



The transition we are going through will radically change the face of the electricity system. According to the international agreements implemented by the National Integrated Plan for Energy and Climate, the share of total energy consumption met by renewables in Italy should reach 30% by 2030. The International Energy Agency (IEA) has calculated that for every euro spent on new power generation, more than one euro will need to be invested in grid infrastructure. As transmission and system operators, located in Italy and the heart of Europe, we are working to bring about all aspects of this transformation. ”



35%

OF ITALY'S DEMAND  
MET BY RENEWABLES

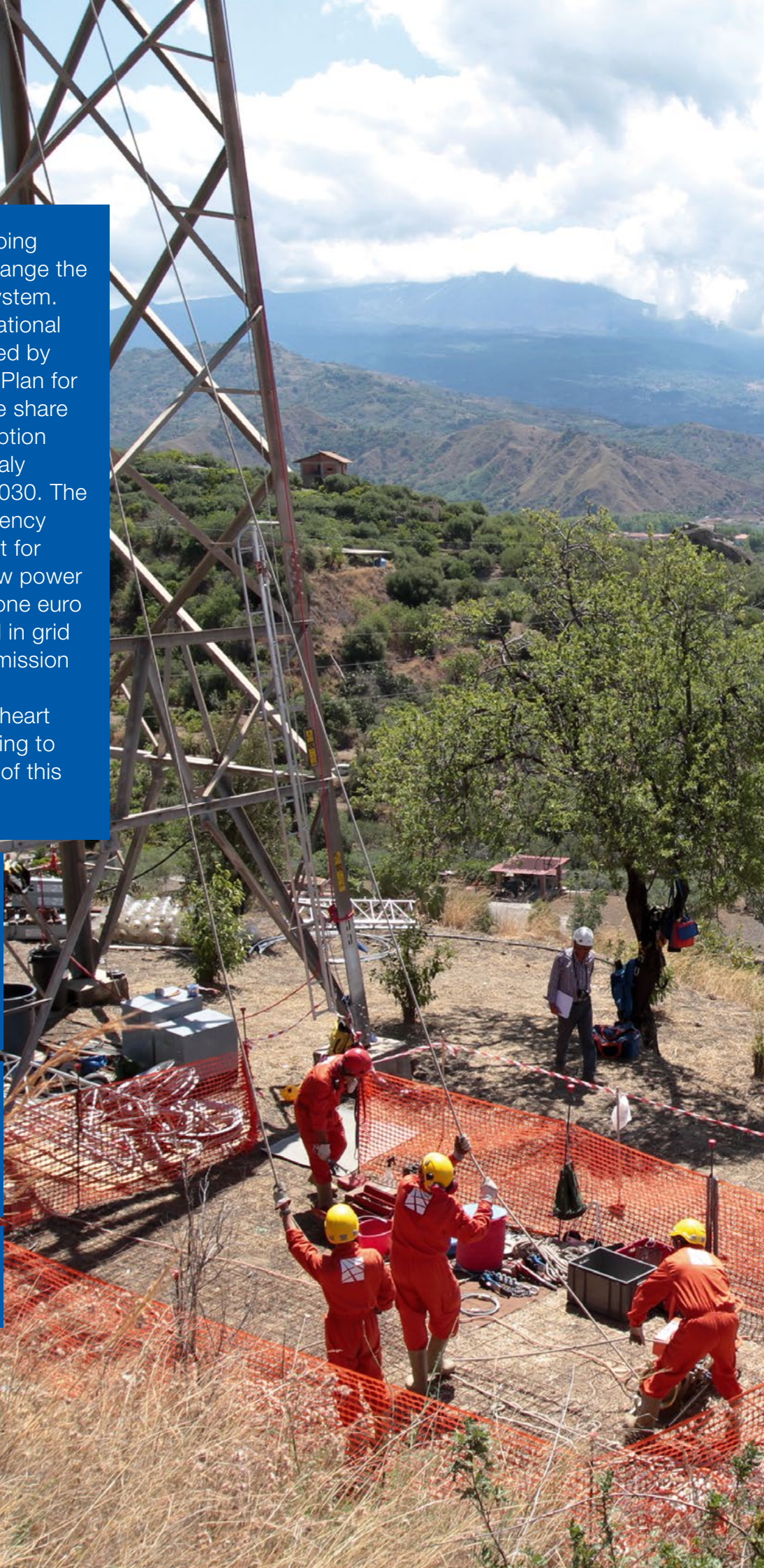
15%



TERNA'S SHARE OF THE €96 BILLION  
EARMARKED FOR DEVELOPMENT  
OF THE ENERGY INDUSTRY IN ITALY

+0.4%

ENERGY DEMAND  
IN 2018







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## The energy environment



# Macroeconomic environment

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Global economic expansion has continued, whilst showing signs of a slowdown compared with 2017. In the euro area, this trend was associated with the uncertainties generated by trade wars, Brexit and more specific geopolitical issues.

In 2018, the **Italian economy gradually weakened**, after a favourable start encouraged by the positive conditions that characterised 2017.

Moderate expansion  
at global level

**Global economic expansion** continued, albeit with a modest slowdown compared to 2017. In 2018, however, the synchronous growth phase was interrupted. The United States saw accelerated GDP growth, supported by expansionary fiscal measures, whereas in the euro area and Japan GDP growth was less dynamic than in the previous year. Economic expansion also weakened in emerging economies, which were affected by a strengthening dollar and the resulting financial tensions.

Slowing GDP  
in the euro area

