

TERNA: 2023 DEVELOPMENT PLAN FOR THE NATIONAL ELECTRICITY GRID PRESENTED

OVER €21 BILLION IN INVESTMENTS, +17% COMPARED TO THE PREVIOUS TEN-YEAR PLAN, TO ACCELERATE THE ECOLOGICAL TRANSITION AND GUARANTEE ITALY'S ENERGY SECURITY

INNOVATIVE *HYPERGRID* PROJECT UNVEILED: €11 BILLION FOR FIVE NEW ELECTRICITY BACKBONES THAT WILL DOUBLE THE EXCHANGE CAPACITY FROM THE SOUTH TO THE NORTH

MORE THAN 30 STRATEGIC INFRASTRUCTURE PROJECTS TO MEET NATIONAL AND INTERNATIONAL DECARBONISATION TARGETS: FURTHER CONSOLIDATION OF TERNA'S ROLE AS DIRECTOR OF THE ENERGY TRANSITION

Rome, 15 March 2023 – Enable the achievement of the European targets set by the “Fit-for-55” package, promote the integration of renewable sources, develop international interconnections, increase the security and resilience of the electricity system, and invest in grid digitalisation. These are the pillars of the **2023 Development Plan** of the national transmission grid presented today by Terna: **over €21 billion of investments** in the next 10 years, 17% more than the previous Plan, to accelerate the energy transition, promote decarbonisation across the Country, reduce dependence on foreign supply sources, and increase the environmental sustainability of the Italian electricity system. Considering the entire lifespan on the projects of the *Development Plan* beyond its ten-year horizon, total investments will amount to more than **€30 billion**.

The new Plan of the company chaired by **Valentina Bosetti** and led by **Stefano Donnarumma** was presented today during a press conference attended by **Gilberto Pichetto Fratin**, Minister of the Environment and Energy Security, and **Stefano Besseghini**, President of ARERA, the Italian Regulatory Authority for Energy, Networks and Environment.

The main new feature introduced by the *2023 Development Plan* is the **Hypergrid** network, which will leverage the technologies of the HVDC (High Voltage Direct Current) transmission system to achieve the energy transition and security targets. In addition to the development projects that have already been announced, Terna has planned **five new electricity backbones** designed to integrate renewable energy capacity, backed by investments totalling **€11 billion**. The project involves a major

modernisation of the existing power lines on the Tyrrhenian and Adriatic backbones on the mainland and towards the islands, and - a first for the company - the construction of new undersea 500 kV connections. With Hypergrid it will be possible to double the exchange capacity between market zones from the current 16 GW to **over 30 GW**. The development of the direct current backbones will also minimise land use and the impact on the landscape.

*“The investments included in the 2023 Development Plan are Terna's highest ever and will have a decisive enabling effect on the energy transition and the achievement of the targets adopted by Europe and Italy”, said **Stefano Donnarumma, CEO of Terna**. “In today's particularly challenging context, long-term planning has never been so important, a coordinated effort between institutions that enables Italy to seize all the opportunities that the transition brings with it. Renewable sources are our oil: enabling their distribution and integration is part of our mission as directors of the electricity system and will be a determining factor in ensuring Italy's energy security.”*

The projects planned by Terna will make significantly contribute to the achievement of the targets set at European level by the “**Fit-for-55**” measures' package, which aims to achieve a **55% reduction in CO₂ emissions by 2030** compared to 1990 levels. In Italy, renewable energy will need to cover at least 65% of end consumption in the electricity sector by 2030, compared to the 55% initially set out in the National Integrated Energy and Climate Plan (PNIEC), for a total of **70 GW of additional power**.

According to Terna's data, at the end of January 2023 requests for connection to the high-voltage grid from new renewable power plants reached **around 340 GW**, of which **approximately 37% was from solar and 54% from onshore and offshore wind power**, around five times higher than the targets Italy has set itself for 2030. In further confirmation of its increasing commitment to provide and distribute high quality data to stakeholders, at the end of February Terna launched **Econnexion**, a platform that provides the capability to consistently and constantly monitor these initiatives, representing a key tool for planning the development of infrastructure for electricity networks, renewable sources and accumulation systems.

In particular, the significant investments planned by Terna for the electricity transmission grids to benefit the national system will serve to **increase the meshing and reliability of the network, to strengthen the backbones between the South** (where the production of electricity from renewable sources is greater) **and the North** (where demand for electricity is more sustained), **to enhance connections between the islands and the mainland**, to develop infrastructures on the two largest islands, and to improve the resilience, efficiency, sustainability and integration of renewables.

