sector that requires significant quantities of resources, accounting for around 50% of all extracted materials. Indeed, it was this industry that was singled out by the European Union's most recent circular economy action plan as one of the key sectors that needed to be reappraised from a circular perspective.

Existing buildings are not designed for easy demolition and recovery of materials at the end of their life, a circular approach to building decommissioning therefore becomes fundamental in order to recover the greatest possible value, exploring a variety of possibilities such as reuse and recycling as well as selective demolition techniques, in order to find the best possible solution for each component or material.

Regarding new buildings, it's essential for them to be conceived with circularity in mind, right from the outset at the design phase, with the objective of maximizing the end-of-life value recovery. From this perspective, some of the key aspects to consider are:

- Choice of materials: recycled, bio-material, free from toxic substances, or with environmental product declarations (EPD - Environmental Product Declaration; Cradle to Cradle; LCA - Life Cycle Assessment);
- Flexibility of spaces to increase their durability and render them easy to adapt to different types of use;
- Design and build with the building's entire life cycle at the forefront of all considerations, evaluating all life stages, including decommissioning;
- Use models for the structured collection of information on buildings (Building Information Models), thus considering them as banks of materials.



At Enel we are applying a circular approach to the management of our assets, power plants, networks and offices, developing best practices and implementing those practices through various initiatives conducted within all the countries in which we operate.

Circular construction site: the objective is to minimize the consumption of energy and materials during the construction of facilities, by using a circular approach to reduce the environmental impacts. This model encompasses the choice of materials (including recycled materials), the use of renewable energy, minimizing the quantity of materials going to landfill through reuse or recycling and minimizing land use.

Circular decommissioning: the objective is to maximize the end-of-life value of activities and equipment by exploring different business models such as internal reuse, recycling, sale to secondary markets through auctions, etc.

Locations: the objective is to act on three different dimensions: rethinking the design and management of inputs (materials, energy, etc.), increasing the utilization factor and exploiting the end-of-life value of the assets.

More specifically, here are some examples:

- rethinking the design and inputs (materials, energy, etc.), considering the building’s entire life cycle, favoring choices aimed at reducing energy consumption (almost Zero Energy Building) and that make the most reasonable use of materials, adopting systems such as BMS and EMS for the management and control of facilities and consumption and for actively involving all the professionals and suppliers that are part of the process, so as to extend the useful life of the building and its individual components, always considering the efficient use of resources as an obligation in order to minimize the environmental impact;
- increase the utilization factor through space sharing and the "product as a service" mechanism, introducing innovative models for the management of office space;
- exploit the end-of-life value of assets, identifying dismantling solutions that increase the quantity of material recovered from such activities.

6

Circularity on thermal asset sites

In 2015 Enel launched the Futur-e project, the world's first example of a large-scale redevelopment of an industrial area to be conducted using a circular economy approach, a vast, unique program designed to find new uses for old thermal power plants. New, innovative and sustainable uses which reuse existing structures, infrastructures and connections, with the active involvement of local stakeholders, to create value for local communities through sustainable economic growth and job creation.

Previously, divestment had generally only ever been undertaken using a linear model: "produce, consume, dispose". With this logic, disused power plants were simply considered collections of worthless waste materials that represented a cost to the business rather than an asset.

However, this project has shown how it's possible to reverse the paradigm and it explains how, through an approach to site construction that circular and sustainable, decommissioning and regeneration can go hand-in-hand, with disused materials and facilities no longer seen as a burden, but as a resource capable of generating significant returns for all interested parties: energy companies, investors and local communities.