The latest estimates for the euro area in 2018 put GDP growth at 1.8%, marking a slowdown compared with the 2.4% growth recorded in 2017, which is the highest figure for the last ten years (source: Eurostat release of 14 February 2019). **The slowdown is linked to the increase in uncertainty factors** generated by trade wars, the Brexit process and other more specific geopolitical elements. During the year, monetary policy continued to strike an expansionary note, despite the reduction in the volume of securities purchased by the ECB.

In 2018, the Italian economy registered GDP growth of 0.9%, slipping back from the 1.6% growth achieved in 2017 (source: ISTAT, Italy's Office of National Statistics, March 2019). Annual growth was driven by domestic demand. However, signs that the economy was running out of steam emerged during the year, resulting in a technical recession as a contraction in GDP was registered in the last two quarters of 2018, after sixteen quarters of continuous growth. The economic slowdown, while partly due to absence of the positive conditions of 2017, was also affected by an upsurge in internal and external elements of uncertainty. These factors have weighed heavily on business confidence, leading end consumers and investors to think hard before going ahead with their plans.

+1.5%  
Italian Industrial  
output in 2018

**Industrial production also shows signs of weakness.** In 2018, it grew by 1.5% compared to the previous year (up 0.8% with the same number of working days), almost halving the growth recorded in 2017. In addition to this contraction, the last months of the year saw a steady slowdown in activity, with production levels below those of the previous year across almost all sectors.

## ITALIAN GDP AND KEY ECONOMIC INDICATORS IN VOLUME TERMS

% annual change in volume



# The energy sector

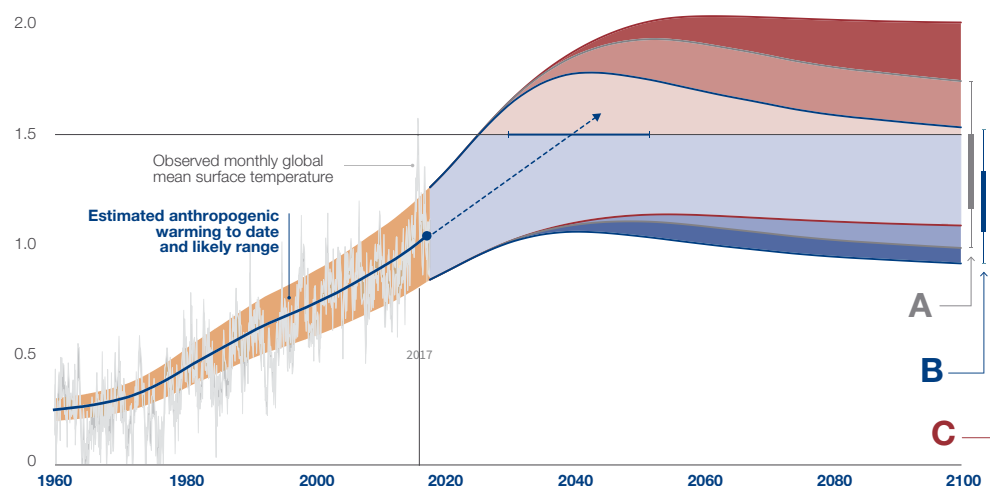
The energy transition is an irreversible process. Changes in generation technologies and consumption patterns, together with international directives and guidelines implemented via Italian energy sector regulations, require Terna to take on a leading role in the current energy transition process. Of the €96 billion of investment earmarked to develop the energy industry in Italy, Terna's investment programmes account for 15%.