The timeline for the authorisation and implementation of the works in the context of the rapidly evolving energy generation and demand scenarios will be crucial. In this regard, Terna will adopt a modular approach to develop a flexible investment model that will allow the development of new grid infrastructure that reflects the actual energy scenario. To this end, the planning and authorisation procedures for the new Hypergrid projects will be immediately launched so that they can be implemented in line with the priorities of the system to **prepare the grid to absorb the new renewable installed capacity**.

The projects integrated into the new plan aim to achieve a total reduction in **CO₂ emissions** of up to 12,000 kt/year by 2040, a testament to the company's constant commitment to guarantee a sustainable future for the next generations.

GUIDELINES OF THE 2023 DEVELOPMENT PLAN

In the new *Development Plan*, now published every two years, Terna has introduced over **30 infrastructure projects**, prioritising those deemed strategic for the entire national electricity system, maintaining the projects announced in the previous ten-year Plan, and incorporating the new projects of the Hypergrid network.

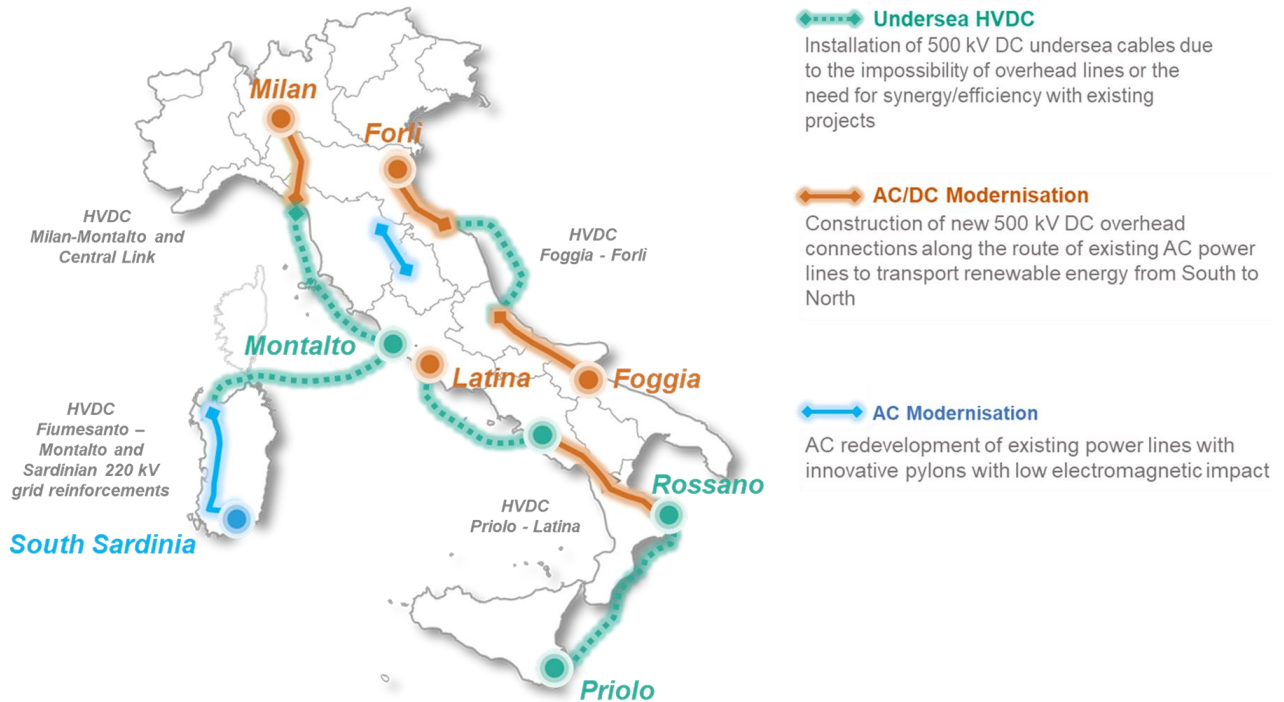
These are the guidelines of the *2023 Development Plan*:

- increase the exchange capacity between market zones by developing enabling and innovative infrastructures.
- Enhance synergies between infrastructure with planned strategic projects, such as the Tyrrhenian Link and the Adriatic Link, and use of existing infrastructure and decommissioned sites to supplement the grid, while also reducing the environmental impact.
- Enable renewable energy sources.
- Increase grid resilience with a forward-looking approach to measure grid risk in the case of extreme weather events.