Therefore, for all sites due to be reconverted, a strategy for their regeneration is being devised in line with the following fundamental principles, all of which are considered equally important:

- Site staff working to be transferred through an internal Group reassignment process, thus avoiding any redundancies and any loss of know-how;
- Redevelopment projects must be an opportunity for writing new stories of energy conversion, sustainable growth and the development of innovative ideas that improve creative thinking and promote business initiatives;
- Throughout the entire project, from preliminary interviews with stakeholders through to the decision on which redevelopment project to pursue, Enel must work in collaboration with local communities via a multi-stakeholder approach so as to encourage the creation of shared value;
- Ensure environmental protection: soil remediation to be performed to the highest possible standards;
- Maximize the reuse of disused facilities, such as roads, infrastructure, connections to the HV network, buildings, etc., for new functions in line with circular economy principles;
- Contribute to the Enel Group's objectives by collaborating with other business lines for the realization of

projects such as BESS, e-mobility, digitalization, network stability, etc.

Since its launch, the approach followed by the Futur-e project has proved to be successful and has therefore been extended to the geographical areas in which the Group will manage its thermoelectric power plants through the energy transition process, such as in Spain and Chile. The eventual aim is for this project to be seen as international best practice for the end-of-life management of disused industrial facilities.

Furthermore, whilst the situation is evolving it also requires a similar evolution from a corporate strategy standpoint, this is primarily necessary due to:

- National, European and global strategies that orient energy development towards ever greener and more sustainable technologies;
- the Group's choice to move our growth model from large-scale direct investments into large power plants to smaller, flexible and renewable projects;
- the Group's decarbonization objectives which has led to the significant acceleration in the development of renewable energies within our fleet, so as to increasingly reduce CO2 emissions and to continue to increase compliance with the requirements of the Sustainable Development Goals (SDGs).

Within this context, the opportunities for redevelopment are therefore widened thanks to the possibility of replacing thermal energy production sites with new renewable or hybrid production facilities (e.g. with gas facilities capable of guaranteeing system stability during the transition to a fully decarbonized economy), integrating new business projects with complementary sustainable investments that meet the needs of the communities where the facilities are located.
As a result of the above, Enel sites will therefore assume a new role within the context of renewable development strategies and objectives and as part of new sustainable development models.

6.1. Secondary materials

The suitable collection and management of secondary materials is essential not only to ensure compliance with environmental regulations, but also to maximize their value by developing secondary raw material markets that are capable of enabling circular flows by creating, amongst other things, synergies between the various sectors.

Enel applies circular economy principles to the management of secondary materials and manages the recovery of "ash and gypsum" produced by Enel's thermal power plants.

Indeed, these waste materials represent a precious resource for the construction industry. The most common use for ash is in the cement, concrete and brick

production market, and for gypsum it's in the production of plasterboard panels and cement. The benefit of using these materials, in addition to reducing the use of natural raw materials and energy consumption, derives from their superior quality which is thus transferred to the quality of the final products produced (e.g. the use of ash in cement is particularly suitable for the construction of dams and tunnels where the permeability and durability of the structures are key).

For several years now in Italy, 100% of the ash and gypsum produced by coal-fired power plants has been recovered, bringing significant environmental benefits; in parallel, Enel, with its global perspective, is trying to export the best practices implemented in Italy to the countries (Spain, Chile, Colombia and Russia) where end-customer markets have been developed which encourage businesses to operate with a view to environmental sustainability.

People, regions and cities

7

7.1. Circular cities

Collectively, today, cities make up a global urban system, they're deeply interconnected, and they play an increasingly important role at all levels: economic, environmental and social. As urban growth continues to evolve and develop, cities as a global phenomenon, i.e. global cities, simultaneously represent both a formidable sustainability challenge as well as a priceless source of opportunity. As of today, cities are responsible for over 70% of global CO2 emissions, and the involvement of the urban system is absolutely key if the energy transition process is to be accelerated in a way that ensures nobody is left behind, through the progressive electrification of energy consumption that simultaneously works towards achieving a carbon-neutral electric power industry.

Indeed, it is widely accepted that in order to reduce mankind's impact on the planet, cities must play a key role: they are living laboratories within which the planet's critical issues must first be tackled.