## The 2019 - 2023 scenario

In order to combat global warming, international climate and energy agreements set an emissions target aimed at **keeping the rise in global temperature below 2°C compared to the pre-industrial level**, and preferably below 1.5°C (COP21 - Paris Agreement, 2015).

The IPCC\* study, published on 6 October 2018, officially announced that global warming is already within the range of 0.8 to 1.2 °C, with a rising trend of 0.2 °C per decade.

### GLOBAL WARMING COMPARED TO THE PERIOD 1850-1900 (C°)



\* Intergovernmental Panel on Climate Change

#### BASELINE SCENARIO (A)

- Global CO<sub>2</sub> emissions reach net zero by 2055.
- Emissions of greenhouse gases other than CO<sub>2</sub> will be reduced from 2030.

#### SCENARIO (B)

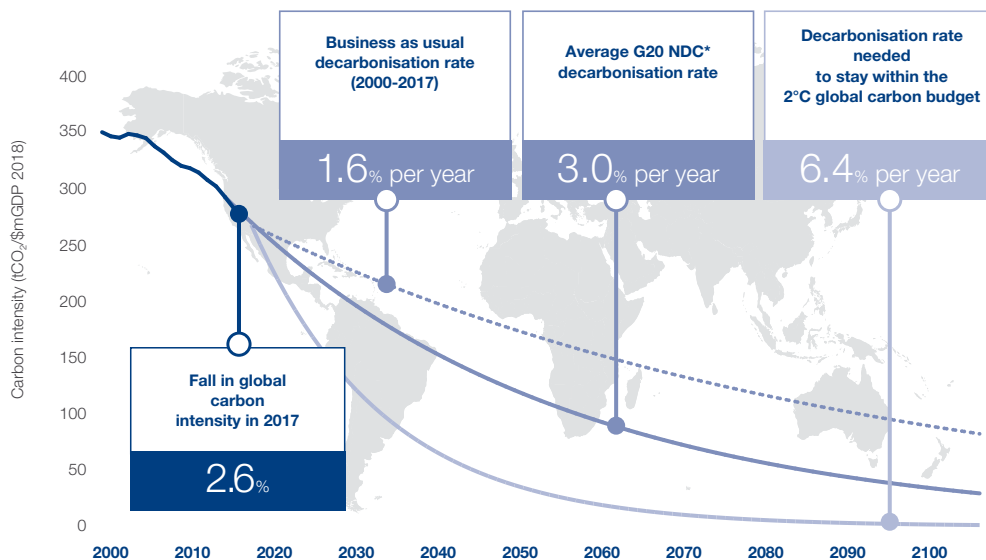
**Improvement hypothesis:** global CO<sub>2</sub> emissions reach net zero by 2040 (greater likelihood of limiting the temperature rise to 1.5 °C).

#### SCENARIO (C)

**Worsening hypothesis:** emissions of greenhouse gases other than CO<sub>2</sub> are not reduced from 2030 (less likelihood of limiting the temperature rise to 1.5 °C).

To prevent warming from rising above 2°C compared to the pre-industrial level, the global economy should commit to cutting its carbon intensity by 6.4% per year until 2100. A necessary condition for achieving the COP 21 targets is decarbonisation of the electricity sector together with acceleration of the decoupling of economic growth and energy consumption.