THE KEY PROJECTS OF THE HYPERGRID NETWORK

The Hypergrid - a project comprised of overhead and undersea HVDC (High Voltage Direct Current) connections - represents a **cost-effective and competitive solution** to develop the national transmission grid. The use of direct current technology and, in some cases, innovative Alternative Current (AC) pylons, will also reduce the electromagnetic field of the power lines and deliver several environmental advantages over normal AC systems.

Figure 1: the new Hypergrid works



The Hypergrid is comprised of five backbones that **pass through most of the Italian regions:**

- **HVDC Milan-Montalto:** the project will serve to balance the transit between Lazio and Tuscany and safely transfer surplus energy from Central Italy to the northern regions that typically have a higher energy demand. The power line will connect **Lazio to Lombardy** with an over 400 km backbone and will include an undersea section from Montalto (Viterbo) to Avenza (Massa Carrara), as well as the modernisation and reconversion to 500 kV direct current of overhead power lines from the area of Avenza to the south of Lombardy. The converter substations will be built on decommissioned industrial sites to provide greater sustainability and synergy with the existing infrastructure. **Investments totalling around €2.7 billion** have been allocated to the project.
- **Central Link:** the project involves the reconstruction of the 220 kV power lines between **Umbria and Tuscany**, following the existing route, and will connect the substations at Villavalle (Terni) and Santa Barbara (Arezzo). The development of the work will enable the safe transfer of energy from Central Italy to the load area of Tuscany. The **total capital expenditure of the project is estimated to be around €300 million.**
- **Sardinian Backbone:** the project will maximise the integration of renewable energy and strengthen the island's electricity grid. It involves the development of two new infrastructure works: the first, the **Sa.Pe.I.2**, consists of a new undersea direct current connection with an output of 1,000 MW between the substations of Fiumesanto (Sassari) and Montalto (Viterbo).

The converter substations will be built on decommissioned industrial sites to provide greater sustainability and synergy with the existing infrastructure.

The second one is the **Sardinian Link**, which involves the reconstruction of the Sardinian 220 kV grid from Codrongianos (Sassari) to Sulcis (South Sardinia) and Selargius (Cagliari), using innovative pylons with a low electromagnetic impact. The work - more than 500 km - will help to deliver an exchange capacity of 1,000 MW between the north and south of the island, and will enable the integration of renewables, including energy generated by offshore wind technology. Total investment for both projects is estimated to be in the region of **€1.4 billion**.

- The **Ionian-Tyrrhenian Backbone** will connect the Ionian coast of Sicily to Lazio and will be composed of two sections: **the HVDC Ionian Link, from Priolo (Siracusa) to Rossano (Cosenza) and the HVDC Rossano – Montecorvino (Salerno) – Latina connection**, through an overall 800 km infrastructure. The HVDC Ionian Link consists of a new undersea connection with an output of 1,000 MW to promote the transmission of renewable energy between Sicily and Calabria. The undersea stretch between Montecorvino and Latina will serve to transport renewable energy from the south to the central regions. The Rossano-Montecorvino connection will use existing power lines. The backbone will create another connection between Sicily to the mainland, in synergy with other planned works. The converter substations will be built on decommissioned industrial sites to provide greater sustainability and synergy with the existing infrastructure. Overall, the total capital expenditure of the Ionian-Tyrrhenian Backbone is expected to be around **€4.1 billion**.
- The **Adriatic Backbone** is represented by the **HVDC Foggia-Villanova-Fano-Forlì connection** which will link the northern part of **Apulia to Emilia Romagna, passing via Abruzzo and Marche regions**, for a total length of over 500 km. The project will help to reduce grid congestion in areas characterised by strong renewable production such as Apulia. The works will be developed in two phases: the first phase consists of an overhead HVDC connection between Foggia and Villanova (Pescara) and the doubling of the Adriatic Link with a new undersea connection, while the second phase involves the construction of an overhead HVDC connection between Fano (Pesaro Urbino) and Forlì. It is a major project that will integrate seamlessly with the planned works to transport renewable energy from the regions of the south to the northeast: in fact, Veneto has the second highest energy demand in Italy after Lombardy. **Around €2.4 billion** will be invested in the project.