To design the cities of tomorrow a paradigm shift is required, cities are complex systems and need to be treated as living organisms, where flows of energy, materials, and information are essential for their development. In recent years, thanks to the circular economy, a new model based on circular flows (therefore resembling the basic laws of thermodynamics) has emerged as an opportunity for sustainable development. Although the difference may seem purely semantic, there is actually a conceptual distinction between the smart and the circular city. The smart city concept is primarily focused on the role of information technology, whereas circular cities focus on a more holistic approach that encompasses all its dimensions, with objectives set in terms of competitiveness, environmental sustainability and social inclusion. A vision such as this requires governance to play a central role too, and in order to enable the transition towards the circular model, it has to be two-fold: both top-down and bottom-up. This means that all the elements of the urban ecosystem (citizens, companies, start-ups, organizations, policy/decision makers, etc.) need to be strongly involved and able to participate and contribute in terms of ideas, proposals, projects and initiatives.

Technology is also at the core of the circular city vision, as a tool to support the achievement of economic, environmental and social targets.

With the circular vision in mind, we can view the urban environment in terms of five urban subsystems: the built environment, energy, mobility, the bio-economy and material flows (e.g. waste, water, food, etc.).

Each of these subsystems has a key role to play in supporting the transition.

Within the circular city vision, infrastructure is an aspect that pervades all areas and represents the backbone upon which circular cities operate: smart grids, smart lighting, ports, optical fiber. All these infrastructures need to be (re)designed in order to enable the circular city to operate flexibly and with increased resilience. New technologies have a key role to play, with the most important being renewable technologies, electrical appliances and IoT solutions.

Renewable energy sources, distributed and integrated with electrical appliances (such as electric vehicles and heat pumps), represent a new paradigm that can, on the one hand, eliminate the global and local pollution emitted from current technologies and, on the other, improve the quality of life for citizens. Big data from digital technologies, such as sensors, the Internet of Things, etc., feed artificial intelligence applications that are capable of maximizing the benefit of not just new physical technologies, but also older technologies as they enable the application of new business models and uses. Significant digital advances in recent years have led to the proliferation of solutions such as car sharing, waste tracking, pay-per-use and peer-to-peer exchanges enabled by blockchain technologies.

The circular city vision is strongly interconnected with the Sustainable Development Goals (SDGs) and can have a significant impact on all of them.
The majority of the linkages are fairly obvious, but some of the less evident are outlined here below:

Enel has placed the circular economy at the center of its strategy and is strongly focused on the circular city vision. Enel's contribution is not just in terms of business solutions and services, but also leading the way in terms of theoretical thinking, and to this end has recently published a Position Paper on circular cities[1].

Circular cities therefore represent the only opportunity for driving cities down a sustainable development path and, given that all the necessary technologies already exist, we consider the holistic approach, one that involves all the sectors and key players, to be the correct approach for the cities of tomorrow to take; the issues that still need to be overcome are those relating to the linear model of old and unfit infrastructure, the current legislative 'silos' that do not support circular solutions and a culture that is still embedded with linear concepts.

7.2. Islands

Islands, from a circular economy standpoint, are like living laboratories, and ever since the days of Darwin they've beguiled scientists as key hotspots for change.

Mainly due to their special location and rich natural and cultural heritage, islands attract millions of tourists each year. However,

[1] To find out more

despite their attractive qualities, islands face distinct challenges and issues resulting from resource pressure, limited economic diversity and their vulnerability to the effects of climate change. It is these issues that demonstrate the urgency of the circular economy and the isolated nature of island systems is what renders them perfect laboratories for such an approach.

With respect to energy, island economies experience issues relating to energy scarcity and their isolation from the markets, they rely almost exclusively on imported fossil fuels and therefore have low economic diversity, high fossil fuel dependence and high carbon intensity. As fuel supply constitutes an important part of the demand for raw materials, and considering that islands offer great potential for renewable energy generation and the electrification of transport, an accelerated energy transition process is a feasible option and would prevent thousands of tons of fossil fuels from entering the loop, which is a fundamental lever for starting a circular economy.

Islands usually have difficulties in terms of waste management, in addition to the shortage of space, the high natural value of the vast majority of the land often results in the necessity for its waste to be shipped to and managed on the mainland. An emission-free energy system is also practically waste-free, offering significant additional benefits in terms of circularity as well as major savings in terms of waste management.