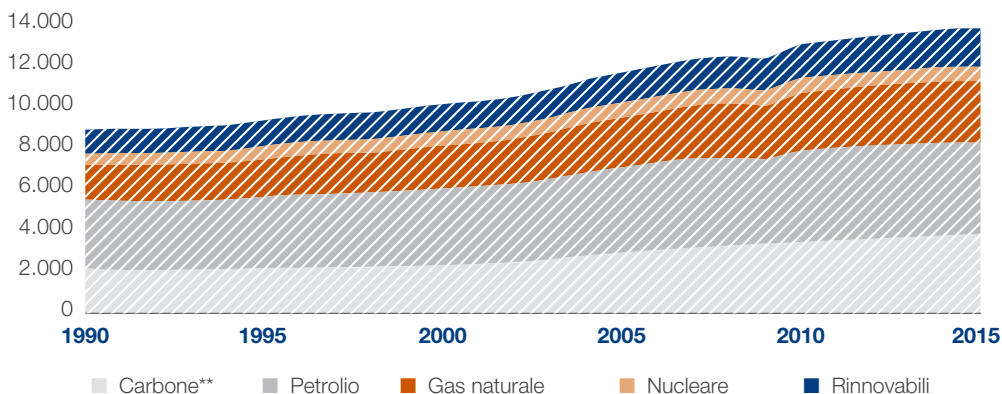
#### LOW CARBON ECONOMY INDEX 2018: TRANSITION LEVELS



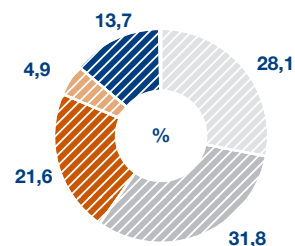
\* NDCs: nationally determined contributions

**World primary energy consumption is growing steadily.** In 2015, the RES share of primary energy consumption was approximately 14%, almost the same as 25 years previously, despite the growth of RES in the electricity sector.

#### TOTAL SUPPLY OF PRIMARY ENERGY\* AT GLOBAL LEVEL



#### 2015 LEVELS



\* Excluding electricity trading..

\*\* In the chart, peat and oil shale were aggregated with coal, where relevant.

Source: International Energy Agency 2017.



## Guidelines at european level

The 2018 European guidelines for the development of the energy sector are set out:

- in the guidelines and regulations of the European Union's **Clean Energy Package**;
- in **Regulation (EU) 2018/1999** which established the Governance of the Energy Union and Climate Action, in line with the Paris Agreement of 2015 (COP21) and the United Nations Sustainable Development Goals (SDGs).

Almost at the same time, **two Directives regarding energy sector regulations and policies were published**:

- the Energy Efficiency Directive (EU) 2018/2002;
- the Renewable Energy Directive (EU) 2018/2001.

## The United Nations SDGs

Approved by 193 member states of the United Nations in September 2015, the 17 Sustainable Development Goals (SDGs) form the heart of the 2030 Agenda, the global plan that aims to eradicate poverty and promote economic prosperity, social development and protection of the environment.

Terna is playing a central role in enabling the energy system's transition to one in which production is based on renewable sources.

For further details on Terna's commitment to the SDGs, reference should be made to the Sustainability Report.

## Key SDGs for Terna

Terna's activities and its mission coincide almost entirely with the SDGs and the related targets, especially Goals 7, 9 and 13.



Ensure access to affordable, reliable, sustainable and modern energy for all.



Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.



Take urgent action to combat climate change and its impacts.



## Resolutions at national level

In line with these guidelines, at the end of 2018 the Italian government finally prepared a **Proposal for an Integrated National Plan for Energy and Climate (PNIEC)**, carried out by the Ministry of Economic Development, the Ministry of the Environment and Protection of Land and Sea and the Ministry of Infrastructure and Transport, which provides key guidelines on the development policies for the national Energy System.

The document - which was submitted to the EU at the beginning of 2019 and will soon be subject to consultation with key stakeholders - does not differ widely from the SEN (National Energy Strategy) in quantitative terms, but it does propose some important revisions to the benchmark targets and is closely linked to the five Energy Union dimensions.



## PROPOSAL FOR AN INTEGRATED NATIONAL PLAN FOR ENERGY AND CLIMATE - PNIEC

- For final energy consumption: 116.6 Mtep by 2020 and 103.8 Mtep by 2030.
- RES to increase from 18.6% in 2020 to 30% in 2030 as a share of total energy consumption.
- In the electricity sector, the increase will be from 34.1% in 2017 to 55.4%, compared to expected gross domestic electricity consumption.
- Competitive auction mechanisms.
- Promotion of self-consumption for smaller power plants and renewable energy communities.
- Full deregulation of the retail market.
- Introduction of the Capacity Market.
- Development of the grid to facilitate integration with renewable production plants and resolve congestion.
- 6,000 MW expansion of central storage, pumping and electrochemical plants.
- In the industrial sector, reconversion of infrastructure to improve sustainability.
- Additional measures to combat energy poverty.