The project's priorities were chosen to maximise the advantages for the electricity system considering the current energy scenarios and the development works of previous plans. Specifically, top priority has been given to the HVDC Montalto-Milan, the Central Link and the HVDC Fano-Foggia backbones, that will considerably increase transport capacity from the Central South to the Central North.

OTHER KEY PROJECTS OF THE 2023 DEVELOPMENT PLAN

In line with the previous Plan, the main projects that will be completed in the first five years include various works of national interest:

- The 380 kV **“Colunga-Calenzano”** power line, which runs for 84 km between the provinces of Bologna and Florence. The infrastructure, for which an investment of around €250 million is planned, of which €70 million has already been spent, will ensure a significant increase in the exchange capacity between the North and Centre-North, strengthening the meshing of the area's electricity grid.

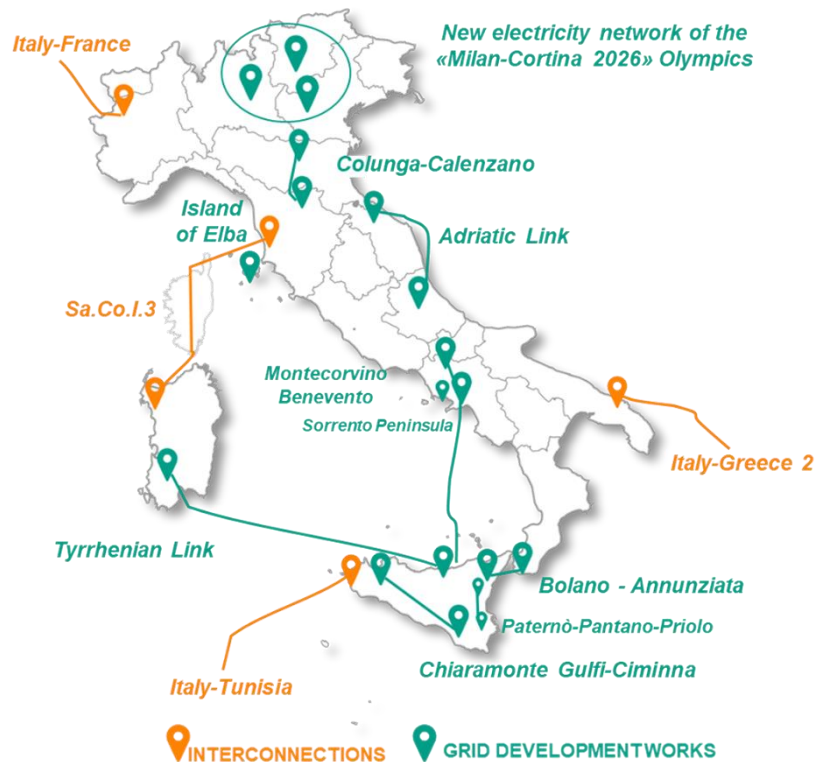


Figure 2: other key projects of the 2023 Development Plan

- The 380 kV **“Chiaramonte Gulfi-Ciminna”** power line, which extends for over 170 km through the provinces of Agrigento, Caltanissetta, Catania, Enna, Palermo and Ragusa. The power line will be the first very high voltage connection in the western part of Sicily and, thanks to an investment of around €480 million, will significantly improve the quality of the regional grid, favouring production from renewable sources. The work was authorised by the Ministry at the end of 2021.
- The 380 kV **“Paternò-Pantano-Priolo”** power line, which will extend for 60 km between Catania and Siracusa, will increase the safety and flexibility of the grid and will enable the decommissioning of over 150 km of old overhead lines. For this project Terna has allocated investments of around €325 million, of which €218 million have already been incurred.
- The project to redevelop and restructure the 150 kV electricity grid of the **Sorrento peninsula** will enable the removal of almost 60 km of obsolete overhead power lines, freeing up valuable land in a highly tourism-focused area.