Tourism is a fundamental engine for local economies, but it also places a huge burden on local infrastructure, especially energy, mobility and waste management systems. The development of a circular economy is inevitably associated with the development of sustainable, circular tourism and the development of good circular practices on islands can be exported to other contexts and territories.

Islands also provide an excellent link between the circular economy and the blue economy, i.e. that relating to the exploitation and preservation of the marine environment. Both models are aligned in terms of their commitment to the sustainable use of renewable natural resources and in the concept of waste as a source for the creation of new products. One of the key future challenges is the problem of marine pollution, which requires significant changes regarding the issue of plastic, including ambitious recycling and reuse targets or the improvement and greening of port facilities.

Despite the challenges and vulnerabilities mentioned, islands are in a unique position to lead the way on sustainability, the circular economy and climate action. Island communities understand the urgency to act quickly. They are excellent focal points for sustainability education, research and practice. The political leaders of island territories are under increased pressure to make sustainability a priority, evidence of which is provided by the various commitments that have been made by island states around the world. Small states are, by their very nature, agile in size and governance, useful players for becoming

"test beds" of innovation and circularity. They can quickly react when there's a need to test and scale-up new technologies, providing real environments for testing new technologies and production processes.

7.3. Social Impacts

The question of what are the social impacts of the circular economy is a new and enormous field of study. There have been a number of macroeconomic equilibrium studies (European Union, McKinsey, etc.) which have estimated the possible impacts, both in terms of GDP growth and the creation of new jobs.

As a result of the complexity of the circular economy concept and the rapid evolution of the institutional, technological and competitive context that surrounds it, these studies have only minimal significance due to the inherent level of uncertainty and their low-level focus. However, some initial considerations can be made on the fundamental drivers underlying the circular economy concept.

Firstly, a conceptual premise: human labor may be defined as the renewable resource par excellence, with the further peculiarity that while a renewable 'energy' resource is substantially constant, human labor gradually improves in performance when used, whereas if it's not used it deteriorates.

Secondly, a linear model is based on extraction, production and decommissioning and is extremely exposed to the replacement of human labor with automation. Whereas a circular model is based on maintaining value through maintenance, repair and servicing and is therefore more linked to design and innovation on the one hand, and to 'manual' and relationship skills on the other.
Also, when considering models such as the product as a service, the approach to interacting with the customer changes: from a single, one-off transaction we move towards a more stable relationship with a consequent strengthening of the role of services.

It's also interesting to consider the fact that initiatives such as 'Industry 4.0' must incorporate the vision of the circular economy from the outset, otherwise they just accelerate the linear model (with related consequences also in terms of jobs).

More specifically, the circular model focuses on:

- **Design, planning and innovation**: this is the 'heart and soul' of the circular economy and is fundamental in driving the transition. There will therefore be a strong focus on these skills and associated professionalism;
- **Maintenance and repair**: moving to a model based on the repair and systematic maintenance of products generates a regionally distributed workforce. In this sense, the Swedish example is interesting, where VAT on repair work has practically been halved;

These are geographically distributed jobs, ones that require manual and technical skills and which also contribute to the strengthening of the social fabric. Of course, in order for this to be possible, goods must be designed so as to enable and facilitate their reparability and maintainability;

- **Value recovery**: circular end-of-life management involves a series of phases (such as reverse logistics - regeneration/repair - re-invoicing), which consists partly of global loops, but mainly of local loops;
- **Recycling**: recycling is, paradoxically, something of a critical area. On the one hand, it can generate many jobs, but it should also be remembered that recycling represents the 'design error' aspect of the circular economy: generally speaking, the recycling phase of the circular economy should only be limited to very specific supply chains. For this reason, investment and job creation in an oversized recycling chain could actually hinder the transition of the system towards the circular economy, since they would introduce the 'need' to maintain a certain level of waste generation.
- **Services**: the sharing and 'product as a service' models require the development of new skills and professionals. In this regard, it's important to stress that Uber and AirBnB are no longer examples of sharing. These are examples of 'platformization' which were initially about shared use, but have since completely lost this initial connotation. By distinguishing between the two models, the following considerations can be made:
  - Product as a service: this model, where the company sells a product in the form of a service, places strong focus on the maintenance of the asset, on the service management activity and on the exploitation of the asset at the end of its life (all labor intensive activities). Furthermore, the approach to interacting with the customer completely changes, moving from a single, one-off transaction to a more continuous relationship focused on service;
  - Sharing: in its correct definition (i.e. sharing an asset that's only partially used) it implies, on the one hand, the opportunity to generate a form of revenue from an underutilized asset and, on the other, the supply of associated services. In this case, it is more of a form of 'self employment'.