## THE 5 DIMENSIONS

Energy efficiency

Decarbonisation

Internal energy market

Energy security

Research, innovation and competitiveness

To **reduce energy demand**, it will be necessary to deploy major initiatives. The expected reduction in final energy consumption will result in overall savings of 51.4 Mtoe, and development of renewable resources that will enable an increase in the consumption of RES as a share of total consumption.

**Even more challenging are the goals set for the electricity sector**, which will see a rise in the share of total electricity consumption represented by renewables from 34.1% in 2017 to 55.4% in 2030. This will increase the amount generated from renewables to 186.8 TWh by 2030, compared with 113.1 TWh in 2017.

**Sustainable growth** will also be enabled through the development of new technologies - such as **electric vehicles** (up to 6 million vehicles by 2030, including hybrid and fully electric models) - and **applications relating to air conditioning** that ought to be used more widely, in view of the energy efficiency savings they offer. Finally, a measure adopted in the 2017 SEN for the electricity sector regarding the phase-out of coal for power generation by 2025 is maintained.

The regulatory measures regarding the **security of supply for energy**, above all electricity, are dependent on the introduction of the Capacity Market, as well as revision of the Emergency Plan for the Security of the Electricity System (*piano di Emergenza per la Sicurezza del Sistema Elettrico* or "PESSE").

There are also plans to increase the capacity of storage systems (up 6,000 MW, net of distributed stockpiles), above all through the use of pumps, and for further expansion of interconnections with neighbouring countries. **Investment in resilience**, in relation to transmission grids and interconnector projects, will also play a major role, by helping to increase the network's ability to cope with increasingly frequent extreme weather events and the emergencies they create, including boosting coordination at European level. This has taken on added importance given the structural changes currently taking place in the electricity systems of many European countries, primarily linked to progressive decarbonisation and the reduction in nuclear generation capacity.



6 million

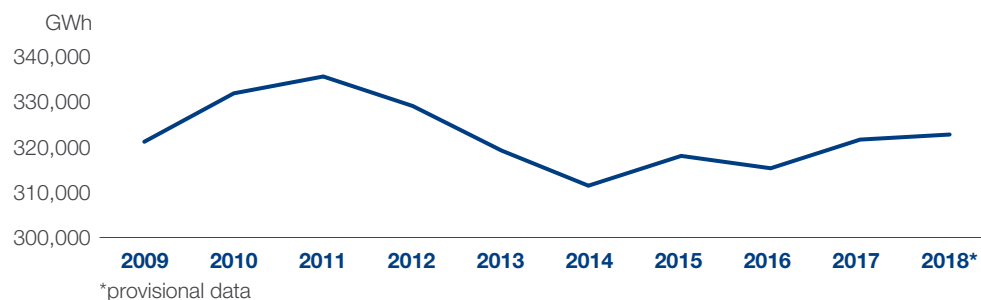
ELECTRIC VEHICLES BY 2030



## Electricity demand and production in Italy

Terna monitors domestic demand trends and takes appropriate actions, in full implementation of EU directives.

### DEMAND TREND OVER THE LAST 10 YEARS



### Demand for electricity in Italy

Demand for electricity in Italy amounted to 321,910\* GWh in 2018, an **increase of 0.4% compared with 2017**, which registered a rise of 2% compared with the previous year.

ELECTRICITY BALANCE IN ITALY (GWH)	2018**	2017	Δ	Δ%
Net production	280,234	285,265	(5,031)	(1.8)%
From overseas suppliers (imports)	47,179	42,895	4,284	10.0%
Sold to overseas customers (exports)	(3,270)	(5,134)	1,864	(36.3)%
For use in pumping***	(2,233)	(2,478)	245	(9.9)%
Total demand in Italy	321,910	320,548	1,362	0.4%

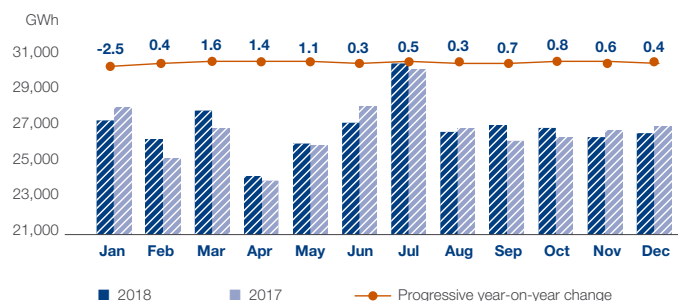
\* Does not include demand for energy for ancillary services related to electricity production.