The following will also come into operation during the period of the Plan:

- The **Tyrrhenian Link**, the 500 kV HVDC submarine cable that will connect Sicily with Campania and Sardinia, thanks to investments of around €3.7 billion. The infrastructure will allow for greater integration between the different market zones and more effective use of the flows of energy from renewable sources. The eastern section of the project (“Campania-Sicily”) was authorised by the Ministry of the Environment and Energy Security in September 2022, while the authorisation procedure for the western section (“Sicily-Sardinia”) is underway. The work is due to be completed by 2028.
- The **Adriatic Link**, the 1000 MW HVDC connection between Abruzzo and Marche which extends for around 250 km, of which 210 km are undersea, with total capital expenditure in the region of € 1.3 billion. The authorisation procedure was launched recently and the work is due to enter into operation in 2028, two years ahead of initial estimates. The project will play a major role in the development, integration and transfer of energy produced by the many wind and photovoltaic plants in the South of Italy to the energy-intensive hubs of the North.
- The new “**Bolano-Annunziata**” 380 kV AC connection between Sicily and Calabria, which will allow the exchange of electricity between the island and the continent to be increased to a total of 2,000 MW, benefiting the development of renewable sources planned in Southern Italy. For this project, Terna has planned to invest approximately €175 million. The Ministry of the Environment and Energy Security began the authorisation procedure in January 2023.
- The new electricity network of the “**Milan-Cortina 2026**” Olympic and Paralympic Games will increase energy reliability in the regions where the Winter Olympics are to be held in February and March 2026, while also ensuring a reduced impact on the landscape. Specifically, Terna has planned 12 technologically advanced projects, involving the construction of approximately 130 km of power lines. For the new entirely “invisible” underground power lines in Lombardy, Veneto and the Autonomous Provinces of Trento and Bolzano, Terna has allocated investments for over €200 million.
- The submarine power line between the **Island of Elba** and the mainland. The €140 million infrastructure, which will extend for 37 km and will be completely “invisible”, will help to improve the quality of local electricity services, guaranteeing important benefits in terms of safety, reliability, and environmental sustainability. Terna started works to lay the undersea cable for the 132 kV connection at the end of February.
- Connection development works have been planned to promote the **integration of renewable energy plants** in line with European and national targets (+70 GW by 2030), **supported by over €1 billion in investments** across the Plan's ten-year horizon.

CROSS-BORDER INTERCONNECTIONS: ITALY, A EUROPEAN AND MEDITERRANEAN ELECTRICITY HUB

In line with the previous ten-year plans, Terna is aiming at strengthening and developing cross-border interconnections, with a **total capital expenditure of about €2 billion**. In fact, an interconnected grid contributes to the achievement of energy transition targets, enabling greater integration of renewables in a safe and efficient way.

The interconnection between **Italy and Tunisia** is an important and strategic project that will optimise the distribution of energy resources between Europe and North Africa. In December 2022, the Ministry of the Environment and Energy Security began the authorisation procedure for the 600 MW high voltage energy bridge in which Terna and Steg, the Tunisian electricity grid operator, will invest approximately €850 million. Of these, €307 million will be funded by the Connecting Europe Facility, the European Union fund established to support key projects that aim to optimise energy infrastructure in the EU.

The **Sa.Co.I.3** project, a connection that links the electricity systems in Sardinia, Corsica, and the Italian mainland, is also confirmed in the 2023 *Development Plan*, with total investments of €950 million.

Furthermore, in the second half of 2023 Terna will launch the public consultation for the new undersea cable with **Greece**, a 200 km-long 500 MW connection that will double the exchange capacity between the two countries. Terna will invest approximately €750 million in this project.

These interconnections, together with the power lines between **Italy-France**, **Italy-Switzerland** and **Italy-Austria** will allow the Country, by virtue of its strategic geographical position, to strengthen its role of energy hub in Europe and the Mediterranean area, becoming a leading player internationally.

THE 2023 DEVELOPMENT PLAN ON THE TERNA APP

The 2023 *Development Plan* is now digital, thanks to a dedicated section **on the Terna app**. Users will be able to view the main projects and grid development works, along with accessible multimedia content, on their own mobile devices. The app will introduce the key projects for the energy transition and enable users to explore extra content in four different sections: reference context, the planning process, development projects, benefits for the system. The app contains all of the essential data on the Italian energy system, along with **a constantly updated information box on the CO₂ savings associated with the renewable evolution of energy production sources**.



Apple Store <https://apps.apple.com/it/app/terna/id1458535498>



Google Play Store: <https://play.google.com/store/apps/details?id=it.terna.energia>

Terna's *2023 Development Plan* is available at the following link: <https://www.terna.it/en/electric-system/grid/national-electricity-transmission-grid-development-plan>

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