This transition naturally presupposes the training and development of new professionals who possess the skills that will become increasingly necessary.

8

The circular economy and decarbonization

Decarbonization and the circular economy are issues that have arisen in different areas but which have then followed a path of rapid convergence. The reason is essentially due to the fact that they are two approaches that are far from indistinct.

In order to decarbonize the economic system it's insufficient to follow an approach based solely on renewable energy sources and improved efficiency, it's necessary to rethink the entire model by considering all the life cycle phases: extraction, production, use and closure. Decarbonization objectives should therefore not only be linked to direct emissions and compensation measures, but should also encompass all aspects of the economic model.

Initial studies expect the impact to be key[2] and that the circular economy could make an essential contribution to the achievement of decarbonization targets.[3]

The circular economy must therefore complement the energy transition process so as to more effectively combat the issue of climate change by reappraising the various sectors from a circular perspective.

The circularity of a product cannot just encompass its material elements, it must also include the aspects relating to energy too. If we analyze the life of products along their entire life cycle, the energy and material needs are both key and therefore a 'circularity by design' approach must measure and impact on both. The use of renewable energy sources is therefore a first step which, when combined with the electrification of consumption, enables the transition of sectors such as mobility and heating/cooling towards zero-emission models.

The significant growth in renewable energy technologies (e.g. PV, wind, etc.) is posing great challenges in terms of the supply of materials, production and end-of-life management, and the necessary growth of these technologies, if not immediately established as part of a circular economy approach, is likely to create new environmental problems in the near future.

Increasing energy generation from renewable sources will also continue to result in the decommissioning of thermoelectric plants which in turn, due to the volume of land, assets and materials involved, will represent a major test bench for any circular economy strategy.

2. The Circular Economy. A Powerful Force for Climate Mitigation, Sitra 2018.

3. Completing the Picture: How the Circular Economy Tackles Climate Change, Ellen MacArthur Foundation, 2019.

9

The circular economy and finance

The transition to a circular economy will generate multiple economic, social and environmental benefits. Finance plays a fundamental role in accelerating this transition, by providing financial assistance to companies and projects implementing circular business models and by supporting the development of the new innovative technologies that are necessary to enable the functioning of new circular business models.

This is crucial for accelerating the development of circular models, it is therefore key that, in addition to the engagement of financial parties, there is also involvement from policymakers, NGOs and companies active in facilitating circular economy models, in terms of contributing to creating guidelines and tools in order to support circular financing and to overcome the principal obstacles through:

- developing financial know-how on the circular economy;
- creating a "level playing field" with respect to the linear model;
- assessing the long-term impacts and related benefits of a circular model;
- enabling collaboration between the various value chains.

In order to facilitate discussions on this subject and to help identify and develop solutions and tools for overcoming these obstacles, Enel collaborates with other companies within its circular economy networks with regards to circular financing (e.g. we participated to the EU's Expert Group for Financing Circular Economy).

Innovation

10

Innovation plays a fundamental role as a circularity accelerator through both new technologies and business models. Technology is an enabler that needs to be fully leveraged whilst also taking the social, economic and environmental aspects into account.

Technologies relating to electric mobility, renewable energies, storage, the digitalization and automation of networks, and energy efficiency are becoming increasingly more mature and competitive, and in combination with electrification are enabling the transition of sectors such as mobility and heating/cooling towards zero emission models, which in turn is also contributing to the objective of decarbonization.