\*\* Provisional data.

\*\*\* Electricity used for pumping water, for sole subsequent use in electricity production.

Monthly demand for electricity in Italy in 2018\* was slightly higher in most months of the year compared with the previous year.

### MONTHLY DEMAND FOR ELECTRICITY IN ITALY (2018\* vs. 2017)



\* Provisional data.



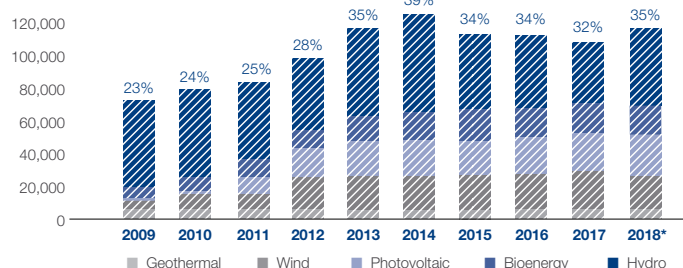
## Meeting demand and energy production

In 2018 approximately **35% of total energy demand was met by renewable energy sources**, up from 32% in 2017.

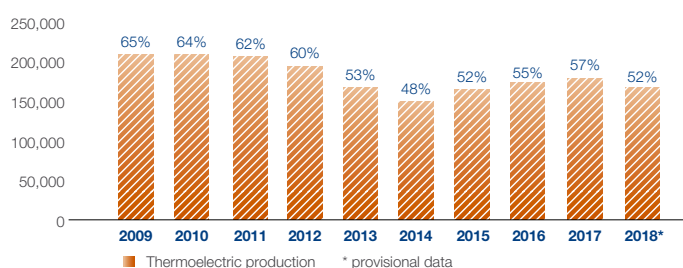
This performance is mainly due to the strong recovery of hydroelectric production (up 31% on 2017), which offsets the slight contraction in other renewable sources.

### PERFORMANCE OF PRODUCTION SOURCES IN TERMS OF DEMAND<sup>7</sup>

#### Renewable sources



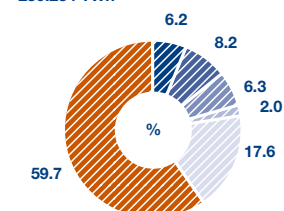
#### Traditional sources



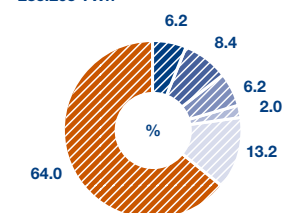
The two charts show the performance of renewable production in Italy over the last ten years, compared with the performance of thermoelectric production over the same time period.

#### NET ELECTRICITY PRODUCTION BY SOURCE

2018\*  
280.234 TWh



2017  
285.265 TWh



■ Net wind production  
■ Net photovoltaic production  
■ Net biomass production  
■ Net geothermal production  
■ Net hydroelectric production  
■ Net thermoelectric production  
\* provisional data

As can be seen from the charts, **the progressive increase in production from renewable sources has been matched by a similar reduction in thermoelectric production.**

This demonstrates Italy's commitment to observing European Community directives requiring that renewable sources account for over 27% of demand by 2020. From as early as 2012, Italy has achieved, maintained and then improved on this target.

<sup>7</sup> The percentages shown in the two charts compared refer to the share of demand met by renewable sources (blue chart) and thermoelectric sources (orange chart).



# European and international relations

We have a strategic role to play in integrating Europe's principal electricity networks: our aim is to build a more secure and efficient system for the benefit of citizens and businesses. As the leading independent grid operator in Europe, we are members of various associations at European, national and industry level.

Opportunities for engagement and dialogue are provided by Terna's membership of the **principal national and international trade associations**, as well as of the leading associations connected with sustainability issues.

## Stakeholder

ENTSO-E  
European Network of  
Transmission System  
Operators for Energy

## EUROPEAN RELATIONS

ENTSO-E is the European Network of Transmission System Operators for Electricity including 43 operators which is involved in the process of integrating national electricity markets, coordinating the secure operation of interconnected electricity systems and developing electricity transmission grids, in implementation of the EU's Third Energy Package. ENTSO-E's main objectives are to: draw up European network codes, guarantee the coordinated development of the electricity grid at European level by drawing up the European Electricity Grid Development Plan (TYNDP) and the related benchmark scenarios, and draw up the Research, Development and Innovation Plan at European level.

EASE  
European Association for  
Storage of Energy

The European association that is responsible for promoting industrial research and development in the field of electricity storage system applications in Europe and around the world and the use of this technology for the transition to a stable, flexible, sustainable and cheaper continental energy system. In particular, EASE is working on the development of a European platform for sharing information in the field of energy storage.

RGI  
Renewables Grid Initiative

An association consisting of nine European TSOs and eight environmental NGOs which aims to promote the integration of renewable energy sources through the development of electricity grids. RGI is committed to promoting strategic planning and participating in the construction of new power lines, via a meeting platform involving environmental NGOs and European TSOs.

During the year, at bilateral level, Terna initiated a series of contacts with the senior managements of European and non-European system operators, with the aim of **entering into cooperation agreements in areas of common interest**, especially in these sectors:

- technological innovation
- grid development
- electricity system operation.



Bruxelles

The **Brussels Office, which has been operating since July 2018**, was set up to strengthen Terna's links with European institutions, including from a technical standpoint, and to take advantage of the Company's technical contribution regarding European matters ahead of implementation of European legislation to reform the electricity sector (the so-called Clean Energy Package) in support of the energy transition.

## INTERNATIONAL RELATIONS

<p>An international non-profit association that conducts research regarding high-voltage grids. It has 58 member countries, and Terna has been appointed as the Chair and Vice Chair of the Italian Committee.</p>	<b>Stakeholder</b>
<p>An international association bringing together the 19 leading grid operators worldwide in order to share best practices in the management of electricity transmission grids. Terna chairs the "Reliability and security" group, which deals with the resilience of the electricity system.</p>	<p>CIGRE - Conseil International des Grands Réseaux Electriques (International Council on Large Electric Systems)</p>
<p>This association brings together the TSOs from 19 Mediterranean countries, with the aim of promoting the standardisation of development plans and the coordinated management of grids. The association also works to facilitate the creation of a legislative and regulatory framework designed to drive the development of interconnection projects and promote the exchange of electricity between electricity systems in the Mediterranean area. Terna hosts the association's registered office and operational headquarters in Rome and appoints its Secretary General, as well as chairing the Technical Committee, which is responsible for planning the Mediterranean electricity grid.</p>	<p>GO15 Reliable and Sustainable Power Grids</p>
<p>The associations aim to promote renewable energy and energy efficiency projects in the southern Mediterranean and sub-Saharan Africa, enabling the development of projects in these areas to meet local energy needs.</p>	<p>Med-TSO Mediterranean Transmission System Operators</p>
<p>The Italian national committee of the WEC, an international organisation that brings together operators from over 90 countries, with the aim of promoting a sustainable energy system worldwide.</p>	<p>RES4MED&amp;AFRICA (Renewable Energy Solutions for the Mediterranean &amp; Africa)</p> <p>WEC (World Energy Council (Italian committee))</p>

During 2018, in addition to consolidating its presence in industry associations, Terna actively participated in **World Energy Week held in Milan** in October, which was attended by the world's leading energy experts to discuss the current energy transition.

In addition, in synergy with this event, **Terna hosted a meeting of the CEOs of the 19 largest electricity system operators in the world belonging to the GO15 association**, which focused on the importance of having increasingly resilient and sustainable electricity infrastructure as a key factor in the energy transition.

The Company also continued to participate in the activities of organisations with a broader thematic scope (such as Diplomacy, the Council on Foreign Relations, etc.) in order to monitor the socio-political and economic contexts in which to develop or consolidate its business, focusing its attention on Latin America and the Mediterranean basin. In Latin America, in 2018 Terna joined the regional body, **CIER (Comision de Integracion Energetica Regional)**, participated in by energy companies and local authorities, which pursues the objective of regional energy integration through cooperation between its members.