Furthermore, technologies such as bio-materials, new materials from recycled sources, 3D-printing, IoT, big data and artificial intelligence, new recycling solutions and robotics have enabled the creation of new circular solutions.

At Enel we are working to integrate these new technologies into our assets and products with a view to improving their circularity. This process starts from the materials and energy used for production, and is aimed at extending their life cycle duration, increasing their utilization factor and maximizing the value recovered at the end of the life cycle.

Outlined below are some examples of how we are using these technologies to increase the circularity of not just our assets, but also those of our customers:

- Predictive maintenance: the use of sensors and big data analytics to enable predictive maintenance activities that are capable of extending the useful life of our system equipment;
- 3D-manufacturing: the use of 3D-printing to repair damaged components thus extending the useful life of machines in the facilities and reducing the quantity of components required in the warehouse;
- Vehicle-to-grid: whereby electric cars can also provide two-way network services whilst parked, thus maximizing their use;
- City Analytics: support to public administrations for planning and dimensioning services (thus optimizing the necessary resources and increasing the utilization factor) based on actual demand through the collection, analysis and processing of big data;
- New recycled materials: use of recycled materials in our assets such as smart meters or charging stations for electric vehicles.

Start-ups, with their contribution in terms of innovation and technology, play an indispensable, driving role in the circular

model. In view of this and within the context of Open Innovation, Enel collaborates with and supports these organizations by making its Innovation Hub & Lab available to them, enabling start-ups to engage with Enel's business lines and to test and develop their solutions in the real world, with the eventual aim of being able to offer these solutions to public administrations in their drive towards circularity: for example, energy flexibility, electric mobility, smart grids (focus of the Milan and São Paulo Hubs) and renewable energy (focus of the Catania Hub). In the last three years Enel has assessed more than 5,000 start-ups across the globe, it has collaborated with more than 200 and has adopted, at an international level, around 50 solutions.

In three years, openinnovability.com has hosted around 70 challenges, collected thousands of solutions from over 90 countries worldwide, awarded economic prizes and entered into collaboration agreements with Italian and international companies, start-ups, researchers and individuals.
Some of the challenges that have been launched are aimed at the circular economy concept, for example by focusing on the recycling of wind turbines or the extraction and reuse of lithium and other minerals from geothermal frost.

11

The ecosystem

A circularity based business model requires maximum collaboration between all the key players: it is for this reason that we believe it’s essential to open lines of communication with those who share this vision, involving supply chains and promoting common initiatives to safeguard natural resources and increase a country's competitiveness.

A circular solution cannot be sought within just one company or its sector of activity, it’s necessary to explore and create synergies with sectors that we’ve historically never collaborated with before.

Globally Enel, after joining the Capital Equipment Coalition, a coalition of business leaders to accelerate the implementation of the circular economy, is now engaged in similar initiatives. With this in mind, in 2018 Enel, together with a number of other "Made in Italy" companies from different sectors, launched the Alliance for the Circular Economy (the original manifesto).

Another key element to support the creation of a circular economy ecosystem is participation in international networks in order to contribute to the discussion on how to accelerate the transition towards a circular economy, to share best practice and to identify possible synergies and partnerships. To this end we are involved in a variety of different networks, for example:

- World Business Council for Sustainable Development;
- European Remanufacturing Council;
- Italian Circular Economy Stakeholder Platform.

Active participation in these circular economy networks, a collaborative approach to working with the outside world, and a focus on co-innovation with our suppliers and customers are fundamental for creating an innovative ecosystem that’s capable of increasing the circularity of the various value chains.

Appendix

Focus on Metrics

One of the main challenges associated with the implementation of a circular economy model is defining the international reference criteria and metrics that enable us to distinguish between circular and non-circular solutions, measure their impact, define objectives and understand what the improvement levers might be.