# Regulatory environment

We operate as a natural monopoly in a market regulated by the Regulatory Authority for Energy, Networks and the Environment (ARERA).

Regulated revenue accounts for approximately 86% of the Group's total revenue

Regulated revenue, which represents approximately 86% of the Group's total revenue, mostly derives from transmission and dispatching, subject to regulation by the **Regulatory Authority for Energy, Networks and the Environment (ARERA)**.

In Resolutions 653/2015/R/eel, 654/2015/R/eel and 658/2015/R/eel, ARERA set the tariff regime for electricity transmission, distribution, metering and dispatching services and regulations regarding the quality of the transmission service for the 2016-2023 regulatory period (the fifth regulatory period). This period has been divided into two sub-periods: NPR1 (2016-2019) and NPR2 (2020-2023).

In the first four years, the situation is essentially in line with the past, despite a number of changes and, more generally, a **greater emphasis on output-based regulation**. Instead, for the second-four-year period, ARERA has adopted a new method of regulation for the transmission service, involving the recognition of costs based on the total expenditure incurred (operating expenses and capital expenditure), also known as the **"TOTEX"** approach. Subsequently, in consultation document no. 683/2017/R/eel containing the first guidelines for the introduction of incentive regulation schemes based on overall control of expenditure, ARERA specified a period of 30 months between the decision to adopt TOTEX methodology and its actual implementation. Given that, at the date of publication of this document, the decision to actually adopt TOTEX methodology has not yet been taken, it seems unlikely that the TOTEX approach could start before 2022.

In Resolution 583/2015/R/com, ARERA announced the procedure for determining and revising the **Weighted Average Cost of Capital (WACC)** for a period of six years (2016-2021). This applies to infrastructure services in the electricity and gas sectors and is subject to revision, mid-way through the period, which, with Resolution 639/2018/R/COM, enabled adjustment of the WACC in a predictable and transparent manner in keeping with the economic cycle. The WACC the period 2019-2021 has been set at 5.6%. This is a vital element in guaranteeing revenue stability, a key factor in enabling Terna to complete the substantial investment programme needed to meet the challenges of the energy transition.

A number of key aspects of regulation in the period NPR1 are described below, with regard to allowed revenue for transmission and dispatching services.

**Transmission revenue** makes up the most significant portion of regulated revenue and is generated from application of the related transmission charge (**TC**), billed by Terna to distributors connected to the National Transmission Grid. This charge pays for the transmission services provided by all transmission service operators, including the owners of residual portions of the grid (external to the Terna Group), and is divided into two components: a power component (equal to 90% of revenue, expressed in euro cents/kW/year) and an energy component (10% of revenue, expressed in euro cents/kWh).

Transmission revenue makes up the most significant portion of regulated revenue

The **dispatching service charge (DSC)** aims to recompense Terna for carrying out the activities relating to the dispatching service and is billed by Terna to users of the dispatching service in proportion to the quantity of energy dispatched.

Allowed costs that combine to determine the TC and DSC components are attributable to three main categories, as summarised below:

#### THE THREE MAIN TYPES OF ALLOWED COST

Determined on the basis of the Regulated Asset Base (RAB) and the Weighted Average Cost of Capital (WACC). The RAB represents net invested capital for regulatory purposes. It is revalued annually on the basis of data from ISTAT (Italy's Office of National Statistics) on the change in the deflator applied to gross fixed investment and revised on the basis of the performance of investment and disposals. The WACC<sup>8</sup> represents the weighted average cost of equity and debt.

The methods of determining and revising the WACC are established by the regulator.

1. To cover the return on capital (RAB)

Allowed depreciation (calculated on the basis of an asset's useful life for regulatory purposes) is revalued annually based on the change in the deflator applied to gross fixed investment.

2. To cover depreciation

Allowed costs are determined by the regulator at the beginning of the regulatory period, based on operating costs recognised during the relevant year (which, in the case of NPR1, was 2014) and increased by any remaining portions of additional efficiencies achieved in the previous two regulatory periods.

3. To cover operating costs

The resulting amount is revalued annually to take account of inflation and reduced by an efficiency factor designed to ensure that additional efficiencies are, over time, passed back to end users in full.

<sup>8</sup> The real pre-tax regulatory WACC for the transmission service was 5.3% for the period 2016-2018, and is set at 5.6% for the period 2019-2021.