The definition of such metrics was the very first question that Enel found itself trying to answer. There were a number of proposals, but none of them incorporated the entire value chain, renewable inputs or the subject of energy: all fundamental aspects for measuring the genuine effectiveness of circularity. To this end, around three years ago Enel developed and refined a model for measuring the circularity of its business, assets, services and products it supplies to customers. The model, which is called the CirculAbility Model and is also applied to suppliers, quantitatively represents the five pillars of circularity and combines both the material and energy components to give a single circularity indicator. For further information on the model, please refer to the document KPI-Model_3.2018 (or access through this link).

The model has been shared with peers, competitors and institutions in order to stimulate dialogue, but it has also been made available online in order to publicize it as widely as possible and hopefully encourage the sharing of ideas to further improve it. To establish a uniform, internationally recognized reference metric you need the experience and expertise of those organizations that first addressed this subject and that have studied, tested and improved their solutions. Using the CirculAbility Model as a start point, which represents the integrated approach of the Group, Division specific approaches have also been established.

- Procurement: categories of supplies are subjected to a systematic Life Cycle Assessment (LCA) to track all material and energy flows throughout the entire life of the product or asset;
- Circular Asset: in order to manage the Group's assets using a circular approach, the circularity of the design, construction/manufacturing, operation and decommissioning phases is measured so as to enable the identification of operational initiatives that could increase the overall circularity index of the process, obtained by carefully measuring the environmental, economic and social impacts of each asset along its entire value chain;
- Enel X: measurement of the level of circularity of the products and services offered to customers (so as to provide a useful comparison tool for final consumers who are interested in and concerned about environmental issues) as well as the circularity of industrial customers and public administrations.

Focus on Digitalization

The aim of digital solutions developed in Enel, outlined here below, is to promote innovation and sustainability with a view to facilitating and implementing the circular economy concept.

The Cloud

For Enel, the cloud ("cloud") is an essential strategic enabler that allows the use of infrastructure and application IT resources when required, fully exploiting the "product as a service" model and the access possibilities made available to it by the network, thus allowing the reduction of waste deriving from the consumption of unused resources, and therefore maximizing the load factor. The cloud used by Enel calls for, on average, around 16% of the energy required by conventional "on-premise" infrastructure, enabling an average reduction in CO2 emissions of around 88%, and it is hosted on green data processing centers, 40% of whose energy requirements are supplied by renewable sources.

Unified Communications and Collaboration

The Unified Communications and Collaboration Platform (UCC) integrates real-time communication services such as Instant Messaging (chat), IP Telephony and video communications with deferred communication means such as, for example, the answering machine, e-mail, SMS and fax, taking full advantage of the "sharing" model which, through the Internet, allows you to share and enjoy content, including on the move, from your PC, smartphone or tablet. This reduces travel and therefore reduces carbon dioxide emissions.

Data Sharing and e-API (Enel Application Programming Interface)

The e-API (Enel API) Digital Ecosystem is the digital environment through which all Enel Group companies are able to simply, quickly and automatically share information that would normally be restricted to specific vertical applications (information “silos”). The ecosystem is underpinned by an API (Application Programming Interface), thanks to which the company's systems can exchange information flows in real time through interfaces and standard data tracks, making use of the latest interoperability standards. The e-API Ecosystem has helped accelerate the implementation of digital solutions, facilitate the genuine reuse and exchange of information, reduce data redundancies within Enel and, more generally, reduce the amount of time and resources wasted on exchanging information flows.

Machine learning and predictive maintenance

The use of machine learning technologies has been adopted to make it possible to conduct predictive analysis for the maintenance of electricity distribution and generation facility components, identifying faults early and taking action before the

occurrence of breakdowns of major components, which would reduce the availability of the facilities. On one hand this has enabled the quality of the service provided to be improved, thus making it more sustainable over time, and on the other it has improved the use of internal resources and increased the levels safety at work, enabling inspections to be concentrated on the equipment most exposed to risk of failure.

Circular digital assets

The life cycle management of IT equipment is conducted both by extending its useful life through implementing initiatives aimed at extending the life of devices, for example offering employees the possibility to purchase disused equipment, and by using reuse and recycling when the equipment enters its end-of-life phase.